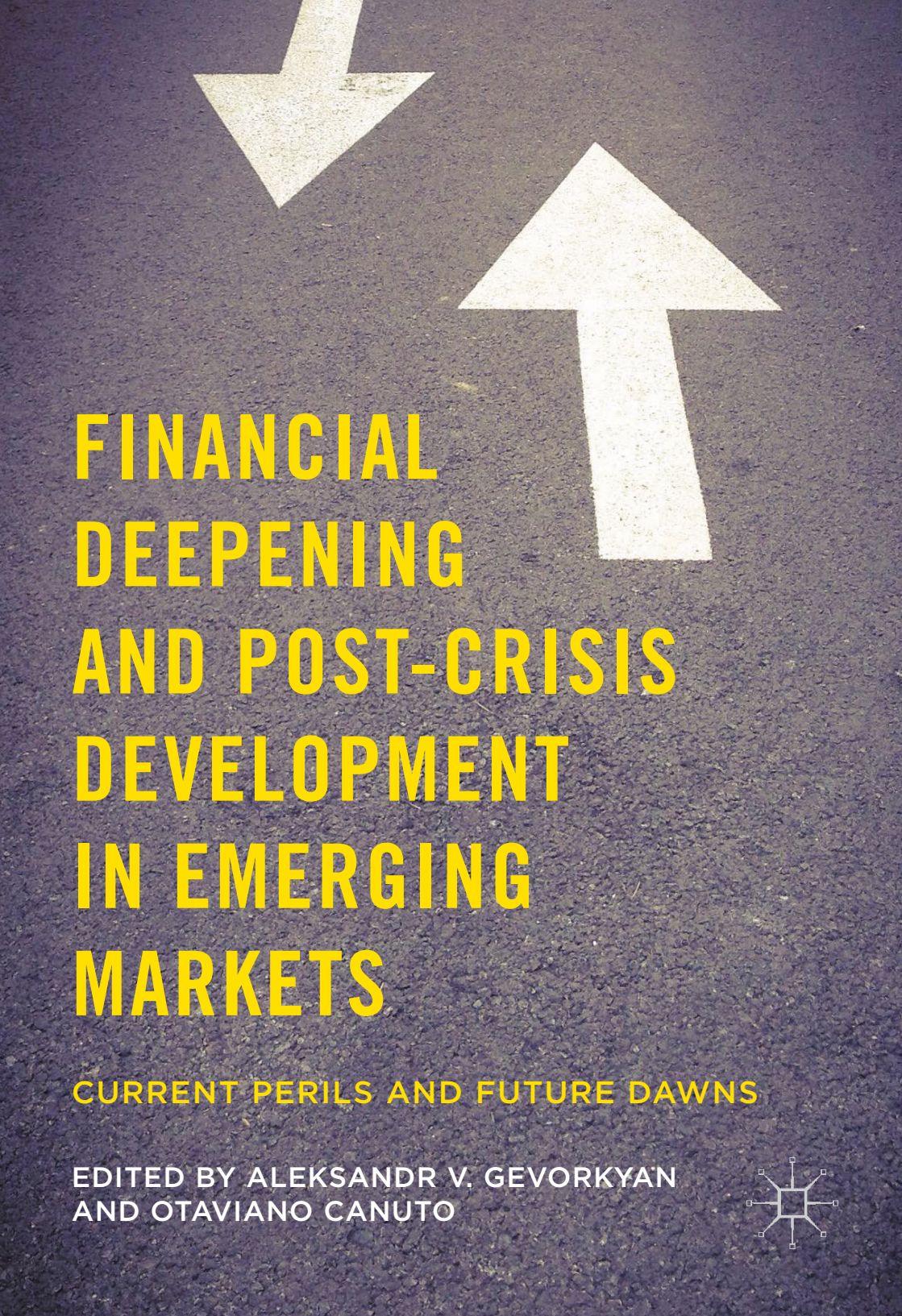

FINANCIAL DEEPENING AND POST-CRISIS DEVELOPMENT IN EMERGING MARKETS

CURRENT PERILS AND FUTURE DAWNS

EDITED BY ALEKSANDR V. GEVORKYAN AND OTAVIANO CANUTO

Aleksandr V. Gevorkyan • Otaviano Canuto
Editors

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Current Perils and Future Dawns

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CHAPTER 1

Emerging Markets and the Post-2008 World

Aleksandr V. Gevorkyan and Otaviano Canuto

1.1 Introduction

This volume is about a diverse mix of experiences across a broad group of emerging markets in the post 2007–2008 crisis environment. The term "emerging markets" became popular at the beginning of the 1990s to designate some developing economies that were then being incorporated into massive flows of global finance. The category remained strong since then as a reference for those economies that were developing fast and differentiating themselves from other developing countries, while not yet belonging to the club of advanced economies.

Risks and opportunities to sustainable macroeconomic development vary across this wide variety of countries, shaped by a long list of country-specific factors and degrees of global exposure. Our book covers a wide range of issues on theoretical and empirical grounds, going

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from generic, country group, to country-specific analyses. Before outlining those issues, it is worth approaching a recent broader story of hype and gloom about emerging markets' prospects that serves as a common background.

1.2 Emerging Markets and the Switchover of Global Locomotives: From Hype to Gloom

While advanced economies at the center of the post-2008 global economic crisis were going through their process of putting their houses in order, emerging markets as a group seemed to be on the way to become the new engine of global growth, leading some analysts to talk about a switchover of global locomotives (Canuto 2010). Prior to the global financial crisis, not only had those economies been on a path of convergence of per capita income levels toward the ones of advanced economies but also their post-2008 resilience seemed to point to their ability to keep high growth rates going on. Such a "decoupling" might even make them able to rescue advanced economies from their macroeconomic quagmire.

However, analyses of common emerging economies' prospects oscillated rapidly from hype to gloom over the last three years. More recently, the enthusiasm about these countries' post-2008 economic resilience and growth potential has given way to bleak forecasts, with economists like Ricardo Hausmann declaring that "the emerging-market party" is coming to an end (Hausmann 2013).

Many now believe that the broad-based growth slowdown in emerging economies since 2013 is not cyclical but is instead a reflection of underlying structural flaws. That interpretation has contradicted those (including one of ours, see Canuto 2011) who, not long ago, were anticipating a switchover in the engines of the global economy, with autonomous sources of growth in emerging and developing economies compensating for the drag of struggling advanced economies.

To be sure, the baseline scenario for the post-crisis "new normal" has always entailed slower global economic growth than during the pre-2008 boom. For major advanced economies, the financial crisis marked the end of a prolonged period of debt-financed domestic consumption, based on wealth effects derived from unsustainable asset-price overvaluation. The crisis thus led to the demise of China's export-led growth model, which had helped to buoy commodity prices and, in turn, bolster gross domestic product (GDP) growth in commodity-exporting developing countries.

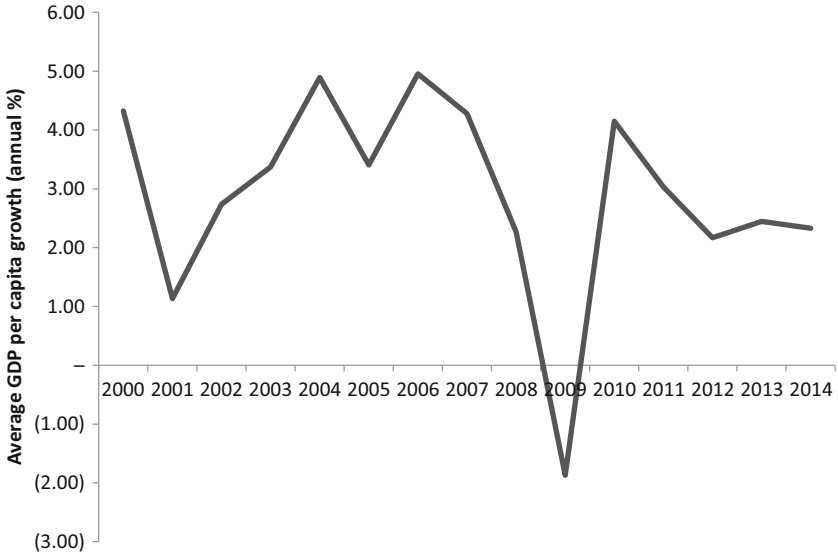

Fig. 1.1 Average GDP per capita growth rate for the MSCI emerging markets group. *Source*: Authors' estimates based on the WDI (2015) data

Against this background, a return to pre-crisis growth patterns could not reasonably be expected, even after advanced economies completed the deleveraging process and repaired their balance sheets. But developing countries' economic performance was still expected to decouple from that of developed countries and drive global output by finding new, relatively autonomous sources of growth. Consider Fig. 1.1 that shows average growth rate for the Morgan Stanley Capital International (MSCI) Index (MSCI 2015) emerging markets group since 2000 reaching the peak by 2008, plunging in 2009, and yet gaining traction of the pre-crisis years. Note also that the crisis reaches the emerging markets in 2009 with a considerable lag—a factor in the initial optimistic reports on the global recovery at the time.

According to this view, healthy public and private balance sheets and existing infrastructure bottlenecks would provide room for increased investment and higher total factor productivity in many developing countries. Technological convergence and the transfer of surplus labor to more productive tradable activities would continue, despite the advanced economies' anemic growth.

At the same time, rapidly growing middle classes across the developing world would constitute a new source of demand. With their share

of global GDP increasing, developing countries would sustain relative demand for commodities, thereby preventing prices from reverting to the low levels that prevailed in the 1980s and 1990s.

Improvements in the quality of developing countries' economic policies in the decade preceding the global financial crisis—reflected in the broad scope available to them in responding to it—reinforced this optimism. Indeed, emerging countries have largely recognized the need for a comprehensive strategy, comprising targeted policies and deep structural reforms, to develop new sources of growth.

It has become apparent, however, that emerging-market enthusiasts underestimated at least two critical factors. First, emerging economies' motivation to transform their growth models was weaker than expected. The global economic environment—characterized by massive amounts of liquidity and low interest rates stemming from unconventional monetary policy (Canuto 2013a) in advanced economies—led most emerging economies to use their policy space to build up existing drivers of growth, rather than develop new ones.

However, growth returns have dwindled, while imbalances have worsened. Countries like Russia, India, Brazil, South Africa, and Turkey used the space available for credit expansion to support consumption, without a corresponding increase in investment. China's nonfinancial corporate debt increased dramatically, partly owing to dubious real-estate investments. The trend is clearly visible in Fig. 1.2 that shows the difference in average gross capital formation growth rates between the post- and pre-crisis periods (see the Note for technical clarification). The pattern is quite diverse across current members of the MSCI index, with investment rates on average declining in the post-crisis "recovery" period.

Moreover, not much was done in anticipation of the end of terms-of-trade gains in resource-rich countries like Russia, Brazil, Indonesia, and South Africa, which have been facing rising wage costs and supply-capacity limits. Fiscal weakness and balance-of-payments fragility have become more acute in India, Indonesia, South Africa, and Turkey.

The second problem with emerging-economy forecasts was their failure to account for the vigor with which vested interests and other political forces would resist reform—a major oversight, given how uneven these countries' reform efforts had been prior to 2008. The inevitable time lag between reforms and results has not helped matters.

Nonetheless, while emerging economies' prospects were clearly overhyped in the wake of the crisis, the bleak forecasts that dominate today's

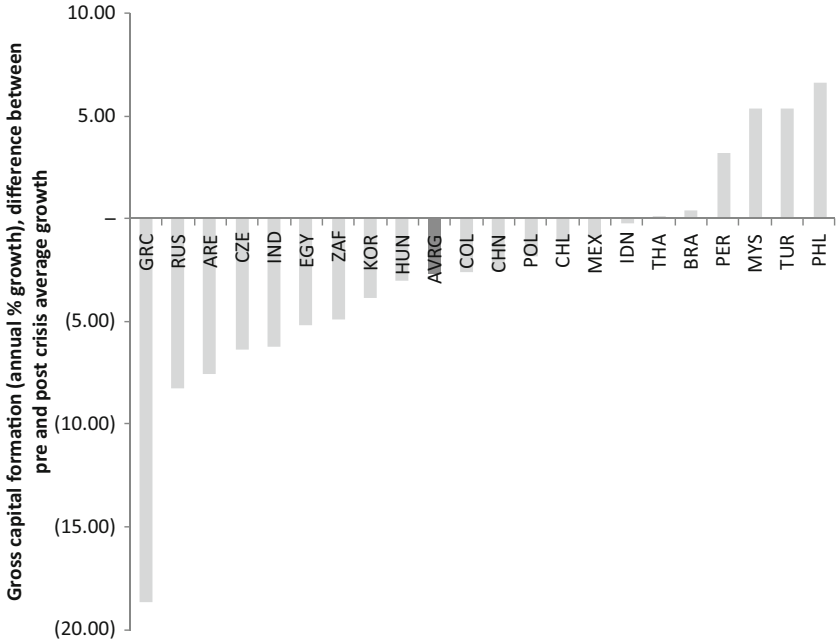

Fig. 1.2 Total investment: difference between post- and pre-crisis annual growth rates for the MSCI emerging markets group. *Source*: Authors' estimates based on the WDI (2015) data. *Note*: Pre-crisis period covers 2000–2008 while post-crisis includes 2010–2015. See Appendix Table 1.1 for country codes

headlines are similarly exaggerated. There are still a number of factors indicating that emerging economies' role in the global economy will continue to grow—just not as rapidly or dramatically as previously thought.

In the summer of 2013, the mere suggestion of a monetary-policy reversal in the USA sparked a surge in bond yields, which triggered an asset sell-off in several major emerging economies (Canuto 2013b). After bouts of volatility since then, global financial markets went through an extraordinary new wave of sharp sell-offs and increased volatility in the last few weeks of the summer of 2015, with equity markets and currencies across a range of emerging markets being especially hit. While recent financial events and policy responses in China may be pointed out as triggers of such emerging-market asset massive sell-off (Canuto 2014), it corresponded to an intensification of underlying, structural trends already at play.

1.3 Emerging Markets Face a Redefined Fundamental Uncertainty

In the context of the above discussion, Gevorkyan and Gevorkyan (2012a) suggested that the post-2008 crisis global economy environment may be characterized as one of "redefined fundamental uncertainty" (RFU): At the current stage, the newly realized interconnectedness of the global finance and the reality of new trade patterns—like global value chains (Canuto 2015)—render greater instability and uncertainty, particularly in emerging markets. Specifically, there are six RFU conditions that are also related to the risks facing the emerging markets today. Those are:

- Global market and interlinks—financial and economic contagion.
- Asset prices volatility (e.g., carry trade and commodity derivatives).
- Short-run returns maximization and global speculation.
- Evident decoupling of financial and real spheres.
- Global economy rebalancing: deindustrialization, industrialization, and uneven human capital.
- Sovereign debt pile-up and limited access to (and/or run-down on) international reserves.

All six aspects of the RFU are the subject of daily discussions and analysts' commentary. The authors, however, remark the need to approach them all together as connected features of the current international economic system. Contributing to the RFU is the recent volatility in commodity markets as well as rising sovereign debt levels. To highlight just one, Gevorkyan and Gevorkyan (2012b) find that for each group of emerging market exporters across various primary commodity lines there is a strong pass-through of the commodity futures price volatility to countries' foreign exchange rates. The evidence further pointed to the varying ability of exporting economies to sustain competitive exchange rates as their terms of trade fluctuated. As a rule, the larger, mainly oil exporting, nations were able to maintain fixed or pegged exchange rate regimes, while developing countries mainly exporting agricultural commodities saw their currencies lose value as prices plunged.

A related aspect is the absence of a pickup in foreign direct investment (FDI) flows to emerging and developing economies. While individual country records vary, on average the group (again going by the MSCI index) has not been able to recover to the same per capita levels that had

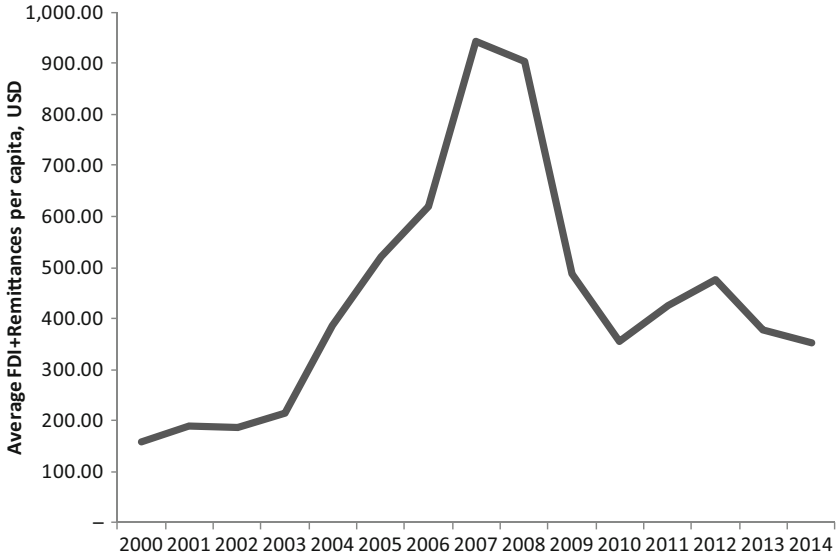

Fig. 1.3 Combined FDI and workers' remittances per capita for the MSCI Index emerging markets group. *Source*: Authors' estimates based on the WDI (2015) data

been built up immediately before the 2008 crisis. Figure 1.3 illustrates the severity of decreasing capital flows as a combined FDI and workers remittances per capita transfers for the MSCI Index emerging markets group. The 2007–2008 peak is clearly visible preceding the plunge and subpar, if uncertain, performance thereafter.

Finally, to drive the point home about diversity of the emerging markets experience and lack of one-fits-all picture, consider data assembled in Fig. 1.4. As reported above, on average GDP per capita growth has declined for the representative emerging markets included in the MSCI index. However, looking at individual countries the narrative becomes more diverse with perhaps three general patterns along the following lines.

The first group has seen little change in growth rates between pre- and post-crisis years with under 1 % deviations in either positive or negative direction (e.g., Brazil, Chile, Colombia, India, Indonesia, Malaysia, Mexico, Peru, and Turkey). The second group has experienced significant declines in the rate of GDP per capita growth, significantly impacting their economies (e.g., Czech Rep., China, Egypt, Greece, Hungary, South

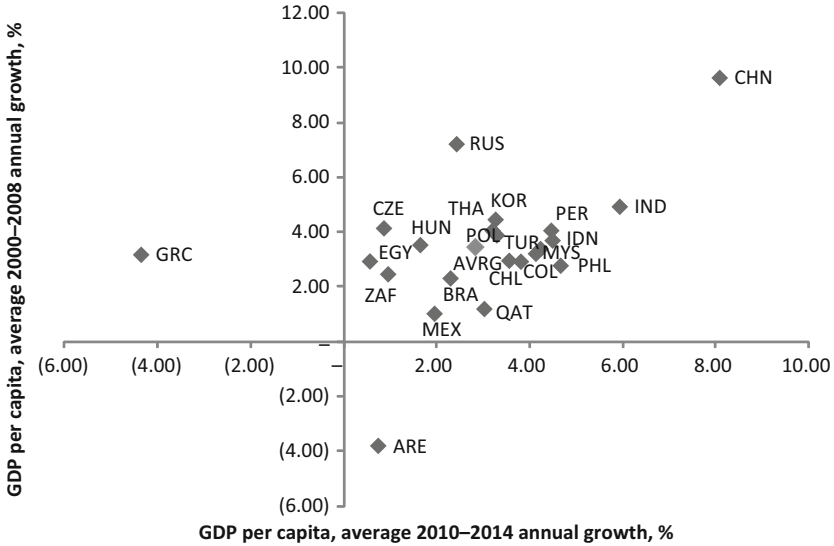

Fig. 1.4 Annual GDP per capita growth pre- and post-crisis, MSCI index emerging markets group, %. *Source*: Authors' estimates based on the WDI (2015) data. *Note*: see Appendix Table 1.1 for country codes

Korea, Poland, Russia, South Africa, and Thailand). Finally, the third group comprising the Philippines, Qatar, and the United Arab Emirates reports faster GDP per capita growth in the post-crisis years.

Clearly, the experience of each country in each of the three groups is unique as each has its own profile in terms of domestic economic structure and external sector performance. Even to attempt to find a general explanation for such a diverse record would be a dis-service to the more focused analysis offered in the chapters of this volume. Yet, the general trend of average decline in GDP per capita growth rates is indicative, rendering RFU validity in the emerging markets mix.

The most recent cycle of global financial flows seems to be running out of steam, in the wake of the phasing out of the US accommodative monetary policy stance, while concerns over the advanced economies' recovery remain. The period of large-scale speculative financial flows and broad access to credit in emerging markets seems to be coming to an end. Despite some possible reversal of the downfall in foreign capital flows, emerging markets, in a RFU environment, may soon be facing foreign exchange dry out with subsequent shockwaves to local currencies, sovereign debt, banking, and trade.

For the global economy, this means new reassessment of risks and opportunities. For smaller, developing economies, the structural macroeconomic impact may be more profound affecting recent development trends. The risk is particularly acute in the smaller, net importer, economies in transition in Eastern Europe and the Former Soviet Union. There the institutional basis and economic structure are yet to evolve in a solid, established, form able to withstand unexpected and severe external pressures (e.g., Gevorkyan 2015 and Gevorkyan 2011).

In an effort of contributing to the ongoing debate in the field, the goals of this edited volume are to present quality contributions on the above topics of emerging markets finance and to address risks, opportunities, and new dynamic perspectives in a small developing economy context, which is a rare focus for contemporary studies on emerging markets that tend to center on larger (e.g., BRICS) economies. Below, we outline the key points of each contribution to this volume.

1.4 Part Two: Emerging Markets' Post-2008 Trends

The second part of this study titled "Emerging Markets' Post-2008 Trends" comprises four chapters. All four provide an informed palette of diverse macroeconomic interpretations of the post-2008 trends across emerging markets group. The examination focus of the second part is on country groupings, outlining some commonly shared macroeconomic trends. As an added benefit, the studies vary from theoretical and empirical to conceptual discussions on the core topic being accessible to general reader.

In their opening, Chap. 2, Catiana Garcia Kilroy and Anderson Caputo Silva provide an extensive review of the post-crisis lessons in emerging capital markets. They offer empirical evidence linking sound macroeconomic fundamentals with capital market development leveraging significant pre-crisis progress in the emerging markets, as mentioned briefly above. Kilroy and Silva emphasize the complexity of profound changes brought on by the crisis challenging sustainability of the capital markets. As a result, emerging economies invoked actions consolidating government bond yield curves, enhanced the supply of domestic corporate debt, and provided long-term financing for strategic sectors for growth, including small-medium enterprises and infrastructure.

Nathaniel Cline and Matias Vernengo follow up in Chap. 3 with their theoretical analysis of interest rates, terms of trade, and currency crises. They speculate whether the emerging economies may be on the verge

of a new crisis, consistent with the earlier mentioning of the RFU concept (Gevorkyan and Gevorkyan, 2012a). More concretely, the authors emphasize the role of currency mismatches and the balance of payments constraint as they develop a model of currency crises. Here, the country's exposure to external shocks is the driving factor upsetting the balance (a similar argument is developed in Gevorkyan (2015) in the external exposure index analysis of the transitional periphery with an example of Armenia and Georgia). Cline and Vernengo further illustrate how such externally induced currency crisis leads to a domestic fiscal crisis. They bring up historical relevance of the model and assess the present conditions raising a concern over a potentially renewed wave of currency crises.

Continuing with problems of currency, Chap. 4, written by Vikram Kumar, tackles the question of devaluation and labor market dualism in emerging markets. Set in the post-crisis scenario, this contribution unveils the role of two structural elements of a typical developing economy: labor market segmentation between formal and informal sectors and the stylized mapping across tradable and nontradable goods production in relation to each aspect of the labor market, respectively. Kumar identifies particular circumstances when devaluation is immiserizing, hence causing differential wage effects across countries. The chapter argues for institutional policies integrating segmented labor markets, as this could be an independent source of real exchange rate depreciation.

The final, Chap. 5 in this section, by Luiz Fernando de Paula and Daniela Magalhães Prates, draws a general picture post-crisis cross-border capital flows across emerging markets and calls attention to policy alternatives. De Paula and Prates refer to financial flows intensification as emerging markets become further integrated with global economy. However, the authors also point to the pro-cyclicality and volatile nature of such flows. In the post-2008 world, global investors reached for the yield readjusting their portfolios toward developing economies and contributing to the domestic asset price inflation and speculative growth (themes also highlighted below in Chap. 11 by Ingrid Harvold Kvangraven and her discussion of recent sovereign borrowing in Sub-Saharan Africa; also see Gevorkyan and Kvangraven 2016). At the same time, some, in particular stronger in macroeconomic terms, emerging nations opted to regulate capital inflows to sustain their respective economies' absorption ability of those speculative flows. Finally, the authors direct attention to capital account regulation as a policy option available to the emerging economies' governments seeking those absorption mechanisms.

1.5 Part Three: Region and Country Case Studies

The title of part three, "Region and Country Case Studies," speaks for itself. Comprised of seven contributions with attention to minute details, this section offers an intriguing overview of country groups and individual country studies. As such this section carries the applied value in the overall study of emerging markets.

In Chap. 6, Carlos O. Trejo-Pech, Magdy Noguera, and Michael Gunderson analyze corporate cash holdings in Mexico in the background of economic crises. This is a panel study that looks at firms listed on the Mexican Stock Exchange since the 1990s. The authors offer two alternative empirical specifications driving their analysis: relating cash to contemporaneous firm characteristics and relating the lead and lag firm characteristics and macroeconomic factors. Importantly, results point to firm size, operating cash flow, its volatility, leverage, and net working capital among significant factors explaining corporate cash holdings in this model. Important for Mexico is the positive and statistically significant association between the firm size and dividends paid to the cash holding. The authors contend this finding to be contrary to established view in financial economics and empirical studies in advanced nations, but consistent for the developing economies case.

Moving forward, Chap. 7 by Elena Rusticelli, Semei Coronado Ramirez, and Leonardo Gatica Arreola addresses nonlinearity in Latin American exchange rates. An empirical study, the chapter applies ARCH- and GARCH-type models examining the groups' currency behavior in relation to the US dollar with inferential testing procedure. The approach helps address data dependence issues in nonlinear models. The procedure includes a maximal bispectral linearity test controlling for the non-flat higher order polyspectra and bispectrum nonlinearity. Based on their analysis, the authors conclude that GARCH models cannot capture data generating processes for Argentina, Brazil, Chile, and Mexico (confirming nonlinearity), while finding exchange rate series following GARCH model in Colombia.

Chapter 8, by Dave Seerattan and Nicola Spagnolo, studies liquidity dynamics and the central bank's policy in the Caribbean foreign exchange markets. The authors emphasize that a reliable supply of foreign exchange or hard currency is critical to the smooth functioning of economies in the Caribbean due to the high import content of local economies and foreign

capital-dependent growth. This is another empirical study that utilizes a multivariate GARCH framework linking trade volumes, policy intervention, interest rates, and exchange rates in the foreign exchange markets in Jamaica and Trinidad and Tobago. Consistent with the reality of foreign funds flows, the authors develop a joint analysis framework with multiple links and feedback loops. An important contribution of this study is the focus on exchange rate variance, carrying critical timely information for central bank policy makers and analysts.

The Caribbean economy is also the subject of Tarron Khemraj and Sukrishnalall Pasha in Chap. 9, where they look at the determinants of non-performing loans in Guyana. They leverage on the model motivated by Jimenez and Saurina (2006) and panel dataset comprising macroeconomic and firm-level data covering the period 1994–2004. In agreement with earlier work, the authors find a significant positive relationship between the real effective exchange rate and non-performing loans. Khemraj and Pasha then suggest that non-performing loan portfolios of commercial banks are likely to increase with the local currency appreciation in relation to the major trading partners or primary foreign currency. Somewhat intuitively, empirical results suggest that macroeconomic expansion in the domestic economy may lead to a reduction in the banking sector's non-performing loans. On the other hand, the authors find that bank size does not necessarily have any significance for non-performing loans. Instead, those banks that lend excessively or adopt relaxed lending policies are likely to see higher non-performing loan balances.

In their contribution in Chap. 10, Lucas Bernard and Unurjargal Nyambuu move the discussion to Eastern Europe—a region rarely studied in the emerging markets context. The authors focus on the financial flows and productivity in the context of growth and macroeconomic policy. Yet another empirical contribution, this chapter investigates how productivity is impacting employment and also discusses the methodological and empirical challenges involved in creating more robust models. A general finding is that of the declining wage-shares transcending countries, sectors, and policy. Across the board, there is a sense of a new phase of history connected to the rapid technological improvement in its broadest interpretation, automation, and much uncertainty with future sustainability of the labor markets.

In Chap. 11, Ingrid Harvold Kvangraven carries out a conceptual analysis of the changing trends in financial flows to Sub-Saharan Africa. A key contributing aspect of this study is its focus on the primary commodity

exporting African nations. It is a rare research angle taken in empirical studies these days, as much of the analysts' attention remains on macroeconomically and geopolitically larger market players. Still, Kvangraven is able to track the unprecedented dynamic in financial flows over the 2000s coming to Africa and the external risk exposure among commodity exporters. A shared feature of the group is growing indebtedness and increasing sovereign borrowing in foreign currency. The author argues that despite the fact that the opportunities to boost economic development from the increasing capital flows, the external exposure factor, that is dependence on the world's demand for commodity exports, underscores the macroeconomic vulnerability for the region and each country in the group specifically.

Finally, in Chap. 12, Heiko Hesse and Tigran Poghosyan discuss oil prices and bank profitability. They focus primarily on the major oil-exporting nations in the Middle East and North Africa. An empirical study, the paper relies on data from 145 banks across 11 countries for the period 1994–2008. Testing their key hypotheses of oil price shocks on bank profitability effects, the authors confirm indirect effects of the oil price shocks on bank profitability. This is primarily channeled through country-specific macroeconomic and institutional variables. At the same time the direct effect is insignificant. Critically for a large group of emerging markets, the results of this study suggest that investment banks are more affected by the oil price shocks as opposed to commercial banks of financial institutions organized in accordance with Islamic banking principles. The systemic implications of oil price shocks on bank performance are critical in the case of the country group but have key macroprudential regulation policy lessons for a larger commodity-exporting group across other emerging markets.

1.6 Conclusion

The objective of this study is to present a set of contributions that advance our knowledge and understanding of the problems of emerging markets and developing countries in the post-crisis transformation. The main question that we seek to address is: What lies ahead for emerging markets now that it is clear there is no "one-fits-all" post-crisis model? Answering this question requires not only deep understanding of the economic theory and superb economic data analysis, but first and foremost it requires a profound realization of and familiarity with small developing economy dynamics. The "what is next" question also relates to the risks and, equally, opportunities for the developing economy advancements.

1.7 Appendix

Table 1.1 Country codes for the MSCI index emerging markets group

Code	*Country name*
BRA	Brazil
CHL	Chile
CZE	Czech Republic
CHN	China
COL	Colombia
EGY	Egypt, Arab Rep.
GRC	Greece
IND	India
IDN	Indonesia
HUN	Hungary
KOR	Korea, Rep.
MYS	Malaysia
MEX	Mexico
PER	Peru
POL	Poland
PHL	Philippines
QAT	Qatar
RUS	Russian Federation
ZAF	South Africa
THA	Thailand
TUR	Turkey
ARE	United Arab Emirates
Average	Average

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CHAPTER 2

Post-crisis Lessons for EME Capital Markets

Catiana García-Kilroy and Anderson Caputo Silva

2.1 Introduction

The period following the 2008 global financial crisis has had two consequences in emerging market economy (EME) capital markets. In the first place, it has successfully tested the extent of the transformation of EMEs' local currency bond markets (LCBMs), specifically government, into deeper and long-term financing sources that had been building up over the previous decade. EMEs' government debt markets in local currency have been able to show resilience in the midst of capital volatility and international market instability in general. Governments in EMEs now finance most of their fiscal needs through their domestic bond markets unlike little more than a decade ago when most of their market funding was offshore and in hard currency.

In the second place, the post-crisis scenario has had in itself a direct positive effect on local currency capital market development with capital

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flowing into EMEs in search of yield and higher growth prospects above those of advanced economies (AEs). Inflows into EMEs' fixed-income funds, a proxy of inflows into LCBMs, reached peak levels in 2012 well above those in 2007, in spite of outflow events in certain moments of stress. Those inflows have challenged the initial belief that growing fiscal deficits in AEs after the 2008–2009 crisis would prevent capital from flowing into EMEs. Government bonds in advanced EMEs and in second-tier EMEs and corporate bonds generally have benefited from record long maturities and low yields with exposure to foreign investors reaching levels unseen before. However, the two latter assets are still in an incipient stage in local currency and are mostly performing in hard currency denominated debt.

An even more incipient asset class, infrastructure and subnational financing through fixed-income markets, has stayed very much in the margins of access to capital. Progress in government bond markets is a necessary first step to create the enabling environment for those instruments, but at the same time more complex technical frameworks are required that involve, among others, sectorial regulations, reliable tariff structures, and policy commitments.

Post-crisis developments in EMEs' capital markets have not taken place in a straight line and have differed depending on countries and on the type of asset, whether government bonds, corporate bonds, or equities. The final result is positive in terms of increasing availability of long-term capital and of improved markets to absorb the capital in government bonds, with a large pending agenda in nongovernment fixed-income instruments and equity markets.

Twists and turns experienced by EME capital markets since the crisis provide many insights into vulnerabilities still to be addressed and into new challenges and dilemmas in the context of increased interdependency and a still-ailing global economic recovery. The volatility also reinforces the need to continue developing government bond markets and to expand reforms to create environments that enable the development of other important asset classes in fixed-income markets: corporate bonds, infrastructure, subnational bonds, and more efficient equity markets.

This chapter is organized as follows: Sect. 2 provides background on the encouraging developments on the macroeconomic and market development fronts experienced by EMEs in the period before the crisis. Sect. 3 describes progress of domestic capital markets in the post-crisis period, thereby providing a snapshot of key aspects related to both supply

and demand factors. Common themes having a positive or negative effect on capital market development since the start of the crisis are discussed in Sect. 4. Conclusions and policy implications are presented in Sect. 5.

2.2 Capital Markets and Long-Term Finance in EMEs: Encouraging Developments Before the 2008 Crisis

The experience of EMEs in the decade beginning in 2000 represented a strong transformation in government debt portfolios in favor of a large predominance of local currency domestic instruments. The significant achievements on government debt markets paved the way for other asset classes in what has proven to be a structural process of capital market development in those economies. The pre-crisis period provided valuable lessons on the relevance of sound economic fundamentals as a precondition for a solid process of capital market development.

2.2.1 Supportive Macroeconomic Fundamentals

The years that preceded the 2008 crisis were marked by a benign global environment with ample liquidity, coupled with wide-scale improvements in macroeconomic fundamentals by EMEs. On the macroeconomic front, progress was significant in several of the most relevant determinants for country solvency, including (a) fiscal policy, (b) monetary policy, (c) external vulnerability indicators such as current account deficit and external debt to international reserves ratio, and (d) economic growth.

Healthier fiscal balances helped reduce debt ratios and created space for countercyclical policies. Governments' primary balances, as a percentage of gross domestic product (GDP), were overwhelmingly positive or becoming positive during the pre-crisis period, and overall budget balances, as a percent of GDP, were improving steadily across all regions. Those improvements were crucial in boosting investor confidence that EMEs could be better positioned to adopt countercyclical policies should conditions change toward an economic downturn.

Monetary policy credibility was significantly enhanced. EMEs were in large part capable of keeping inflation rates steady at historically low levels. Greater price stability and positive expectations in EMEs were favorable ingredients to boost confidence in longer-term bonds, includ-

ing government bonds. In many countries, especially those that had been historically plagued by volatile and high-inflation levels, that scenario allowed for interest-rate cuts, the development of local currency yield curves, and the lengthening of the average time to maturity of the domestic government debt.

Improvements in the external accounts of EMEs provided solid foundations to reduce vulnerability to shocks and reversals in capital flows. Although external-account improvements were driven by cyclical factors that led to extremely high international liquidity conditions, proactive policies to reduce debt vulnerabilities (such as buybacks of external debt and shifts to funding in local markets) were highly instrumental in the rapid pace of change witnessed in external debt vulnerability indicators.

Buoyant economic growth provided a perfect match with other fundamentals previously described, thus strengthening the positive outlook that had been formed for EMEs in general. As a result, the virtual cycle brought by improved fiscal indicators, lower interest rates, and strong GDP growth allowed countries to simultaneously reduce their debt-to-GDP ratios and achieve remarkable progress in their debt structure as discussed in the next part.

2.2.2 Capital Market Development Before the Crisis

The unique combination of sound macroeconomic fundamentals, a benign international environment, and enhanced institutional capacity in the years preceding the 2008 crisis triggered an unprecedented chain of developments in domestic capital markets of EMEs. The level of expertise on the design and implementation of capital market policies in EME institutions such as central banks, ministries of finance, and capital market regulators substantially improved following the series of crises that hit those economies in the 1990s. Moreover, greater appetite from foreign investors and reforms in pension and insurance industries in many EMEs helped expand the investor base, particularly for longer-term instruments, and reduce the dominance of banks as bond holders. The most notable results were perceived in local currency government debt markets because of the anchoring role that that asset class played before other asset classes, such as corporate bonds and asset-backed securities, developed. Those achievements were initially predominant in more developed EMEs. However, the seed had been planted for a further-reaching process of development encompassing a broader set of instruments and countries (the so-called next generation markets).

Progress on local currency government debt markets was reached in size and structure (i.e., the types of instruments and maturities). Governments set priorities for the issuance of local currency debt and substantially retracted from international capital markets in many places, such as Mexico and Brazil, through a simultaneous reduction in new issuances and an aggressive program of early buybacks. The (weighted) average ratio of external to domestic debt for selected EMEs dropped steadily from 0.75 in 2000 to 0.22 times in 2009 (see Anderson, Phillip R.D. et al. 2010). Currency composition of the government debt portfolio moved dramatically in favor of local currency, thereby reducing the exposure to changes in exchange rates. In parallel, the structure of the domestic debt experienced a significant transformation as debt managers were able to issue a higher share of fixed-rate instruments and to extend maturities.

Two actions—the shift from external to domestic debt and the consolidation of government debt yield curves in a scenario of reducing debt-to-GDP ratios—improved the enabling environment for nongovernment issuers to tap both international and domestic debt markets. As discussed in more detail as follows, the growth of EME corporate debt was initially more pronounced in international capital markets, where they continue to be dominant as a result of several factors: the scarcity value generated by the significant reduction of EME hard currency sovereign debt, the search for yield by international investors, and the slower pace of reforms in domestic corporate bond markets. Domestic issuances of corporate debt also started to grow in the years before the crisis, but they were highly concentrated in a few more developed EMEs.

2.2.3 Effect on Weathering the Crisis

Sound macroeconomic policies and proactive strategies to improve the debt profile were critical in creating a buffer and positioning EMEs for quicker recovery from the crisis of 2008. EMEs arrived at the global financial crisis with government debt portfolios that were more resilient to shifts in the economic cycle and in market sentiment. The increase in the share of domestic debt reduced the exposure to exchange rate shocks and the vulnerability to sudden stops in capital flows. The lengthening of maturities in local currency fixed-rate instruments reduced rollover and interest-rate risk in the time of crisis.

During the crisis, debt managers had room to maneuver and were able to adapt quickly. Several EMEs implemented a series of crisis-response

measures. Market turbulence was fueled by a strong demand for shorter-term and more liquid instruments, especially by banks and foreign investors. Whereas the mix of measures varied across countries, common actions by EMEs included (a) the use of cash buffers to reduce government funding pressures in the market (Brazil and Turkey) and (b) the implementation of debt buybacks or exchanges, thus replacing long-term debt for shorter and more liquid instruments that were in high demand by investors (Hungary, Indonesia, and Mexico).

A strong and clear lesson from the pre-crisis period was the relevance of building sound macroeconomic fundamentals (on fiscal and monetary policies and on external accounts) and the need for taking advantage of "good times" to proactively engage in policies that reduce vulnerabilities and support the development of capital markets.

2.3 EME Capital Markets: A Snapshot of Developments Since the 2008 Crisis

Several developments have occurred in EME capital markets in the aftermath of the 2008 financial crisis.

2.3.1 Capital Has Continued to Flow into EMEs But With Wider Swings Across Years and Currencies

After a brief respite in 2008, capital flows to EM fixed-income funds came back even more heavily than in the previous decade for a few years, from 2009 to 2012. However, the funds have receded more recently on concerns about shifts in US monetary policy and US dollar (US$) appreciation against EME currencies. The structural picture those events create is that EMEs have consolidated themselves as investment destinations, in spite of temporary shifts in tactical allocations by foreign investors.

For many investors, EME resilience to the 2008 crisis represented a strong signal that those economies passed with high marks a stress test of the type they had failed in the past. The start of the crisis in 2008 was only a temporary hiatus in EMEs as a main destination for international capitals. By the beginning of 2009, only five months after Lehman Brother's collapse, capital flows gradually returned to EMEs' fixed income, as illustrated by flows into fixed-income funds that reached an all-time peak of US$ 97.5 billion at the end of 2012. In the years since, capital flows have been more modest but the

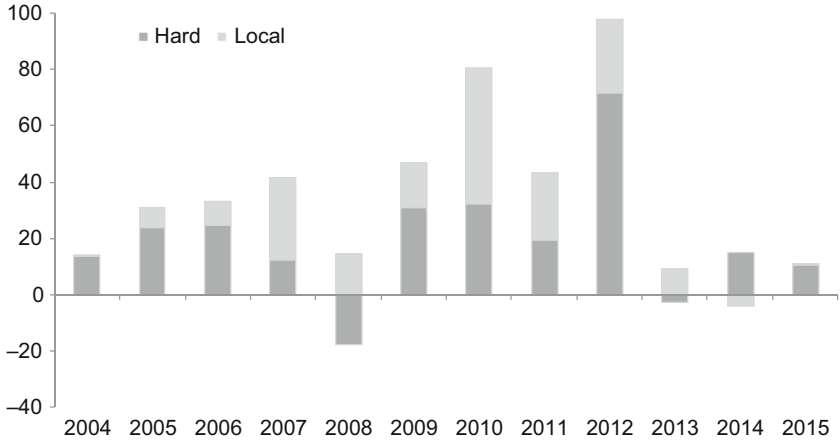

Fig. 2.1 EM fixed-income fund inflows by hard and local currency (US$ billion). *Source*: EPFR Global, J.P. Morgan, Bloomberg, May 2015. *Note*: EM = emerging market

outlook is positive, especially for those EMEs following sound macroeconomic policies that could sustain growth and control fiscal, monetary, and current account risks. The expectation is that capital will continue to flow in, even if at levels below the historic peak of 2012, with temporary bouts during risk-on events and with greater distinction across countries (Fig. 2.1).

In the months following the crisis, governments and central banks had to deal with extremely difficult conditions: depreciating currencies, worsening current account surplus or deficits, and more expensive access to finance in both local and hard currency. However, from the start of 2009, strong macroeconomic fundamentals, relatively developed local bond markets, and worsening conditions in the euro periphery helped maintain inflows into EMEs. That trend was reinforced by narrower interest-rate spreads between EMEs and AEs, with the latter reaching record lows in the context of quantitative easing programs.

The evolution of flows into EME fixed-income funds over the past five years illustrates some of the vulnerabilities that EME LCBMs still confront. First, when risk perceptions increase, even in AEs, large shares of investments in EMEs are offloaded from the portfolios of international investors. That situation occurred in 2011 with the exacerbation of the tensions in the Euro Area and during 2015 with the expectation of an interest rise in

the USA, a slowdown in China, and increased vulnerabilities among commodities exporters. Second, EMEs' debt in hard currency has gained a stronger weight along with debt in local currency debt. In 2012, 75% of flows went into EMEs' fixed-income funds denominated in hard currency.

That change is related in part to the increased volatility of EME currencies, particularly since 2011 with important currency depreciations in major EMEs such as Brazil, Indonesia, and South Africa. In addition, capitals have been heavily flowing into the hard currency debt of EMEs' corporate bonds and government debt in second-tier EMEs. For both types of assets, LCBMs are less developed. Funds are also flowing into local currency government debt markets but the lower degree of development in those markets is putting a limit to the amount of capital they can absorb.

2.3.2 Domestic Markets Provide Most of Governments' Funding While Private Corporations Access Mostly International Markets

Government debt is generally kept at sustainable levels under 40% of GDP, a level that has helped maintain EMEs at relatively stable and on average at investment grade level (see Sect. 4). In 2009, countercyclical fiscal packages temporarily had the effect of increasing government debt. A constant factor was that most governments funded fiscal stimulus through increased issuance in their domestic markets, reinforcing the value of local currency markets in periods of financial stress (Fig. 2.2). The outlier is the Middle East and North Africa region, represented by Morocco and the Arab Republic of Egypt, especially the latter, which entered the crisis with high levels of debt. Even in the special circumstances of Egypt with domestic debt around 80% of debt over GDP, progress made before the revolution on the local government debt market has enabled the nation to fund most of its debt in the domestic market. Countries such as Brazil also faced pressures in recent years with deteriorating fiscal accounts in 2013–2014 and low growth. Against this backdrop, recovering fiscal credibility and stabilizing debt-to-GDP ratios has become a main concern in Brazil to, among others, mitigate concerns of downgrades in credit ratings.

The share of local currency debt over the total debt of EMEs continued to predominate and increase after the crisis across all regions. It accounts for around 70% in Latin America and 91% in Asia. Funding through external markets has been done opportunistically to take advantage of low yields in hard currencies and only as a secondary source of funding.

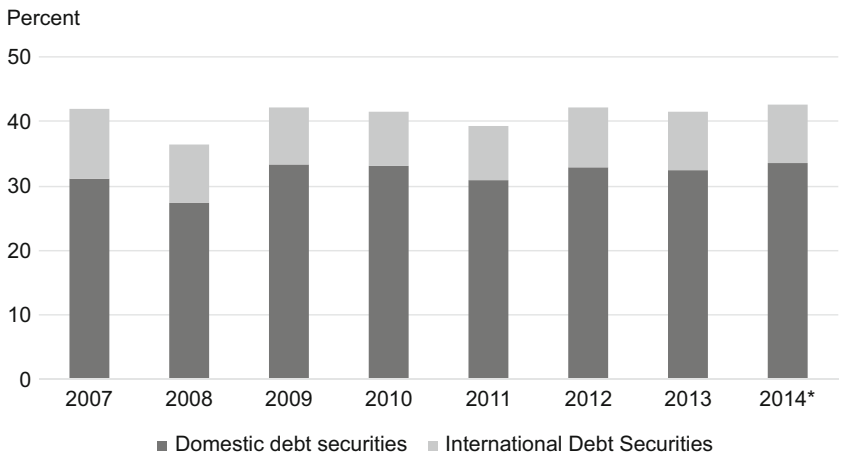

Fig. 2.2 Debt securities as percentage of GDP. *Sources*: World Bank Group staff calculations based on data from BIS and IMF. *Note*: Average for Brazil, China, Colombia, Indonesia, Lebanon, Malaysia, Mexico, Pakistan, Peru, Philippines, South Africa, Thailand, Turkey. (*) Data for 2014 is for September, end-year for other years

As for EMEs' corporate debt, local currency debt is growing, but it is still small with issuance around US$ 800 billion as of the end of 2014. China takes the largest share with almost 90% of the total and more than 140% of GDP after rapid growth resulting from the post-crisis fiscal stimulus through subnational governments. The transactions were conducted off balance sheet through several types of shadow banking vehicles and bond issuance by urban development investment corporations linked to subnational governments. Additionally, state-owned enterprises also became large bond issuers by rebalancing their funding structure from bank loans into local medium-term notes. The rest of the debt is concentrated on a small group of EMEs including Brazil, India, Malaysia, Mexico, and Thailand, with financial sector issues taking the largest share (Fig. 2.3).

In contrast with the slow pace of growth of local corporate bonds in EMEs (except China), EME corporations have increased substantially their issuance of hard currency denominated debt. Also, contrary to the case of local currency debt, most international corporate debt is issued by nonfinancial multinational corporations based on EMEs.

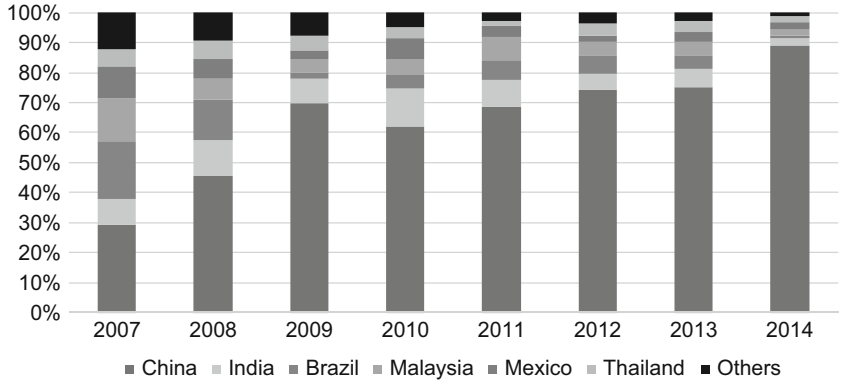

Fig. 2.3 Concentration of local currency corporate issuances in selected EMEs. *Sources*: World Bank Group staff calculations based on data from World Bank Group FinDebt database (based on data from Dealogic's Debt Capital Market Database). *Note*: "Others" cover: Philippines, Colombia, Indonesia, South Africa, Argentina, Kazakhstan, Pakistan, Peru, Ukraine, Vietnam, Hungary, Turkey, Ecuador, Nigeria, El Salvador, Morocco, Egypt, Dominican Republic, Kenya, Marshall Islands, Belarus, Venezuela, Tunisia, Namibia, Azerbaijan, Sri Lanka, Botswana, Romania

The current structure of the corporate bond market that favors growth in hard currency debt rather than the trend observed in government bond markets points to two relevant conclusions. First, the crisis does not seem to have had a negative impact on the capacity of EMEs' corporations to access long-term funding as long as it is in hard currency. Many of those corporations are multinationals whose preferred financing option is international markets. Note that a large share of the revenues of the multinationals are in hard currency and their funding needs are generally too large for the size of their home LCBMs.

Second, the crisis has not had a noticeable effect on improving or worsening corporations' access to local currency funding—China being a special case and not representative of trends in other EMEs, as explained above. The structural problems present before the crisis have persisted: high cost of issuance, poor disclosure requirements, defective creditor's rights frameworks, insufficient demand from institutional investors, and poor market liquidity. Even in the larger EMEs with some critical mass of local currency bonds, corporate bond markets remain relatively small and concentrated in financial issues. These negative prospects could be changed if new policies

to address those structural problems are implemented, as banks adapt to new prudential regulations, such as those in Basel III, that create incentives for a wider use of capital markets in place of bank funding (see Sect. 5).

2.3.3 Average Maturities Have Recovered to Pre-crisis Levels

The crisis had only a temporary effect on shortening maturities in issuances in 2009. The following year, most EMEs started to issue at pre-crisis maturities, and by the end of 2012 almost all regions were issuing at longer maturities. That recovery may be interpreted as yet another sign of the consolidation of EME LCBMs as an asset class.

One illustration of the effect of that consolidation as an asset class is the emergence of several EM local currency indices such as the JPMorgan Government Bond Index-Emerging Markets (GBI-EM). The indexes have become key benchmarks for EME local currency instruments, with increasing market capitalization and assets under management (AUM) benchmarked against them. Taking the GBI-EM as an example, the composition of instruments across different maturities has remained diverse, reaching the different segments of EME yield curves. The average maturity of these instruments stands at levels close or slightly superior to pre-crisis level, demonstrating the resilience of the markets.

Whereas maturity lengthening across government bond markets is a positive development, countries still face significant challenges to enhance liquidity, especially in the long-tenor segment of the yield curve. More important, liquidity in the longer maturities tends to be lower with large differences across countries. New post-crisis regulations have also adversely affected the costs of traditional market-making functions executed by primary dealers, thereby causing pressures on bid-ask spreads and on overall liquidity (see Sect. 4). Some countries, such as Mexico, have implemented a comprehensive debt market development agenda, including hedging options with long-term interest-rate futures, with positive effects on secondary market liquidity; however, in several countries including large EMEs, such reforms are still a pending agenda.

2.3.4 Performance of LCBMs in EMEs Has Been Positive But Volatile

LCBMs in EMEs have figured among the best performing asset classes, but the crisis of 2008 and the volatility in foreign exchange (FX) and

EME domestic interest rates since 2013 demonstrate that the returns are not without risks. The volatile but generally positive returns are directly reflected in the wide swings of capital flows discussed previously. Although the extent of yield differential between AEs and EMEs has fluctuated over the years, the overall perception is that EME yields will remain attractive in the long run and provide good perspectives of investment performance for the growing set of dedicated investors in EME LCBMs globally. Tactical allocations and temporary shifts between hard currency and local currency (and vice versa) will also tend to become more common as both dedicated and more opportunistic investors will try to manage their currency exposures to EMEs in a more dynamic fashion.

A notable development since 2011 is the availability in international markets of relatively low-cost, long-term funding for EMEs with less developed LCBMs when the market is on a risk-off stance. Most of these countries had little or no history of global bond issuance and are now able to issue bonds above five years.

Ongoing appetite for EME debt under low interest rates would be a reinforcing factor to consolidate reforms in LCBMs in advanced EMEs and to build comprehensive programs in the less-advanced EMEs that are accessing foreign capital mainly through international markets.

2.3.5 The Investor Base Continues its Structural Shift to the Long Term

After a halt at the end of 2008, the investor base has continued to undergo structural changes, initiated previously, that support increasing the availability of long-term capital. Two types of investor classes are contributing to increased demand for long-term bonds in EMEs, each one of them presenting simultaneously opportunities as well as potential vulnerabilities: (a) foreign investors of various types and (b) domestic institutional investors, mainly pension funds and insurance companies. A third type that continues to be dominant in EMEs is the domestic banking sector.

Foreign investors traditionally associated with an appetite for long-term debt have in several cases doubled or tripled their holdings of government debt in local currency since the peak reached in 2007 (see Fig. 2.4). The nature of foreign investors also has shifted from shorter-term to longer-term strategic investors.

EME indexes also are behind the increasing share of foreign investors from two angles, in addition to the factors pointed to in previous sections. On the one hand, bond indexes, both EME and non-EME specific, are in a continuous process of increasing their coverage of EMEs. Long-term strategic investors, such as pension funds, insurance companies, and sovereign wealth funds, follow those indexes. On the other hand, AUM benchmarked to EME indexes also are increasing at high rates in recent years.

Another relevant element to drive foreign-investor impact in the future of EME LCBMs is that the set of EM-dedicated investors has over time become increasingly represented by a small group of very large fund managers (with AUM above US$ 10 billion) and some small players. The implications of that concentration of holdings in the hands of a few dedicated investors have been a matter of debate at international conferences, such as the 2014 World Bank Sovereign Debt Management Conference. A clear message is that the size of domestic debt markets matters if these investors need to do portfolio reallocations. Foreign investors have emphasized the relevance of government policies that enhance transparency (such as auction calendars), promote benchmark issues, and facilitate access (easy setting of a custodian account, being able to trade FX with third parties) and the need for a tax regime that does not inhibit access of long-term, dedicated investors.

Domestic pension fund and insurance companies are increasingly becoming a major demand for long-term investments. Local pension fund assets represented about US$ 2.4 trillion at the end of 2013, and insurance companies reached US$ 3.6 trillion. The growth is expected to accelerate across all regions as a result of both organic growth and reforms toward funded pension schemes and life insurance. However, their portfolios are mostly concentrated in government debt either because of regulatory restrictions or because market conditions do not exist to invest in other long-term instruments such as corporate, infrastructure, or subnational debt (see sections above). Another challenge faced in many countries (e.g., Brazil, Poland, and Turkey) is that the growth of pension fund assets has not necessarily translated into substantial increases in the demand for long-term capital market instruments. In fact, portfolio allocations of several pension funds have concentrated in short-term assets, especially in the cases of defined contribution programs. The design of regulations and incentives to align portfolio allocations to long-term goals of pension contributors is a key item to be addressed by several EMEs, with an expected positive effect for the development of capital markets.

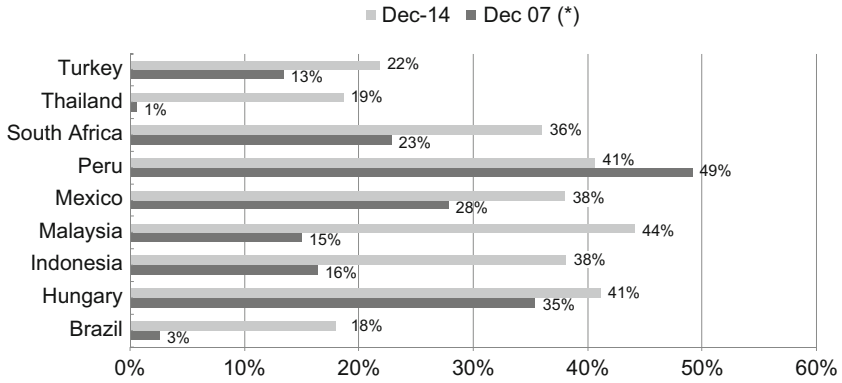

Fig. 2.4 Foreign ownership of local currency government debt. *Source*: EPFR and J.P. Morgan, Bloomberg. (*) *Note*: The earliest data available for Mexico, Peru, South Africa and Thailand is: Jan 2012, Jan 2012, Mar 2011 and Apr 2008, respectively

In spite of developments toward a more diversified investor base, domestic banks continue to be a major source of demand in LCBMs. That source has raised several issues: the potential to develop long-term financing instruments given limits for balance sheet duration mismatch and effect on liquidity and market competition as many EMEs have relatively concentrated banking sectors.

Investor trends in EMEs raise several issues to be monitored. A greater share of foreign investors increases the risk of a turnaround in periods of financial stress, particularly when a stable domestic investor base has not yet developed and when domestic markets are not sufficiently liquid. The increased size of pension funds and insurance companies could add stability. However, they also risk becoming captive investors with the consequence of distorting price formation of the assets they invest in.

2.4 Common Themes Operating in EME Capital Markets Since 2008

Following the description of developments in EME capital markets, a series of factors can be listed that have had a positive or negative effect on market deepening and the availability of long-term financing since the start of the financial crisis.

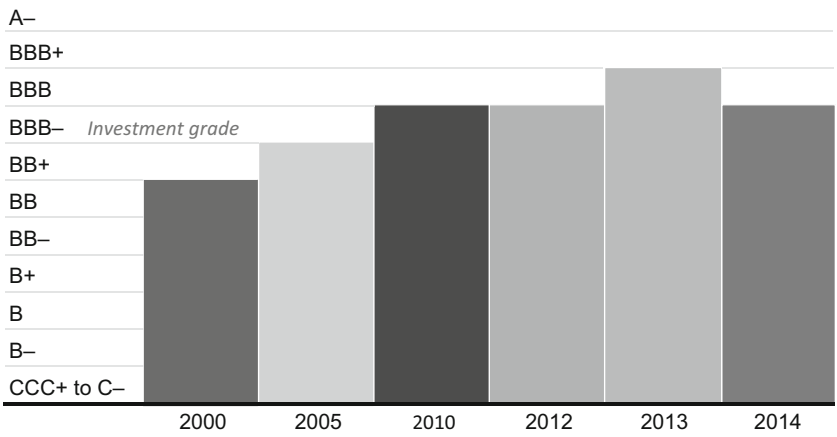

Fig. 2.5 Evolution of credit ratings for a sample of the largest 20 EMEs. *Source*: Authors' elaboration with data from Bloomberg. *Note*: The sample of countries are sovereign ratings for Brazil, Chile, China, Colombia, Egypt, Hungary, India, Indonesia, Malaysia, Mexico, Morocco, Nigeria, Peru, Philippines, Poland, Russia, South Africa, Thailand, and Turkey

2.4.1 Market Context Features

Some of the factors that affected the performance of EME capital markets relate to the market context in the countries.

2.4.1.1 Macroeconomic Fundamentals

Improved macroeconomic fundamentals, so-called pull factors, have had a major effect on the attractiveness of EMEs, in spite of less positive growth prospects after 2013. This effect has been reflected in the continuous improvement of EMEs' credit ratings. Since the start of the crisis, the average credit rating of EMEs' sovereign did not deteriorate; it remained at investment-grade level with a temporary one-notch upgrade on average (BBB on the Standard & Poor's scale), depending on the sample chosen (Fig. 2.5).

2.4.1.2 Yields and Spreads

On average, monetary policy rates between AEs and EMEs have been relatively high, with spreads on the 10-year yields between 300 and 600 basis points above US Treasury securities ("push factors"). The spread

differential has attracted both leveraged short-term capital with carry trade strategies as well as longer-term investors in search of yield. Although spreads are maintained, capital will continue flowing into EMEs, including long-term financing.

2.4.1.3 Risk-on, Risk-off Paradigm

In spite of the increased credibility of EMEs, they are still far from being considered safe havens. Any event that increases uncertainty—even if generated in AEs, such as tensions in the Euro Area, the US fiscal cliff discussion, or the "2013 taper tantrum"—has immediately triggered a sell-off in EMEs whereas reduced risk perceptions have caused inflows. The volatility of capital inflows and outflows caused by the perception of EMEs as riskier assets, independent of fundamentals, is an obstacle for the development of stable long-term financing.

2.4.1.4 Currency Volatility

The performance of LCBMs has been very much exposed to currency fluctuations. With increased capital flows before and after the start of the crisis, currency volatility has depended in great part on central banks' willingness and ability to intervene in the FE market. That uncertainty has weighed negatively on the performance and attractiveness of domestic government bond markets with greater currency volatility. One of the main reasons behind increased flows into EMEs' debt denominated in hard currency, which accelerated in 2012 (75% of total flows into fixed-income funds), instead of local currency debt is the increased volatility of the EMEs' currency. Compressed premiums for long-term US Treasury bonds also played a role in pushing capital toward long-term offshore hard currency bonds issued by EME corporations.

2.4.2 Market structure features

Among the factors that have affected the performance of EME capital markets since the 2008 financial crisis are situations that have a basis in market structures.

2.4.2.1 Changing Structure of the Investor Base

The added share of strategic foreign investors has increased the availability of long-term funding at relatively low cost, but it has not necessarily increased its stability, as investors will still be acting on the risk-on, risk-off

paradigm mentioned previously. Furthermore, international institutional investors have gone through a process of consolidation, with a larger order book to execute, thus potentially increasing market volatility. At home, a number of EMEs have relatively large domestic pension funds and insurance companies with substantial absorption capacity. However, as a result of regulations, domestic investors tend to be highly concentrated and conservative in their investment strategies, thereby focusing on government debt. That tendency limits the potential of domestic investors to act as a buffer when capital inflows reverse.

2.4.2.2 Capital Market Development Policies

Most EME governments have instituted policies to develop further their capital markets, though they have been more successful in their local currency government bond markets. The resilience of those markets is in part related to the policies, which include reforms designed to extend the yield curve in government securities and to increase liquidity. The policies have also included contingent measures in the period of higher stress to compensate for the lower liquidity caused by outflows, such as security buybacks and swap programs. Mexico provides several examples of successful long-term reforms and short-term actions. Yet, a large agenda of unimplemented policies persists, including efforts that would consolidate reforms in the government bond market and extend them to the nongovernment fixed-income segment so that the availability of long-term financing becomes sustainable. The reforms are becoming even more pressing with the need to finance strategic sectors for growth such as housing and infrastructure. A number of EME governments are developing strategies to increase the use of fixed-income markets for housing and infrastructure financing. The development of alternative financing instruments, such as plain vanilla securitization, covered bonds, or infrastructure project bonds, is still in its infancy. Such policies need to bring the traditional nongovernment bond market agenda to the forefront and combine it with proactive support from domestic and multilateral development institutions (see Sect. 5).

2.4.2.3 Effect of New Regulations

Prudential regulations issued as a result of the crisis are still unfolding and being tested, so their effect on market liquidity and structures remains to be seen. However, three main effects can be identified so far. The first one is a greater share of capital markets in financing generally, both in

AEs and EMEs. The growth is a positive effect as long as new risks are identified and monitored. The second effect is a change in banks' funding model so that their asset–liability mismatch is reduced. This new model requires a greater reliance on capital market products for funding and therefore opens new possibilities in the development of long-term financing instruments. The third effect is the potential influence of reduced liquidity given more stringent regulations on proprietary trading and a higher opportunity cost for traditional market makers to hold securities inventory. The latter would translate into lower liquidity and greater market volatility.

2.5 Conclusions and Policy Implications for EME Capital Markets Since the 2008 Crisis

The higher growth prospects of EMEs in relation to AEs will continue to support capital inflows, in spite of temporary reversals or volatility events, as experienced on several occasions since the crisis (the "2013 taper tantrum," e.g.,). Additionally, the new bank prudential regulations will drive EMEs into reducing the role of banks as the main providers of long-term credit. In that context, policies to reinforce the role of domestic debt markets in channeling international savings and in reducing EME vulnerabilities will become even more important. Although continued capital inflows will create new opportunities for deepening further long-term LCBMs, challenges and policy dilemmas will require a response from the public sector.

A number of structural and regulatory changes that are taking place create a need to develop deeper and more efficient local currency capital markets, particularly government and nongovernment bond markets. Four types of vulnerabilities related to structural changes have developed since the beginning of the crisis, as mentioned in the previous sections: (a) Financing has poured into long-term assets at relatively low rates, implying in some cases asset overvaluation and limited liquidity; (b) emerging market corporations have increased their currency mismatch by borrowing in offshore bond markets; (c) the implementation of Basel III would require banks to rely more on new fixed-income instruments in their funding model (such as covered bonds and securitization) to support their role as credit providers; and (d) traditional long-term financing from governments and banks will not be able to support financing needs for infrastructure as they did previously.

In that context, a selection of the most relevant policy issues that are expected to be in play in the coming years follows.

Macroeconomic fundamentals and commitment to financial sector reform, focusing on nonbank intermediation, will be essential drivers to support the inflow of long-term financing. Since the "2013 taper tantrum," and even more during the volatility episodes in 2015, investors are increasingly differentiating EMEs depending on their degree of macroeconomic vulnerability. However, EMEs have all been subject to currency and capital flow volatility across the board when uncertainty and risk have been perceived to be higher than usual. The availability of fiscal space and financial instruments to counterbalance "risk-on events" would have the double benefit of increasing the governments' margin of maneuver, as well as reducing the cost of funding through a lower-risk premium required by foreign investors.

Local currency sovereign bond markets would need to be consolidated with policies supportive of sustainable long-term yield curves. Although a number of EMEs are able to issue relatively long maturities, beyond 10 years, the long end of the curve is still generally illiquid and depends mostly on search-for-yield factors from AE investors. Efficient government bond markets would be essential to support fiscal sustainability, as well as to develop capital markets for other assets, including corporate, housing, and infrastructure financing.

Local currency nonsovereign bond markets are still in very preliminary stages of development both in the volume and diversity of instruments. The availability of low-cost funding in hard currency in offshore bond markets has delayed more proactive policies to support the development of domestic nonsovereign bond markets. Ongoing efforts to implement Basel III prudential regulations, particularly in the most advanced EMEs, are starting to create the incentives to reduce bank funding in favor of fixed-income instruments. In fixed-income instruments, banks still have a role to play as originators or intermediaries, particularly in housing finance (such as in covered bonds and securitization). A particular strong policy effort is required to develop regulatory frameworks and to lower issuance transaction costs, as well as to strengthen investor protection.

A greater share of foreign capital is expected to continue to be channeled through domestic capital markets with potentially opposite effects. Although foreign investors have been instrumental in lengthening maturities and increasing the liquidity of domestic capital markets, the new financial landscape will reduce some of those benefits. New prudential regulations are already having an effect on reduced liquidity in both AEs

and EMEs. Additionally, EMEs that are still consolidating reforms may be subject to destabilizing volatility and capital inflow's sudden stops.

Long-term financing for strategic sectors of growth, such as small- and medium-sized enterprises, housing, and infrastructure, would need a combination of well-coordinated policies on several fronts. Particularly for infrastructure financing, governments need to work on three main fronts: (a) sectorial and project structuring policies supporting a bankable pipeline of projects, (b) standardized capital market instruments and regulations on the supply and the demand side for infrastructure financing, and (c) financial instruments provided by national or multilateral development institutions to crowd in private investment (such as financial guarantees). The development of infrastructure project bonds is especially relevant given their potential to tap the large pools of long-term savings managed by institutional investors. Those instruments are currently undergoing a promising process of innovation in their structures and risk-return profiles to replace the monoline model of before the crisis that was based on provisioning full guarantees on the bonds.

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CHAPTER 3

Interest Rates, Terms of Trade, and Currency Crises: Are We on the Verge of a New Crisis in the Periphery?

Nathaniel Cline and Matías Vernengo

3.1 Introduction

Conventional models of currency crises suggest that at the heart of the process there is invariably a fiscal crisis. Alternative models suggest that expectations play a role, that self-fulfilling crises are possible, and that balance sheet problems and banking crises might also be relevant to understand currency crises. Both the so-called second- and third-generation models still insist that fiscal crises might be one of the elements triggering a currency crisis. The model developed in this chapter, on the other hand, emphasizes hikes to foreign rates of interest and terms of trade (TOT) shocks, highlighting the role of the balance of payments constraint in currency crises.

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In the same vein of the first-generation models, the alternative model emphasizes the role of fundamentals in leading to crises. Yet, in contrast to the Krugman model, it suggests that the fiscal crises are not central for currency crises. Fiscal crises might be the result of currency crises, but not their cause, within this framework. The model is by design simplistic and reduces the complexities of real world currency crises, as much as the first-generation models did. The fundamental role of the simplification is to highlight the differences in causality and the deep roots of currency crises. In this view, it is not the excessive spending of the bloated Leviathan, but the currency mismatch between spending requirements—which often involve imports of essential intermediary and capital goods for peripheral countries and are in foreign currency, and receipts, which are in domestic currency—that lead to a crisis. It is what used to be called the balance of payments constraint and has now been more colorfully referred to as the "original sin" that is at the heart of the problem (Eichengreen et al. 2005).

The remainder of the chapter is divided in four sections. The following section develops a model that might be referred to as post-Keynesian, since demand determines output, prices are determined by technical conditions of production and distribution, and following those conditions the balance of payments is the main constraint on economic growth. Though not all of the central post-Keynesian characteristics are explicitly treated in the model, it certainly fits within the tradition, as well as that of the old Latin American Structuralists. Alternatively, the model would also fit within the classical-Keynesian tradition (Bortis 1997). The subsequent section provides a short overview of the history of currency crises, intended to provide support to the notion that the balance of payments and not fiscal matters are often at the center of these crises. The next section briefly discusses, in light of the model developed in the chapter, the possibilities for currency crises in peripheral countries after the global crisis of 2008. It is argued that even though conditions have become more problematic in the last three years, the prospects of currency crises in the periphery have been exaggerated. A short conclusion brings the argument together.

3.2 A Post-Keynesian Model of Currency Crises

First-generation models, based on the ideas of Krugman (1979), suggest that the causes of currency crises are related to the fundamentals of the economy. The fundamentals are associated to the tendency of the economy to reach its potential "natural" level, purchasing power parity (PPP), and

the quantity theory of money. Under these circumstances, fiscal deficits financed by printing money are inflationary, and under a fixed exchange rate regime, excessive money printing would cause inflation, expectations of depreciation, deterioration of the current account, and loss of reserves.

In second-generation models (e.g., Obstfeld 1996), a currency crisis might occur even if the central bank pursues the correct monetary policy, consistent with its commitment to a fixed rate. The reason for a crisis is that there are multiple combinations of exchange rate and money supply that would be consistent with a fixed exchange rate regime and speculators might take advantage of multiple equilibria. Hence, speculators might attack a currency not because the central bank follows an inconsistent policy but because they think that the costs of keeping the parity (hiking interest rates to reduce loss of reserves, with consequent reduction in the level of activity) would force the central bank to abandon the fixed peg.

Third-generation models emphasize the role of the financial sector, since currency crises are often associated with banking crises (twin crises). The banks have explicit currency mismatches on their balance sheets because they borrow in foreign currency and lend in local currency. Devaluation would increase the cost of repaying under these circumstances. Speculation results not from inconsistent policies or multiple equilibria but from the risk associated to balance sheet mismatches (firms might not be able to repay, since revenue is in domestic currency). Notably, in their theoretical model of twin crises, Kaminsky and Reinhart (1999) include fiscal deficits. However, in empirical testing they find that "fiscal variable fared the worst, accurately calling only slightly over a quarter of the currency crises" (Kaminsky and Reinhart 1999, 490). Of course even this finding may be capturing reverse causality.

While conventional currency crisis models of all generations suggest that at the heart of currency crisis there is a fiscal crisis, post-Keynesians emphasize hikes to foreign rates of interest and TOT shocks, highlighting the role of the balance of payment constraints in currency crises. Note that the economy in this view is not at full employment, and hence the effect of fiscal expansions is not on prices but on the level of activity. A higher level of income leads to increasing imports and a deteriorating current account (CA).

It is the deteriorating CA and not the fiscal deficits per se that matter and the CA position might worsen even if the fiscal accounts are balanced. Further, after a currency crisis the central bank hikes the rate of interest, increasing the costs of debt-servicing, and hence government spending, leading to a weakening of the fiscal accounts. In this case, it is the external currency crisis that causes the domestic fiscal crisis (Vernengo 2006).

The dynamics of the foreign debt-to-export ratio (d) is given by definition as:

$$\frac{\dot{d}}{d} = \frac{\dot{D}}{D} - \hat{x} \tag{1}$$

where x-hat is the rate of export growth and D-dot is given by:

$$\dot{D} = \left(p_M m Y - e p_X X \right) + i^* D \tag{2}$$

In other words, foreign currency denominated debt increases when the nominal value of imports is higher than that of exports, and with the service of foreign debt, where m is the import coefficient, p is price, the m and x subscripts refer to imports and exports, and i^* is the foreign interest rate.

Substituting (2) into (1) we obtain:

$$\dot{d} = \left(p_M \mu - e p_X \right) + \left(i^* - \hat{x} \right) d \tag{3}$$

where μ is the import-to-export ratio. The dynamics of the exchange rate is described below:

$$\dot{e} = \delta \left(\bar{e} - e \right) \tag{4}$$

where e-dot is the change in the nominal exchange rate measured as the domestic price of foreign currency (i.e., an increase implies depreciation), e-bar is the target exchange rate that the monetary authority tries to maintain in a fixed exchange rate regime, presumably one that would be compatible with a sustainable equilibrium of the CA, including the ability to service international debt commitments. Currency crises may occur without a strictly fixed exchange rate, in regimes where the central bank sets a band, crawling peg, or simply has a "fear of floating." For simplicity, we assume that the central bank sets the exchange rate in conformity with a target rate that is compatible with CA equilibrium.

Under these circumstances, the exchange rate dynamic might be different and could be affected by interest rate differentials and possibly the debt-to-export ratio. If the exchange rate is lower (more appreciated) than

what would be seen as consistent with a sustainable CA, then there is a tendency for the nominal exchange rate to depreciate. In other words, the nominal exchange rate depreciates if for a given nominal exchange rate there is an unsustainable CA deficit.

Equations (3) and (4) provide a dynamic system that allows us to determine the relation between exchange rate and foreign-debt-to-export ratio. Assuming that δ, σ, and γ are positive, if $\hat{x} < i^*$, then the determinant of Jacobian of the system will be negative, and the system will be unstable. The dynamics are shown in Fig. 3.1. The *d*-dot phase path might be positively or negatively sloped, depending on whether export growth is higher or lower than the international interest rate. If the interest rate is higher than the export growth, then the d-dot line is positively sloped, since depreciation does not increase exports enough to reduce the debt-to-export ratio. Notably, if the opposite is true (if export growth is higher than the rate of interest), the system is stable. This situation would be relevant for analyzing the possibility of a currency crisis in the periphery after the 2008 global crisis (as discussed in a subsequent section). The horizontal sloped e-dot line indicates the fixed exchange rate regime with a rate fixed at *e*-bar.

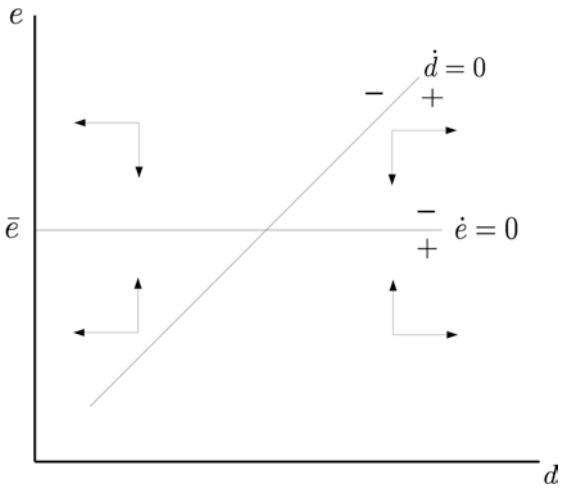

Fig. 3.1 Exchange rate and foreign-debt to exports ratio phase diagram

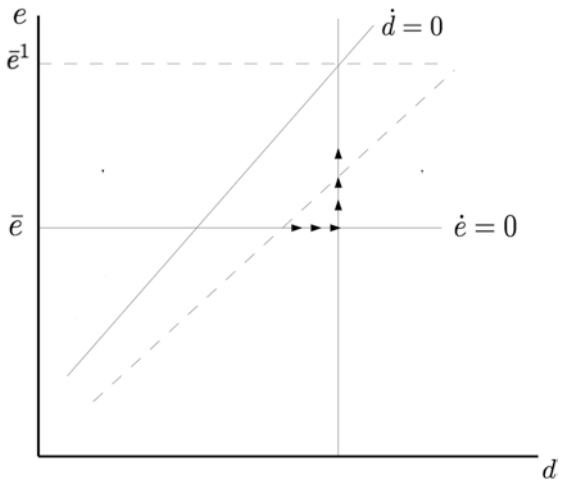

Fig. 3.2 Dynamics of a financial shock

A financial shock characterized by the increase in the foreign interest rate affects the dynamics of the system. An increase in the rate of interest affects the ability to service foreign debt, forcing a counter-clockwise rotation of the d-dot line. This implies that the original exchange rate is not sustainable. The final outcome is shown in Fig. 3.2, where the dotted line represents the original d-dot path and the initial equilibrium. The increase in the international interest rate generates an increasing burden of debt, which eventually leads to, at some level of the debt-to-export ratio, the depletion of external reserves and forces the floating of the currency, which would jump to the new e-bar prime level. In other words, the burden of debt increases until *default* puts an end to the process, and at that point depreciation follows. The result is the increase in both the debt-to-export ratio and the nominal exchange rate.

The increase in the international interest rate causes a currency crisis irrespective of the fiscal position of the economy. A fiscal imbalance might lead to an increase in imports, and in the CA deficit, but in this model it would only affect the foreign-debt-to-export ratio and the dynamics of the exchange rate if it affected the import-to-export ratio (μ). In this sense, the problem would not be that excessive fiscal spending leads, in an economy at full employment, to excessive monetary

financing, and eventually to depreciation, but that fiscal policy puts excessive pressure on the current account. The balance of payments disequilibrium, and not full capacity utilization of labor and capital, is the limit to fiscal expansion.

A similar situation would occur if a negative TOT shock took place, but in this case the whole d-dot curve would move upward. In this situation the d-dot curve would shift upward, and the fixed exchange rate would be unsustainable, since it would lead to incapacity to service debt again. A twin shock—meaning higher international interest rates and lower TOT—would be the worst possible scenario and the perfect storm regarding currency crises.

Note that once a shock has affected the equilibrium, if agents have rational expectations, meaning that they form expectations consistently with the model and using all available information, then they would have an advantage to try to speculate against the currency before reserves are exhausted, and devaluation would occur immediately after the shock, very much like in the self-fulfilling crisis models. Yet, the main characteristic of the model presented here is that it emphasizes the role of fundamentals, like the first-generation models. In contrast with those models, the fundamentals are essentially connected to the external accounts, and the main drivers of currency crises are the twin shocks of higher interest rates and lower TOT.

It is also important to note that once the currency devalues, and the system moves to a new equilibrium with a depreciated nominal exchange rate and higher foreign-debt-to-export ratio, it is not necessarily the case that the new equilibrium exchange rate, which might be considered compatible with a sustainable CA, was the main instrument of the re-equilibration process in the external accounts. The more likely mechanism for the adjustment of the CA is a collapse of imports associated to a domestic recession, in particular since we assume that export growth is smaller than the foreign rate of interest and that exports might not be very responsive to the exchange rate. This is the well-known contractionary effect of depreciation (see Krugman and Taylor 1978, though the idea can be traced back to Hirschman 1949 and Diaz-Alejandro 1963). In this case, the income effect associated to lower wages, resulting from depreciation and the contraction of purchasing power in foreign currency, is larger than the substitution effect. Although not formalized in this chapter, our results would be compatible with a model of currency crisis in which variations of prices are not central for depreciation.

This is particularly important, since it suggests a completely different macroeconomic environment than the one that would be compatible with

the first-generation currency crisis models. In that model, the system must be at full employment, and that is the reason why monetary financed fiscal expansion leads to pressures for the depreciation of the currency, depletion of reserves, and the ultimate crisis. In our model, not only can the pressure for depreciation take place considerably before the system is at full employment (the CA deficit could be unsustainable and the dynamics of the foreign-debt-to-export ratio could be explosive well before the system is at maximum capacity of labor and capital), but the adjustment itself and the crisis would likely be contractionary.

In addition, as noted above, in this scenario the fiscal crisis might be a result of the currency crisis, and not vice versa. If the crisis leads to a recession, then fiscal revenues collapse, and spending, particularly unemployment insurance expenditures, welfare spending, and transfers, increases exacerbating the fiscal problems. Further, the central bank might hike the domestic interest rate to preclude capital flight and further devaluation, and that would have an additional effect on interest payments on domestic debt, also worsening the fiscal stance. In this sense, this chapter puts the logic of currency crises upside down with respect to first-generation models.

Finally, whereas inflation was central to conventional currency crisis models, here it plays no direct role. Again the logic is in reverse to conventional models. In the monetarist story usually adopted in currency crisis models, money printing causes inflation, which, in turn, leads to external imbalances, reserve depletion, and depreciation. Causality goes from money to prices and from the latter to the exchange rate. In the current model, on the other hand, causality is reversed. Depreciation, which results from the incapacity to service foreign debt and CA imbalances, leads to inflation. If the central bank accommodates inflation by increasing money supply, as often is the case, at least to some extent, the sequence would go from the exchange rate to prices and from those to money. Money is endogenous in this case, something that most mainstream models have now accepted. For a formalization of inflation along these lines see Câmara-Neto and Vernengo (2004).

3.3 A Brief History Of External Constraints, Currency Crises, and Defaults

The perspective adopted here suggests that ultimately currency crises may be the result of payment imbalances which in turn are intimately related to economic growth. In this sense, the model above belongs to a larger class of models which view the balance of payments as the primary constraint

on economic growth. That is, peripheral countries may have difficulty reconciling equilibrium in the balance of payments with domestic policy objectives like full employment or price stability. If the rate of economic growth and equilibrium in the balance of payments become misaligned, adjustment will primarily come from income rather than relative prices. In the context of this model, this adjustment may involve a fiscal crisis, which is generated by the ensuing currency crisis. In the examples provided above, a TOT shock or a foreign-interest-rate shock initiates the crisis that realigns economic growth with the balance of payments.

That the requirement for long-term payments balance acts on the rate of growth is well established by the large literature following Thirlwall's law. The contributions in McCombie and Thirlwall (2004) provide a recent summary. The core notion is that the long-run growth of many countries is consistent with the growth rate that would ensure balance on current account, given import and export propensities. What these models do not specify is the nature of the adjustment to the long-run balance of payments' consistent growth rate. The model here suggests that TOT shocks and foreign interest rate shocks often (but not always) initiate the crisis, which then results in an exchange rate crisis, decline in output, and a transition to unsustainable debt ratios. In what follows, we will describe the evidence that TOT shocks and foreign interest rate shocks are often the source of exchange rate crises, which in turn are associated with debt crises and declines in output.

This view is compatible with the notion of long-term debt cycles. Marichal (1989) argues that debt crises in peripheral countries are usually associated with financial cycles in central countries. Cycles of growth and expansion of international trade lead to surges in lending to developing countries, as the funds in central countries grow faster than their needs, leading to a frenzy of speculation. Ultimately, investors become overextended and retrenchment occurs leading to a reversal of capital flows and eventually to default. Suter (1992) finds evidence of decreasing profitability in the center and higher indebtedness in the periphery. Finally, Ginzburg, Andrea and Annamaria Simonazzi (2004) suggest that contractionary monetary policy, that is higher interest rates in the center, would lead to falling TOT and financial crises in the periphery. This view of long-term debt underplays the role of public finance in the crises in peripheral countries.

Easterly et al. (1993) argue that the observed volatility of growth rates (which contrasts with the stability of country level policy institutions) is explained by shock variables. In particular, they find that the TOT, war,

and a dummy for high debt to GDP in low and middle income countries in 1980 are all significant. These variables lend support to the notion that country growth rates are closely related to events that dominate the external accounts. Importantly, Easterly et al. (1993, 470–71) conclude that "shocks, especially TOT shocks, statistically explain as much of the variance in growth rates over 10-year periods as do country policies." This finding has subsequently been confirmed by Mendoza and Enrique (1995) and Kose (2002).

Historically, the pattern described in this model has been repeated several times in a variety of international monetary contexts. While it is clear that debt and currency crises are often popularly associated with corruption or speculative state expenditures, some core structural issues permeate each major wave of fiscal and currency crisis that lends support to the approach of this chapter. In particular, there is a common pattern in which the country at the center of international finance increases its interest rate to "bring gold from the moon" (in the famous words of Bagehot) and resolve a balance of payment problems often associated with deterioration in the TOT. While increasing the interest rate can often resolve the balance of payment difficulties for the core country, other countries are not so lucky. Many issued foreign loans denominated in the core countries currency, which were predicated on export earnings from a favorable TOT. Once the central country has raised its interest rate, new loans are no longer forthcoming, domestic interest rates rise, and often the TOT collapse creating a perfect storm for a dual currency and fiscal crisis.

The first major wave of country defaults, which occurred during the period of Latin American independence, meets some of our criteria. The conclusion of the Napoleonic Wars resulted in London's displacement of Amsterdam as the center of international trade and finance and a lending boom to the newly independent Latin American countries (starting with Colombia). This coincided with a boom in Britain which in turn led to rising imports and a drain on the Bank of England's reserves. In response, the Bank of England raised its discount rate (the main monetary policy tool during the nineteenth century) in 1825. The rate increase prompted recessions throughout Europe and a collapse in world trade which was also associated with a decline in TOT for Latin American economies (Kaminsky and Vega-García 2014). The rising interest rates, collapsing TOT (which in turn led to collapsing tariff revenues), and depreciation (with bonds denominated in pounds or containing specie clauses) all conspired to produce a wave of depression and defaults (Dawson 1990).

Interestingly, a similar pattern of rising foreign interest rates and collapsing TOT produced similar depreciations and defaults for the US states during the 1840s. While the federal government was able to issue debt in domestic currency, the individual states were not, and thus were subject to the kind of exchange rate risk that produces an explosive saddle path. During the 1830s, US export prices (cotton in particular) began to rise, putting pressure on British specie holdings (cotton was a main import for the British textile industry). In response, the British raised the bank rate that then pulled capital back from the USA, caused the dollar to depreciate, and caused cotton prices to collapse as demand fell and carrying costs rose (Cline, Nathaniel 2012).

The next major wave of defaults associated with currency crises came in the late nineteenth century, featuring British investments in Latin America once again. By the 1860s, lending to Latin America had resumed but once again resulted in a wave of defaults toward the end of the century. Notably, this period of crisis once again coincided with a sharp increase in the British bank rate, large fluctuating gold premiums, TOT collapse, and eventual sovereign defaults. Ultimately, as Ford (1962) argues, the crises were resolved primarily through the level of income and not relative prices. The process leading to default was again a deadly combination of increasing servicing costs, declining output, a fall in export proceeds, and exchange rate depreciation. It is worth noting that this process did not apply to Great Britain, which was able to exert a great deal of influence over international capital movements via changes in the bank rate. For these reasons, De Cecco (1985) has argued that the classical gold standard may have produced some stability for the center, but also resulted in instability for the periphery.

Another wave of defaults and currency crises was associated with the collapse of the classic gold standard and then the Great Depression. Figure 3.3 shows the coincidence once again of collapsing commodity TOT and rising interest rates. The commodity TOT are measured by the Grilli and Yang (1988) commodity price index deflated by an index of manufactured goods' unit values. Though imperfect, this series can be interpreted as a long-run measure of developing country TOT. As the gold standard collapsed in the aftermath of World War I, British long-run rates doubled while commodity prices collapsed. This produced two related waves of currency crises and sovereign debt problems. Notably, as pointed out by Câmara-Neto and Vernengo (2004), the German hyperinflation experience can be seen in this context as related to the balance

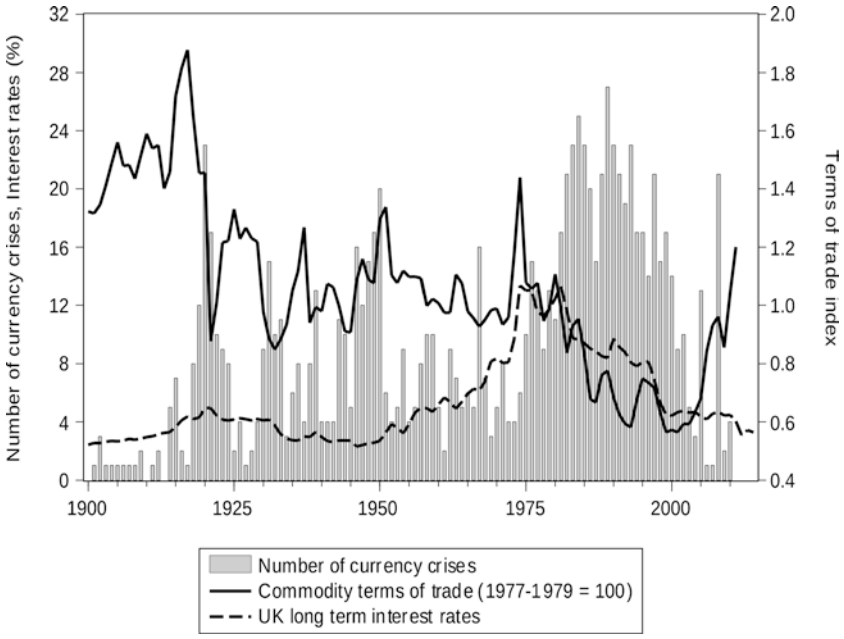

Fig. 3.3 Currency crises, the terms of trade and interest rates. *Source:* Reinhart and Rogoff (2010), Pfaffenzeller, Newbold and Rayner (2007), and Officer (2015)

of payment problems stemming from real causes (war reparations of the Versailles treaty). The resulting large depreciation was associated with a major contraction in German output and rising external obligations.

As can be seen in Fig. 3.3, the massive wave of defaults in the 1980s and 1990s clearly involved the largest number of countries. While the conventional currency crisis models described earlier saw the 1980s' crisis as being the result of excessive fiscal policy, the empirical record seems closer to the model presented here. As pointed out by Eatwell and Taylor (2001), many of the countries involved actually ran very modest deficits or even surpluses prior to the crisis. Instead, a severe increase in US interest rates, famously pursued by Paul Volcker to stem inflation, increased debt service costs of Latin American countries whose debt was often indexed to the London Interbank Offered Rate (LIBOR). In addition, since much of the debt was in dollars, the resulting appreciation of the dollar caused the external debt to balloon. Finally, the crisis

was associated with large TOT shock in which commodity prices collapsed. Prior to this, several non-oil exporters were already developing the balance of payment difficulties due to the oil shocks of the 1970s. The external payment imbalances were then only resolved through large contractions in output. This process also notoriously coincided with the collapse of the Bretton Woods regime. In Latin America, it also marked a turning point for many countries that subsequently abandoned the import substitution strategy and moved toward the so-called Washington Consensus.

The countries involved in the wave of currency crises and defaults limped along through a "lost decade." Currency crises returned again in the late 1990s among the East Asian economies. This time, traditional currency crisis models clearly could not apply as the countries in question largely had budget surpluses to begin with. The newly industrializing economies of East Asia were not negatively impacted by the falling commodity prices and in fact benefited from a large wave of foreign investment causing some currencies (the Yen in particular) to appreciate. These flows led to productive investments in some countries and unproductive investments in others. While explanations of the ensuing crises often focused on excessive state intervention, Henderson (1999) argues the state was rather weak in Thailand and Indonesia. Additionally, Alexander et al. (2006) discuss the weakness of banking and financial regulatory institutions in the East Asian crisis, while Chang (1998) argues convincingly that South Korea's state capacity was weakened by the crisis itself. The crisis instead may have more to do with the increased capital market liberalization. Stiglitz (2000, 1075) has argued this point, noting that as the crisis spread, "even countries with good economic policies and relatively sound financial institutions (at least as conventionally defined) were adversely affected."

The common theme, emphasized by our model and the preceding institutional history, suggests that there is a pattern of external shocks which generate the balance of payments and currency problems which then in turn cause fiscal crisis. This contrasts with explanations that emphasize country-specific policies. As Diaz-Alejandro (1984) emphasized, "blaming victims" is fairly common in the wake of a crisis, but "when sins are heterogeneous" this line of argument becomes harder to maintain.

The dominant role of external shocks in capital flows has been confirmed by others. Calvo et al. (1993) suggest that capital flows to Latin America in the early 1990s could only be explained with reference to an

external shock originating in the USA, which was common to the region, a view also argued by Fernandez-Arias and Montiel (1996). Ying and Kim (2001, 954) find that for both Korea and Mexico, "the U.S. business cycle and shocks to foreign interest rates account for more than 50% of capital inflows to both countries."

TOT shocks also affect developing countries more often than developed. Baxter and Kouparitsas (2000) have found that the TOT fluctuations are much larger for developing countries (by roughly two times) than for developed countries, which is clearly related to the composition of exports in those countries. The export basket of developing countries has historically been dominated by primary commodities that themselves are known to be quite volatile. Importantly, these goods and prices are often beyond the control of any one commodity exporter (Broda et al. 2003).

In addition, it is notable how common the coincidence of TOT and interest rate shocks are historically. There seems to be an institutional pattern that lies behind our formal model, in which central countries (first Great Britain and then the USA) respond to rising prices and deteriorating TOT with large interest rate shocks. These are then potentially transmitted to commodity prices, as demand for these goods by industrialized economies slows, or through carrying costs as argued by Frankel and Jeffery (2006). Thus, while commodity prices may be beyond the control of one commodity exporter, they are directly and indirectly influenced by conditions in central countries. The central country thus manages its TOT, while the periphery is subject to a perfect storm of external shocks, which lead to currency crises and unstable debt dynamics.

3.4 Post-Crisis Development in Light of the Alternative Model

In the aftermath of the 2008 global crisis, the prices of commodities that fell significantly recovered somewhat and seemed to be in a decreasing trend once again. Ocampo and Erten (2013) suggest that we are at the end of a super-cycle of commodity prices. Further, interest rates in advanced economies had remained at very low levels, mostly close to the zero-lower bound, in advanced economies, including the USA. This has generated fears that a not too distant normalization of interest rates in advanced countries and the negative terms of trade tendency in peripheral economies might lead to a wave of currency crises in the developing world.

However, the anxieties about the plausibility of that scenario might be exaggerated. For one, the fall in TOT has not been yet alarming, or at least not uniformly in all regions, as shown in Fig. 3.4. While the TOT of oil exporters in the Middle East and North Africa (MENA) and commodity exports in Latin America and the Caribbean (LAC) and Sub-Saharan Africa regions have fallen, in Developing Asia and Europe the TOT have improved. For all developing countries, TOT have fallen less than 5 % in

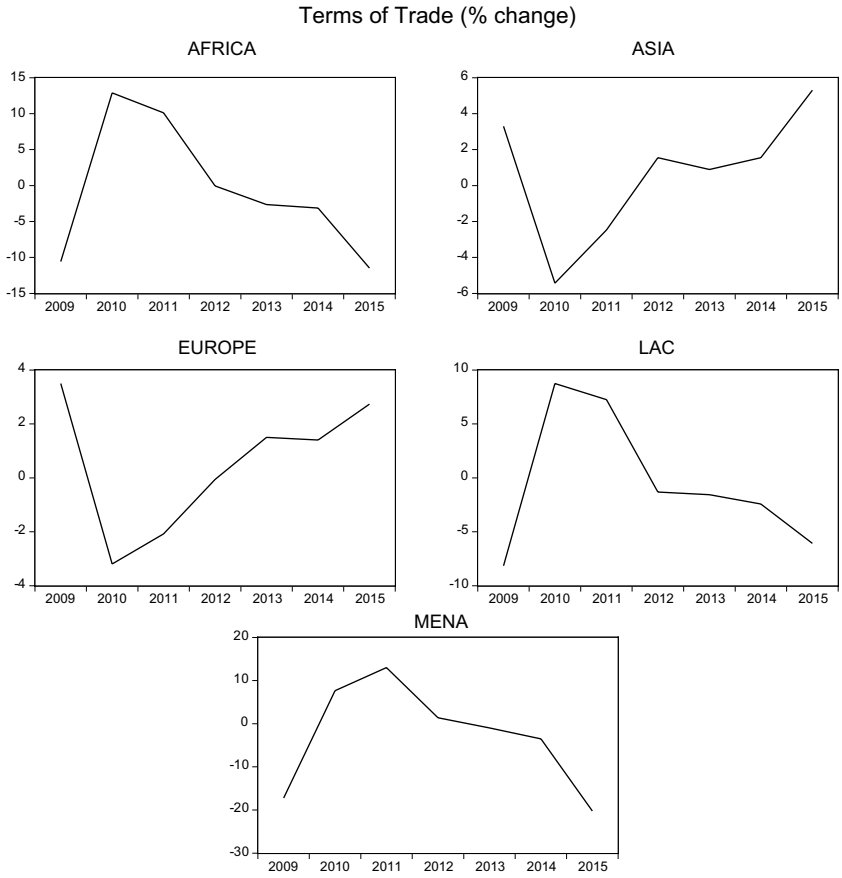

Fig. 3.4 Global terms of trade

cumulative terms over the last three years (the numbers of Sub-Saharan Africa, LAC, and MENA are, respectively, 17.3%, 11.4%, and 24.8%). Further, when the CA situation is examined, not surprisingly a similar picture emerges with deteriorating external positions in Sub-Saharan Africa,

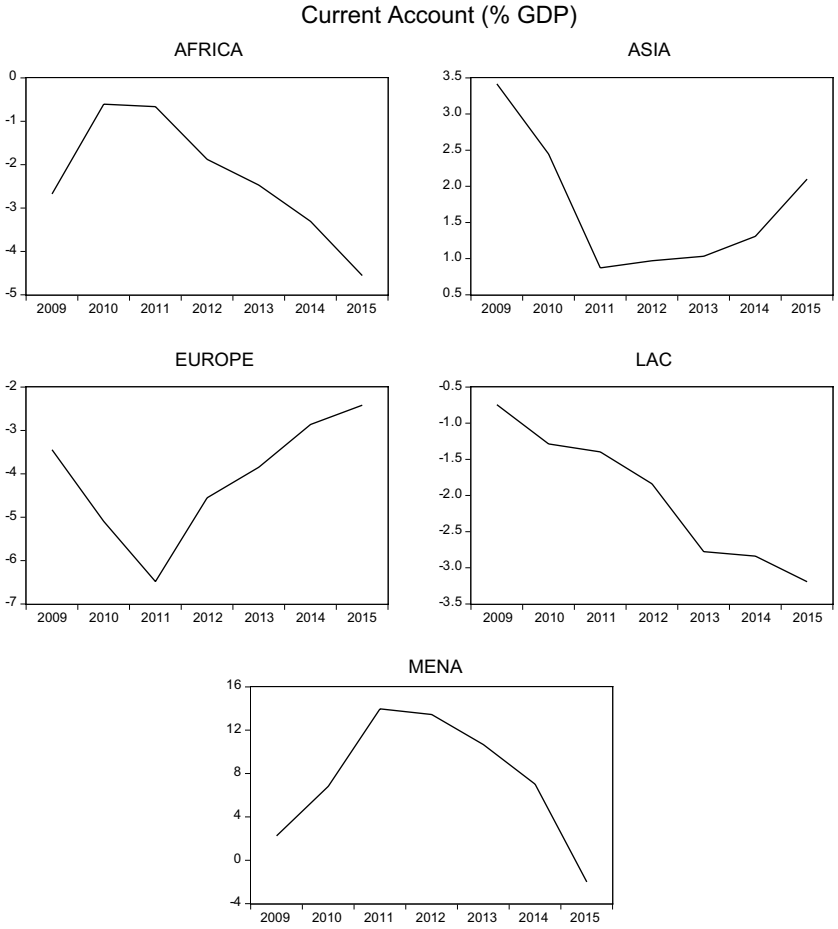

Fig. 3.5 Global current accounts

LAC, and MENA, and improving external conditions in developing Asia and Europe (Fig. 3.5). Regionally, the worst CA deficit is in Sub-Saharan Africa at about 4.5% of GDP.

These would indicate, according to the model discussed in this chapter that the possibilities of currency crises in developing countries have increased significantly over the last three years. However, a few counterbalancing forces should be taken into consideration. Following the model, the other crucial variable would be the debt-to-export ratios, and these are relatively low in most regions, the exceptions being developing Europe and LAC, with ratios of 167.2% and 131%, respectively, in 2013, which is the last data available (WEO-IMF, April 2015). However, when we look at the total debt service as percentage of exports, only developing Europe has a relatively large burden of 62.2% while LAC is about 34.7%, which seems considerably less problematic. All the other regions have debt service burdens of less than a quarter of their exports. Further, again with the exception of developing Europe, all regions have had stable or decreasing foreign debt as of 2013.

Finally, international reserves in developing countries are at a historically high level, which also provides for protection against a currency crisis. Up to 2013, the last available data, all regions continued increasing their foreign exchange reserves, even if at a slower pace, with only Sub-Saharan Africa displaying a minor decrease in the very last year.

Additionally, while the volume of exports of goods and services, not to be confused with its value, is not growing at the same pace as in the boom period between 2003 and 2008, there is a slow recovery in course, with Asia, not surprisingly, ahead of the rest of the developing countries. More importantly for our purposes, however, is the relation of export growth and the rate of interest. Using the overall rate of growth of the volume of exports of goods and services for developing countries and the 12-month LIBOR, based on US dollar, for the interest rate, it is quite clear that the situation would be in the stable situation according to our model (see Fig. 3.6). In particular, the stability follows as a result of the very low levels of the international interest rate since the global crisis.

The current conditions in advanced economies, in the Unites States, in Europe as well as Japan seem to suggest that there will be a tendency for international interest rates to remain at low levels by historical standards. Even in the USA, where arguably there has been more pressure for the normalization of interest rates, it seems that the Fed, under the conduction of Janet Yellen, remains very cautious and that increases in the basic

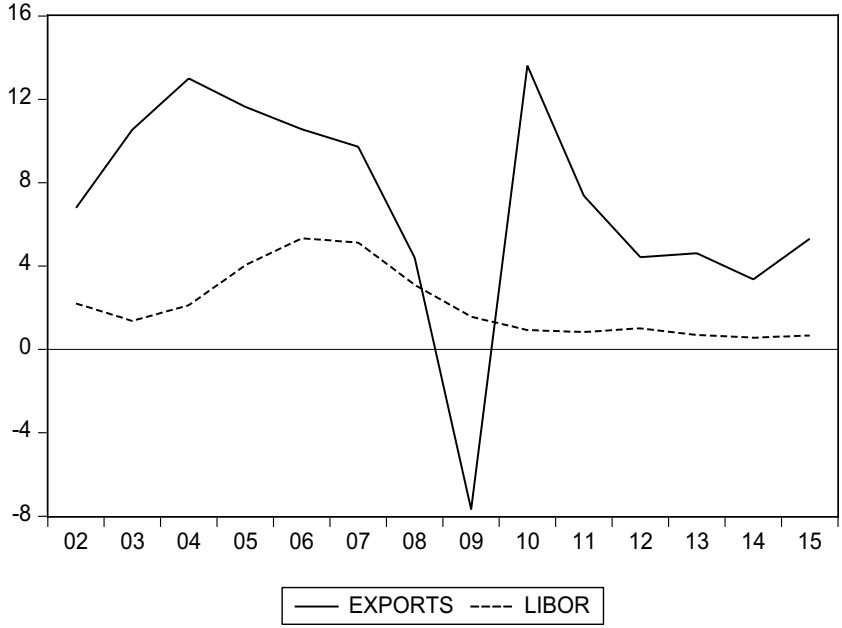

Fig. 3.6 Developing country export growth and the London Interbank Offered Rate

interest rate will be slow and will remain below historical levels for a prolonged period. With international interest rates close to the zero-lower bound, the chances for currency crises in the periphery are considerably more limited than otherwise they would be.

This is not to say that currency crises in particular countries are not possible in the near future, since that would be an excessively bold conclusion on the basis of regional averages. Specific conditions in some countries might imply that a currency crisis is more likely in one particular country than for peripheral countries as a whole. Certainly, the case of Greece comes to mind as a possible one, and the possibility of an exit of the euro—which would imply a creation of a more devalued national currency, and that is very much under debate at the time of writing this chapter—cannot be completely discarded. This is not to suggest that Grexit would necessarily solve Greek or European problems. Internal devaluation (a fall in domestic wages and prices) in Greece has been extensive. However, it seems that

most of the adjustment of the external accounts and the rebalancing of the CA deficit were accomplished by the recession and contractionary austerity policy which resulted in lower imports.

Another possible case would be that of Argentina, plagued by Vulture Funds. On why the Argentine case is, however, unlikely to lead to a currency crisis in the near future, see Vernengo (2014).

The inflationary effects of higher TOT in the 1970s contrasts sharply with the low inflation environment of the so-called Great Moderation-a phenomenon that is primarily attributable to the reduced bargaining power of the working class (Perry and Vernengo, 2013). Thus, a 1980s style debt crises that results from higher interest rates in the USA seems unlikely. (Perry and Cline 2013)—the possibility of higher rates in the USA leading to a 1980s style general debt crisis seems less plausible. Only a large, and somewhat implausible, increase in the rate of interest in the USA would recreate that scenario. At any rate, even if it happened, the fiscal accounts of most emerging and developing markets, to use the IMF's term for peripheral countries, would have no direct bearing on the possibility of currency crises and defaults.

3.5 Concluding Remarks

Traditional models of currency crisis, and even second- and third-generation models, all include the possibility of a crisis triggered by domestic fiscal policy. In this chapter, we suggest a fundamentals-based model in which the causality is exactly reversed. Instead, structural problems in the balance of payments are generated by external shocks, in particular TOT and foreign interest rate shocks. It is thus currency mismatches and the structure of imports and exports in peripheral countries that generate crises. We argue that this causality has significant historical relevance and suggest that, although TOT have fallen for some regions, low interest rates relative to peripheral export growth imply that a renewed wave of currency crises seems unlikely.

While the more conventional models of currency crisis might lend credence to the global push for austerity measures since the 2008 crisis, our model and analysis suggests the opposite. Austerity measures have in fact not necessarily led to increased stability and declining debt ratios, particularly in peripheral Europe. Rather than focusing on the domestic fiscal accounts, our approach suggests that greater attention should be paid to the structure of the current and capital accounts. Measures to control the nature and size of capital flows and control borrowing costs,

as well as domestic policies that generate more favorable import/export propensities, may be more successful in avoiding future currency crises.

In particular, as noted above, the crisis among peripheral Eurozone countries, and Greece especially, is relevant to our approach. In our view, the core issue is a CA one, which then generates domestic fiscal problems (a similar argument about the Eurozone crisis can be found in Pérez-Caldentey and Vernengo 2012). This approach has recently been empirically confirmed by Nikiforos et al. (2013) who find that for Greece the causality runs from the foreign deficit to the public deficit. The focus on austerity is thus dangerously misplaced.

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CHAPTER 4

Devaluation and Labor Market Dualism in Emerging Markets

Vikram Kumar

4.1 Introduction

The global financial crisis has affected emerging markets in complex ways and put pressure on both the current and financial accounts in economies operating under fixed exchange rate regimes. The post-crisis scenario requires a careful consideration of conventional policy choices by developing economies in the context of their specific circumstances, particularly in regard to changing currency pegs. In line with other findings on the subject, this chapter identifies circumstances that can cause perverse effects on the real exchange rate to follow from currency devaluation without appropriate fiscal policy adjustment. Moreover, though emerging economies share similar institutional characteristics, they can experience different sectoral wage effects from currency devaluation. So while caution is indicated in the standard use of economic policy given some structural elements of emerging markets, the analysis below also clarifies how increasing the efficiency of labor markets through suitable institutional remediation can have an independent beneficial effect on the real exchange rate.

Among the common structural features of developing countries is the presence of dual labor markets. On the one hand, there exists a formal, organized sector of the economy, usually with a binding wage floor where

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jobs are eagerly sought and which produces the bulk of tradable goods, and on the other, an unorganized, informal sector where entry is free, wages are relatively low and which largely produces non-tradable goods. Meaningful open-economy analyses of shocks in developing countries therefore require proper consideration of the prevalence of dual labor markets with wage restrictions of partial coverage and the presence of non-traded goods.

Whatever the source of the barrier to wage arbitrage, in such an economy the persistence of a wage differential between the high-wage formal and low-wage informal sectors is consistent with a state of unemployment that is both voluntary and economically rational. Workers not employed in the formal sector may freely enter the informal sector and earn the going wage; at the same time they face some probability of obtaining a formal sector job by happenstance while employed in informal activity. Conversely, they may eschew informal employment altogether and devote their time exclusively seeking out a higher-paying formal sector job thereby increasing the probability of obtaining the formal sector job. They would do so if the opportunity cost of unemployment—the expected earnings obtainable in the informal sector—is offset by the gains resulting from the increased probability of obtaining the formal sector job. The increase in this probability reflects the existence of a "job search premium" as articulated in Pinera and Selowsky (1978).

In this chapter, such a labor market is nested in a product market framework where tradables are produced in the formal sector and non-tradables in the informal sector (Fiess et al. 2010; Agénor and Aizenman 1999). We examine how these structural factors shape the responses of a small open developing country to policy shocks. In doing so, we specifically highlight the role of the job search premium in determining their outcomes, and this particular focus provides a point of departure from the rich literature on both small open economies and dual labor markets. For instance, Brecher (1974) is an early study of the effects of wage restrictions which did not consider non-traded goods, whereas Helpman (1977) considers both tradable and non-tradable goods but in an economy with a wage floor across both sectors, which results in involuntary unemployment. The importance of search activity in segmented labor markets is exemplified in Harris and Todaro (1970), where the existence of an informal labor market ensures that any unemployment is voluntary, but it does not disaggregate commodities into tradables and non-tradables.

Effective management of foreign exchange parities is a perennial challenge for many developing countries, often with political ramifications related to sectoral wage differentials. The findings that devaluation can

appreciate the real exchange rate and worsen the trade balance (Helpman 1977) and may be contractionary (Krugman and Taylor 1978) have been examined extensively, for instance by Mejía-Reyesab et al. (2010), Shieh (2009), Frankel (2005), Agénor and Aizenman (1999), Kamin and Klau (1998) and Edwards (1986). This chapter contributes to the existing literature by showing that the job search premium and the relative sizes of the informal and formal sectors play an important role in shaping the response of the economy to a devaluation of its currency. Since developing economies differ in respect to these structural elements, their consideration can account for differences in outcomes across economies.

It is well understood that real exchange rate changes are caused by real shocks often driven by productivity or other shocks. We show that a reduction in the job search premium itself has an independent effect on the real exchange rate, causing it to depreciate. Hence, efforts by governments and multilateral agencies to institute mechanisms to bring about reductions in the search premium by increasing the efficiency of labor exchange also serve to enhance international competitiveness. In any event, to the extent that the process of economic development is usually accompanied by such a reduction in the search premium, it will have a beneficial impact on the evolution of real exchange rates. To our knowledge this issue has not been investigated elsewhere.

A theoretical model embodying the specific characteristics mentioned above is provided in the next section. In Sect. 3, the effects of a shock in the price of tradable goods caused by devaluation are analyzed. The consequences of a shock in the job search premium are the subject of Sect. 4. Section 5 provides concluding comments.

4.2 Model of a Small Open Economy with a Partial Real Wage Floor

A small, open, developing economy produces tradable (t) and non-tradable (n) goods. Following the scheme in Fiess et al. (2010) and Agénor and Aizenman (1999), tradable goods are produced in the formal sector and non-tradable goods are produced in the informal sector. This output market-labor market assignment is notional, suggestive of developing country practices and an approximation that captures the broad realities and which is, of course, not strictly true in practice. A counter-example to the proposed scheme may be non-plantation agriculture: overwhelm-

ingly associated with the informal labor market, its output is also tradable. However, in view of agricultural commercial policies and tight government control of food prices in many developing countries, it is not invariably true that the domestic price of agriculture is determined by world prices. Further, most production in the informal sector is thought to be in services, and services are non-tradable in general, though anecdotal counter-examples exist where tradables are produced in industry segments with informal labor markets where norms and practices render legal minimum wage unenforceable. Consequently, we believe that the assumption of the model is a reasonable first approximation to developing country realities.

In the formal sector, the wage in terms of a consumption basket is exogenously given and the demand for tradable goods is infinitely elastic at given world prices; any excess demand is met by changes in the trade balance. Given the binding real wage floor in the *t*-sector, employment is determined by labor demand. In contrast, the market for non-tradables clears domestically and the informal *n*-sector wage adjusts freely to clear the informal labor market.

4.2.1 The Output Market

If $e(\cdot)$ is the minimum expenditure required to attain utility $\bar{v}$ at prices p_i, then the wage restriction in the *t*-sector is:

$$W_t \geq e(p_t, p_n, \bar{v})$$

where W_i is the nominal wage in sector i and $P = p_t^{\alpha} p_n^{1-\alpha}$ is the aggregate price index, where α is the share of tradables in consumption. Assume the wage restriction is binding, excludes money illusion and is of the form $W_t = \omega_t(\bar{v}) p_t^{\alpha} p_n^{1-\alpha}$. Then real consumption wage floor in the formal sector that ensures minimum utility $\bar{v}$ is $\omega_t(\bar{v}) = \bar{\omega}_t = W_t / p_t^{\alpha} p_n^{1-\alpha}$. Define $\omega_n = W_n / p_t^{\alpha} p_n^{1-\alpha}$ as the *n*-sector consumption wage. Assume that the wage floor is binding.

Let the exchange rate x be fixed by policy; x is the domestic currency price of foreign currency. The home currency price of tradable goods is $p_t = x\bar{p}_t$, where $\bar{p}_t$ is the foreign currency price. Since for a small country the foreign currency price of tradable goods exogenous, choose units of the tradable good so that $\bar{p}_t = 1$. Then x is the domestic currency price of both the foreign currency and the tradable good. Define the real exchange rate—the relative price of traded goods—as $p = x/p_n$. An increase in p denotes a real depreciation of the domestic currency.

Employers in sector i choose labor L_i to maximize profits subject to the production function $S_i = L_i^{\beta_i}$. The first-order conditions are $S_n'(L_n) = \omega_n p^{\alpha}$ and $S_t'(L_t) = \hat{\omega}_t p^{\alpha-1}$. Commodity supply curves are given by:

$$S_n(p, \omega_n) = \left(\frac{\beta_n}{\omega_n p^{\alpha}}\right)^{\frac{\beta_n}{1-\beta_n}} \tag{1a}$$

$$S_t(p; \bar{\omega}_t) = \left(\frac{\beta_t p^{1-\alpha}}{\hat{\omega}_t}\right)^{\frac{\beta_t}{1-\beta_t}} \tag{1b}$$

The demand for good j ($j = n, t$) is $D_j = D_j^P(p_t, p_n, y) + D_j^G$, where D_j^P and D_j^G are private and government demands, respectively. With Υ and T denoting the GDP and tax, respectively, the local currency disposable income is $y = \Upsilon - T = \sum_j p_j S_j(\cdot) - T$. Let $\bar{y} = y/x$ be the disposable income in foreign currency units. Then in view of (1a) and (1b), being homogenous of degree zero, the demand function for good j ($j = n, t$) can be expressed as:

$$D_j(p, \omega_n) = D_j^P\left(p, \bar{y}(p, \omega_n)\right) + D_j^G \tag{2}$$

where

$$\bar{y}(p, \omega_n) = p^{-1} S_n(p, \omega_n) + S_t(p; \hat{\omega}_t) - x^{-1} T \tag{3}$$

Goods market equilibrium requires that the output market for n-goods clear domestically as given in (4a) below. For t-goods, however, any excess demand is met by reducing the domestic currency trade balance B. This condition is given by (4b), where x also represents the domestic currency price of tradable goods:

$$S_n(p, \omega_n) - D_n^P(p, \omega_n; x) - D_n^G = 0 \tag{4a}$$

$$S_t(p; \hat{\omega}_t) - D_t^P(p, \omega_n; x) - D_t^G = x^{-1} B \tag{4b}$$

Following Helpman (1977), we assume that there is no demand for financial assets in this economy and consequently we omit the wealth

effects of the corresponding change in net foreign assets in the balance of payments accounts. In view of this assumption, Walras' Law and (4a and 4b)*** imply that the trade balance denominated in the domestic and foreign currencies, respectively, are given by (5a) and (5b) below:

$$B = T - \left(p_n D_n^G + x D_t^G \right) \tag{5a}$$

$$\overline{B} = x^{-1} T - \left(p^{-1} D_n^G + D_t^G \right) \tag{5b}$$

4.2.2 *The Labor Market*

Labor demands in the two sectors are obtained by inverting the first-order conditions noted above:

$$L_n^d \left(p, \omega_n \right) = \left(\frac{\beta_n}{\omega_n p^{\alpha}} \right)^{\frac{1}{1-\beta_n}} \tag{6a}$$

$$L_t^d \left(p; \widehat{\omega}_t \right) = \left(\frac{\beta_t p^{1-\alpha}}{\widehat{\omega}_t} \right)^{\frac{1}{1-\beta_t}} = L_t \left(p \right) \tag{6b}$$

Note that in (6a) and (6b), $p = x p_n^{-1}$ is the real exchange rate; the demand for labor in each sector is an increasing function of the relative price of the output of that sector. Also note that with a binding wage restriction, employment in the t-sector L_t is determined by the demand side alone, but in the informal n-sector, it is a function of both labor demand and supply.

Labor supply to the informal sector is modeled after Pinera and Selowsky (1978) where informal sector workers have some probability of gaining coveted formal sector jobs, but if they opt not to work and devote the period to job search instead, the probability of getting a formal sector job increases. Given there exists this search premium—presumed to depend on custom, technology and policy—the marginal worker balances the benefit of the informal sector wage against the cost of facing a reduced probability of obtaining a formal sector job. Assume the economy's endowment of labor is $\overline{L}$. Each of $\left(\overline{L} - L_t \right)$ workers rationed out of the t-sector may follow one of two strategies:

(1) Accept an informal *n*-sector job in the current period and work there until a *t*-sector job is offered with probability π of generating this offer in any period. Let the expected payoff from this strategy be R_1.
(2) Devote the present period exclusively to searching for a *t*-sector job, increasing the probability of success from π to $\varphi\pi$, $\varphi > 1$ being the job search premium. In the next period, he will be employed in the *t*-sector if successful or in the informal sector if unsuccessful. Let the expected payoff from this strategy be R_2.

As noted in Pinera and Selowsky (1978, pp. 473–474), if δ and T, respectively, denote the real rate of discount and time, then the expected payoffs from these two strategies, R_1 and R_2, are:

$$R_1 = \omega_{n0} + \sum_{T=1}^{\infty} \frac{\hat{\omega}_{tT} - (\hat{\omega}_{tT} - \omega_{nT})(1-\pi)^T}{(1+\delta)^T} \tag{7a}$$

$$R_2 = \sum_{T=1}^{\infty} \frac{\hat{\omega}_{tT} - (\hat{\omega}_{tT} - \omega_{nT})(1-\varphi\pi)(1-\pi)^{T-1}}{(1+\delta)^T} \tag{7b}$$

With respect to (7a), note that in the current period 0 the worker earns wage ω_{n0}, in period 1 he expects to earn $\left[\pi\hat{\omega}_{t1} + (1-\pi)\omega_{n1}\right]$, in period 2 $\left[\pi\hat{\omega}_{t2} + (1-\pi)\left[\pi\hat{\omega}_{t2} + (1-\pi)\omega_{n2}\right]\right]$ and so on. The expression for R_1 is obtained by appropriately discounting and summing this stream of expected payoffs. The expression for R_2 in (7b) is similarly derived by setting $\omega_{n0} = 0$ and using the probability $\varphi\pi$ instead of π to weigh the formal *t*-sector earning in each period.

The marginal worker in the *n*-sector is in equilibrium when the payoffs from these two strategies are equal, that is $R_1 = R_2$. Now assume that wages in both sectors are expected to grow at the same constant rate g. Since developing countries may be generally thought to have high discount rates and low wage growth, assuming that $\delta > g$, the equality of payoffs (7a) and (7b) occurs when:

$$\pi = \frac{k\omega_n}{(\varphi-1)\hat{\omega}_t - \varphi\omega_n} \tag{8a}$$

It may be seen from Eq. (8a), where k is a positive constant, that since φ and $\bar{\omega}_t$ are exogenously determined, the informal worker's equilibrium $\left(R_1 = R_2\right)$ stipulates an implicit relationship between π and the informal sector wage ω_n. Now, π itself depends upon labor market variables such as the number of vacancies in the t-sector, the number of aspiring potential t-sector workers and their employment status. We assume that t-sector offers arise as firms strive to fill vacancies (V) caused by normal turnover and growth. Since employment in the t-sector is demand-determined, t-sector firms will successfully fill the V vacancies. They will do so by absorbing πL_n^s workers engaged in the n-sector production and $\varphi\pi U$ of the unemployed—but successful—searchers. Thus, $V = \pi L_n^s + \varphi\pi U = \pi\left(L_n^s + \varphi U\right)$, implying that in addition to (8a), π must also satisfy:

$$\pi = \frac{V}{L_n^s + \varphi U} \tag{8b}$$

Further note that the consistency condition in the labor markets requires that the $\left(\bar{L} - L_t\right)$ workers excluded from the t-sector be accounted for either as n-sector workers or as unemployed (U), that is:

$$\bar{L} - L_t = L_n^s + U \tag{9}$$

Equations (8a), (8b) and (9) can be used to obtain the informal or *n-sector* labor supply function. Eliminating π from (8a) and (8b), and using the resulting expression and (9) to then eliminate U yields the following n-sector labor supply function:

$$L_n^s\left(p, \omega_n\right) = a_0 - a_1\left(\frac{\bar{\omega}_t}{\omega_n}\right) + a_2\left(\bar{L} - L_t\left(p\right)\right) \tag{10}$$

In Eq. (10) $a_0 = a_1 a_2 > 0, a_1 = \left(V/k\right) > 0$ and $a_2 = \varphi/\left(\varphi - 1\right) > 1$. This relationship specifies how many of the workers rationed out of the t-sector are willing to work in the n-sector at different wage rates. Note that $L_n^s(\cdot)$ is increasing in ω_n and decreasing in p (the real exchange rate is $p = xp_n^{-1}$). In this labor supply function, it is instructive to single out for consideration the coefficient a_2, which plays a significant role in the analysis below. Note $a_2 = -\partial L_n^s / \partial L_t > 1$, implying that when the t-sector

hires one worker, *more than one* worker leaves the n-sector. Let us call this effect, captured by a_2, the *magnification effect* of t-sector employment.

4.2.3 General Equilibrium and Stability

Define E_L and E_n as quantity imbalances in the informal labor market and non-tradable output market, respectively. The general equilibrium is given by the following market clearance conditions:

$$E_L(\omega_n, p) = L_n^d(\omega_n, p) - L_n^s(\omega_n, p) = 0 \tag{11}$$

$$E_n(\omega_n, p; x) = S_n(\omega_n, p) - D_n\left(p, \bar{y}(\omega_n, p; x)\right) = 0 \tag{12}$$

Equations (11) and (12) provide two independent equations in two unknowns, ω_n and p. Let the equilibrium be denoted by (ω_n^*, p^*). Then substitution in Eqs. (1a, 1b), (6a, 6b) and (9) yield the equilibrium values of the relevant endogenous variables: S_n, S_t, L_n, L_t and U. The local asymptotic stability of the equilibrium is guaranteed if the pure substitution effect of a relative output price change on the private demand for non-traded goods dominates the effect of a change in disposable income caused by the same price change, that is $\partial D_n^P / \partial p + \left(\partial D_n^P / \partial \bar{y}\right)\left(\partial \bar{y} / \partial p\right) > 0$. This condition ensures that the excess supply of n-goods is a negative function of p and it is assumed to hold for each of the propositions in the following sections. The parameter restriction implied by this condition as derived in Appendix 1 is that $c < \min\left(1, d_n \sigma_{np}\right)$, where c is the marginal propensity to consume n-goods, $d_n = D_n^P / D_n$ and σ_{np} the elasticity of demand for n-goods with respect to p.

In Fig. 4.1, the loci $E_L(p, \omega_n) = 0$ and $E_N(p, \omega_n; x_0) = 0$ are given by LL and NN^0, respectively. Graphically, stability boils down to the requirement that LL cross NN from below. The slope of the LL curve may be negative or positive depending upon the balance of two structural features of the economy. Firstly, consider the effect of a given reduction in the price of tradable goods, that is in the real exchange rate p, on the supply of labor in the n-sector. The increase in n-sector labor supply per unit reduction in t-sector employment is given by the magnification effect a_2. Thus, the larger is a_2, the larger will be the increase in n-sector labor supply. Secondly, consider the n-sector labor demand. Define the *effective size* of the informal sector relative to the formal sector as $z = (\eta_{np} L_n / \eta_{tp} L_t)$,

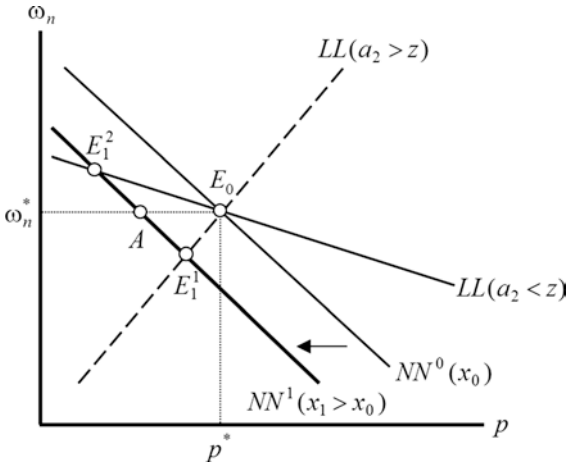

Fig. 4.1 General equilibrium and the effects of devaluation

where η_{ip} is the (absolute value of) i-sector labor demand elasticity with respect to the relative price. The magnitude of z determines the increase in the desired demand for labor by n-sector firms per unit layoff of workers by t-sector firms. If $a_2 > z$, the increase in labor supply dominates the increase in labor demand, ω_n decreases as p decreases and LL is positively sloped. Conversely, if $a_2 < z$, then LL is negatively sloped. Hence the slope of LL is of $\operatorname{sgn}(a_2 - z)$.

In the output market, a given decrease in the real exchange rate p increases $S_n(\cdot)$. Holding disposable income $\bar{y}$ constant, the demand for non-tradables $D_n^P(\cdot)$ decreases and creates an excess supply of n-sector output. But the decrease in p also affects income. Since $\bar{y} = p^{-1}S_n(\cdot) + S_t(\cdot)$, and $p^{-1}S_n(\cdot)$ increases while $S_t(\cdot)$ decreases as p decreases, $\bar{y}$ may decrease or increase. If $\bar{y}$ decreases, then the direct effect of the reduction in p on the demand for n-goods is reinforced by its negative income effect. If $\bar{y}$ increases, the effect of income on $D_n^P(\cdot)$ is positive, but under parameter restrictions for stability discussed above, the total effect of a decrease in p is also to decrease the demand for non-tradables. Therefore, when p decreases, an increase in ω_n is required to reduce the excess supply of non-tradables and consequently NN is negatively sloped.

4.3 Effects of Devaluation

In this section, we examine how this small open economic with dual labor markets and fixed exchange rate responds to a policy-induced change in the exchange rate. Findings of particular interest are that devaluation always leads to an appreciation of the real exchange rate, that the balance of the magnification effect arising from the job search premium and the relative effective sizes of the informal and formal sectors determine the direction of change in the sectoral wage differential, and that devaluation may cause the real output to contract. It should be noted that in this atemporal model, following the analysis in Helpman (1977), we have assumed there is no demand for financial assets and consequently ignored the effects of wealth changes pursuant to changes in net foreign assets resulting from the trade imbalance; nominal devaluation is assumed to have real effects through its impact on real wages.

Proposition 1 A devaluation results in the following changes:

(i) $dp / dx < 0$
(ii) $\operatorname{sgn}(d\omega_n / dx) = \operatorname{sgn}(z - a_2)$
(iii) $dL_n / dx > 0$
(iv) $dL_t / dx < 0$
(v) $dU / dx < 0$ if $z \geq 1$
(vi) $dB / dx < 0$; $d\bar{B} / dx < 0$

Proof See Appendix 2.

Discussion Helpman (1977) has shown that in the presence of an economy-wide floor, the real exchange rate will appreciate in the face of a nominal devaluation if the effective size of the *n*-sector (though defined differently) exceeds the marginal propensity to consume *n*-goods. We find that with a partial wage floor, devaluation always causes the real exchange rate to appreciate (p decreases): the devaluation of the home currency is outweighed by the increase in the price of non-tradables so that the relative price of tradables decreases in equilibrium. As a point of reference, at the initial equilibrium (ω_n^*, p^*) let $a_2 = z$ so that in Fig. 4.1 the LL curve is flat and the labor market clears at ω_n^* for any nominal exchange rate. The stability condition given above ensures that an increase in x reflecting the devaluation increases the demand for non-tradables. However, at (ω_n^*, p^*)

the supply of non-tradables is unchanged and therefore, at the initial equilibrium, there exists an excess demand for n-goods. With a given ω_n^* (as implied by the assumption that $a_2 = z$), the entire burden of adjustment in the output market falls on the real exchange rate p: It must appreciate. And as p decreases, $S_n(\omega_n^*, p)$ increases per (1a) to clear the market for non-tradables. In Fig. 4.1, NN^0 shifts to NN^1 and the output market moves from initial equilibrium E_0 to A.

The real exchange rate appreciation affects both the supply and the demand for labor. The ensuing contraction of employment in the *t-sector* increases L_n^s, which is larger the larger is the magnification effect a_2. However, the appreciation also increases L_n^d. Now, if the magnification effect of the change in t-sector employment (a_2) is larger than the effective labor absorption by informal sector firms (z), then the increase in labor supply L_n^s dominates the increase in labor demand L_n^d, and ω_n declines. Because the reduction in ω_n also increases the supply of n-goods relative to demand, the real exchange rate appreciation required for output market clearance is smaller than in the previous case: the equilibrium shifts from E_0 to E_1^1 rather than to A. Regardless of the effect on ω_n, informal (formal) sector employment and output will increase (decrease). Conversely, if $a_2 < z$, then the equilibrium shifts to E_1^2.

Consequently, the sectoral wage gap given by $\hat{\omega}_t/\omega_n$ can increase or decrease accordingly as $a_2 >=< z$. All else constant, countries with smaller informal sectors (low z) are more likely to see an increase in the sectoral wage gap. The effect on unemployment is less clear. If $z > 1$, unemployment decreases; otherwise it may increase or decrease. It is clear, though, that if $z > a_2$ then $z > 1$, since $a_2 > 1$ so an increase in ω_n is accompanied by a decrease in unemployment. The appreciation of the real exchange rate p, that is the decrease in the relative price of t-goods, causes an excess demand for t-goods that is met by a deteriorating balance of trade. Since x increases and p decreases, it can be seen by inspection of Eqs. (5a) and (5b) that without fiscal policy contraction the devaluation will worsen the trade balance.

The real exchange rate appreciates in response to the devaluation because the proportionate increase in the price of non-traded goods exceeds that of traded goods. So the aggregate price level increases to a larger proportionate extent than the extent of the devaluation. That the devaluation is inflationary in this sense is, therefore, confirmed. Consider now its effect on real output. We already know that the output of non-tradables increase and tradables decrease due to devaluation regardless of

whether output is measured in units of one good or the other, so the most meaningful concept of real output is to consider it in terms of the typical consumption basket. In this sense, the change in real output turns on both output and labor supply behavior. Define ε_{jp} as the absolute value of the elasticity of supply of good j ($j = n, t$) with respect to the real exchange rate p, and s_n as the share of non-tradables in total output.

Proposition 2 Devaluation will be contractionary if $z > a_2$ and $s_n \leq \left(1-\alpha+\varepsilon_{tp}\right)\left(1+\varepsilon_{np}+\varepsilon_{tp}\right)^{-1}$. It will be expansionary if $z < a_2$ and $s_n \geq \left(1-\alpha+\varepsilon_{tp}\right)\left(1+\varepsilon_{np}+\varepsilon_{tp}\right)^{-1}$.

Proof See Appendix 3.

Discussion The results indicate that if the effective size of the informal sector (z) is larger than the magnification effect (a_2) but the share of non-tradables in GDP is smaller than the particular configuration of the price elasticities of output supply ε_{jp} (in absolute values) and the share of tradables in consumption α, then devaluation will be immiserizing. This analysis therefore provides new insights into the causes of the possible contractionary effects of devaluation in the developing country context by showing that the specific structural features of the devaluing country plays a determining role. It generally follows that the qualitative impacts of devaluation will vary across developing countries since they likely differ by these structural features along a spectrum.

4.4 Effects of a Change in the Job Search Premium

Since the job search premium $\varphi > 1$ reflects the efficiency of labor exchange, it is to be expected that developing countries at different stages of development or through time will see the search premium decline as labor market practices change to market norms and domestic labor markets become integrated. A policy-induced reduction in the cost of information through the creation of employment exchanges or penetration of information technology could lead to such changes. Stated differently, broader dispersion of information and exchange mechanisms are likely to reduce the relative attractiveness of unemployment as an equilibrium state for

workers seeking formal sector jobs. What effects ensue from a decline in the search premium?

Proposition 3 A change in the job search premium φ has the following effects:

(i) $dp / d\varphi < 0$
(ii) $d\omega_n / d\varphi > 0$
(iii) $dL_n / d\varphi < 0$
(iv) $dL_t / d\varphi < 0$
(v) $dU / d\varphi > 0$
(vi) $dB / d\varphi < 0;\ d\bar{B} / d\varphi < 0.$

Proof See Appendix 4.

Discussion Other things given, a reduction in φ reduces the expected returns from the strategy of searching for a formal sector job without working in the informal sector, and causes an excess supply of labor in the informal sector at the initial relative prices. In terms of (10) it increases the magnification effect a_2, and of those workers rationed out of the formal sector, fewer choose unemployment over informal sector employment; the new labor market equilibrium calls for a downward shift in the *LL* curve. Overall, ω_n falls and the real exchange rate depreciates. Employment and output in the *t*-sector rise.

Even though the relative price of *n*-goods declines, the reduction in the informal sector wage is sufficiently large so as to lead to an increase in employment and output of *n*-goods. A decrease in the search premium causes the output of *both* sectors to increase: the existing slack in the labor market allows both sectors to expand and, consequently, unemployment declines. It bears notice that this type of institutional change in the context of developing countries is in essence a benign supply shock which has an independent effect on the real exchange rate, and by inference, on the trade balance, which, in this model increases in terms of both currencies. Our conclusion is thus a reassuring one that as economies become internally integrated, development occurs and labor market dualism declines, output will increase throughout the economy.

4.5 Concluding Remarks

This chapter presents a model of a small open developing economy with dual labor markets producing tradable and non-tradable goods. Wage arbitrage is prevented by the exogenous imposition of a floor on the real consumption wage in the formal sector; there are no barriers to entry in the informal sector. Unemployment in this economy is voluntary since unemployed workers can increase the probability of obtaining a high-wage formal sector job through search activity relative to the probability of obtaining one while employed in informal sector production; job search carries a probability premium and is a rewarding activity.

The results suggest differential responses among developing economies to adjustment policies such as a devaluation depending upon differences in structural factors such as the relative size of the non-traded goods sector and the job search premium. Devaluation, for instance, may be expansionary in some cases and contractionary in others. Likewise, unemployment and the sectoral wage differential may increase in some countries and decrease in others. These results offer an explanation of inter-country differences in economic performance and possibly of differences in political appetites and enthusiasm for undertaking policy reform. They also suggest that uniform adjustment policies for developing countries may not be warranted. We identify conditions under which such anomalous and divergent outcomes can occur.

We also find that the job search premium has an independent effect on the real exchange rate. As the job search premium declines, the real exchange rate depreciates and causes the tradable goods sector to expand. Hence, efforts by the government to institute mechanisms to bring about reductions in the search premium also serve to enhance international competitiveness. The increase in the output of traded goods does not come at the cost of non-traded goods: Both sectors expand and unemployment declines, reflecting the effect of increased labor supply in the production of non-tradable goods due to the falling premium on search activity. Inevitably, this finding presents a case for policy action to hasten increased efficiency of labor exchange between segmented labor markets.

Broadly speaking, the foregoing analysis suggests caution in the conventional use of devaluation in response to challenges presented to emerging markets in the post-crisis era to the extent that the structural features of these economies replicate the assumptions of the framework provided. At the same time, it identifies a path for developing economies to benefit

from real currency depreciation generated by better integration of their labor markets.

4.6 Appendix 1

Define the following terms:

$\frac{\partial \ln L_n^d}{\partial \ln \omega_n} \equiv -\eta_{n\omega} = -\frac{1}{1-\beta_n} < 0$	$\frac{\partial \ln S_n}{\partial \ln \omega_n} \equiv -\varepsilon_{n\omega} = -\frac{\beta_n}{1-\beta_n} < 0.$. Note $\varepsilon_{n\omega} = \beta_n \eta_{n\omega}$
$\frac{\partial \ln L_n^d}{\partial \ln p} \equiv -\eta_{np} = -\frac{\alpha}{1-\beta_n} < 0$. Note $\eta_{np} = \alpha \eta_{n\omega}$	$\frac{\partial \ln S_n}{\partial \ln p} \equiv -\varepsilon_{np} = -\frac{\alpha\beta_n}{1-\beta_n} < 0$. Note $\varepsilon_{np} = \beta_n \eta_{np}$
$\frac{\partial \ln L_t^d}{\partial \ln p} \equiv \eta_{tp} = \frac{1-\alpha}{1-\beta_t} > 0$	$\frac{\partial \ln S_t}{\partial \ln p} \equiv \varepsilon_{tp} = \frac{(1-\alpha)\beta_t}{1-\beta_t} > 0$. Note $\varepsilon_{tp} = \beta_t \eta_{tp}$
$\frac{\partial \ln L_n^s}{\partial \ln \omega_n} = \frac{a_1(\bar{\omega}_t / \omega_n)}{L_n^s} > 0$	$\left.\frac{\partial \ln D_n^P}{\partial \ln p}\right\|_{\bar{y}=\bar{y}_0} \equiv \sigma_{np} > 0$
$\frac{\partial \ln L_n^s}{\partial \ln p} = -a_2 \eta_{tp} \frac{L_t}{L_n^s} < 0$	$c = p^{-1} \partial D_n^P / \partial \bar{y} \equiv$ marginal propensity to consume n.
$s_n \equiv p^{-1} S_n / \left(p^{-1} S_n + S_t\right)$: share of n-goods in GDP.	$d_n \equiv D_n^P / \left(D_n^P + D_n^G\right) = D_n^P / D_n$, the share of private demand in total demand for n goods.

Let $\dot{p} = a\left\{S_n(\cdot) - D_n(\cdot)\right\} = aE_N\left(p, \omega_n; x\right)$,

$\dot{\omega}_n = b\left\{L_n^d(\cdot) - L_n^s(\cdot)\right\} = bE_L\left(p, \omega_n\right)$ where $a, b > 0$, and $(p^*, \omega_n{}^*)$ be the equilibrium. Let $J = \left\{j_{kl}\right\}$ be the Jacobian:

$$J = \begin{bmatrix} \frac{\partial E_L\left(p^*, \omega_n^*\right)}{\partial \omega_n} & \frac{\partial E_L\left(p^*, \omega_n^*\right)}{\partial p} \\ \frac{\partial E_N\left(p^*, \omega_n^*\right)}{\partial \omega_n} & \frac{\partial E_N\left(p^*, \omega_n^*\right)}{\partial p} \end{bmatrix} \tag{13}$$

$$j_{11} = -\left(\eta_{n\omega} L_n + a_1 \frac{\widehat{\omega}_t}{\omega_n}\right) < 0;\ j_{12} = (a_2 - z)\eta_{tp} L_t \qquad \text{(Where)}$$

$$j_{21} = -(1-c)\varepsilon_{n\omega} < 0;\ j_{22} = -\left\{(1-c)\varepsilon_{np} + \left(d_n \sigma_{np} - c\right) + \frac{(1-s_n)}{s_n} c\varepsilon_{tp}\right\}$$

By application of the Liapunov theorem, the system in (11)–(12) is locally asymptotically stable if $\text{tr}(J) < 0$ and $|J| > 0$. The trace condition is satisfied if $c < \min(1, d_n \sigma_{np})$. Under this parameter restriction, noting that $\varepsilon_{np} = \beta_n \eta_{np}$ and $\varepsilon_{n\omega} = \beta_n \eta_{n\omega}$, $|J| > 0$ as given in (14) below:

$$\begin{aligned} |J| = {} & \eta_{n\omega} L_n \left[\left(d_n \sigma_{np} - c\right) + \frac{(1-s_n)}{s_n} c\varepsilon_{tp}\right] \\ & + a_1 \frac{\widehat{\omega}_t}{\omega_n} \left[(1-c)\varepsilon_{np} + \left(d_n \sigma_{np} - c\right) + \frac{(1-s_n)}{s_n} c\varepsilon_{tp}\right] \\ & + (1-c)\varepsilon_{n\omega} a_2 \eta_{tp} L_t > 0 \end{aligned} \qquad (14)$$

4.7 Appendix 2

Let $\hat{z} = dz / z$. Totally differentiating Eqs. (11) and (12) with respect to the nominal exchange rate x yields:

$$\begin{bmatrix} j_{11} & j_{12} \\ j_{21} & j_{22} \end{bmatrix} \begin{bmatrix} \hat{\omega}_n \\ \hat{p} \end{bmatrix} = \begin{bmatrix} 0 \\ k \end{bmatrix} \hat{x} \qquad (15)$$

where $k = cpT / x^2 > 0$. Cramer's Rule yields

$$\hat{\omega}_n = -k_1 j_{12} \hat{x} \qquad (16)$$

where $k_1 = k|J|^{-1} > 0$. Since $j_{12} = (a_2 - z)\eta_{tp} L_t$, $\text{sgn}(\widehat{\omega}_n) = \text{sgn}(z - a_2)$. Further

$$\hat{p} = k_1 j_{11} \hat{x} < 0 \qquad (17)$$

Equation (6a) implies $\hat{L}_n = -\left[\eta_{n\omega}\hat{\omega}_n + \eta_{np}\hat{p}\right]$. Upon substitution of (16) and (17), given $z = \eta_{np}L_n / \eta_{tp}L_t$:

$$\hat{L}_n = k_1\left[a_1\left(\hat{\omega}_t / \omega_n\right)\eta_{np} + a_2\eta_{n\omega}\eta_{tp}L_t\right]\hat{x} > 0 \tag{18}$$

Since $\hat{p} < 0$ by (17), from Eq. (6b) we obtain:

$$\hat{L}_t = \eta_{tp}\hat{p} < 0 \tag{19}$$

Equation (9) implies $U = \bar{L} - L_t - L_n$. Since $dU / dx = -\left(dL_t / dx + dL_n / dx\right)$, use (18) and (19) to obtain:

$$dU = -k_2\left[\left(a_2 - 1\right)z\eta_{tp}L_t + \left(z - 1\right)\alpha a_1\left(\hat{\omega}_t / \omega_n\right)\right]\hat{x} < 0 \tag{20}$$

where $k_2 = \alpha^{-1}k_1 > 0$. Because $a_2 > 1$, $dU < 0$ if $z \geq 1$.

Q.E.D.

4.8 Appendix 3

The GDP is $\Upsilon = \sum_j p_j S_j\left(\cdot\right)$ and the price level is $P = p_t^{\alpha}p_n^{1-\alpha}$. Price deflated GDP can then be written as:

$$\tilde{y} = p^{-\alpha}S_n\left(\cdot\right) + p^{1-\alpha}S_t\left(\cdot\right) \tag{21}$$

Totally differentiating $\tilde{y}$ and collecting terms yields:

$$d\tilde{y} = p^{-\alpha}\left\{\left[-\alpha p^{-1}S_n + \frac{\partial S_n}{\partial p} + \left(1-\alpha\right)S_t + p\frac{\partial S_t}{\partial p}\right]dp + \frac{\partial S_n}{\partial \omega_n}d\omega_n\right\} \tag{22}$$

Upon expressing terms in Eq. (22) in elasticity form, after rearrangement, we obtain:

$$\hat{\tilde{y}} = \frac{p^{2-\alpha}}{x}\left\{\left[\left[\left(1-\alpha\right) + \varepsilon_{tp}\right] - s_n\left[1 + \varepsilon_{np} + \varepsilon_{tp}\right]\right]\hat{p} - s_n\varepsilon_{n\omega}\hat{\omega}_n\right\} \tag{23}$$

Upon substituting from (16) and (17) we obtain:

$$\hat{\hat{y}} = -\frac{k_1 p^{2-\alpha}}{\alpha x} \left\{ \left[\left[(1-\alpha) + \varepsilon_{tp} \right] - s_n \left[1 + \varepsilon_{np} + \varepsilon_{tp} \right] \right] \lambda + \left[\left(1 - \frac{a_2}{z} \right) s_n \varepsilon_{np} \right] \right\} \qquad (24)$$
$$\eta_{np} L_n \hat{x}$$

where $\lambda = 1 + \frac{\alpha a_1 (\hat{\omega}_t / \omega_n)}{\eta_{np} L_n}$. By inspection of (24), if $z > a_2$ and $s_n < \frac{1-\alpha+\varepsilon_{tp}}{1+\varepsilon_{np}+\varepsilon_{tp}}$, then $\hat{\hat{y}} < 0$ and devaluation is contractionary. Q.E.D.

4.9 Appendix 4

Totally differentiating Eqs. (11) and (12) with respect to φ yields:

$$\begin{bmatrix} j_{11} & j_{12} \\ j_{21} & j_{22} \end{bmatrix} \begin{bmatrix} \hat{\omega}_n \\ \hat{p} \end{bmatrix} = \begin{bmatrix} -\left(\bar{L} - L_t \right) a_2^2 / \varphi \\ 0 \end{bmatrix} \hat{\varphi} \qquad (25)$$

The solutions are as follows:

$$\hat{\omega}_n = -\frac{j_{22} \left(\bar{L} - L_t \right) a_2^2}{|J| \varphi} \hat{\varphi} > 0 \qquad (26)$$

since $j_{22} < 0$ and

$$\hat{p} = \frac{j_{21} \left(\bar{L} - L_t \right) a_2^2}{|J| \varphi} \hat{\varphi} < 0 \qquad (27)$$

since $j_{21} < 0$. Because $\hat{L}_n = -\left[\eta_{n\omega} \hat{\omega}_n + \eta_{np} \hat{p} \right]$ by (6a), and $\eta_{np} = \alpha \eta_{n\omega}$, $\hat{L}_n = -\eta_{n\omega} \left[\hat{\omega}_n + \alpha \hat{p} \right]$, substitution of (26) and (27) yields, upon simplification:

$$\hat{L}_n = -k_3 \left(\left(d_n \sigma_{np} - c \right) + \frac{(1-s_n)}{s_n} c \varepsilon_{tp} \right) \hat{\varphi} < 0 \qquad (28)$$

where $k_3 = \frac{\eta_{n\omega} \left(\bar{L} - L_t \right) a_2^2}{|J| \varphi} > 0$, and $\left(d_n \sigma_{np} - c \right) > 0$ by assumption as discussed in Appendix I. Since $\hat{p} < 0$ by (27), from Eq. (6b) we obtain:

$$\hat{L}_t = \eta_{tp} \frac{j_{21}\left(\bar{L} - L_t\right)a_2^2}{|J|\varphi}\hat{\varphi} < 0 \tag{29}$$

since $j_{21} < 0$. Moreover, since $U = \bar{L} - L_t - L_n$ by (9), and $\hat{L}_t < 0$ and $\hat{L}_n < 0$ from (28) and (29),

$$\frac{dU}{d\varphi} = -\left(\frac{dL_t}{d\varphi} + \frac{dL_n}{d\varphi}\right) > 0 \tag{30}$$

Finally, since $\hat{p} = \hat{x} - \hat{p}_n < 0$ and $\hat{x} = 0$, $\hat{p}_n > 0$. Thus by inspection of (5a) and (5b):

$$\frac{dB}{d\varphi} < 0 \tag{31}$$

Q.E.D.

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CHAPTER 5

Financial Flows to Emerging Economies and Policy Alternatives Post 2008

Luiz Fernando de Paula and Daniela Magalhães Prates

5.1 Introduction

Cross-border capital flows have been intensified over the last decades with the greater integration among domestic financial markets and the consequent increase in the volume and speed of financial resources in the international financial market. Along with their greater size, gross flows have become more volatile everywhere mainly in the case of their share oriented to emerging-market economies (EMEs), which have been procyclical, exacerbating economic fluctuations.

Concerned with the amount and volatility of capital flows to EMEs after the contagion of the 2008 global crisis and the potential risks and costs related to international financial integration, International Monetary Fund (IMF) has revised its former official position against capital controls, which it considers now as a "measure of last resort." Indeed, the issue of the regulation of financial flows garnered greater attention in the years following this crisis, which brought a new wave (or boom) of capital inflows to EMEs

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from the second quarter of 2009. This wave has been boosted by the post-crisis circumstances, among which the Federal Reserve (Fed) quantitative easing (QE) policy, low interest rates in advanced economies (AEs), and better prospects for economic growth EMEs in the aftermath of the crisis (Canuto and Leipziger 2012; Akyüz 2011). The recent boom has been featured by short periods of fall in capital inflows followed by new surges.

Especially during the zenith of the recent wave (mid-2009 to mid-2011), "emerging-market" assets and currencies became objects of desire on the part of global investors, resuming policy dilemmas to emerging countries stemming from the combination of high growth rates, accelerating inflation (associated with the new commodity prices boom), excessive currency appreciation, and/or asset price overshooting. Yet, some EMEs decided to regulate capital inflows in order to deal with these policy dilemmas, on the contrary of the pre-crisis context when prevailed a hands-off approach to capital inflows.

This chapter aims at analyzing some macroeconomic issues related to the recent waves of capital flows to EMEs and discussing some policy alternatives post 2008 to deal with them, with special focus on capital account regulation (CAR) and official intervention in foreign exchange market. For this purpose, firstly (Sect. 2) the recent features of cross-border capital flows and some consequences to EMEs are analyzed. Secondly (Sect. 3), the relationship between capital flows and exchange rate regime in EMEs under conditions of an international monetary hierarchy are discussed. In Sect. 4, some economic policy approaches to deal with capital flows, with emphasis on CAR, are examined. Finally, Sect. 5 concludes the chapter.

5.2 Recent Features of Cross-Border Capital Flows and Some Consequences on EMEs

5.2.1 Some Features of Cross-Border Capital Flows

Private capital flows have increased sharply to and from both developed and EMEs over the last decades (Cardarelli et al. 2009; Bluedorn et al. 2013). In the case of EMEs, capital flows have boosted since the beginning of the 1990s due to a set of factors both structural (international portfolio diversification, capital account liberalization, trade openness, and high emerging economies' potential growth) and cyclical (low US interest rates, low global risk aversion, and high domestic interest rates). Consequently, international financial integration of a diversified group of EMEs has swelled rapidly, in particular over 1991–2006

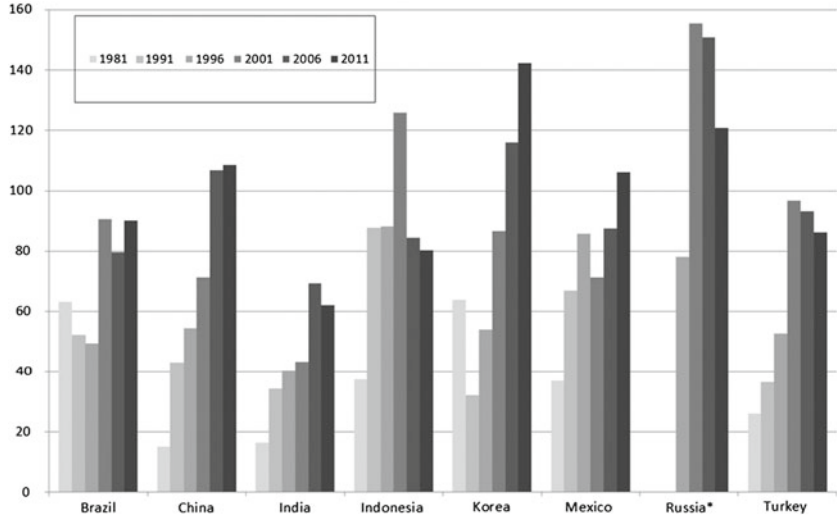

Fig. 5.1 International Financial Integration—major emerging economies (% of GDP). *Source*: Data from Lane and Milesi-Ferretti database, http://www.philiplane.org/EWN.html. *Note*: The index corresponds to international assets plus liabilities over GDP. (*) For Russian Federation data in 1996–2011 only

(Fig. 5.1), according to the index of international financial integration (Lane and Milesi-Ferretti 2007).

Along with their greater size, gross flows have become more volatile everywhere. AEs experiment greater substitutability across the various types of capital flows (direct investment, portfolio, and bank credit) and greater complementarity of gross inflows and outflows, resulting in relatively small and smoother movements in net capital flows. While in AEs capital outflows increase in line with capital inflows, in EMEs capital inflows increase more than outflows (Fig. 5.2), and as a result net inflows tend to be greater compared to AEs. The values of net private capital flows (IIF – Institute for International Finance) differ from financial account balance (IMF) in Fig. 5.2 due to the use of different definitions and classifications of EMEs (e.g., Korea is part of the IIF sample but is not part of the IMF's group). Moreover, IIF capital inflows include all the flows related to non-residents, while outflows include all the flows related to residents. Therefore, "net private capital flows" is the sum of all net purchases of EME assets by private foreign investors. As we can see in Fig. 5.2, in EMEs both gross and net capital flows have been sizable, while net flows have been much volatile: Capital inflows and outflows tend to

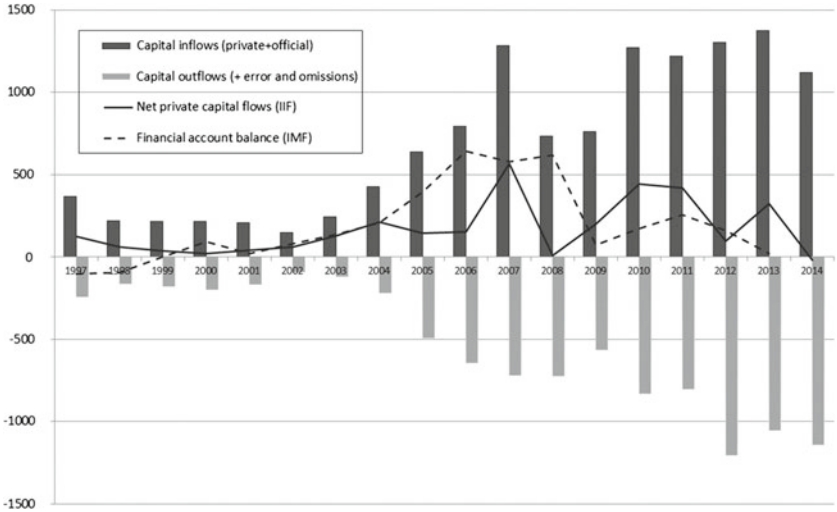

Fig. 5.2 Capital inflows and outflows—emerging economies (USD million). *Source*: Data from Institute for International Finance (2015) and IMF (2015). *Note*: Capital inflows: sum of all private capital inflows (FDI, equity and debt) by non-residents plus official inflows (international financial institutions and bilateral creditors); capital outflows: sum of all private capital outflows (direct investment, equity and debt) by residents plus error and omissions (excludes reserves variations); net private capital flows: inflows minus outflows, according to IIF definition

rise when global financing condition are easy and fall when these conditions tighten (Bluedorn et al. 2013; Claessens and Ghosh 2013).

As for the regional distribution of capital flows, over 2011–2014, emerging Asia was the region that received the greatest amount of capital inflows to EMEs (52.8% of total capital inflows in 2013), followed by Latin America (23.5%) and emerging Eastern Europe (17.1%), while Africa and the Middle East got a more modest amount (6.6%) (Fig. 5.3). In emerging Asia, China, the biggest emerging economy, received records of capital inflows, mainly in the form of foreign direct investment (FDI). In Latin America, Brazil and Mexico, the major economies of the region, and more recently Peru, were the biggest recipients of capital flows, while in Emerging Europe, Russia and Turkey stood out as the main recipients of capital flows.

Regarding the composition of net capital inflows according to IIF data (see note of Fig. 5.2), historically FDI has been the main type of capital flow to EMEs followed by portfolio lows (mainly bonds). Other

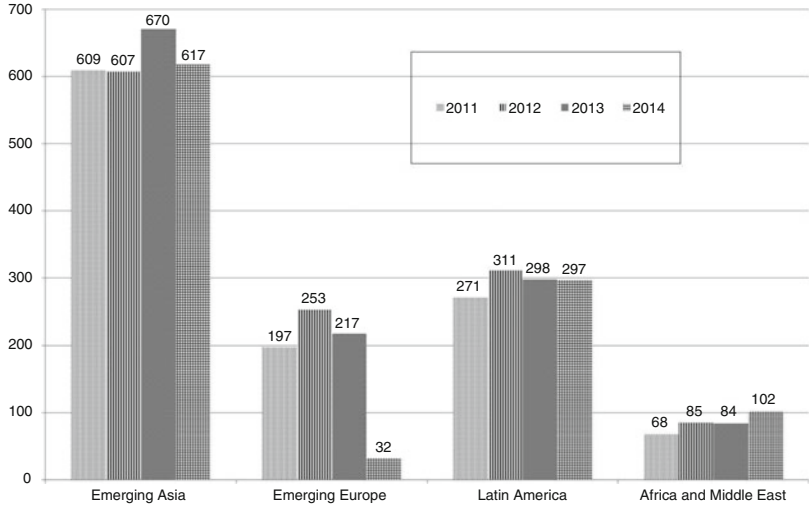

Fig. 5.3 Capital inflows by region (USD billion). *Source*: Data from Institute for International Finance (2015)

investments (bank loans and official financing), that were prominent in the 1970s, have become a secondary class of capital flows. As Fig. 5.4 shows, over 2011–2014 FDI was the predominant type of capital inflow to emerging Asia (mainly due to China). In the case of Latin America, the main types were portfolio and FDI, while in emerging Europe debt portfolio was the main modality (with the exception of 2014 when a withdrawal of portfolio from Russia and Ukraine took place). As for Africa and Middle East, FDI was the main sort of capital flow of non-residents.

5.2.2 Waves of Capital Flows to Emerging Economies

Capital inflows to EMEs have increased sharply since the beginning of the 1990s from 1.4% of GDP on average in 1989–1994 to 4.7% of GDP in 1995–2014 (Fig. 5.5). From the 1990s on, it is possible to identify, broadly speaking, three waves of episodes of capital inflows to EMEs: A first one from early 1990 to 1997–1998 Asian and Russian crises; a second wave from mid-2004 to the global contagion that followed the Lehman Brothers bankruptcy (September 2008); and, finally, a third wave that

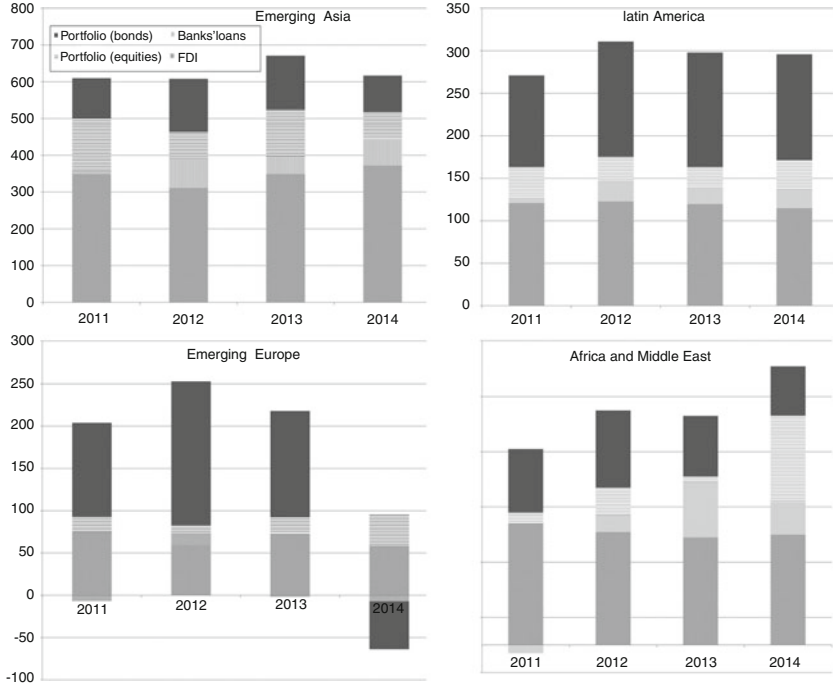

Fig. 5.4 Capital inflows by region and modality (USD million). *Source*: Data from Institute for International Finance (2015). *Note*: Emerging Asia: China, India, Indonesia, Philippines, South Korea, and Thailand; Latin America: Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, and Venezuela: Emerging Europe (Eastern): Bulgaria, Czech Republic, Poland, Romania, Russia, Turkey, and Ukraine; Africa and Middle East: Egypt, Lebanon, Morocco, Nigeria, Saudi Arabia, South Africa, and UEA

began in mid-2009, with a strong recovery in 2010–2013 and a fall in 2014. The recent literature has referred to such episodes as "surges" of capital inflows that are periods of large capital inflows (Ghosh et al. 2012).

Concerning the determinants of capital flows, the literature distinguishes between *push factors* (global ones) and *pull factors* (country-specific). Most empirical works show that exogenous factors are the main determinants of large upward swings in capital flows to EMEs. Ghosh et al. (2012) found

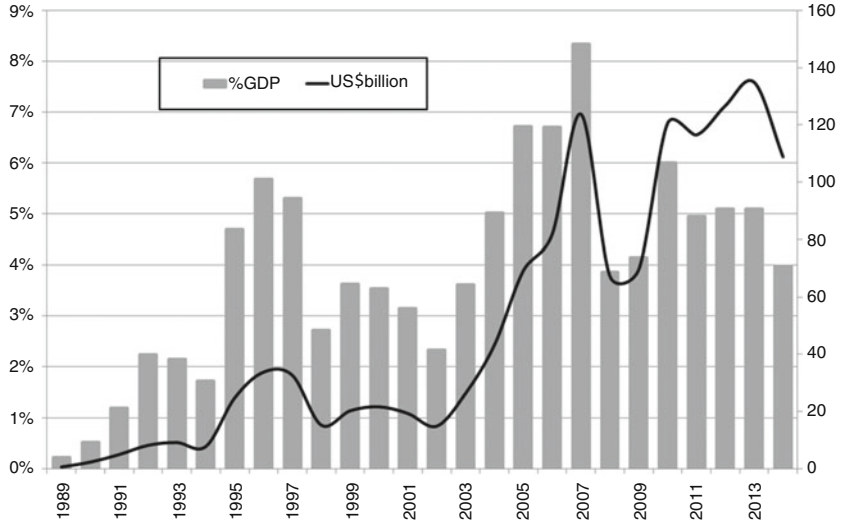

Fig. 5.5 Private capital inflows to emerging economies. *Source*: Data from Institute for International Finance (2015). *Note*: Private capital inflows includes all the capital flows (both equity and debt) involving non-residents (foreign private sector and lenders). Included foreign investors' withdrawals of capitals and not included outward investments of residents and inflows from official sector sources

that surges of capital inflows to EMEs over 1980–2009 were synchronized among countries and that global factors—US interest rates and risk aversion—were key to determine whether a surge would occur, while domestic factors (economic performance, country's external financing needs, financial openness, etc.) seem to explain the magnitude of the surge. On the same stride, Ahmed and Zlate (2013) identified a number of factors, including growth, interest rate differentials, and global risk aversion, as important determinants of net private capital flows to EME in 2002–2012. Moreover, they found that the sensitivity of portfolio flows to interest rate differentials and risk aversion increased during the post-crisis period.

The trigger to the first wave of capital inflows (1991–1998) was the US expansionary monetary policy at the beginning of the 1990s, along with the search of risk diversification of global institutional investors and the process of capital account liberalization of EMEs. During this period,

emerging Asia and Latin America were the main recipients. Regarding the composition of capital flows, portfolio flows were the main type, favored by interest rate differentials and increasingly FDI. Most EMEs adopted some sort of managed exchange rate regime (semi-pegged exchange rate). Capital inflows financed large current-account deficit and consequently external vulnerability climbed in most economies that witnessed speculative attack on domestic currencies. As a result, this regime collapsed almost generally in Asia and Latin America EMEs (Paula et al. 2013).

The second wave of capital inflows to EMEs (2003–2008) was related to either push factors—low US interest rates due to the loosing Fed monetary policy and the reduction in the global risk aversion—or pull factors, including higher EMEs' potential growth. During this boom, net FDI flows predominated in all EME regions (Fig. 5.6), involving a larger set of countries, including emerging Europe. New features of the international financial integration of the EMEs during this wave were: (i) the surge in capital inflows that was accompanied by a sharp increase in outflows due to the increasing diversification of portfolios; (ii) much stronger current-account positions

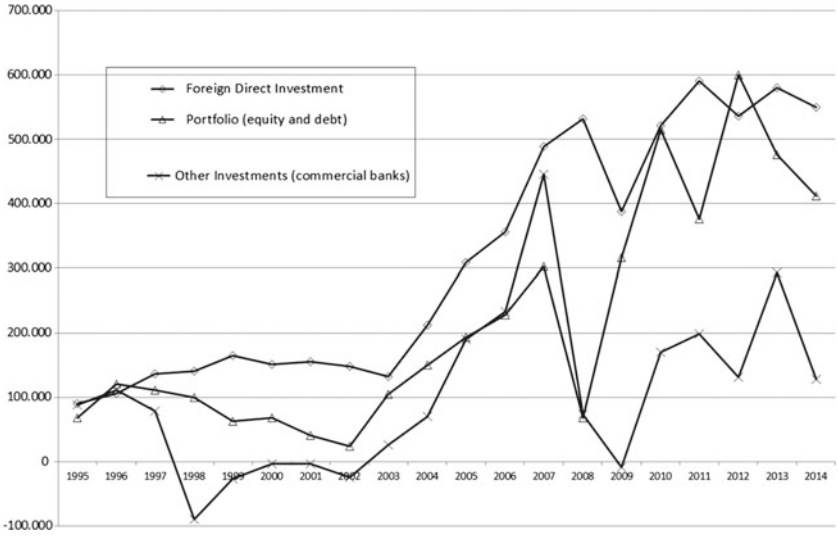

Fig. 5.6 Emerging economies—types of net capital inflows (USD million). *Source*: Data from Institute for International Finance (2015)

for most EMEs with surplus or reduction of the deficit due to the commodity boom; and (iii) acceleration in the accumulation of foreign reserves that, along with the adoption of floating exchange rate regimes, contributed to the reduction in the external vulnerability but did not avoid the currency appreciation trend (Fig. 5.7). The contagion effect following the Lehman Brothers bankruptcy curtailed the surge of capital flows.

The third wave of capital flows to EMEs began in mid-2009, with a strong recovery of capital inflows (Fig. 5.2). The main drivers behind this wave are: (i) loosening monetary policy in AEs (including Fed "QE"), interest rate differentials widening, and increased risk appetite of global investors; (ii) better economic performance of the EMEs; and (iii) quick recovery of commodity prices. Capital inflows were driven primarily by portfolio flows (excluding China) and FDI (Fig. 5.6). This episode was characterized by a greater share of volatile portfolio inflows compared to the previous wave. According to Sahay et al. (2014), during 2010–2013 EMEs received nearly a half of all global flows (mainly Latin America

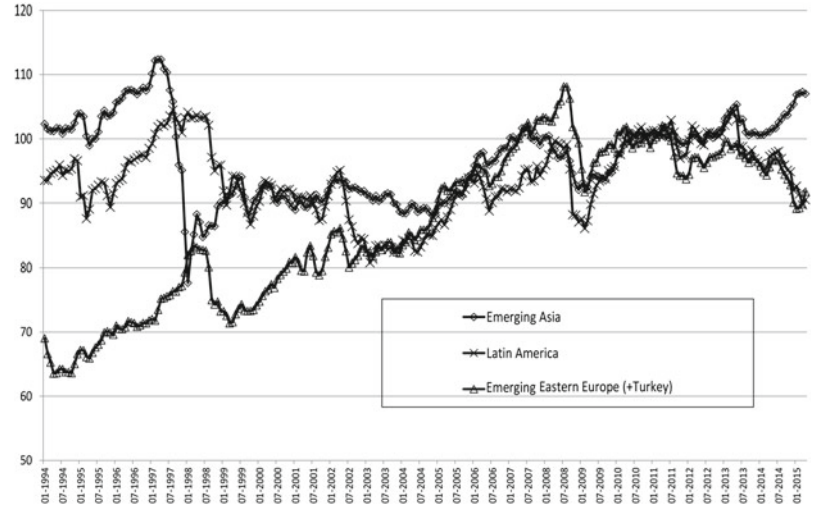

Fig. 5.7 Real effective exchange rate (2010 = 100). *Source*: Data from BIS (2015). *Note*: Emerging Asia: China, India, Indonesia, Korea, Malaysia, Philippines, and Thailand; Latin America: Brazil, Chile, Colombia, Peru and Mexico; Eastern Europe (+Turkey): Croatia, Hungary, Poland, Romania, Turkey, and Russia

and emerging Asia) and total inflows were larger than their fundamentals would suggest. In May 2013, when the Fed indicated that it might begin tapering its monetary policy toward the end of the calendar year, global investors set into motion a portfolio adjustment that caused a temporary but significant reversal in capital flows to the USA, putting upward pressures on the exchange rates of many EMEs (Fig. 5.7) (BIS 2014). In this period, appreciated currencies and boosting domestic demand resulted in a gradual widening of current-account deficits or the narrowing of surpluses in most countries. From mid-2013, capital inflows (portfolio and other investments) have somehow reduced and are becoming more volatile. The combination between tighter financial conditions with weaker terms of trade for commodity exporters has led to less favorable external conditions that have contributed to a synchronized slowdown in EMEs (Sahay et al. 2014, p. 15).

5.2.3 Summing up of the Main Characteristics and Some Consequences of Capital Flows to EMEs

Based on our previous analysis and other recent empirical studies, some of the main features and consequences of capital flows to EMEs have been as follows:

(a) The volatility of capital flows has increased over time and fluctuations in net flows are much sharper for EMEs compared with AEs—in the latter, gross outflows largely offset gross inflows, generating smoother movements in net flows. By contrast, in EMEs gross inflows and net flows have fallen dramatically during the crisis and have rebounded sharply afterward (IMF 2011a, p. 125; Bluedorn et al. 2013).
(b) Exogenous (push) factors have been the main determinants of large upward swings to EMEs, while surges of capital inflows have been synchronized among countries and determined mainly by global factors—US interest rates and risk aversion (Ghosh et al. 2012).
(c) Portfolio flows and banking flows have been very volatile compared to FDI and such volatility has recently risen. FDI has been slightly more stable than other types of flows, and its volatility has increased due to the rise of direct borrowing by subsidiary firms (IMF 2011a).
(d) EMEs tend to receive capital flows (gross and net ones) that are large compared to their domestic economies and absorptive capacity,

in particular relative to the size and depth of their financial systems, so that such economies face problems related to an asymmetric financial integration (see more on this in the next section).

(e) Episodes of large capital inflows have been associated with GDP growth acceleration, but afterward growth often drops significantly: Over one-third of the completed episodes ended with a sudden stop or a currency crisis (Cardarelli et al. 2009, p. 5). Thus, an inverted V-shaped pattern of net capital flows to EMEs around outside the policymakers control has taken place (IMF 2011a).

(f) Fluctuations in GDP growth have been accompanied by large swings in aggregate demand and in the current-account balance, with strong deterioration of the current account during the inflow period and sharp reversal at the end (Cardarelli et al. 2009, p. 5). Indeed, business and financial cycles have been much more volatile in EMEs than in AEs (Claessens and Ghosh, 2013, p. 92).

(g) The surges of capital inflows have been associated with real effective exchange rate appreciation (Fig. 5.7), damaging the competitiveness of export sectors and potentially reducing economic growth in the long run (Cardarelli et al. 2009), while contributing to macroeconomic overheating in the short run by increasing domestic consumption followed by widening current-account imbalances.

Summing up, the boom-and-bust pattern of capital flows has been predominant in EMEs, as sharp rises in capital flows have been followed by slowdowns and reversal. This pro-cyclical pattern has been stressed by many analysts and has important consequences for the modus operandi of economic policies in EMEs, in particular to the exchange rate management. These issues are analyzed in the next section.

5.3 Capital Flows and Exchange Rate Regime in Emerging Economies Under Conditions of International Monetary Asymmetry

Since the breakdown of the Bretton Woods system and the financial liberalization trend, both prominent mainstream and heterodox scholars have stressed the increased likelihood of speculative capital flows, which brings challenges to the macroeconomic policies, among which is the management of the exchange rate.

Tobin (1978) was one of the first mainstream economists to state that the main macroeconomic problem related to integrated financial markets is not the choice of the appropriate exchange rate regime but the excessive short-run capital mobility that reduces the autonomy of national governments to pursue domestic objectives with respect to employment, output, and inflation. Stepping forward, Stiglitz (2000) points out the pro-cyclicality of capital flows mainly to EMEs under conditions of asymmetric information, which exacerbate economic booms, exposing these countries to the vicissitudes associated with external factors in line with the empirical findings reported in Sect. 2.2.

More recently, some empirical works have confirmed the direct relationship between an increasing international financial integration and the loss of economic policy autonomy. For instance, by analyzing the impact of capital flows and the exchange rate regime on monetary policy in EMEs from 1975 to 2006, Saxena (2008) found that domestic short-term interest rates are significantly affected by foreign interest rates in countries with high capital mobility. This author also found that flexible regimes tend to exhibit greater co-movement with US interest rates than the pegged exchange rate regimes, and consequently even with flexible exchange rate regime the autonomy of the monetary policy was reduced with greater international financial integration.

In the same stride, Rey's (2015) analysis restated that the capital flows' boom and bust pattern is determined by a global financial cycle, which depends on two linked variables: the VIX (a measure of investor's risk aversion) and the monetary policy (Fed Fund Rate level) in the USA. Monetary conditions of the center country contribute to increasing global banks leverage, with credit growth in the international financial system being transmitted world-wide through cross-border gross credit flows. Therefore, as Rey stressed, this channel invalidates the traditional "trilemma" of the open economy, upon which in a world of free capital mobility, independent monetary policies are feasible if exchange rates are floating. Instead, monetary conditions are transmitted from the main financial center to the rest of the world through gross credit flows and leverage, irrespective of the exchange rate regime. Therefore, "fluctuating exchange rates cannot insulate economies from the global financial cycle, when capital is mobile. The 'trilemma' morphs into a 'dilemma'—independent monetary policies are possible if and only if the capital account is managed, directly or indirectly, regardless of the exchange rate regime" (Rey 2015, p. 21).

Yet, heterodox scholars have already come to the same conclusion. According to Flassbeck (2001, p. 44): "Fixing the exchange rate one way or the other does not create, but only reveals, the existing lack of monetary autonomy in a system of free capital and goods flows. There is no 'impossible trinity', but rather an 'impossible duality'. To open the capital account and to lose national monetary autonomy is not contingent on the exchange rate regime."

The loss of monetary autonomy even with floating exchange rates is due to the need of official interventions in the currency market to smooth exchange rate volatility in the post-Bretton Woods era. As the Post Keynesian literature (Schulmeister 1988; Davidson 1982; Harvey 2009) highlighted, in this setting, featured by floating exchange rates and free capital mobility, short-term capital flows constitute the chief determinant of nominal exchange rates, which are highly volatile. In this perspective, the speculative feature of these flows, subordinate to financial investors' risk aversion/appetite, is the main cause of the volatility of exchange rates. Further, there are feedback loops between capital flows and exchange rate volatility, inasmuch this volatility stimulates short-term flows.

However, in EMEs the volatility of capital flows is higher than in AEs; these flows are even more sensitive to the monetary policy in the center country and to risk perception. As a result, their exchange rates are more volatile, requiring permanent interventions by the central banks (the so-called fear of floating, e.g., Calvo and Reinhart 2002), which, in turn, reinforce the interaction between the exchange rate and the policy rate, as domestic interest rates are used to curb exchange rate fluctuations. This means that in the case of EMEs, the loss of monetary autonomy in a context of free capital mobility is greater than in AEs. Further, exchange rate volatility is more harmful for these economies than for the AEs due to its negative impacts on financial fragility and inflation. One of the reasons why authorities seek to limit exchange rate movements is related to the effects of excessive exchange rate volatility (mainly devaluation) on the outstanding foreign currency debts of banks and firms with unhedged foreign currency liabilities and also on governments with large foreign currency debt, raising questions about their fiscal sustainability. In addition, exchange rate fluctuations may generate uncertainties that can adversely affect export competitiveness and investment in the external sector. As Flassbeck (2001) pointed out, the "fear of financial fragility" and the "fear of inflation" underline the widespread "fear of floating" in EMEs.

The EMEs' specificities are linked, in last resort, to their position in the current international monetary and financial system (IMFS). Following Prebisch's thinking, as it is impossible to analyze the dynamics of developing countries independently of their position within the inherently hierarchical "center-periphery" world economic system (Ocampo 2001b), it is not feasible to grasp these specificities without regard to the hierarchical and asymmetrical nature of the IMFS.

Cohen (1998) adopts the concept of "monetary pyramid" to classify the different types of currencies, which should be distinguished according to their degree of "monetary internationalization." Besides the superior position of the key currency (currently, the fiduciary US dollar—USD)—which has the highest degree of liquidity as it performs internationally the three functions of money (medium of exchange, unit of account and denomination of contracts, and store of value)—this system is marked by an asymmetry cutting across the currencies of AEs (other than the USA), placed in an intermediary position, and those of EMEs at the bottom of the monetary hierarchy. While AEs' currencies are also international currencies inasmuch they perform (in a lesser degree than the USD) the aforementioned functions of money, EMEs' currencies are non-international ones, for they are incapable of performing at this scale these functions. EMEs are not able to issue international debt in their own currency (the so-called original sin, e.g., Eichengreen and Hausmann 2005) and their currencies are the first victims of global investors' "flight to quality." However, although EMEs' currencies (*qua assets*) are priced with a lower liquidity premium, they might be demanded according to investor's expectations of financial return (Andrade and Prates 2013). One should note, however, that hierarchy of currencies is not about total returns, but about liquidity.

This monetary asymmetry is one of the basic asymmetries featuring the world economy and superimposed itself on the financial asymmetries, among which two stand out. Firstly, capital flows toward EMEs depend on exogenous sources, which cause these countries to be permanently vulnerable to their reversal by virtue of changes in the monetary conditions of the center countries (mainly in the USA) as well as by the increase in risk aversion of global investors; using the words of Ocampo (2001a) and Rey (2015), whereas the AEs (center) are "global financial cycle makers," EMEs (periphery) are "global financial cycle takers." Secondly, the disparity between the size of EMEs' currency and financial markets when compared to AEs' markets. Although the resid-

ual nature of capital flows directed to EMEs, their potentially destabilizing effects on their financial markets and exchange rates are significant, since the volume allocated by global investors is not marginal in relation to the size of these markets (Akyüz and Cornford 1999). In other words, this financial asymmetry stems from that fact that international financial integration is integration between "unequal partners" (Studart 2001).

It is exactly the mutually reinforcing monetary and financial asymmetries that underlie the aforementioned greater macroeconomic challenges faced by EMEs in a context of free cross-border finance. On one hand, their currencies, placed at the bottom of the currency hierarchy, are particularly vulnerable to the inherent volatility of capital flows, ultimately determined by an exogenous process (the global financial cycle). Consequently, their exchange rates are more volatile. In turn, the greater exchange rate volatility has more harmful effects than in AEs exactly because EME currencies are non-international ones, which increases the risk of financial fragility (due to the potential currency mismatches) as well as the pass-through of exchange rate changes to domestic prices. Many studies show that this pass-through is greater in EMEs than AEs (Mohanty and Scatigna 2005). Yet, the main explanation put forward by them is the different composition of their price indexes: the higher pass-through in EMEs is due to the higher share of basic goods, whose prices are set in the international market, in the consumption basket.

On the other hand, monetary and financial asymmetries also result in different degrees of monetary policy autonomy in EMEs and AEs. As Ocampo (2001a, p. 10) points out: "whereas the center has more policy autonomy and is thus 'policy making'—certainly with significant variations among the different economies involved—, the periphery is essentially 'policy taking.'" In other words, the monetary and financial asymmetries result in a macroeconomic asymmetry: the dilemma or impossible duality is greater in EMEs because their position in the IMFS strengthens the relationship between the policy rate and the nominal exchange rate and the influence of global investors' portfolio decisions on these key macroeconomic prices.

To sum up, in order to figure out the relationship between capital flows and the exchange rate regime in EMEs, it is necessary to taken into account the monetary, financial, and macroeconomic asymmetries of the current IMFS.

5.4 Economic Policy Approaches to Deal With Capital Flows

The capital flow's boom that surged after the 2008 global financial crisis has had similarities and differences with regard to the pre-crisis one (see Sect. 2). This section addresses another specificity of this more recent boom: The economic policy responses of EMEs aimed at curbing the undesirable effects of an excessive entry of foreign currency. Indeed, the combination of high growth rates under the double-speed recovery of 2009–2010, accelerating inflation (also associated with a renewed commodity prices boom), excessive currency appreciation, and/or asset price overshooting presented EMEs with policy dilemmas (Akyüz 2011). The adoption of restrictive monetary policy would also help to contain growth and inflationary pressures, but it would encourage further capital inflows, which, in turn, would foster an asset price boom and exchange rate misalignment, aggravating the risk of future sudden stops and subsequent financial crises.

Unlike the case in the pre-crisis context, many EMEs (even those with current-account deficits) did not adopt a hands-off approach to capital inflows in the post-crisis period. As Rodrik (2006, p.12) points out, during 2003–2006 these countries "over-invested in the costly strategy of reserve accumulation and under-invested in capital account management policies." Indeed, after the financial crises of the 1990s in Latin America and in Asia, in most EMEs the managed exchange rate regimes (fixed or currency bands) were replaced by the dirty floating regime in which official intervention in currency markets became the rule and not the exception (Calvo and Reinhart 2002).

In some cases, the significant interventions of central banks aimed at influencing the level of the nominal exchange in order to ensure a competitive real exchange rate, the so-called mercantilist motive. An increasing number of countries have also started to intervene in the currency markets to accumulate foreign currency reserves as an insurance against future negative shocks and speculative attacks against the domestic currency. Whereas between 1998 and 2002 such a trend was more evident in East Asian countries (Aizenman et al., 2004; Dooley et al., 2005), after 2003 many Latin American economies, benefiting from increased commodity prices and the pre-crisis capital flow wave, have begun to imitate the Asian strategy. However, precautionary reserve accumulation often implies quasi-fiscal costs, as it generally involves sterilization operations by the central bank (exchange of high-yield domestic assets for low-yield foreign reserves).

Yet, the contagion effect of the 2008 global crisis on EMEs, which witnessed capital flights and currency depreciations in the last quarter of 2008, brought to light that the accumulation of foreign currency reserves was insufficient to immunize them against the potentially destabilizing effects of capital flows. These effects reached especially their currencies due to the asymmetries of the current IMFS (see Sect. 3). Moreover, it also revealed that the effectiveness of reserves in curbing a speculative attack depends on the institutional features of the currency market and the composition of the balance of payment surplus that enables the accumulation of the foreign exchange stock. For instance, the greater currency depreciations took place not only in countries with high current-account deficits (such as South Africa and Turkey) but also in those that absorbed significant amounts of speculative capital inflows and/or allowed speculative transactions on the foreign exchange derivative markets, such as Brazil and South Korea.

These lessons shaped the economic policy responses over the zenith (mid-2009 to mid-2011) of the post-crisis boom. Over these years, Brazil, South Korea, and other emerging-market countries (such as Indonesia, Thailand, Peru, and Turkey) chose to adopt CARs to deal with the aforementioned policy dilemmas (on the regulations adopted by emerging peripheral countries after the global financial crisis see, among others: IMF 2011b; Klein 2012; Fritz and Prates 2014; Baumann and Gallagher 2013). Nevertheless, this hands-on approach to capital flows did not result in the abandonment of the reserve accumulation strategy but in a slower pace of this strategy (see Fig. 5.8).

This new policy mix was also related to the very post-crisis circumstances. Historical low interest rates, QE, and the double-speed recovery resulted in excessive inflows of capital to EMEs (see Sect. 2) and the related "currency war," which meant strong appreciation pressures on their currencies. In this setting, policy-makers in many EMEs adopted a pragmatic approach, as the accumulation reserves policy, besides insufficient, would be even more costly due to the greater amount of foreign currency surplus to be sterilized. Ahmed and Zlate (2013) evidenced for the pre-crisis boom that reserve accumulation improved the country's external liquidity situation, having a positive impact on global investors' expectations and on external ratings, therefore stimulating further capital inflows. This amplifying outcome also justifies the mix of the two approaches to face capital flows booms.

CARs belong to the broader family of financial regulations and encompass two classes of regulations: (i) *Prudential financial regulations* are regulations affecting the asset and liability positions of resident financial

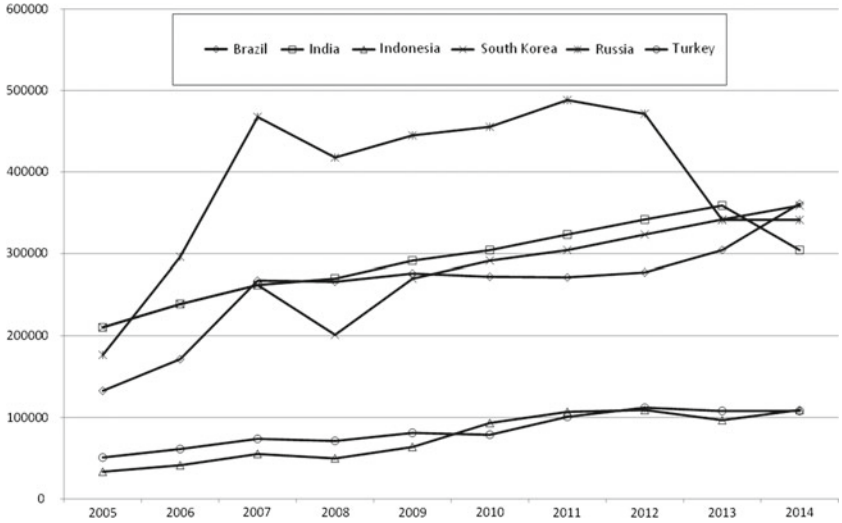

Fig. 5.8 Foreign exchange reserves (USD 1000). *Source*: Data from IMF (2015)

institutions, among which are capital-adequacy standards, reporting requirements, or restrictions on the ability and terms under which domestic financial institutions can provide capital to certain types of projects; they may also include prudential rules on currency mismatching of balance sheets or restrictions on issuing certain types of derivatives or forward contracts. (ii) *Capital controls* are a range of financial regulation tools that manage cross-border flows (both inflows and outflows) associated with foreign investors as well as resident companies and banks; unlike prudential financial regulations, they can influence portfolio decisions taken by resident non-financial institutions and non-resident agents (Gallagher et al. 2012). Capital controls can target inflows or outflows and generally concern particular flows (such as portfolio investment). Moreover, they can be *tax-based* (financial taxes or reserve requirements against certain types of investments are examples of tax-based controls) or *quantitative*, which may involve outright bans on certain investments (e.g., the purchase of equities by foreign investors), restrictions or quotas, or license requirements (Epstein et al. 2004; Prates 2015).

CAR can be used for different goals, such as: (i) to reduce the vulnerability to financial crises related to speculative capital inflows and out-

flows; (ii) to drive a wedge between onshore and offshore interest rates in order to provide monetary authorities with some policy autonomy at least in the short run; and (iii) to maintain short-term stability of nominal exchange rate and curb currency appreciation pressures derived from excessive capital inflows. Yet, these goals are related. For instance, currency appreciation stimulates speculative positions in foreign currency in the spot and derivatives markets, threatening financial stability. Therefore, the ability to maintain the exchange rate at a competitive level contributes to financial stability.

Some countries such as Brazil and South Korea needed to also launch specific regulations targeting FX derivatives operations to reach these two goals due to their central influence on the exchange rate trend and/or in the financial situation of banks and corporations in both economies (Prates and Fritz 2014).

As these two classes of CAR are specific in terms of the range of agents and capital flows they can reach, the set of CAR adopted has varied among EMEs. Indeed, the case studies aforementioned as well as the ones on the CAR adopted in the 1990s (Epstein et al. 2004; Magud and Reihart 2006) highlight that designing the regulatory toolkit is country-specific, shaped by the policy goals, the capital flows composition (Table 5.1), as well as by macroeconomic and institutional factors. Regarding the macroeconomic ones, for instance, a great interest rate differential due to a restrictive monetary policy stimulates regulatory arbitrage with the aim of circumventing CAR, mainly in the case of countries with sophisticated financial markets and a high degree of financial openness. As for the effectiveness of CAR, Magud and Reihart (2006) reviewed more than 30 papers that evaluated capital controls either on inflows or outflows around the world, making use of a capital controls effectiveness index in order to standardize the results of the empirical studies; the authors concluded that "capital controls on inflows seem to make monetary policy more independent; alter the composition of capital flow; reduce real exchange rate pressures (although the evidence is more controversial)," but "seem not to reduce the volume of net flows (and hence, the current-account balance)" (Magud and Reihart 2006, p. 6–7). In order to be effective, CARs have to be broader and even more dynamic, flexible, and adjustable, involving a steady "fine-tuning" to close the loopholes found by private agents. This seems to be the case of the Brazilian experience with CAR after the global financial crisis (Prates and Fritz 2014; and Paula and Prates 2015).

Table 5.1 Capital account regulations

Regulation		*Agents*	
		Financial vs. non-financial	*Resident vs. non-resident*
Prudential regulation		Financial institutions	Resident
Capital controls	Portfolio and FDI	Both	Non-resident
	Foreign loans	Both	Resident

Source: Adapted from Prates (2015, p. 182)

5.5 Final Remarks

The amount and volatility of capital flows during the post-crisis boom, their potentially damaging consequences for EMEs, and the very pragmatic response of these countries summarized above pushed forward the IMF research department to produce a series of policy and background papers on this subject (IMF 2011b; Ostry et al. 2010, among others) that result in a definitive policy framework launched in December 2012 (IMF 2012).

This framework made relevant progress compared to the IMF traditional rejection of capital controls and also to its preliminary approaches of 2010 and 2011. These approaches established a clear-cut hierarchy between instruments to manage capital flows covering the whole range of macroeconomic policies, prudential regulations, and capital controls (defined in a jurisdictional manner as measures discriminating between residents and non-residents), which should be used under highly specific circumstances (Ostry et al. 2010, 2011a, b; IMF 2011c). By introducing the term "capital flow management measures" (CFMs), the IMF gives more policy space to EMEs subject to major capital inflows. However, by labeling CFMs as a temporary instrument, it still supports financial liberalization in these economies as a final goal and keeps discriminating between CFMs and financial prudential measures, setting bounds to EMEs' policy space and their country-specific needs (Gallagher 2012; Prates and Fritz 2014).

Therefore, the differences between prudential regulation and capital controls regarding the types of agents and capital flows they could reach as well as the other macroeconomic and institutional specificities shaping each country regulatory approach (see Sect. 4) are not taken into account by the IMF in its new institutional view on capital flows regulation.

However, EMEs should have permanent authority to manage capital flows based on all types of available regulatory tools not only because each country approach needs to be tailor-made according to the aforementioned specificities (as the experiences in the 1990s and 2000s revealed) but also due to the features of the current IMFS. As the global financial crisis was not followed by the structural reforms awaited by many scholars (Davidson 1982), this system is still featured by a currency hierarchy with the dollar at its top and an asymmetrical financial integration. The interplay of these features has more harmful impacts exactly on EMEs whose currencies are positioned at the hierarchy lower bond, as detailed in Sect. 3. Moreover, the improvements in the international governance after this crisis have been shy (Frieden et al. 2012). As AEs are business and financial cycle makers (Ocampo 2001a; Rey 2015) and have not embraced capital outflow regulations, EMEs need to tackle alone the spillover effects of those countries' domestic policies.

Hence, CARs need to be a permanent part of the policy toolkit to be used in a counter-cyclical way to smooth booms and busts, to curb financial risks, and to increase the policy space in order to exert control over the key macroeconomic prices such as the exchange rate and interest rate. We call this strategy "an integrated approach of capital flows regulation."

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CHAPTER 6

Corporate Cash Holdings and Economic Crises in Mexico

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6.1 Introduction

The main objective of this study is to model cash holdings by corporations in Mexico. The sample, firms listed at any point in time from 1991 to 2014 on the Mexican Stock Exchange, covers two severe economic crises in this emerging market, namely, the 1994–1995 Tequila crisis and the 2007–2009 global financial crisis.

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Modeling cash has become a popular research topic since the publications by Harford (1999) and Opler et al. (1999). These authors revived the cash literature, which until then was either descriptive or concerned with corporate transactions demand for cash (Harford 1999), by providing more comprehensive models with explanatory variables from the precautionary motive to hold cash. Later, Bates et al. (2009), extending the model by Opler et al. (1999), modeled the secular increase of cash in US firms, especially dramatic during the 1990s and the 2000s. Some firms, especially those in developed countries, are hoarding cash in the midst of the recent global financial crisis (Dittmar and R. Duchin 2012). Such behavior could be hurting investors or impeding the recovery of the economy. To assess the effect of cash hoarding, researchers typically reference the models by Harford, Opler et al., and Bates et al. To provide a context for the impact of these studies, the three publications together account for more than 4000 academic citations in Google Scholar by mid-2015.

Because cash typically generates immediate returns below firms' weighted average cost of capital, one might assume that the firms would quickly redeploy cash into other assets or return earnings to shareholders. Cash holding levels lately prove otherwise, making the modeling of cash a challenging empirical problem. Financial theory implies that the value of cash varies across firms because optimal cash holdings are determined by firm-specific characteristics. Harford (1999, pp. 1973) states in this regard, "If two firms have the same cash reserves, one may be cash-rich while the other may have the amount appropriate for its expected financing demands." In addition, shocks to the economy affect cash levels. While studies on cash typically do not put much emphasis on macroeconomic factors, two exceptions are Harford (1999), including economic recessions, and Pinkowitz et al. (2013), studying cash holdings around the global financial crises.

The study of cash in an emerging country could represent other challenges compared to developed economies. While not extensive, the literature on cash for emerging markets seems to indicate that shocks to the economy are of relevance. For instance, Alvarez et al. (2012) study the impact of the recent financial crisis on Chilean firms' cash holding decisions, and Elkinawy and Stater (2007) analyze cross-country effects of the 1994–1995 Mexican crisis and the 1999 Brazilian crisis on Brazilian, Mexican, and Argentinian firms. To the extent that Mexico is an open economy since the 1990s, and that several firms in the Mexican Stock Exchange simultaneously trade in the form of depository receipts in more

efficient stock exchanges, one would expect that after controlling for economic crises results should be similar to those in a developed economy, where models have been widely tested. This is the spirit of our hypothesis in this study. Our results suggest so with few exceptions.

The following section provides a literature review, with emphasis in studies for emerging markets, and presents our hypothesis. Next, a methods section includes both the models and a description of the data. Econometric test results are discussed then, and a conclusions section ends this chapter.

6.2 Literature Review and Hypothesis Development

6.2.1 Optimal Cash

While cash is the most generic of all assets, it has received increasing scholarly interest. Empirical results are inconclusive, however, on whether cash holdings improve or impair firms' performance (O'Brien and Folta 2009). Faulkender and Wang (2006) document that cash holdings are valuable for financially constrained firms and Denis and Sibilkov (2010) provide evidence that cash enhances firm investments. In contrast, other studies have shown that cash holdings destroy firm value (Jensen 1986, among others).

Studies documenting that cash holdings add value support the precautionary theory to hold cash either to save for the uncertain future (Keynes 1936; Han and Qiu 2007; Duchin 2010; Gao et al. 2013; Harford et al. 2014) or because information asymmetry makes external capital more expensive (Myers and Majluf 1984; Kim et al. 1998). The second group (Jensen 1986; Harford 1999; Dittmar et al. 2003; Harford et al. 2008; Drobetz et al. 2010) supports the free cash flow hypothesis by Jensen and Meckling (1976) and Jensen (1986). This hypothesis proposes that managers in firms with large free cash flows and low growth opportunities are likely to hoard cash for their personal benefit or to invest in value destroying projects.

Widely accepted cash models are based on the precautionary motive for cash holdings mainly with few elements of the transaction cost motive (refer to Ozkan and Ozkan 2004 for a summary of these theories). Deviations of cash levels from predictions by those models could serve as the basis to explore the potential for agency problems of managerial discretion or the free cash flow hypothesis. A recent reference for the free cash flow

hypothesis is Harford et al. (2008). For the precautionary theory, recent studies include Han and Qiu (2007), Duchin (2010), Gao et al. (2013), and Harford et al. (2014). For the transaction motive of cash holdings refer to Kim et al. (1998).

6.2.2 Cash in Developing Countries

Most of the literature has examined cash holdings for US firms or other developed countries. Our interest is more on cash holdings determinants in emerging markets, such as Mexico, which may differ from cash determinants for firms operating in developed markets. Al-Najjar (2013) studies the determinants of cash holdings for companies in BRIC countries (Brazil, Russia, India, China) for the 2002–2008 period and finds no consistent determinants across these four countries. When they test a common model for cash holdings across the developed (USA and UK) and the aforementioned developing countries, their findings indicate that cash holding decisions are related to each country's institutional settings (shareholder protection) and firm-specific factors.

In the case of Latin America, Noguera and Trejo-Pech (2012) assess the levels and determinants of cash for companies from Argentina, Chile, Mexico, and Peru for the 1995–2006 period and find that compared to US holdings, Latin American firms hold less cash. However, both US and Latin American firms' cash holdings are determined by net working capital levels, capital expenditures, net leverage, and growth opportunities. Interestingly, firm size, measured by total assets, and dividends increase Latin American cash as a percentage of total assets while they decrease cash levels for US firms. These findings on cash levels are supported by the most recent work by Pinkowitz et al. (2013). Using a sample of 45 countries for the 1998–2010 period, they attempt to explain the evolution of US and foreign firms' cash holdings and find that US firms hold significantly more cash than foreign firms, at either advanced or developing economies. They also estimate a model of abnormal cash holdings allowing for country fixed effects. The authors find that US abnormal cash holdings are higher than for the world as a whole in every year. They do note, however, that from before the recent global crisis to after the crisis, the increase in abnormal cash holdings for US firms is not significantly different from the increases in abnormal cash holdings in other developed countries. Interestingly, abnormal cash holdings of developing countries are found to be always lower than US abnormal cash holdings and never significantly different from zero. In other words, they find that developing countries' firms do not accumulate cash in excess.

We suspect that the aggregated sample in Pinkowitz et al. (2013) masks the real impact of crises on cash holdings of firms in developing countries. In fact, in Latin America, crises seem to have a great bearing on cash holdings. Alvarez et al. (2012) study the impact of the recent financial crisis on Chilean firms' cash holding decisions and find episodes of liquidity crisis to be negatively related to the firm's level of cash holdings, especially for the case of small firms. Elkinawy and Stater (2007) analyze cross-country effects on Brazilian, Mexican, and Argentinian firms of the 1994–1995 Mexican crisis and the 1999 Brazilian crisis, with a focus on how the determinants of cash holdings and firm value changed during these crises. They find that cash holdings fell during the Mexican crisis but not during the Brazilian crisis and that the determinants of cash holdings stay quite similar to pre-crisis level during the Mexican crisis but not during the Brazilian crisis. Overall, their findings indicate that the two financial crises have different effects on the determinants of cash holdings and firm value and that governance concerns became more significant during these crises.

6.2.3 Hypothesis

Recent findings confirm that economic crises have significant effect on cash holding decisions in *developed* economies. Bliss et al. (2015) show that the shock to the supply of credit during the recent financial crisis increased the marginal benefit of cash retention in firms. Sun and Wang (2014) examine the effects of the financial crisis on cash holdings and saving propensities and find that firms tended to save more as a precautionary motive during the crisis. Kahle and Stulz (2013) find that bank-dependent firms hoard cash during the crisis compared to unlevered firms. Garcia-Appendini and Montoriol-Garriga (2013) find that firms with high pre-crisis liquidity increased the trade credit extended to their clients during crises, offering another precautionary savings motive to accumulate cash for periods of crises.

Given the more fragile economies of developing countries, we hypothesize that optimal cash holding decisions in Mexican firms are modeled by variables from the precautionary theory, mainly, *and* by control variables related to the supply of credit by the banking system and economic crises. Specifically, if the precautionary theory holds, cash holdings should *increase* in years of economic crises after controlling for bank funding. Deviations, if any, from the models, should be explained by emerging market-specific characteristics. Table 6.1 lists the determinants of cash in

Table 6.1 Determinants of cash and predicted directional impact

Determinants	Prediction	Proxy (Variable)
Panel A—Dependent variables		
Cash to assets		Cash plus marketable securities to total assets (*CtoA*)
Cash to sales		Cash plus marketable securities to total revenue (*CtoS*)
Panel B—Explanatory variables		
Growth opportunities	+(P) or −(A*)	Market to book value (*MTB*)
Firm size	−(TC) or +(A*)	Log of total assets in 2014 dollars, adjusted by the cpi (*Size*)
Small firms	+(TC)	Firms in the bottom 30% percentile when firms are ranked by *Size* (*SmallFirms*)
Cash flow	+(A*)	Operating cash flow to assets (*CFtoA*)
Cash flow net of investments	+(A*)	Free cash flow to sales (*FCF*)
Volatility of cash flow	+(P)	Standard deviation of operating cash flow for the previous ten years (*CFVol*)
Net working capital	−(SC)	Year to year (YtoY) change in working capital to total assets (*NWC*)
Capital expenditures	−(P)	YtoY change in acquisitions, net of sales, of PP&E to total assets (*CAPEX*)
Leverage	−(SC)	Total debt with financial cost to total assets (*LEV*)
Dividends	+(P)	Dummy for dividend payers (*DIV*)
Loans from banks	−(FH)	Bank debt relative to total liabilities (*BankDebt*)
Economic crises	+(P)	Dummy for economic crises in Mexico (*Crisis*)
Country risk	+(P)	Country risk score by the Economist Intelligence Unit (*CountryRisk*)

Notes: P refers to the precautionary theory; A, agency theory; and TC, transaction cost theory. SC means substitute of cash

*The agency theory or free cash flow hypothesis has a unidirectional conditional prediction: large firms *with* low growth opportunities hold more cash

this study according to the most representative studies. The second column shows the direction of the prediction with the underlying theory indicated in brackets. Ozkan and Ozkan (2004) provide an explanation on these predictions. The last column indicates the proxies, explained in the next section.

6.3 Methodology

6.3.1 Models

We employ panel regression analysis. Our first model (1) begins from the Bates et al. (2009) model and model (2) from Harford (1999):

$$\Upsilon_{i,t} = \sum_1^k \beta_k X_{i,t,k} + u_i + v_t + \varepsilon_{i,t} \tag{1}$$

The dependent variable ($\Upsilon_{i,t}$) is cash to total assets, explained by k firm characteristics ($X_{i,t,k}$). Equation (1) is a fixed effects model, which assumes that firm cash levels are affected by both the cross-section and time series. u_i represents cross-section effects that are constant over time, v_t represents time effects that are common to all firms, and $\varepsilon_{i,t}$ is the residual error. Standard errors are corrected for heteroscedasticity and within cross-section serial correlation.

The empirical specification (1.1) is

$$\begin{aligned} CtoA_{i,t} = {} & \alpha_i + \alpha_1 MTB_{i,t} + +\alpha_2 Size_{i,t} + \alpha_3 CFtoA_{i,t} + \alpha_4 CFVol_{i,t} \\ & + \alpha_5 NWC_{i,t} + \alpha_6 CAPEX_{i,t} + \alpha_7 LEV_{i,t} + \alpha_8 DIV_{i,t} + \varepsilon_{i,t}, \end{aligned} \tag{1.1}$$

where *CtoA* is cash to total assets; *MTB*, market to book value; *Size*, firm size measured as log of total assets; *CFtoA*, operating cash flow to assets; *CFVol*, firm's cash flow volatility; *NWC*, net working capital relative to total assets; *CAPEX*, capital expenditures relative to total assets; *LEV*, leverage; and *DIV*, a dummy variable for dividends paid. Table 6.1 summarizes variables used in this study, and the appendix provides variable definitions.

Model (1.2) adds *BankDebt* and *Crisis*:

$$\begin{aligned} CtoA_{i,t} = {} & \alpha_i + \alpha_1 MTB_{i,t} + +\alpha_2 Size_{i,t} + \alpha_3 CFtoA_{i,t} + \alpha_4 CFVol_{i,t} \\ & + \alpha_5 NWC_{i,t} + \alpha_6 CAPEX_{i,t} + \alpha_7 LEV_{i,t} + \alpha_8 DIV_{i,t} \\ & + \alpha_9 BankDebt_{i,t} + \alpha_{10} Crisis_{i,t} + \varepsilon_{i,t}. \end{aligned} \tag{1.2}$$

Model 1.2 is a cross-section fixed effect model controlling for years of economic crises in Mexico, defined as dummy variables for 1994–1995 and 2007–2009. At the end of this section, we elaborate on economic crises. *BankDebt* is defined as debt from banks relative to total liabilities. This variable is similar as in Alvarez et al. (2012) (we do not separate short-term debt from long-term debt), following Fama's (1985) argument that bank loans can signal positive information about the financial health of firms as banks have access to information that is not publicly available.

Finally, model 1.3 has two additional variables: dummy variable *SmallFirms*, defined as firms in the bottom 30 percentile when ranked by *Size*, and the interaction of *Crisis* and *SmallFirms*:

$$\begin{aligned} CtoA_{i,t} = {} & \alpha_i + \alpha_1 MTB_{i,t} + +\alpha_2 Size_{i,t} + \alpha_3 CFtoA_{i,t} + \alpha_4 CFVol_{i,t} \\ & + \alpha_5 NWC_{i,t} + \alpha_6 CAPEX_{i,t} + \alpha_7 LEV_{i,t} + \alpha_8 DIV_{i,t} \\ & + \alpha_9 BankDebt_{i,t} + \alpha_{10} Crisis_{i,t} + \alpha_{11} SmallFirms_{i,t} \\ & + \alpha_{11} SmallFirms * Crisis_{i,t} + \varepsilon_{i,t}. \end{aligned} \tag{1.3}$$

Model (2), following Harford (1999), has

$$\begin{aligned} \Upsilon_{i,t} = {} & \alpha_0 + \sum\nolimits_1^k \beta_k X_{i,t-1,k} + \sum\nolimits_1^l \beta_l X_{i,t,l} + \sum\nolimits_1^m \beta_m X_{i,t+1,m} \\ & + \sum\nolimits_1^n \beta_n X_{i,t+2,n} + u_i + v_t + \varepsilon_{i,t}. \end{aligned} \tag{2}$$

Particularly, (2.1) is

$$\begin{aligned} CtoS_{i,t} = {} & \alpha_i + \alpha_1 MTB_{i,t-1} + \alpha_2 Size_{i,t-1} + \alpha_3 FCFtoS_{i,t} + \alpha_4 CFVol_{i,t} \\ & + \alpha_5 \Delta CountryRisk_{i,t+1} + \alpha_6 \Delta FCFtoS_{i,t+1} \\ & + \alpha_7 \Delta FCFtoS_{i,t+2} + \varepsilon_{i,t}, \end{aligned} \tag{2.1}$$

where *CtoS* is cash to sales; *FCFtoS*, free cash flow to sales; and $\Delta CountryRisk$ is year to year change of country risk score, as measured by the Economist Intelligence Unit (obtained from Bloomberg). *FCFtoS* slightly differs from the specification in Harford. *FCFtoS* in (2.1) has both net working capital and CAPEX subtracted from operating income minus taxes and interest plus D&A; in Harford (1999) CAPEX is not included, probably because they use their model to study major acquisitions. Since we are not controlling for CAPEX in this model (but we are in model 1), we include this variable in *FCFtoS*.

The rest of the variables are as defined previously. Equation (2.1) is a two-way fixed effects model. Equation (2.2) runs the model with cross-section fixed effects, adding variable *Crisis*:

$$\begin{aligned} CtoS_{i,t} &= \alpha_i + \alpha_1 MTB_{i,t-1} + \alpha_2 Size_{i,t-1} + \alpha_3 FCFtoS_{i,t} + \alpha_4 CFVol_{i,t} \\ &+ \alpha_5 \Delta CountryRisk_{i,t+1} + \alpha_6 \Delta FCFtoS_{i,t+1} + \alpha_7 \Delta FCFtoS_{i,t+2} \\ &+ \alpha_8 Crisis_{i,t} + \varepsilon_{i,t}, \end{aligned} \tag{2.2}$$

The model by Harford considers firm control variables and a time series component capturing planned future investments. For instance, the incorporation of leading cash flow levels two years ahead ($t+2$) intends to capture the possibility that managers hoard cash in previous years (t and $t+1$) when they expect their free cash flows to fall below their planned investments (cash free from working capital and CAPEX outlays). The model also considers economic crises. The specification by Harford uses

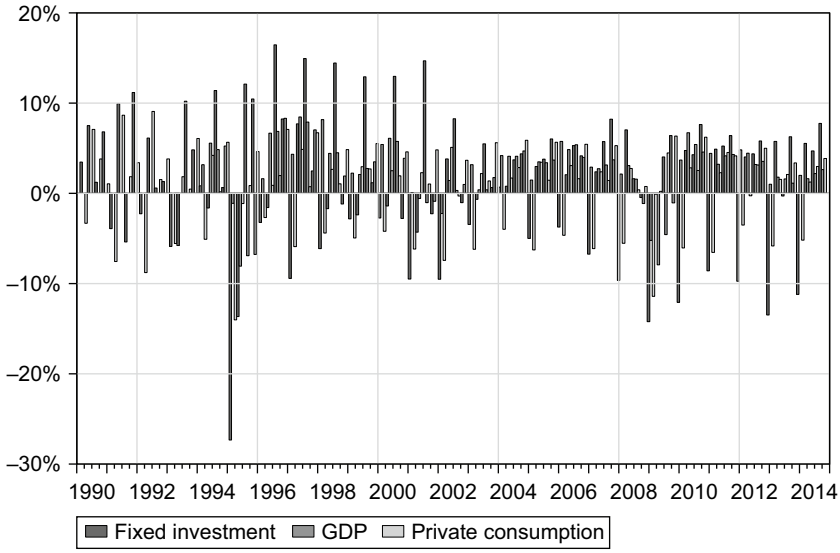

Fig. 6.1 Selected series related to economic crises, Mexico 1990–2014. *Notes*: Quarter to quarter changes of fixed investment, gross domestic product, and private consumption in Mexico adjusted for inflation. Estimations using data in S&P Capital IQ

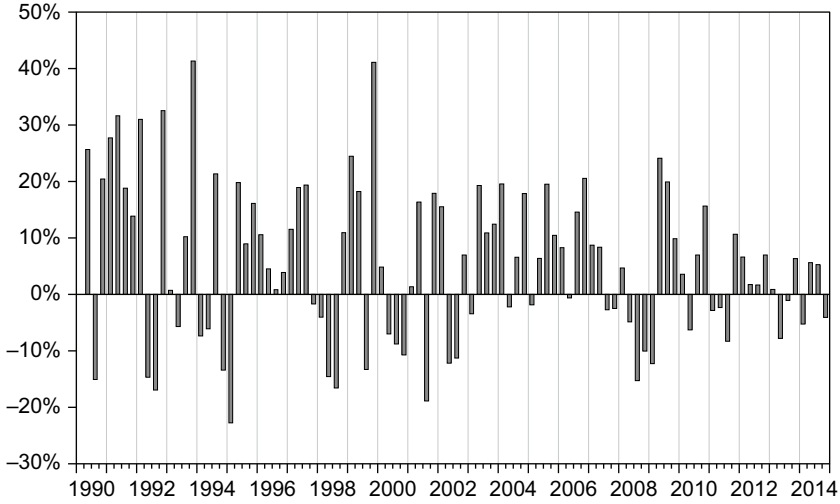

Fig. 6.2 Mexican Stock Exchange Index, 1990–2014. *Notes*: Quarter to quarter changes of the Mexican Stock Exchange Index. Estimations using data in Economatica

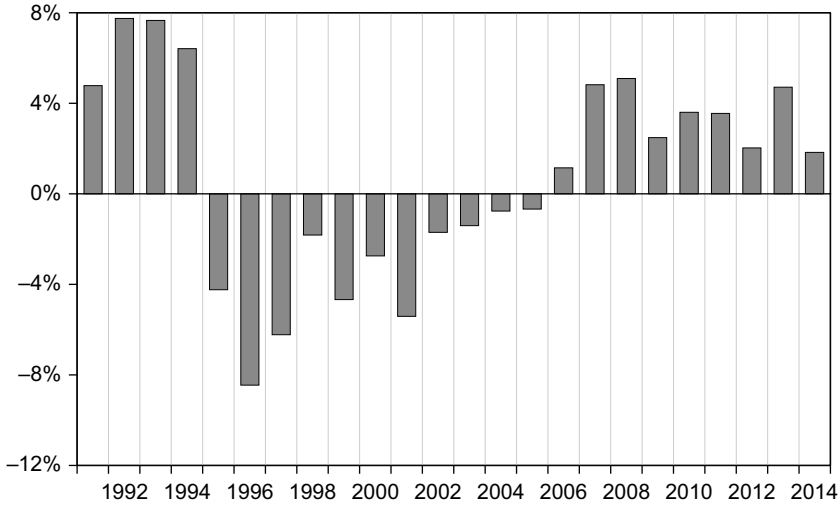

Fig. 6.3 Net debt issuance in Mexican firms listed on the Mexican Stock Exchange, 1990–2014. *Notes*: Inflows from bank loans minus payment to banks all divided by total assets. Estimations using data in Economatica

recessions, according to the National Bureau of Economic Research (NBER), instead of economic crises as defined in this study.

6.3.2 *Economic Crises*

An economic crisis is an abrupt breakup of established business practices, consumption patterns, and production lines caused by either exogenous (external, irregular) or endogenous (within the economic system) shocks (Gevorkyan 2015). During crises, output, employment, investment, consumption, and stock prices, among other economic series, are negatively impacted. For this study, two severe economic crises in Mexico are considered, the well-known 1994–1995 Tequila crisis and the recent 2007–2009 global financial crisis. Figure 6.1 depicts growth rates of Gross Domestic Product, fixed investment, and private consumption in Mexico. Figure 6.2 plots the Mexican Stock Exchange Index, and Fig. 6.3 shows Net Debt Issuance, measured as the difference between inflows and outflows from bank loans on firms listed on the Mexican Stock Exchange. Overall, time series in Figs. 6.1, 6.2, and 6.3 show that the Mexican economy has indeed been severely impacted during the periods 1994–1995 and 2007–2009.

6.3.3 *Data and Descriptive Statistics*

Economatica is the main database used in this study to obtain financial statement and market data during 1991–2014. S&P COMPUSTAT

Table 6.2 Descriptive statistics for Mexican firms, 1991–2014

	Mean	*Median*	*Std. Dev.*	*Skewness*	*N*
Cash to assets	0.070	0.051	0.062	1.334	2556
Cash to sales	0.122	0.072	0.148	2.707	2551
Market to book value	1.223	0.963	0.908	2.816	2121
Log of total assets	6.026	6.078	0.741	−0.138	2608
Cash flow to assets	0.078	0.079	0.089	2.596	2545
Free cash flow to sales	0.187	0.034	4.209	36.460	2499
Standard deviation of cash flow	0.154	0.052	0.931	10.586	2603
Net working capital to assets	0.069	0.047	0.200	0.716	2582
Capital expenditures to assets	0.035	0.029	0.112	−14.137	2531
Leverage	0.274	0.259	0.206	0.615	2591
Dividends paid dummy	0.438	0.000	0.496	0.252	2608
Bank loans to total liabilities	0.328	0.310	0.253	0.324	2603

Notes: Variable definitions in the Appendix

(for US cash estimations), Bloomberg (for the country risk proxy), the Mexican Central Bank database (for the consumer price index), and S&P Capital IQ (for Mexican macroeconomic series) are secondary databases used in this study. The sample includes non-financial firms with total assets and equity greater than 5 million USD per year, following Pinkowitz et al. (2013). To reduce problems with outliers, we winsorize the data following criteria in previous studies (refer to Appendix). In order to avoid survivorship bias, the sample includes both de-listed and active firms.

Table 6.2 provides descriptive statistics. While these statistics are not directly comparable to those from other countries, it is evident that cash holdings in Mexico are much lower than in both developed and developing countries (refer to Pinkowitz et al. 2013 for statistics of similar variables for the USA, UK, and Japan, and for the aggregate of 19 developing countries). The difference of cash holdings between Mexico and the USA is the highest among all countries (below, we provide the time series for both countries). Table 6.2 also shows that with the exception of free cash flow to sales, cash flow volatility, and CAPEX relative to total assets, the level of skewness for most variables is moderate, which allows for least square regression analysis.

Figure 6.4 compares cash holdings in Mexico and the USA over time (for restrictions of space we provide proxy cash to assets only). Cash holdings in the USA are much higher than in Mexico during the period of study, which is in line with the widely known high-cash concern in US corporations. According to Fig. 6.4, cash holdings in Mexico decrease during economic crises, consistent with the fact that liquidity is a problem during those hard economic times. One of the findings of this study, how-

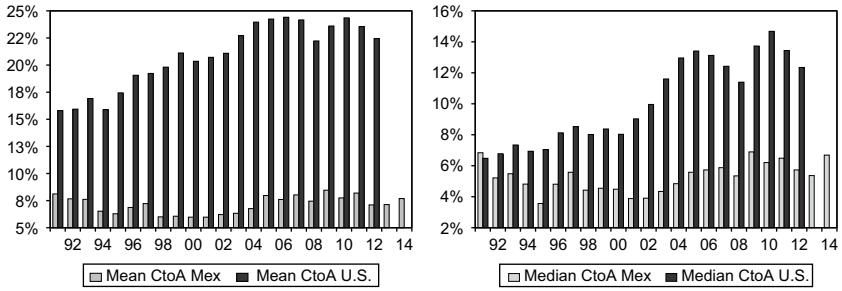

Fig. 6.4 Mean and median of cash to assets for Mexico and USA. *Notes*: Cash to assets for Mexican firms estimated using data in Economatica; and for US firms, in COMPUSTAT. 2013 and 2014 data for US not available

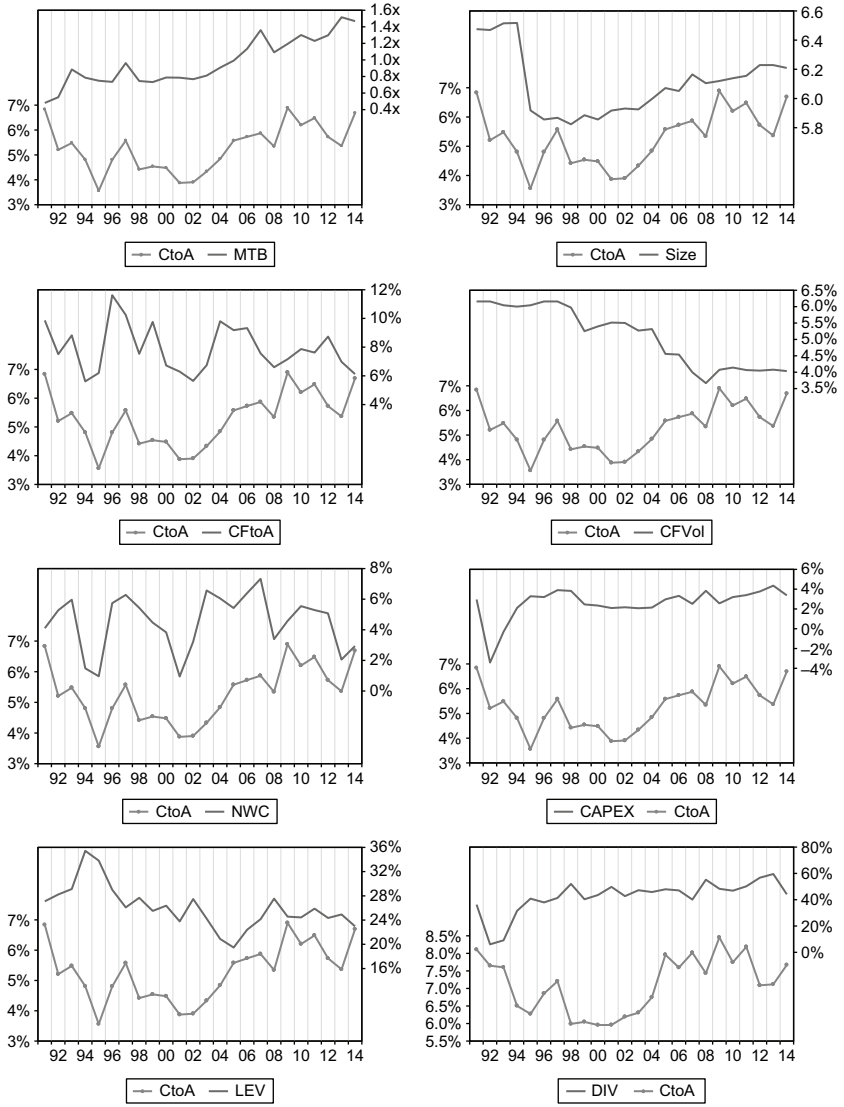

Fig. 6.5 Cash to assets and selected firm characteristics. *Notes*: *CtoA* is cash to assets, *MTB* is market to book, *Size* is firm size, *CFtoA* is operating cash flow to assets, *CFVol* is standard deviation of cash flow, *NWC* is net working capital to assets, *CAPEX* is capital expenditures to assets, *LEV* is leverage, and *DIV* is dividends. Figures plotted are medians (except mean for dummy *DIV*)

ever, is that after controlling for firm and economic factors, cash actually *increases* during crises, supporting the precautionary theory.

Figure 6.5 presents cash to assets and the main explanatory variables. Market to book and cash seem to be positively related except during the 1994–1995 crisis. *Size* decreases sharply during the 1994–1995 crisis, probably due to severe damage the crisis caused to firms that went on bankruptcy or were restructured. The relationship between cash flow and cash to assets seems to be lagged. Cash flow volatility has decreased lately; however, the changes (notice the scale in the right axis) do not seem relevant. Net working capital and leverage as cash substitutes seem to be negatively related with cash. *CAPEX* is relatively stable over time. Finally, the percentage of firms paying dividends in the Mexican Stock Exchange is stable over the two decades of the study. We provide econometric test results in the next section.

6.4 Results

6.4.1 Model 1

Consistent with the literature, results indicate that cash has a positive relation with market to book and operating cash flow to assets, and a negative relation with net working capital to assets and leverage (Table 6.3). Firms with more growth opportunities, higher market to book, hold more cash in order to not give up valuable investment opportunities as they arise. Theory does not provide a clear prediction for operating cash flow; results of *CFtoA* are inconsistent across studies, as noted by Trejo-Pech et al. (2015). The negative estimates for *NWC* and *LEV* are as expected since they are substitutes of cash. Net working capital acts as a non-cash liquid asset easily converted into cash, and leverage is a proxy for the ability of firms to issue debt, hence obtain cash.

Contrary to the precautionary theory, *DIV* is positive for Mexican firms. Arguments and empirical results for a positive relation between cash and dividends have been provided in the literature. For instance, Ozkan and Ozkan (2004) argue that dividend-paying firms can hold more cash relative to non-dividend payers to avoid a situation in which they are short of cash to support their dividend payment, which would be penalized by capital markets. Hall et al. (2014) find that cash holdings in private (family) firms are positively related to dividends. A possible explanation for this is that families extract cash from their firms via dividends. This argument

Table 6.3 Panel regressions for Mexican firms according to model 1

	Model 1.1		*Model 1.2*		*Model 1.3*	
	Estimate	*t stat.*	*Estimate*	*t stat.*	*Estimate*	*t stat.*
Intercept	0.046	0.781	−0.007	−0.127	0.090***	14.916
MTB	0.004*	1.830	0.003*	1.635	0.003*	1.836
Size	0.007	0.696	0.016*	1.757		
CFtoA	0.088***	5.503	0.090***	6.147	0.090***	5.883
CFVol	0.001	0.917	0.001	0.937	0.001	0.983
NWC	−0.052***	−3.408	−0.047***	−2.833	−0.045***	−2.739
CAPEX	0.007	0.293	−0.008	−0.325	−0.008	−0.334
LEV	−0.093***	−8.552	−0.082***	−5.719	−0.077***	−5.580
DIV	0.009***	3.389	0.005**	2.258	0.005*	1.931
BankDebt			−0.016**	−2.111	−0.015**	−2.089
Crisis			0.005**	2.205	0.005*	1.767
SmallFirms					−0.002	−0.320
Crisis*SmallFirms					0.003	0.567
Adj R^2	0.474		0.467		0.464	
Fixed effects	Firm and Year		Firm		Firm	
Recession dummy			Yes		Yes	
Cross sections	171		171		171	
N	1993		1993		1993	

Notes: Dependent variable is cash to assets. Variable definitions in the Appendix. *** 1%, ** 5%, and * 10% statistical significance level

is plausible for firms in developing countries, with a high proportion of family firms. In this regard, Elkinawy and Stater (2007, p. 8) state: "it is generally well-known that there is a high incidence of family ownership among Latin American firms, block holders of firms in this region are likely insiders and consequently have greater incentive to expropriate from minority shareholders." Furthermore, Al-Najjar (2013) documents that *DIV* is positive for Brazil, not significant for India, and positive for China, all emerging economies. Elkinawy and Stater (2007) report no significant *DIV* for Argentina, Brazil, and Mexico, and Noguera and Trejo-Pech (2012) document a positive result for Chile. To recap, positive *DIV* is not consistent with theory but similar to findings in developing countries.

Model 1.2 extends (1.1) by including *BankDebt*, the level of loans from banks, and *Crisis*, the dummy for years of economic crises in Mexico. These two variables have been used to model cash holdings during economic crises in Latin American countries by Elkinawy and Stater (2007) and Alvarez et al. (2012). Model 1.2 results, in Table 6.3, show that *BankDebt* is negative and *Crisis* is positive, both statistically significant. Negative *BankDebt* reinforces the precautionary motive to hold cash *especially* during economic crises. Because bank loans can signal financial strength (Fama 1985), the higher the level of bank loans, the higher the likelihood of firms' financial health. This in turn precludes firms from increasing cash holdings. The positive estimate for *Crisis* is particularly interesting in the context of emerging markets. As shown in the previous section, while overall cash holdings decrease during economic crises in Mexico (Fig. 6.4), after controlling for firm characteristics, cash holdings actually increase during economic crises. By the precautionary motive of cash holdings, Mexican firms increase cash when uncertainties heighten. Given the closeness of the Mexican economy, in terms of trade, to the USA, and that precise time mechanisms for business cycles are tracked by the NBER, in untabulated regressions, we included the 2001 US recession as a dummy variable for crisis as well. Results did not change significantly, especially for the model specification as in Harford (1999). Business cycles affect the effectiveness of production factors in the economy, which in turn impact consumption and investment; however, the business cycle concept differs from that of a transformational crisis (Gevorkyan 2015), such as the two severe crises in Mexico as defined in this study.

Another interesting result of (1.2) is that *Size* becomes positive and statistically significant, at 10% level of significance though, implying that large firms accumulate more cash (all other estimates remain similar as in (1.1)). This result is contrary to the prediction by theory but is consistent

with the findings for emerging markets in Elkinawy and Stater (2007), Noguera and Trejo-Pech (2012), and Pinkowitz et al. (2013). Elkinawy and Stater (2007, p.14) find that "in the pre-Mexican crisis period, firm size has a significant positive effect on cash holdings … During the crisis period, the effect of size becomes even larger … Although large firms tend to have easier access to alternate sources of financing and thus should have less need to hold cash than smaller firms, [other studies] also document a positive size effect, which may reflect higher agency costs in large firms."

In order to further analyze how firm size relates to cash holdings during economic crises, we constructed a dummy variable for small firms, defined as firms in the bottom 30 percentile when they are ranked by the natural logarithm of assets. Model 1.3 presents the results. While dummy variable *SmallFirms* tends to be negative, supporting the positive *Size* estimate in model 1.2, we do not find statistical significance. Neither the interaction of *Crisis* and *SmallFirms* is statistically significant. Tests, not tabulated, were performed for other size categories such as large or very large firms, obtaining similar results. Thus, unlike previous study by Alvarez et al. (2012), we

Table 6.4 Panel regressions for Mexican firms according to model 2

	Model 2.1		*Model 2.2*		*Model 2.3*	
	Estimate	*t stat*	*Estimate*	*t stat*	*Estimate*	*t stat*
Intercept	0.050	0.439	0.055	0.557	−0.079	−0.810
MTB $t-1$	−0.017*	−1.773	−0.013	−1.570		
MTB					−0.014*	−1.729
Size $t-1$	0.011	0.619	0.013	0.780		
Size					0.036**	2.139
FCFtoS	0.060***	3.289	0.051***	3.096	0.053***	4.398
CFVol	0.033**	2.174	0.034**	2.324	0.025***	3.318
ΔCountryRisk $t+1$	−0.033	−1.489	0.001	1.142	0.001	1.199
ΔFCFtoS $t+1$	0.001	0.117	−0.005	−0.493	−0.015*	−1.730
ΔFCFtoS $t+2$	−0.002	−1.588	−0.002	−1.332	−0.001	−0.580
Crisis			0.016***	3.850	0.015***	3.534
Adj R^2	0.553		0.550		0.548	
Fixed effects	Firm and Year		Firm		Firm	
Recession dummy			Yes		Yes	
Cross sections	147		147		151	
N	1388		1388		1436	

Notes: Dependent variable is cash to sales. Variable definitions in the Appendix. ***1%, **5%, and *10% statistical significance level

do not find evidence of a heterogeneous impact, in terms of firm size, of economic crises.

6.4.2 Model 2

This model differs from the previous one in two aspects mainly. First, it assumes that managers decide cash levels in relation to revenues rather than assets. Second, it takes into consideration not only firm characteristics (and macroeconomic factors) that explain contemporaneous cash levels but also lag and lead components that allow normal cash to fluctuate over time in response to planned future investments of net cash flow. Table 6.4 provides the results.

As in the previous section, model 2.1 is the two-way fixed effects model and (2.2) is the cross-section fixed effect model's results when *Crisis* is added. Similar to results in the first model, Table 6.4 shows that cash holding is positively related to (free) cash flow. Furthermore, during economic crises, firms increase their cash holdings. Interestingly, models in Table 6.4 consistently show that *CFVol* is positive and statistically significant, confirming that firms with more volatile cash flows hold more cash to mitigate the expected costs of liquidity constraints (Ozkan and Ozkan 2004).

While the coefficient for $\Delta CountryRisk_{t+1}$ is positive in models 2.2 and 2.3, estimates are not statistically significant. The model predicts that managers expecting an increase in the country risk premium in the near future would increase cash holding as a caution behavior. Similarly, the model predicts that if a firm anticipates that free cash flow will fall short of the amount required for planned investments (both working capital and capex), managers would tend to increase cash holdings in the near future ($t+1$ and $t+2$). Consistent with this prediction, estimates for changes in free cash flow are negative, but only significant for $t+1$ in model 2.3.

Model 2.3 slightly modifies the specification in Harford (1999). We regress contemporaneous, rather than lagged, *Size* and *MTB*. Both estimates become statistically significant (the rest of estimates remain significant), confirming the findings in the previous section that the relation between cash and firm size is positive. The negative sign of market to book is not easy to explain, especially because the sign of this estimate is not consistent across models.

To summarize, with the exception of market to book, the determinants of cash holdings in Mexican firms are consistent across the alternative model specifications in this study. The sign of *Size* and *Dividends* deviate from the expectations by theory. These findings concur with previous studies in emerging economies.

6.5 Conclusions

We study cash holdings for firms listed on the Mexican Stock Exchange for 24 years, rendering special attention to changes in cash holdings during the 1994–1995 and 2007–2009 economic crises. Two alternative model specifications are adapted to analyze the effects of economic crises in Mexico on cash holdings. Results are consistent across models, which explain cash holdings in the vicinity of 50% adjusted R-squared. The results suggest that cash is positively and statistically significant, related to growth opportunities, firm size, operating cash flow, free cash flow, volatility of cash flow, and dividends. In contrast, net working capital and leverage are negatively related to cash. The relation between cash and CAPEX is not statistically significant. These variables are widely used in cash studies in developed economies.

Furthermore, firms increase cash during economic crises, consistent with the precautionary prediction that cash is accumulated when uncertainties heighten. This finding is in line with very recent research focused on the relation of cash in US firms and the global financial crisis (refer to Bliss et al. 2015; Sun and Wang 2014; Kahle and Stulz 2013, and Garcia-Appendini and Montoriol-Garriga 2013). We also find that the relationship of bank loans, a liquidity-credit supply proxy, and cash is negative. This reinforces the precautionary motive to hold cash especially during economic crises. Because bank loans can signal financial strength (Fama 1985), the higher the level of bank loans, the higher the likelihood of firms' financial health, which in turn precludes firms from increasing cash holdings.

Particularly important is the *positive* relation of size and dividends with cash holdings in this emerging economy, which is contrary to the prediction by financial theory and some results in developed countries but is in line with findings in developing market studies. On dividends, arguments for the positive relationship are provided in Ozkan and Ozkan (2004). Hall et al. (2014) provide evidence that cash holdings in private (family) firms are positively related to dividends. This family-business argument is plausible for publicly traded firms in developing countries, with a high proportion of family firms, as documented by Elkinawy and Stater (2007). Furthermore, similar studies document this positive relation. Al-Najjar (2013) finds that dividends are positive for Brazil, not significant for India, and positive for China, all emerging economies. Noguera and Trejo-Pech (2012) document a positive result for Chile.

Somewhat puzzling is the positive relation of firm size with cash, statistically significant when we control for economic crises. Similar to dividends, this result is contrary to the prediction by the precautionary theory and is

consistent with the findings for emerging markets in Elkinawy and Stater (2007), Noguera and Trejo-Pech (2012), and Pinkowitz et al. (2013). Elkinawy and Stater (2007) argue that as information asymmetries are stronger during a crisis because market conditions become increasingly uncertain, the positive sign of firm size could be related to agency problems. Agency problems in Mexican firms are a possibility, however not tested in this study. A necessary but not sufficient condition for agency problems is that large, mature firms with low growth opportunities and high free cash flow accumulate excessive cash (Jensen 1986). Future research efforts might be worthy in this direction.

Appendix. Variable Definitions

Dependent Variables

CtoA = Cash to assets: Cash and marketable securities divided by total assets.

CtoS = Cash to sales: Cash and marketable securities divided by total revenue.

Top tail winsorized at the 1 % level.

Explanatory Variables

MTB = Market to book value: Total assets minus book value of equity plus the market value of equity (Price at fiscal year close times common shares outstanding), all divided by total assets. Top tail winsorized at the 1 % level.

Size = Firm size in 2014 USD values: The logarithm of assets in 2014 dollars; 2014 USD values adjusted by using the consumer price index available in the Mexican Central Bank website.

CFtoA = Operating cash flow to assets: Earnings after interest, dividends, and taxes but before depreciation and amortization divided by total assets. Bottom tail winsorized at the 1 % level.

FCFtoS = Free cash flow to sales: Operating cash flow minus the investment in working capital and the investment in capital expenditures, all divided by total revenue. Bottom tail winsorized at the 1 % level.

CFVol = Cash flow volatility: The standard deviation of operating cash flow to assets for the previous ten years (requiring at least 3 years for this computation) for each firm. For missing values, the average of the cash flow standard deviation from the industry was used.

NWC = Net working capital to assets: Working capital minus cash and marketable securities all divided by assets minus cash and marketable securities. Bottom tail winsorized at the 1% level.

Capex = Capital expenditures to assets: Year to year change in acquisitions, net of sales, of PP&E to total assets.

LEV = Leverage: Total debt with financial cost to total assets. Winsorized so that is between 0 and 1.

DIV = Dividends: Dividend payout dummy variable, set to 1 in years in which firms pay common dividends, and to 0 otherwise.

BankDebt = Bank loans to liabilities: Bank debt divided by total liabilities.

Crisis = Dummy for economic crises in 1994–1995 and 2007–2009.

SmallFirms: Small Firms: Firms in the bottom 30% percentile when firms are ranked by *Size*.

CountryRisk = Country Risk: Country risk score by the Economist Intelligence Unit, obtained from Bloomberg.

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CHAPTER 7

Nonlinearity Testing of Latin American Exchange Rates

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7.1 Introduction

In the literature of financial time series, there exists a general and wide agreement on the evidence of nonlinear behavior characterizing many types of financial data, e.g., stocks, bonds, futures, foreign exchange, which can be described by a generalized/autoregressive conditionally heteroscedastic (ARCH and GARCH) process. In particular, GARCH effects have been found to dominate all other types of nonlinearity, but only few alter-

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native models have been considered. Hence, the debate about whether this is the most appropriate form to represent the nonlinear dependence found in these series remains open.

The vast majority of studies on nonlinear episodes qualifying financial and economic series consider the application of the Hinich bispectrum test (1982) to evaluate the possible membership of the series to the ARCH and GARCH family of models. The importance of the bispectral analysis rests on the ability that statistical techniques, making use of frequency-domain-based methods, have in detecting types of nonlinear serial dependence that conventional time-domain-based tools may not reveal. In fact, spectral analysis provides an alternative way of investigating a data generating process via its decomposition into a sum of uncorrelated periodic components over different frequencies. This approach adds information on the stochastic structure of the process, being a useful tool for time series inference.

A common conclusion when applying bispectral methods is that of an inadequate use of ARCH and GARCH models to represent the nonlinear behavior of high-frequency financial data (Brooks and Hinich 1998; Lim et al. 2005; Czamanski et al. 2007; Wild et al. 2010; Serletis et al. 2012). However, the classic Hinich bispectral test fails in capturing episodic nonlinearity present in the exchange rate data, which is due not to GARCH effects but to the exchange rate economics instead, and which could be better described by more complex threshold models (Brooks 1996). In fact, the bispectrum test has low power against ARCH alternatives, and the power of the test is negatively affected by the presence of strong kurtosis (Barnett et al. 1997).

In this chapter, we apply a new maximal bispectral test (Rusticelli et al. 2009) which modifies the original Hinich bispectrum test while significantly enhancing its power to detect a wide set of nonlinear alternatives, including the ARCH and GARCH family of stochastic processes. Furthermore, a new inferential testing procedure (Rusticelli and Dagum 2012), incorporating the maximal bispectral test together with other specific nonlinearity tests, is adopted to evaluate the possible rejection of the null hypothesis of linearity due to the presence of uncorrelated but non-Gaussian residuals. These latter may be typical of leptokurtic financial series, which do not necessarily belong to the class of nonlinear stochastic processes, but rather to the family of linear non-Gaussian ARMA processes. The new methodology is applied on the exchange rate of five Latin American currencies against the US dollar. The results obtained are consistent with previous studies, such as Coronado et al. (2007) and Coronado and Gatica (2011), signaling the

possible risks of estimating ARCH and GARCH models to capture the nonlinear behavior of financial and economic series.

The rest of the chapter proceeds as follows: Sect. 2 includes a brief review of the literature on financial series and bispectral analysis; Sect. 3 presents the new inferential methodology; Sect. 4 reports the data and the results obtained; and finally, Sect. 5 discusses the conclusions.

7.2 Literature Review

Since the influential work of Hinich (1982), in which he applies his nonparametric bispectrum test to examine the presence of Gaussianity and linearity in stationary time series, a considerable number of studies, applying bispectral analysis on economic and financial series, have been carried out.

Hinich and Patterson (1985) were among the first to investigate the nonlinear behavior of New York Stock Exchange daily stock returns, giving origin to a voluminous literature on the nonlinear behavior characterizing financial asset returns. With reference to the US stock market, several analyses point out latent chaotic and stochastic nonlinearities defining the nature of foreign exchange rates, equities and bond yields (Hsieh 1989 and 1991; Kohers et al. 1997, Patterson and Ashley 2000; Skaradzinski 2003). Similar evidence has been found in Asian markets by Antoniou et al. (1997), Ammerman (1999), Ahmed et al. (1999), Ammermann and Patterson (2003), Lim et al. (2005), Lim and Hinich (2005) and Lim et al. (2008). Likewise, a number of studies focus on the nonlinear behavior of financial time series belonging to the European markets such as Panunzi and Ricci (1993), Abhyankar et al. (1997), Brooks (1996), Brooks and Hinich (1998), Afonso and Teixeira (1998), Opong et al. (1999), Brooks and Hinich (2001), Kosfeld and Robé (2001), Fernandez-Serrano and Sosvilla-Rivero (2003), and Panagiotidis (2005). The literature regarding Latin American cases is scarce; however, evidence of nonlinear dependence for different Latin American series was found in Bonilla et al. (2006, 2007, 2008, 2011 and 2011), Romero-Meza et al. (2007), Bonilla and Sepulveda (2011), Coronado and Gatica (2011), and Coronado et al. (2012). Many of these researches question the identification and estimation of ARCH/GARCH models and conclude that this family of models cannot capture the episodic nonlinearity present in the exchange rate data (Brooks and Hinich 1998; Brooks et al. 2000; Hinich and Serletis 2007; Wild et al. 2010; Czamanski et al. 2007; Serletis et al. 2012).

The use of high-frequency methods, e.g., the bicorrelogram or the bispectrum, to study the behavior of the exchange rate is recent and uncommon. Examples of bispectral analysis applied on exchange rate series include Brooks and Hinich (1998, 1999, 2006), Brooks et al. (2000) and Lim et al. (2003). The literature focusing on the analysis of Latin American exchange rates is even more scant and includes Romero-Meza et al. (2010), who analyzed the periodic behavior of the Chilean peso, while Coronado and Gatica (2011) and Coronado et al. (2012) investigate the behavior of the Mexican peso. Bonilla et al. (2007) apply the Hinich portmanteau bicorrelation test to study five exchange rates for Latin America, i.e., the Mexican peso, the Colombian peso, the Peruvian new sol, the Chilean peso and the Brazilian real, and conclude that the GARCH formulation fails to model the data generating process of the real exchange rate for all currencies studied.

The null hypothesis of linearity of the Hinich bispectrum test must be interpreted as the absence of nonlinearity affecting the third-order moments of the stochastic process under investigation. Since ARCH and GARCH models with Gaussian innovations do not contain third-order serial dependence and are characterized by a constant bispectrum equal to zero, when the bispectrum test rejects the null hypothesis of linearity it rejects also the evidence in favor of ARCH and GARCH models. Although this test has been used repeatedly to determine the relevance of the GARCH models, the Hinich bispectrum test has been criticized for its low statistical power in presence of those forms of nonlinearity that display flat bispectrum and nonflat higher-order polyspectra (Barnett et al. 1997). Thus, the failure to reject the null hypothesis of linearity might be due to some nonlinear stochastic processes for which the bispectrum test has low power, hence indicating the need of further testing. For this purpose, Rusticelli and Dagum (2012) implemented a new testing procedure aiming at identifying the right type of dependence present in a series by sequentially applying specific inferential tests on the moments of the probability distribution of the data generating process. The new inferential procedure performs a nonlinearity investigation up to the fourth-order moments covering the majority of the most common sources of data dependence. In fact, many types of nonlinearity involving low-order moments, as for example the ARCH or GARCH forms of nonlinearity affecting the conditional variance, are usually present also at higher order.

Moreover, the Hinich bispectrum test is bounded to the selection of the smoothing parameter, this latter introducing a relevant component

of arbitrariness in the application of the test. Several attempts have been made in the literature of nonlinearity testing to get rid of this arbitrariness (Ashley and Patterson 1986; Lemos and Stokes 2000; Patterson and Ashley 2000). Rusticelli et al. (2009) propose a modification of the Hinich bispectral test for linearity based on a maximization procedure of the smoothing parameter over a range of feasible values. The new maximal bispectral test proves to have higher power than the classical Hinich test against a number of relevant nonlinear alternatives.

7.3 The New Inferential Methodology

The three-stages testing procedure, implemented by Rusticelli and Dagum (2012), aims at identifying the nature of a time-series-generating process by investigating the probabilistic structure of non-Gaussian estimated residual series $\left\{\varepsilon_t\right\}$. In fact, the Box and Jenkins procedure for the identification, estimation and validation of generating stochastic processes concludes that the process under analysis $\{X_t\}$ is nonlinear in case the estimated residuals $\left\{\varepsilon_t\right\}$ from the fitted ARIMA process are uncorrelated but non-Gaussian. However, the generating process $\{X_t\}$ can still be linear and belong to the class of the so-called non-Gaussian ARMA processes, where the innovations $\{\varepsilon_t\}$ are non-Gaussian and independently and identically distributed (*i.i.d*). Moreover, the absence of linear dependence in the autocorrelation of the residual series $\left\{\varepsilon_t\right\}$ does not necessarily imply lack of any kind of dependence at higher moments.

The new inferential methodology consists of statistical tests applied sequentially on the probability distribution moments of the data generating structure of the estimated innovations $\left\{\varepsilon_t\right\}$. For this purpose, a main prerequisite is the removal of the whole linear dependence in the original data, which is accomplished by fitting a prewhitening autoregressive model on the time series under investigation. In this framework, the new maximal bispectral test of linearity (Rusticelli et al. 2009) enables examining the null hypothesis of linearity while evaluating the constancy of the third-order moments $E[\varepsilon_t^3]$ of the residual series. The maximal bispectral test is applied once the null hypothesis of Gaussianity is rejected on the uncorrelated residuals, since these latter can still be proved independent at order higher than the second.

The iterative inferential procedure considers three different stages where specific statistical tests are applied sequentially. The *first stage* aims at evalu-

ating whether the data generating process is uncorrelated and Gaussian. For this purpose, once the series is made stationary in mean and variance, the Ljung-Box (Ljung and Box 1978) and the Jarque-Bera (Jarque and Bera 1980) tests are applied to assess the autocorrelation structure of the process. An autoregressive prewhitening model $AR(p)$ can be then estimated in order to remove the whole linear dependence characterizing the data. In fact, if the presence of linearity is not completely removed, the robustness of the independence tests can be seriously compromised. In case of rejection of the null hypothesis of Gaussianity on the residuals of the estimated linear model, the new maximal bispectral test of linearity is applied in the *second stage* of the inferential procedure. This latter test intends to verify if the rejection of the Gaussianity hypothesis is due to the presence of nonlinearity or rather if the estimated residuals follow a different probability distribution. The *third stage* is considered when the null hypothesis of linearity is rejected by the maximal bispectral test. Specific statistical tests are applied on the probabilistic structure of the estimated residuals. In particular, the Engle test (1982) or the BDS test with embedding dimension $m=2$ (Brock et al. 1991) are performed on the second-order moments of the residuals series to detect the presence of nonlinearity typical of NLMA, Bilinear, ARCH or GARCH stochastic processes with heteroscedastic conditional variance. The Tsay test (1986) can be also carried out on the second-order moments since it has a very high power against *Threshold Autoregressive* or *Fractional Autoregressive* forms of nonlinearity (Potter 1995; Rusticelli 2005). When the null hypothesis of independence is not rejected, the conclusion that the nonlinear dependence does not affect the conditional second-order moments of the data generating process is drawn and some tests on the third-order moments must be applied. For this purpose, the Hinich bicovariance test (Hinich and Patterson 1995) and the BDS test with embedding dimension $m=3$ are considered to investigate types of nonlinear dependence affecting the skewness of the stochastic process probability distribution. Finally, in case of rejection of the null hypothesis of independence, the BDS test with embedding dimension $m=4$ could still be applied to verify the presence of nonlinear dependence involving the fourth-order moments of the process, although this form on nonlinearity is not so common. Moreover, many types of nonlinearity affecting higher-order moments are already present at the second or third order. The Brock–Dechert–Scheinkman (BDS) test (Brock et al., 1991) with embedding dimension $m=4$ is also proposed, as robustness check, to evaluate the possible presence of dependence in the fourth-order moments of the estimated residuals when the new maximal

Table 7.1 Sequential procedure

	Conditional significance level
First stage tests	
Ljung-Box	$\alpha_1 = 0.1000$
Jarque-Bera	$\alpha_1 = 0.1000$
Second stage tests	
Maximal bispectral	$\alpha_2 = 0.0100$
Third stage tests	
Engle	$\alpha_3 = 0.0010$
Tsay	$\alpha_4 = 0.0009$
Bicovariance	$\alpha_5 = 0.0008$
BDS	$\alpha_6 = 0.009/0.0008$[a]

[a]The BDS test with embedding dimension $m=4$ can be performed as a robustness check once the bispectral test does not reject the null hypothesis of linear dependence at a conditional significance level α equal to $\alpha^2(1-\alpha) = 0.009$, or after the non-rejection of the hypothesis of independence in the second-order moments by the Tsay test at a conditional significance level α equal to $\alpha^3(1-\alpha)^2 = 0.0008$

bispectral test does not reject the hypothesis of linearity. In fact, the BDS test can be used to detect other kinds of nonlinearity representing difficult cases for the bispectral test, such as nonlinear models with flat bispectrum.

The inferential validity of the result from a test is conditioned on the conclusion obtained in the previous stage. For this reason, the testing procedure is performed with a conditional probability scheme where the successive tests are evaluated considering the results obtained at previous stages. Rusticelli and Dagum (2012) show that the nominal size α at which a test is sequentially performed at stage $i+1$ depends on the result obtained at stage i. As a consequence, in case of rejection at stage i, the conditional significance level at stage $i+1$ equals α^2. Similarly, the statistical test at stage $i+1$ is performed at a conditional level $\alpha(1-\alpha)$ in case of non-rejection of the null hypothesis at the previous stage i. Table 7.1 presents the conditional significance levels at which the inferential tests are sequentially performed in the new inferential procedure.

7.4 Data and Results

This study considers the spot price of the closing exchange rate per minute for five Latin American economies: Argentina, Brazil, Colombia, Chile and Mexico against the US dollar. Except for weekends, the data analyzed

show continuity per minute and were collected between October 2011 and January 2012.

The original data were transformed to work with the returns of each series in accordance to the following expression: $R_t = \ln\left(\frac{TC_t}{TC_{t-1}}\right)$, where R_t is the return of the series of the exchange rate in period t, TC_t is the closing exchange rate price in period t and TC_{t-1} is the closing exchange rate price in period $t–1$. Each time series contains 4000 observations and their stationarity in mean and variance is verified by the application of unit root tests (e.g., Augmented Dickey Fuller and Phillips-Perron) and Box–Cox transformations.

Table 7.2 resumes some descriptive statistics regarding the series of returns. In particular, the mean, the standard deviation, the skewness and the kurtosis measures indicate a leptokurtic nature, which is common in this type of series. The Ljung-Box test of autocorrelation, performed on the original dataset, shows the statistically significant presence of linear dependence. As a consequence, a prewhitening autoregressive model is fitted on the series of returns, and its order, chosen through the minimization of the Schwarz criterion, is also reported in Table 7.2.

If the linear autoregressive model is correctly fitted, the estimated residuals $\{\varepsilon_t\}$ should be uncorrelated and their Gaussianity can be evaluated by means of the Jarque-Bera test. In case of rejection of the null hypothesis, the conclusion of existing nonlinearity supported by the Box and Jenkins methodology should be further assessed since the estimated residuals could still follow an *i.i.d.* $(0, \sigma^2)$ process, for instance from a leptokurtic probability distribution. For this purpose, the new inferential methodology is sequentially applied on the five series of returns considered and the relative bootstrapped p-values are reported in Table 7.3 (The number of bootstrap iterations is 1000).

Table 7.2 Descriptive statistics

	Mean	*Standard deviation*	*Asymmetry*	*Kurtosis*	*AR (p)*
Argentina	–2.72E–06	1.78E–04	1.04	32.90	9
Brazil	2.94E–06	4.73E–04	1.52	31.00	2
Colombia	6.12E–06	0.59E–03	1.35	52.20	7
Chile	–1.10E–06	3.50E–04	–2.95	80.50	0
Mexico	6.70E–06	3.62E–04	2.12	46.50	2

Table 7.3 Sequential procedure: bootstrapped *p*-values

	First stage	*Second stage*	*Third stage*			
	Jarque-Bera	*Maximal bispectral*	*Engle*	*Tsay*	*Bicovariance*	*BDS (m = 4)*
Argentina	0.000	0.007	0.002	0.0004		
Brazil	0.000	0.019				0.000
Colombia	0.000	0.001	0.001			
Chile	0.000	0.598				0.001
Mexico	0.000	0.025				0.000

The null hypothesis of Gaussianity, tested at the conditional significance level of $\alpha_1 = 0.10$, is rejected for all five series. Consequently, the new inferential procedure continues with the application of the maximal bispectral test for linearity. The maximal test based on the interdecile range MD_{IDR}, showed to be the most powerful among the existing different versions (Rusticelli et al. 2009), is performed on a smoothing parameter range (30–540) at the conditional significance level $\alpha_2 = 0.01$. It enables rejecting the null hypothesis of flatness in the bispectrum, i.e., of linear stochastic process, for two series of returns of exchange rates: Argentina and Colombia. For these two series, the inferential procedure continues with the third stage, where the presence of nonlinearity in the second-, third- and fourth-order moments is tested. Initially, the Engle test is performed on the squared estimated residuals $\left\{\varepsilon_t^2\right\}$ and allows rejecting the null hypothesis of linear dependence in the conditional second-order moments of the exchange rate return series of Colombia, which is then concluded to be nonlinear in the conditional variance. In the case of Argentina, while the Engle test performed at the significance level $\alpha_3 = 0.0010$ does not allow to reject the null hypothesis, the Tsay test of threshold nonlinearity rejects the null hypothesis at the significance level of $\alpha_4 = 0.0009$. (A wide range of literature and research considers the existence of transaction costs behind the nonlinear adjustment mechanism of real exchange rates toward their PPP defined norm. In particular, when the deviation from the parity exceeds the threshold, some form of foreign exchange arbitrage occurs and the real exchange rate reverts back toward its band. In this context, TAR models shape the development of the exchange rate around the state of the system [e.g., Obstfeld and Taylor 1997; Sarno et al. 2004; Ahmad and Glosser 2009].)

In case of the exchange rate returns of Brazil, Chile and Mexico, the maximal bispectral test does not allow rejecting the null hypothesis of linearity at the significance level $\alpha_2 = 0.01$. However, as a robustness check, the BDS test with embedding dimension $m = 4$ is performed on the three series to evaluate the possible presence of dependence in the fourth-order moments of the probability distributions of the corresponding data generating processes. The BDS test, carried out at a significance level $\alpha_3 = 0.009$, allows rejecting the null hypothesis of linearity in the fourth-order moments of all three series and to conclude in favor of a form of nonlinearity typical of very leptokurtic series as foreign exchange rates.

7.5 Conclusion

In this work we apply a new bispectrum test, more powerful than the classic Hinich test, to verify whether the use of GARCH family models is adequate to describe the nonlinear behavior of some of the most important Latin American exchange rates. Our results show that GARCH models cannot capture the data generating processes for four of the five studied currencies: Mexico, Chile, Brazil and Argentina. These results are broadly consistent with previous studies concerning the evidence of nonlinear behavior in exchange rates in Latin America, Asia and Europe (Liew et al. 2003; Brooks and Hinich 1998; Bonilla et al. 2007; Coronado and Gatica 2011; Coronado et al. 2012). However, our findings contrast with those obtained by Bonilla et al. (2007) in the case of the Colombian peso, whose series is found to follow a GARCH model.

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CHAPTER 8

Liquidity Dynamics and Central Bank Policy Intervention in Select Caribbean Foreign Exchange Markets

Dave Seerattan and Nicola Spagnolo

8.1 Introduction

Most central banks operating flexible exchange rate regimes have intervened directly in the foreign exchange market. Over time, there has been a growing pessimism about the effectiveness of intervention in developed market economies (Schwartz 2000) but more optimism in the case of developing and transition countries (Disyatat and Galati 2007). This greater optimism is based on the structural characteristics which can make intervention more effective in the latter group of countries not least because central bank interventions are relatively larger relative to total

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market volume than it is in developed markets because of small market size. Very importantly, the market microstructure literature has stressed the importance of market volumes to asset price dynamics (Easley and O'Hara 1987; Evans and Lyons 2002; Blume et al. 1994) and as Kim and Sheen (2006) have shown for Japan prevailing condition in the foreign exchange market in terms of volume can significantly impact on the effectiveness of direct intervention in the foreign exchange market.

This literature suggests that foreign exchange price dynamics, both in terms of mean and variance, are affected significantly by the prevailing condition with respect to market volume. The central bank policy reaction to emerging trends is also likely to be driven by trends in market volume, as well as exchange rate and interest rate dynamics. These features of the market and the central banks' policy decision making process highlight the endogenous nature of these policy measures, foreign exchange market volume and exchange rate dynamics. This suggests that these issues should be studied in a joint framework to account for the linkages and therefore the endogenous nature of these relationships. Also, the few studies that have evaluated these issues in a joint framework (Lewis 1995; Kim 2003; Kearns and Rigobon 2005) have focused on the first moment of the exchange rate and not on the second moment, which is a serious lacuna in the literature since central banks increasingly focus on controlling volatility rather than targeting a particular rate. These frameworks also did not allow one to look at how policy intervention affects the conditional covariance over time.

In spite of the volume of work that has been done on the effectiveness of intervention and interest rates on exchange rates and the impact of volume on exchange rate dynamics, not much work has been done in a joint framework on the links between direct intervention, monetary policy, particularly interest rate policy, foreign exchange market volume and exchange rates. This is a major gap in the literature on central bank intervention in the foreign exchange market with only Kim and Sheen (2006) trying to deal with this issue in a bivariate generalized conditionally heteroscedastic (GARCH) framework. That study, however, suffered from the weakness that it only looked at exchange rates and volumes in a joint framework, choosing to handle the central bank's direct intervention policy reaction separately and not including the central bank's interest rate policy reaction function. This framework did not therefore allow for the full set of linkages among the variables of interest to be explored and should in principle generate less efficient estimates than in a multivariate GARCH system where functions for all four variables were estimated simultaneously.

We also utilize daily data on intervention, policy interest rates, market volumes and exchange rates rather than the monthly and weekly data used in some studies (Lewis 1995; Kim 2003). Daily data are more appropriate in today's policy environment, given the ample evidence that exchange rates react to new information and policy interventions very quickly, even on an intra-daily frequency. The chapter therefore makes a contribution in terms of an explicit methodology for measuring the links between market volumes, monetary policy, intervention and exchange rates. It can also provide evidence on the "leaning against the wind" and signaling behavior of central banks.

In this study we extend Kim and Sheen (2006) approach by examining the links between foreign exchange market volumes, direct intervention, interest rate policy and exchange rate dynamics jointly in a multivariate GARCH framework. To our knowledge no study has looked at this issue in a multivariate GARCH framework. The study closest in terms of empirical methodology to our work is that of Beine (2004), who looked at the impact of central bank interventions in three major foreign exchange markets and the spillovers in terms of correlations between the exchange rates in these markets. They did not, however, look explicitly at the issue of the interaction between interest rate policy and direct interventions. The chapter is structured as follows. Section 2 details very briefly the literature on the links between market volumes, direct intervention, policy interest rates and exchange rates. Section 3 outlines the empirical methodology. Section 4 evaluates whether the empirical relationships between market volumes, direct intervention, interest rate policy and exchange rate dynamics in Jamaica and Trinidad and Tobago have important links and feedback effects, and Section 5 concludes.

8.2 Theory

A review of the relationship between trading volumes and asset price dynamics by Karpoff (1987) also indicated that the vast majority of studies up to that period were devoted to examining this issue in the context of stock exchanges. This has since changed with a number of studies looking at these issues in the context of the foreign exchange markets (Bollerslev and Domowitz 1993; Jorion 1996; Kim and Sheen 2006; Galati 2000; Melvin and Yin 2000; Park 2010). This trend has been caused by a number of factors. Some of the main reasons include: the fact that foreign exchange markets are the largest in terms of daily turnover; the fact that exchange rate dynamics have such profound effects on economic conditions generally and on financial asset prices in particular; and because

more comprehensive information on the operations of foreign exchange markets are increasingly readily available.

The relationship between volume and asset returns in financial markets has generally been couched in the information dynamics and market microstructure frameworks. The microstructure approach to foreign exchange markets focuses on order flow, information asymmetries, trading mechanisms, liquidity and the price discovery process. Order flow is transaction volumes that are *signed*; that is, if you are the *active initiator* of a *sell* order this takes on a *negative sign*, while the *active initiator* of a *buy* order takes on a *positive sign*. Markets with a negative sign and a positive sign indicate net selling and buying pressure, respectively. Central bank intervention works in this framework by emitting information to the market, which modifies expectations and generates huge order flows which change exchange rate dynamics (Evans and Lyons 2002). The main branches of market microstructure theory are the inventory and information approaches (Edison 1993; Lyons 2001). The inventory approach focuses on imbalances in order flow and how this drives the exchange rate through the portfolio balance approach, while the information approach posits that information asymmetry among major agents in the market impacts on trading behavior and therefore on exchange rate dynamics. In this context, the central bank is viewed as an "informed trader" and volatility tends to increase when informed traders are in the market since their trades represent new information that the market has to incorporate into prices. Increased volumes, volatility and price changes are therefore likely to occur around central bank intervention operations. In both the inventory and information branches there is motivation for trading, which drives exchange rate dynamics.

In the inventory framework, trading is done to iron out imbalances in order flow, and in the information framework trading is done to gather knowledge about dealers' motives and prices, the "learning by trading process." The empirical literature on the mixture of distribution hypothesis has also shown that there is a strong link between volume and volatility. Epps and Epps (1976) suggest that there are underlying latent variables that lead to the close correlation of volumes and returns. Central bank intervention has been seen as one such latent variable which drives both volumes and returns. Few studies have looked at the joint distribution of volumes and returns in the foreign exchange market because good data on foreign exchange volumes at a daily frequency have been hard to find. The few that did look at this issue in the foreign exchange market have found

that unpredictable volumes tend to push up bid-ask spreads and volatility (Hartmann 1999; Kim and Sheen 2006).

Additionally, the importance of volume information may derive from the possibility that market volumes may factor prominently in central banks' intervention decision. That is, high volumes in a situation where returns are relatively stable may be an important early warning of future volatility which warrants an intervention (Kim and Sheen 2006). For example, high demand for foreign exchange may be sufficient for the central bank to intervene selling foreign exchange to prevent the excessive perturbations in volumes leading to volatility in returns when fundamentals do not suggest a rationale for such volatility. These factors point to the importance of volume considerations not only in the determination of exchange rate returns but also in central banks' policy reaction functions. This suggests the need to explicitly account for volume in empirical studies looking at central banks' policy interventions in the foreign exchange market, that is, how volumes drive exchange rate returns and policy actions and are in turn impacted by these variables, highlighting the endogenous nature of the relationship between these variables.

These studies have also found that the volume data exhibit significant conditional heteroscedasticity. Since it is widely demonstrated that exchange rate returns also exhibit this statistical property, a GARCH framework seems most suitable for any empirical work looking at the joint distribution of these two variables. Also, to adequately capture the complex dynamics of the links between foreign exchange volumes, central bank policy interventions in the market and exchange rates, a joint empirical framework is required. We turn to this in the next section.

8.3 The Empirical Methodology: Multivariate GARCH

The empirical methodologies that have been used in previous studies to capture the relationship between foreign exchange trading volumes, monetary policy, direct intervention in the foreign exchange market and exchange rates in a joint empirical framework include bivariate vector autoregression VAR (Lewis 1995), structural VAR (Kim 2003), simulated generalized method of moments GMM (Kearns and Rigobon 2005) and bivariate GARCH (Kim and Sheen 2006). These studies, however, all suffer from a variety of weaknesses inherent in the empirical methodology used.

Lewis (1995) used two bivariate VARs, one with monetary policy and exchange rate and another with intervention in the foreign exchange market and exchange rates using daily data to study these links. This is an imperfect arrangement because the full range of interactions cannot be studied without a higher-order VAR.

Kim (2003) solved this problem using the structural VAR approach but the use of monthly data and the validity of the identifying restrictions weaken the validity of his results. Kearns and Rigobon (2005) utilize daily data and simulated GMM in a multi-equation framework to study the impact of intervention on exchange rates: whether the central bank reacts to exchange rate developments in the formulation of policy (and therefore the problem of endogeneity) and how the monetary policy initiatives affect these relationships. Their innovation was to use a change in intervention policy by the Reserve Bank of Australia and the Bank of Japan to solve the problem of identification in a situation where the issue of endogeneity of the contemporaneous relationship between intervention and exchange rates was a serious problem. The weakness of this approach is that the identification scheme is very specific to the two markets studied and therefore its applicability to other markets is questionable. The study is also dependent on the assumption that the change in intervention policy is truly exogenous and not dependent on the exchange rate dynamics, which is questionable given that intervention and therefore intervention policy has been shown to react to exchange rate dynamics. This approach also assumes that most parameters of the model are stable across the change in intervention policy, which is also questionable given that the change was made to improve the intervention's effectiveness, that is, to make the coefficient measuring the impact of intervention on exchange rates larger and/or statistically significant relative to what it was before the change in intervention policy.

Moreover, all these studies focused on the first moment, ignoring the variance and therefore the impact of policy on the volatility of the exchange rate. This is a major weakness of these approaches given that central bank policy is increasingly targeting volatility rather than a particular exchange rate. The empirical methodology must therefore be able to measure the impact of policy on the volatility of the exchange rate to be useful in a policy context.

Kim and Sheen (2006) employed a bivariate GARCH framework to study the links between exchange rate changes, volumes and the Bank of Japan's intervention in the foreign exchange market using daily data.

This allowed them to look at these issues in a joint framework both at the level and variance of exchange rate returns and deal with a number of weaknesses of previous studies. There were separate mean equations for exchange rate changes and volume with intervention treated as an exogenous variable. This approach represented a step forward because it was a joint framework which addressed the links and feedback effects between volumes and direct intervention on exchange rate dynamics both at the level of returns and variance. By not including separate mean equations for the central bank's policy reaction functions for both direct intervention and interest rate policy in the multivariate GARCH framework, however, it represented these policy instruments as exogenous, which is not really the case. Kim and Sheen (2006) tried to address this weakness by modeling central bank interventions as driven by a number of variables including exchange rate and volume dynamics in a separate friction model. By not treating this issue explicitly in the multivariate GARCH framework meant that their estimates were not as efficient as they could be and, it did not allow them to explore the full set of links and feedback effects between volume, exchange rate changes, direct intervention and interest rate policy changes in the foreign exchange market.

To address these weaknesses we extend this approach by using a multivariate GARCH framework to study the links and feedback effects between volume, monetary policy, intervention in the foreign exchange market and exchange rate dynamics. This framework allows us to look at the impact of innovations in market volumes on exchange rate changes, as well as how market volumes affect central bank policy initiatives in the market and their feedback effects to volumes.

The following mean equation was estimated for each series being considered:

$$X_{i,t} = \mu_i + \alpha X_{i,t-1} + \varepsilon_{it} \tag{1}$$

where X_{it} is a vector of variables of interest (trading volumes in the foreign exchange market, exchange rates, direct intervention and policy interest rates) at time t, μ_i is a long-term drift coefficient and ε_{it} is the error term for variable i at time t.

This mean equation formulation can be more explicitly represented in this study by the following four equations which outline the mean equation

for the variables of interest, that is, exchange rate (ER), intervention (I), the policy interest rate (RR) and market volume (MV):

$$ER_{1,t} = \delta_1 + \delta_{11} ER_{t-1} + \delta_{12} I_{t-1} + \delta_{13} RR_{t-1} + \delta_{14} MV_{t-1} + \varepsilon_{1,t} \tag{2}$$

$$I_{2,t} = \delta_2 + \delta_{21} ER_{t-1} + \delta_{22} I_{t-1} + \delta_{23} RR_{t-1} + \delta_{24} MV_{t-1} + \varepsilon_{2,t} \tag{3}$$

$$RR_{3,t} = \delta_3 + \delta_{31} ER_{t-1} + \delta_{32} I_{t-1} + \delta_{33} RR_{t-1} + \delta_{34} MV_{t-1} + \varepsilon_{3,t} \tag{4}$$

$$MV_{4,t} = \delta_4 + \delta_{41} ER_{t-1} + \delta_{42} I_{t-1} + \delta_{43} RR_{t-1} + \delta_{44} MV_{t-1} + \varepsilon_{4,t} \tag{5}$$

Lagged values of the explanatory variables are used to deal with potential simultaneity bias that can affect the contemporaneous relationships. In this framework, δ_{14} measures the impact that innovations in market volume have on exchange rates, while δ_{24} and δ_{34} measure the feedback effects from volumes to the policy variables. Very importantly, δ_{41} and δ_{43} measure the impact of exchange rate changes and changes in the policy interest rate on market volume, respectively, while δ_{42} indicates whether central bank intervention precipitates a cascade of trading and increased volumes. Also, δ_{12} and δ_{13} measure the impact of intervention and monetary policy (interest rates) on exchange rates. Additionally, δ_{21} measure the tendency of central bank interventions to lean against the wind and δ_{32} indicates whether intervention signals monetary policy or not.

The two most popular parameterization for multivariate GARCH models are the VECH (Bollerslev et al. 1988) and BEKK (Engle and Kroner 1995) and parameterization. The VECH parameterization is characterized as:

$$vech(H_t) = A_0 + \sum_{j=1}^{q} B_j vech(H_{t-j}) + \sum_{j=1}^{p} A_j vech(\varepsilon_{t-j} \varepsilon_{t-j}^{'}) \tag{6}$$

where $\varepsilon_t = H_t^{1/2} \eta_t \quad \eta_t \sim iid \quad N(0,1)$. The notation $vech(.)$ in Eq. (6) is a matrix operator which stacks the lower part of the symmetric matrix into a column vector and H_t is the conditional variance–covariance matrix. A_0 is a vector of constants capturing the unconditional variances and covariances, while B_j and A_j are matrices of parameters representing the GARCH process. The major weaknesses of the VECH model include the number

of parameters to be estimated (e.g., in a trivariate model, the number of parameters to be estimated for the variance equation would be 78) and the fact that there is no guarantee that the covariance matrix will be positive semi-definite unless additional restrictions are imposed. The latter property is necessary for the estimated variance to be greater than or equal to zero. We therefore use the BEKK parameterization for the multivariate GARCH model estimated in this chapter.

The general form of the BEKK model is:

$$H_{t+1} = C'C + A'\varepsilon_t\varepsilon_t^{'}A + B'H_tB \tag{7}$$

The BEKK model is more tractable since it utilizes quadratic forms in such a way as to ensure that the matrix H_t will be positive semi-definite, without additional restrictions having to be imposed. This multivariate GARCH parameterization can also significantly reduce the number of elements to be estimated in the variance equations. The BEKK model still involves some heavy computations because of the number of matrix inversions which are required. Also, because the BEKK parameterization uses a higher-order polynomial representation which increases the nonlinearity of the parameters, obtaining convergence may be difficult and time consuming. The individual elements of matrices A, B and C in the case of a four-variable multivariate GARCH model are outlined below:

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} B = \begin{bmatrix} b_{11} & b_{12} & b_{13} & b_{14} \\ b_{21} & b_{22} & b_{23} & b_{24} \\ b_{31} & b_{32} & b_{33} & b_{34} \\ b_{41} & b_{42} & b_{43} & b_{44} \end{bmatrix}$$
$$C = \begin{bmatrix} c_{11} & 0 & 0 & 0 \\ c_{21} & c_{22} & 0 & 0 \\ c_{31} & c_{32} & c_{33} & 0 \\ c_{41} & c_{42} & c_{43} & c_{44} \end{bmatrix} \tag{8}$$

where C is a 4×4 lower-triangular matrix of unconditional variances and covariance, A is a 4×4 square matrix of parameters that show the correlation of conditional variances with past squared errors, and B is a 4×4 matrix of parameters that measure the impact of past levels on current

levels of conditional variances. The parameters in A measure the impact of shocks in variables on the conditional variance of all variables, while the parameters in B measure the volatility spillovers from variables under consideration.

As an example, the conditional variance equation for the first variable that shows how shocks and volatility are transmitted over time in each sector can be expanded as follows (the constant terms are excluded):

$$\begin{aligned} h_{11,t+1} = {} & a_{11}^2\varepsilon_{1,t}^2 + 2a_{11}a_{12}\varepsilon_{1,t}\varepsilon_{2,t} + 2a_{11}a_{31}\varepsilon_{1,t}\varepsilon_{3,t}\varepsilon_{3,t}^2 \\ & + 2a_{11}a_{41}\varepsilon_{1,t}\varepsilon_{4,t}\varepsilon_{4,t}^2 + a_{21}^2\varepsilon_{2,t}^2 + 2a_{21}a_{31}\varepsilon_{2,t}\varepsilon_{3,t} + a_{31}^2\varepsilon_{3,t}^2 \\ & + a_{31}^2\varepsilon_{3,t}^2 + 2a_{31}a_{41}\varepsilon_{3,t}\varepsilon_{4,t} + a_{41}^2\varepsilon_{4,t}^2 + b_{11}^2h_{11,t} + 2b_{11}b_{12}h_{12,t} \\ & + 2b_{11}b_{31}h_{13,t} + 2b_{11}b_{41}h_{14,t} + b_{21}^2h_{22,t} + 2b_{21}b_{31}h_{23,t} \\ & + 2b_{31}b_{41}h_{34,t} + b_{31}^2h_{33,t} + 2b_{31}b_{41}h_{34,t} + b_{41}^2h_{44,t} \end{aligned} \tag{9}$$

In this framework, $h_{11,t}$ is the conditional variance for the first variable (exchange rates) at time t, $h_{12,t}$ is the conditional covariance between the first variable (exchange rates) and the second variable (intervention), $h_{13,t}$ is the conditional covariance between the first and third variables (interest rate) and $h_{14,t}$ is the conditional covariance between the first and fourth variables (market volume). The error term $\varepsilon_{i,t}^2$ measures deviations from the mean due to some unanticipated event in variable i and cross-error terms such as $\varepsilon_{1,t}\varepsilon_{2,t}$ measure the impact of unanticipated events in one sector on another. The a_{ii} coefficients measure the impact of shocks in variables under consideration on conditional variances (volatility), while the b_{ii} coefficients measure volatility spillovers between sectors.

Assuming that the errors are normally distributed, the following likelihood function is maximized:

$$L(\theta) = -\frac{TN}{2}\ln(2\pi) - \frac{1}{2}\sum_{t=1}^{T}(\ln|H_t| + \varepsilon_t' H_t^{-1}\varepsilon_t) \tag{10}$$

where T is the number of observations, N is the number of variables in the model and θ is the vector of parameters to be estimated. The BFGS algorithm is used to obtain final estimates of the parameter with the variance covariance matrix and corresponding standard errors. The Simplex method was used to obtain initial parameter for the BFGS algorithm.

8.4 Data and Estimation Results

8.4.1 Data

We utilize daily data from the foreign exchange markets of Jamaica and Trinidad and Tobago. Specifically, we use trading volume in the foreign exchange market, exchange rate returns, direct central bank interventions in the markets and policy interest rates. Trading volume is taken as the total daily value of all spot trade on the two interbank foreign exchange markets measured in millions of US dollars. Since the vast majority of trades are in US dollars we focus only on this part of the market. Intervention is defined as daily sales and purchases of foreign currency by the central banks. The exchange rate (er) is measured as the number of units of the domestic currency per unit of the intervention currency, the US dollar. Exchange rate returns are used in the estimated models as is standard practice in the literature and is defined as $ER_t = 100 * \log\left(er_t / er_{t-1}\right)$, where er_t denotes the number of units of the domestic currency per unit of the US dollar.

Policy interest rate changes are used as proxies for monetary policy initiatives instead of monetary aggregates in this study. This is increasingly the practice in empirical studies since monetary aggregates contain elements that are positively correlated with interest rates. This would be an inappropriate proxy for monetary policy analysis based on a monetary model since monetary models are driven by liquidity effects, which predicts that monetary aggregates would be *negatively* related to interest rates (Christiano and Eichenbaum 2003). Policy interest rate changes are defined as $RR_t = 100 * \log\left(rr_t / rr_{t-1}\right)$, where rr_t denotes the annualized policy interest rate. The annualized rates used are the upper bound of the Repo rate in the case of Jamaica and the Repo rate in the case of Trinidad and Tobago.

The data set on Jamaica covers 1341 observations (after omitting holidays and other nontrading days) over the period May 17, 2005 to September 27, 2010. The data for Trinidad and Tobago include 1130 observations covering the period January 3, 2009 to July 31, 2013.

8.4.2 Empirical Results

The mean equation and the variance equations with BEKK parameterization are estimated simultaneously and the results for Jamaica and Trinidad and Tobago are outlined in Tables 8.1 and 8.2, respectively.

Table 8.1 Estimated coefficients for the VAR-GARCH model for Jamaica

	ER(i=1)	*I(i=2)*	*RR(i=3)*	*MV(i=4)*
δ_{1i}	0.166[a]	0.138[a]	0.046	−0.094[a]
δ_{2i}	−0.204	0.393[a]	−0.010	0.037[a]
δ_{3i}	0.020[c]	−0.047[a]	−0.643[a]	−0.009[c]
δ_{4i}	0.349[a]	0.573[a]	0.328[b]	−0.396[a]
a_{1i}	0.938[a]	0.008	−0.047[a]	0.315[a]
a_{2i}	0.213[c]	0.598[a]	0.165[a]	−1.167[a]
a_{3i}	0.198	0.073	0.178	0.268[c]
a_{4i}	−0.001	−0.004	0.038[a]	0.760[a]
b_{1i}	0.244[a]	0.164[a]	0.032	−0.271[a]
b_{2i}	−0.065	0.044	−0.145[a]	0.140
b_{3i}	−0.437[b]	0.048	1.626[a]	−0.253
b_{4i}	−0.051[b]	0.011	−0.066[a]	−0.061
LB(10)	8.982 (0.03)	8.016 (0.15)	22.048 (0.01)	161.261 (0.00)
LBs(10)	15.324 (0.12)	11.035 (0.35)	0.122 (0.99)	43.329 (0.00)
LLR	−6334.66			

Notes: *LB*(10) and *LBs*(10) are the Ljung-Box Q-statistics for standardized and squared standardized residuals at lag 10 respectively and *LLR* is the log likelihood. Values in brackets are the probabilities for the Ljung-Box Q-statistics. a, b and c denotes significance at the 1, 5 and 10 percent levels respectively. Experiments with other specifications did improve the diagnostics but the results were robust to different specifications

The estimation results from the mean equation are important because they speak to important issues concerning the functioning of the foreign exchange market in these jurisdictions as it relates to volume and other dynamics. In particular, δ_{14} measures the impact that innovations in market volume have on exchange rates, while δ_{24} and δ_{34} measure the feedback effects from volumes to the policy variables. Very importantly, δ_{41} and δ_{43} measure the impact of exchange rate changes and changes in the policy interest rate on market volume, respectively, while δ_{42} indicates whether central bank intervention precipitates a cascade of trading and increased volumes. Also, δ_{12} and δ_{13} measure the impact of intervention and monetary policy (interest rates) on exchange rates. Additionally, δ_{21} measures the tendency of central bank interventions to lean against the wind and δ_{32} indicates whether intervention signals monetary policy or not.

In the case of Jamaica (see Table 8.1), the coefficient δ_{14} is negative and significant (−0.094), indicating that increases in market volumes leads to an appreciation in the exchange rate. Additionally, δ_{24} is positive and sig-

Table 8.2 Estimated coefficients for the VAR-GARCH model for Trinidad and Tobago

	ER(i=1)	*I(i=2)*	*RR(i=3)*	*MV(i=4)*
δ_{1i}	−0.362[a]	0.216[a]	−0.001	−0.028
δ_{2i}	0.070[a]	−0.263[a]	0.002	−0.039[a]
δ_{3i}	0.073	−0.028	−0.031	0.023
δ_{4i}	−0.069	0.013	−0.012	−0.340[a]
a_{1i}	−0.233	−0.244	0.683	−0.678[c]
a_{2i}	0.496	−0.235	0.789	0.538
a_{3i}	−0.127[b]	−0.053	0.319	0.121
a_{4i}	0.485[a]	0.064	−0.408	0.922[a]
b_{1i}	0.001	−0.082	−0.951[c]	0.201
b_{2i}	−0.169	0.154[b]	0.330	0.050
b_{3i}	0.008	−0.001	0.104	0.034[c]
b_{4i}	0.022	0.013	0.301	0.272[b]
LB(10)	118.847 (0.00)	0.520 (0.47)	2.835 (0.98)	8.530 (0.00)
LBs(10)	17.320 (0.07)	4.099 (0.04)	1.908 (0.99)	15.190 (0.13)
LLR	−1112.831			

Notes: *LB*(10) and *LBs*(10) are the Ljung-Box Q-statistics for standardized and squared standardized residuals at lag 10 respectively and *LLR* is the log likelihood. Values in brackets are the probabilities for the Ljung-Box Q-statistics. a, b and c denotes significance at the 1, 5 and 10 percent levels respectively. Experiments with other specifications did improve the diagnostics but the results were robust to different specifications

nificant, indicating that if market volume is increasing the Bank of Jamaica (BOJ) is likely to be purchasing foreign exchange from the market. Also, δ_{34} which is negative and significant, suggests that increasing trading volumes generally leads the BOJ to reduce its policy interest rate. This is expected since in the first case increasing liquidity means the central bank does not need to sell foreign exchange to support the market and in fact may use this opportunity to buy foreign exchange to augment its reserves. Also, the policy rate can also be reduced since higher interest rates are not needed to support the exchange rate in these conditions.

The parameters δ_{41} are also positive and significant, indicating that when the exchange rate is depreciating/appreciating market volumes tend to increase/decrease, which may point to the rebalancing of portfolios during turbulent periods when there have been sharp depreciations of the domestic currency. Some of the most significant periods of volatility in the Jamaican foreign exchange markets have been driven by negative

shocks, which were characterized by the depreciation of the domestic currency. This is in keeping with the market microstructure literature in this area, which argues that the arrival of new information in the markets leads to significant changes in price and volumes as agents trade to rebalance their portfolios. The fact that the coefficient δ_{43} is positive and significant suggests that when the domestic policy interest rate rises, capital flows into the Jamaican foreign exchange markets chasing higher returns. The fact that the coefficient δ_{42} is significantly positive suggests that increased intervention sales are associated with a decline in trading volume, while intervention purchases are associated with a rise in volume that may imply simultaneity bias with the result simply mirroring the result for δ_{24}, reflecting the practice that central bank intervention sales to support the market is usually implemented when market liquidity is low, while central bank purchases to augment reserves usually occur when market volume is high. Also interesting from a policy perspective is the fact that the coefficient δ_{21} is –0.204 and significant, indicating that the BOJ intervened predominantly to "lean against the wind," that is, if the exchange rate was depreciating they intervened, selling foreign exchange to counter this trend. Moreover, the fact that the coefficient δ_{32} is significantly negative lends support to the signaling framework, indicating that the BOJ's intervention and interest rate policies are broadly consistent with intervention sales leading to subsequent increases in the policy interest rate to back up the initial intervention sale, which are both policy measures designed to tighten the monetary and financial policy stance.

In the case of Trinidad and Tobago, the mean equion results were somewhat different from that of Jamaica. The coefficient δ_{14}, which measures the impact of trading volumes on the exchange rate had the right sign but was not significant. Most other coefficients in the mean equation relating to trading volume (δ_{34}, δ_{41} and δ_{43}) were also insignificant except δ_{24}, which was significantly negative. This latter result indicates that there was a tendency for the Central Bank of Trinidad and Tobago (CBTT) to intervene selling foreign exchange when trading volumes were rising, which is counterintuitive (See Table 8.2). On closer inspection, however, the spikes in trading volume were often driven by increased buying of foreign exchange from authorized dealers by the public, indicating that the central banks may have been trying to help dealers to meet this increased demand for foreign exchange. In one important area, the effectiveness of intervention, the result was similar in the sense that intervention sales of

foreign exchange moved the exchange rate in the expected direction, that is, it helped strengthen the exchange rate and it exhibited "leaning against the wind" behavior, indicating it is actively managing the rate particularly by responding in support of the currency when there are depreciating trends. In contrast to Jamaica, however, the impact of interest rate changes on the market was insignificant.

As noted earlier, the multivariate GARCH framework also allows us to look at the volatility dynamics of the market in a joint framework. This is important since central banks are increasingly concerned about the volatility consequences of policy measures. The variance/covariance equations results allow us to assess the volatility spillovers caused by the linkages between trading volumes, exchange rates, intervention and policy interest rates in the foreign exchange market.

The transmission of shocks across variables in the multivariate GARCH is reflected in matrix A of equation 7, with the diagonal elements measuring the impact of own past shocks, while the off-diagonal elements measure the impact of shocks from other variables on volatility. In the case of Jamaica, Table 8.1 shows that shocks to intervention do not significantly increase exchange rate volatility, since (a_{12}) is not significant, while interest rate changes actually reduce volatility in the exchange rate since (a_{13}) is negative and significant. This implies that policy initiatives in the foreign exchange market do not have a problem with increased volatility in the market around interventions. Moreover, in the case of the policy interest rate, this instrument was not only able to move the exchange rate level but also reduce its volatility as well. Shocks to trading volumes, on the other hand, do increase exchange rate volatility, as reflected in the coefficient (a_{14}), which is positive and significant, highlighting the need to monitor volume and liquidity dynamics.

Other interesting results in terms of the transmission of shocks for Jamaica include the fact that shocks to exchange rates do not increase volatility in trading volumes since (a_{41}) is insignificant nor does direct intervention in the market, since (a_{42}) is also insignificant. On the other hand, shocks to policy interest rates do increase volatility in trading volumes since (a_{43}) is positive and significant. This may be caused by the capital flows consequences of policy interest rate changes, which manifest themselves more in volume than in price volatility.

In the case of Trinidad and Tobago, policy initiatives do not seem to increase volatility in either the exchange rate or trading volumes since

(a_{12}), (a_{13}), (a_{42}) and (a_{43}) are all insignificant. Interestingly, shocks to trading volumes tend to lower exchange rate volatility since (a_{14}) is significant and negative. In contrast, shocks to exchange rates increase volatility in volumes. This may be due to the link between direct central bank intervention and trading volumes in the context of attempts to contain price volatility.

Volatility spillovers across variables in the multivariate GARCH are reflected in matrix B of Eq. (7). For Jamaica, increased volatility in intervention spilled over to exchange rate volatility since (b_{12}) is significantly positive. This implies that if the frequency, quantum and timing of direct intervention are irregular, it can lead to increased exchange rate volatility even if it does move the exchange rate at levels in the right direction. Very interestingly, volatility in trading volumes and exchange rates are negatively correlated since both (b_{14}) and (b_{41}) are significantly negative, suggesting that there is some substitutability between exchange rate and trading volume volatility, so when new information comes into the market or agents are rebalancing due to shocks, the related volatility can manifest itself either in volatile prices or volumes. This means that a problem in the market can manifest itself in volatile volumes without significant changes to price, emphasizing the importance of monitoring and controlling volumes during periods of increased market pressure. In the case of Trinidad and Tobago, there is little volatility spillovers between the variables. This may be due to the relatively tight control the CBTT has over the market because of its dominant position in terms of the supply of foreign exchange to the market.

8.5 Conclusions

The results of this study add new information on the dynamics of foreign exchange market in the Caribbean. The results confirmed the effectiveness of direct intervention in the sense that in both Jamaica and Trinidad and Tobago, this instrument moved the exchange rate in the desired direction. In the case of the policy interest rate, however, this instrument was only effective in Jamaica. This may be due to the fact that flows into the foreign exchange market in Trinidad and Tobago are less tied to portfolio flows (which are more sensitive to the spread between domestic and foreign interest rates) as they are in Jamaica. Very importantly, central banks did not have to face increased short-term volatility in the exchange rate during

direct intervention or policy interest rate operations. Shocks to the policy interest rate did, however, increase volume volatility related to portfolio flows. The study also showed that both the BOJ and CBTT generally intervened to "lean against the wind," but only in Jamaica could the relationship of intervention to the policy interest rate be characterized by the "signaling" framework.

The main new insight, however, is the important role trading volume plays in the market, particularly in Jamaica. The results showed that in Jamaica, trading volumes had significant impacts not only on the exchange rate but also on intervention decisions by the BOJ. In Trinidad and Tobago, while the trading volumes do not appear to have a direct impact on exchange rate developments, the CBTT does seem to take volume into consideration in its direct intervention decisions and its intervention operations (mostly sales of foreign exchange to authorized dealers) is the main determinant of exchange rate trends in Trinidad and Tobago.

Other important findings relate to volatility dynamics. In Jamaica, shocks to trading volumes did increase exchange rate volatility, while shocks to the policy interest rate increased volume volatility, suggesting the centrality of interest rate policy in volatility transmission. Moreover, price and volume volatility seem negatively correlated, implying market pressures can be manifest not only in the exchange rate but also in volumes. In contrast, there was little to no volatility transmission across policy variables, volumes and prices in Trinidad and Tobago. This reality is driven by the structure of the foreign exchange market in these countries. In particular, the dominant role the CBTT has in the foreign exchange market not only derived from its role as regulator but also as a main conduit of foreign exchange liquidity. The BOJ in contrast is in a less advantageous position in terms of foreign exchange liquidity, since it has to compete with other market makers for this liquidity. As a consequence, the Jamaican foreign exchange market is driven more by market forces compared to its counterpart in Trinidad and Tobago. In this context, the results from Jamaica more closely approximate the results of similar studies on other foreign exchange markets. Furthermore, these differential impacts in terms of the impact of policy instruments and trading volumes in the market on the mean and variance of the exchange rates highlight the utility and logic of using a multivariate GARCH framework for the simultaneous assessment of these issues.

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CHAPTER 9

Determinants of Nonperforming Loans in Guyana

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9.1 Introduction

It is widely accepted that nonperforming loans (NPLs) are often associated with the collapse of banking institutions and financial crises in both developing and developed countries. In fact, there is abundant evidence that the financial/banking crises in East Asia and sub-Saharan African countries were preceded by high levels of NPLs (see for instance, Alexander et al. 1997; Kwack 2000; Caprio and Klingebiel 2002; Kane and Rice 2001; Louzis et al. 2012). The recent global financial crisis, which originated in the USA, was also attributed to the rapid default of sub-prime loans/mortgages. It is therefore understandable why much emphasis is placed on NPLs when examining financial vulnerabilities. Sorge (2004), for instance, reports that the stress-testing literature makes extensive use

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of NPLs and loan-loss provisions to assess the vulnerability of financial systems.

The aim of this chapter is to analyze the sensitivity of NPLs to macroeconomic and bank-specific factors in Guyana. Specifically, it employs a time-series cross-section (TSCS) data model and unique panel dataset to examine the relationship between NPLs and several macroeconomic and bank-specific variables. To the authors' knowledge there are no previous studies which examine the determinants of NPLs in the Guyanese financial system. As such, this chapter contributes to the existing literature by filling this gap. It also extends the literature by combining firm-level data with macroeconomic variables to ascertain the determinants of NPLs. According to Louzis et al. (2012), few studies consider both variables. Apart from contributing to the literature, it may also have important practical implications for commercial bankers and bank regulators/supervisors. For instance, our findings will serve to clarify whether macroeconomic factors are important determinants of delinquent loans. This in turn can be used by bank regulators/supervisors to develop a stress-testing framework to assess the vulnerability of the banking system to macroeconomic or systemic risks in Guyana.

The chapter shows that the nonperforming loan portfolios of commercial banks are influenced by macroeconomic and bank-specific factors. In particular, we find a significant positive relationship between NPLs and the real effective exchange rate (REER). This means that deterioration in international competitiveness of the local economy (as reflected by an appreciation in the REER) may result in higher levels of NPLs. Our evidence confirms that improvement in real income—as reflected by growth in real Gross Domestic Product (GDP)—exerts a significant negative effect on NPLs. We also find that commercial banks that are aggressive and charge relatively higher interest rates experience greater levels of default by loan customers. However, contrary to expectations, the evidence reveals that large banks are not necessarily more effective in screening loan customers when compared to their smaller counterparts. Additionally, inflation is not an important determinant of delinquent loans.

The remainder of the chapter is organized as follows. Section 9.2 reviews the extant literature on nonperforming loans. Section 9.3 describes the econometric model and estimation procedure. In this section, the rationale for incorporating each variable in the econometric model is explained. Section 9.4 presents the empirical results, and Sect. 9.5 concludes with several policy implications.

9.2 Literature Review

Over the last decade, the literature that investigates the determinants of NPLs has expanded in line with the growing interest dedicated to understanding the factors responsible for financial stability and soundness. This situation may be attributed to the fact that impaired assets play a central role in financial vulnerability as evidenced by the strong association between NPLs and banking/financial crises in Argentina, East Asia, and sub-Saharan African Countries during the 1990s. In this section, we review the extant literature with the aim of deriving a conceptual framework to examine the determinants of NPLs in the Guyanese banking sector.

Keeton and Morris (1987) is one of the earliest studies to explore the causes of loan losses. Using NPLs net of charge-offs as the primary measure of loan losses, Keeton and Morris show that local economic conditions coupled with the poor performance of key sectors explain the variation in loan losses recorded by insured commercial banks in the USA. The study also reports that commercial banks with greater appetite for risks tend to record higher losses. The authors employ a fairly large dataset comprising 2470 insured commercial banks during the period 1979–1985.

Several studies that followed the publication of Keeton and Morris (1987) have since proffered similar, as well as alternative, explanations for problem loans in the USA. Sinkey and Greenawalt (1991), for instance, probe the loan-loss experience of large commercial banks in the USA. The authors argue that both internal and external factors explain the loan-loss rate; defined as net loan charge-offs plus NPLs divided by total loans plus net charge-offs. They find a significant positive relationship between the loan-loss rate and internal factors such as high interest rates, excessive lending, and volatile funds. Similar to the previous study, Sinkey and Greenawalt report that depressed regional economic conditions contribute to expansion in the loss rate of the commercial banks. The study employs a simple log-linear regression model and dataset of large commercial banks in the USA between 1984 and 1987.

Keeton (1999) uses a vector autoregression model to analyze the impact of credit growth and loan delinquencies in the USA and reports evidence of a strong positive relationship between credit growth and impaired assets. According to Keeton, this outcome suggests that rapid credit growth is associated with the lowering of credit standards, which in turn contributes to higher loan losses. The author defines a delinquent loan as any loan that is in arrears for 90 days or does not accrue interest.

Salas and Saurina (2002) employ a panel dataset covering the period 1985–1997 and dynamic model to investigate the determinants of problem loans of Spanish commercial and saving banks. The study shows that real growth in GDP, rapid credit expansion, bank size, capital ratio, and market power impact significantly on the level of NPLs.

In an attempt to extend the previous study, Jimenez and Saurina (2006) examine the determinants of NPLs in the Spanish banking sector from 1984 to 2003. They found evidence that NPLs are influenced by GDP growth, high real interest rates, and credit terms. Jimenez and Saurina attribute the latter to several factors including: disaster myopia, herd behavior, and agency problems that may entice bank managers to lend excessively during boom periods.

Meanwhile, Rajan and Dhal (2003) report that favorable macroeconomic conditions (measured by GDP growth); bank size; credit orientation; and financial factors such as maturity, cost, and terms of credit exert significant influence on the NPLs of commercial banks in India. The authors also utilize panel regression analysis.

Fofack (2005), using a pseudo panel-based model for several sub-Saharan African countries, finds evidence that economic growth, real exchange rate appreciation, the real interest rate, net interest margins, and interbank loans are important determinants of NPLs in these countries. The author argues that the strong association between the macroeconomic factors and NPLs is due to the undiversified nature of some African economies.

Hu et al. (2004) analyze the relationship between NPLs and ownership structure of commercial banks in Taiwan with a panel dataset covering the period 1996–1999. The study reveals that banks with higher government ownership recorded lower NPLs. Hu et al. also show that bank size is negatively related to NPLs, while diversification is not an important determinant of NPLs.

Based on our review of the literature, it is clear that NPLs can be explained by macroeconomic and bank-specific factors. Even though the literature is extensive, there is a paucity of research that focuses on the Caribbean. Very few studies also combine macroeconomic and bank-specific factors when investigating NPLs (see Louzis et al. 2012). In this regard, our study will contribute to the literature by providing evidence for Guyana and, by extension, the Caribbean. It will also extend the literature by analyzing the impact of both macroeconomic and firm-level factors on NPLs.

9.3 Estimation Procedure, Definition of Variables, and Data Issues

A reduced-form econometric model similar to Jimenez and Saurina (2006) is employed to ascertain the determinants of NPLs in the Guyanese banking sector. The model is a simple linear regression function that links the ratio of NPLs to total loans with key macroeconomic and bank-specific variables. The general regression equation is of the form:

$$y_{i,t} = \alpha y_{i,t-1} + \beta x'_{i,t} + \eta_i + \varepsilon_{i,t} \tag{9.1}$$

where $x'_{i,t}$ is a vector that contains a set of explanatory variables (i.e., macroeconomic and bank-specific variables); η_i is a group-specific constant term (or fixed effect); and $\varepsilon_{i,t}$ is a random disturbance term that is independent and identically distributed. The specific equation we estimate takes the following form:

$$\begin{aligned} \ln NPL\_A_{i,t} = {} & \beta_1 \ln NPL\_A_{i,t-1} + \beta_2 \Delta GDP_t + \beta_3 \Delta GDP_{t-1} \\ & + \beta_4 \ln RIR_t + \beta_5 \ln RIR_{t-1} + \beta_6 \Delta LOANS_{i,t-2} \\ & + \beta_7 \Delta LOANS_{i,t-3} + \beta_8 \Delta LOANS_{i,t-4} + \beta_9 SIZE_{i,t} \\ & + \beta_{10} \ln INF_t + \beta_{11} \ln INF_{t-1} + \beta_{12} \ln REER_t \\ & + \beta_{14} \ln REER_{t-1} + \eta_i + \varepsilon_{i,t} \qquad i = 1, \ldots N, t = 1, \ldots T \end{aligned} \tag{9.2}$$

where $\ln NPL\_A_{i,t}$ and $\ln NPL\_A_{i,t-1}$ represent the natural log of the ratio of NPLs to total loans for bank i in year t and $t-1$; ΔGDP_t and ΔGDP_{t-1} represent the annual growth in real GDP at time t and $t-1$, respectively; $\ln RIR_t$ and $\ln RIR_{t-1}$ denote the natural log of the real interest rates (measured as the difference between the weighted average lending rate and the annual inflation rate) at time t and $t-1$; $\ln REER_t$ and $\ln REER_{t-1}$ represent the natural log of the REER at time t and $t-1$; $\ln INF_t$ and $\ln INF_{t-1}$ indicate the natural log of the annual inflation rate at time t and $t-1$; $SIZE_{i,t}$ is the ratio of the relative market share of each bank's assets that capture the size of the institution at time t; $\ln L\ A_{i,t}$ is the natural log of the loans to total asset ratio for bank i in year t; $\Delta LOANS_{i,t}$, $\Delta LOANS_{i,t-1}$, and $\Delta LOANS_{i,t-2}$ represent the annual growth in loans for bank i in year t, $t-1$, and $t-2$, respectively; and $\varepsilon_{i,t}$ is the white noise error term. The

idiosyncratic behavior of commercial banks is captured by the fixed effect coefficient, η_i.

The Eq.. (9.2) is estimated using a TSCS data model with fixed effect. This estimation technique is more efficient than the simple pooled least squares since it overcomes heterogeneity that is often present in panel datasets (see for instance, Hu et al. 2004; Wooldridge 2010; Khemraj and Pasha 2014). It is also appealing because of its effectiveness in terms of controlling for omitted variable bias. Notwithstanding the utility of the Fixed Effect model, it suffers from methodological challenges such as serial correlation, heteroscedasticity, spatial correlation, contemporaneous correlation, and correlation among the regression errors. In order to address these methodological issues, we estimate our model with appropriate robust coefficient covariances or panel corrected standard errors (PCSEs). The model is also estimated with a lagged dependent variable on the right-hand side. This is done to overcome the persistence exhibited by the ratio of NPLs to total loans during our sample period (please refer to Fig. 9.1). Additionally, we follow the general-to-specific approach to derive the parsimonious model. The rationale for considering each variable is provided in the ensuing section of the chapter.

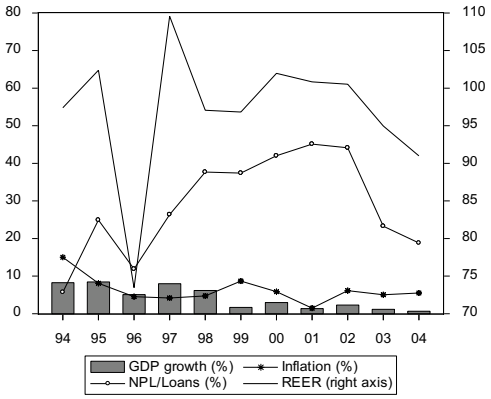

Fig. 9.1 Trend of growth in real economy (GDP), real effective exchange rate (REER), inflation and the ratio of NPLs to total loans. *Source*: Bank of Guyana Annual Report (various years) and International Financial Statistics (IFS)

9.3.1 *Motivation and Description of Variables*

Macroeconomic variables: the literature suggests significant associations between NPLs and several macroeconomic factors such as: annual growth in GDP, credit expansion, real interest rates, inflation, REER, unemployment rate, broad money supply (M2), GDP per capita, among others. This chapter only considers the growth in real GDP, annual inflation (INF), and the REER.

According to the literature, there is an inverse relationship between the growth in real GDP and NPLs (see De Lis et al (2001); Hoggarth and Whitley (2003)). This has been interpreted to mean that an expanding economy contributes to an improvement in earnings (or income), which in turn enhances the debt-servicing capacity of borrower and, consequently, lower NPLs. Conversely, when there is a slowdown in the economy (as reflected by low or negative GDP growth), the nonperforming loan portfolios of banks are likely to increase due to lower debt-servicing capacity of borrowers.

A positive relationship between the inflation rate and NPLs is postulated by the literature. Fofack (2005), for instance, argues that inflationary pressures contribute to the high levels of impaired loans in a number of sub-Saharan African countries with flexible exchange rate regimes. According to Fofack, inflation is responsible for the rapid erosion of commercial banks' equity and contributes to higher credit risk.

A positive association between NPLs and REER is also proposed in the literature. Fofack (2005) shows that changes in the REER have a positive impact on NPLs of commercial banks that operate in some sub-Saharan African countries. According to Fofack, this empirical relationship is due to the high concentration of lending to the export-oriented agriculture sector that was adversely affected by the currency appreciation during the 1980s and early 1990s.

The macroeconomic variables are included in our econometric model both contemporaneously and with one year lags since adverse macroeconomic shocks may not impact immediately on the loan portfolios of commercial banks. Except for GDP, the natural logarithms of the macro variables are used to estimate our model. We did not take the log of GDP since there were negative growth rates during our sample period. Additionally, while we allow the macroeconomic variables to vary over time they are the same across institutions.

Bank-Specific Variables: empirical evidence in the literature suggests that NPLs are influenced by bank-specific factors such as: size of the institution, profit margins, efficiency, the terms of credit (size, maturity, and interest rate), and risk profile of banks (measured by several proxies including total capital to asset ratio and loans to asset ratio). This chapter only considers four bank-specific variables due to data availability. These are: real interest rate (RIR), bank size ($SIZE$), annual growth in loans ($\Delta LOAN$), and the ratio of loans to total asset (L_A).

The impact of real interest rates on NPLs is extensively documented. In fact, numerous studies confirm that high real interest rate is positively related to NPLs (see, e.g., Andreeva (2004); Hoggarth and Whitley (2003)). In this chapter, real interest rate is computed by subtracting the annual inflation rate from the weighted average lending rate of each bank. The variable is included contemporaneously ($RIR_{i,t}$) and with a lag of one year ($RIR_{i,t-1}$) in our model.

Excessive lending by commercial banks is often identified as an important determinant of NPLs (see De Lis et al (2001)). We construct this variable by computing the annual growth in the loan portfolio of each bank (ΔLOANS). This variable is introduced into our model contemporaneously and with up to two lags. We did not take the natural logarithm of (ΔLOANS) since there were periods when the loan portfolios of some commercial banks contracted. We expect a significant positive relationship between NPLs and this variable, since the literature shows that rapid credit growth is often associated with higher NPLs.

The empirical evidence relating to the impact of size on NPLs appears to be mixed. For instance, some studies report a negative association between NPLs and bank size (see Rajan and Dhal 2003; Salas and Saurina 2002; Hu et al. 2004). According to these studies, the inverse relationship means that large banks have superior risk management strategies that usually translate into more superior loan portfolios vis-à-vis their smaller counterparts. There are also studies that provide evidence of a positive association between NPLs and bank size (see Rajan and Dhal 2003). In this chapter, the SIZE variable is defined as the relative market share of the assets of commercial bank.

The risk appetite of commercial banks has also been found to be an important determinant of NPLs. Sinkey and Greenawalt (1991), for instance, show that banks that undertake higher risk in pursuit of greater

profit tend to incur more bad loans during periods of economic contraction. The risk appetite of the commercial banks is measured by the ratio of loans to total assets. The ratio may vary from zero to one; with values closer to one suggesting greater risk tolerance. In this chapter, *SIZE* and *L_A* variables are included contemporaneously. Additionally, the bank-specific variables are included in the model to vary with time and across institutions. The methodology for calculating each variable and the *a priori coefficient signs* are given by Table 9.1.

Table 9.1 Summary of variables used in regression model and a priori signs

Variables	*Definition*	*Expected sign*
$lnNPL\_A_{i,t}$	The natural logarithm of the ratio of non-performing loans to total loans for bank i in year t $NPL\_A_{i,t} = \frac{NPL_{i,t}}{TOTALLOANS_{i,t}} \times 100\%$	
ΔGDP_t	The annual growth in real GDP at time t computed as follows: $\Delta GDP_t = \frac{GDP_t - GDP_{t-1}}{GDP_t} \times 100\%$	(−)
$lnRIR_{i,t}$	The natural logarithm of the real interest rate (measured as the difference between the weighted average lending rate and the annual inflation rate) of bank i at time t $\ln RIR_{i,t} = WALR_{i,t} - INF_t$	(+)
$lnINF_t$	The natural logarithm of the annual inflation rate at time t $InINF_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}}$	(+)
$lnREER_t$	The natural logarithm of the real effective exchange rate at time t	(+)
$lnL\_A_{i,t}$	The natural logarithm of the ratio of loans to total asset of bank i at time t $\ln L\_A_{i,t} = \frac{LOANS_{i,t}}{ASSETS_{i,t}} \times 100\%$	(−)
$SIZE_{i,t}$	Is the relative market share of bank i at time t $SIZE_{i,t} = \frac{Asset_{i,t}}{\sum Asset_{i,t}} \times 100\%$	(+)/(−)
$\Delta LOANS_{i.t}$	The growth in loans of bank i at time t computed as follows: $\Delta LOANS_{i,t} = \frac{LOANS_{i.t} - LOANS_{i.t-1}}{LOANS_{i.t-1}}$	(+)

9.3.2 Data Issues

Our panel dataset comprises firm-level data and macroeconomic variables (such as the annual inflation rate, REER, and annual growth rate of real GDP). It is noteworthy that our dataset excludes one commercial bank, the Guyana National Cooperative Bank (GNCB). This commercial bank merged with GUYBANK in 2002. The merger saw significant growth in the aggregate NPLs of the banking sector, which was not related to the performance of the domestic economy or credit policy of GNCB. Since the aim of this chapter is to determine the relationship between the growth in NPLs and key macroeconomic and bank-specific variables, GNCB was excluded to avoid the distortion that may be caused by the inclusion of this financial institution in our analysis. The firm-level data were collected from the Annual Reports of Commercial Banks, while the macroeconomic variables were obtained from the Annual Reports of Bank of Guyana and the International Financial Statistics.

The dataset covers a ten-year period ending 2004. This time period is selected for two primary reasons. Firstly, data for NPLs before 1994 were not available. Secondly, several local commercial banks (in collaboration with the government) embarked on an exercise to restructure their NPLs to the rice-producing sector during 2005. This initiative saw a sharp contraction in the impaired assets of the banks and can therefore distort the econometric analysis.

9.3.3 Stylized Facts

Prior to 1989, the country experimented with a socialist model, which was responsible for the collapse of the economy. As a consequence, the government jettisoned the failed economic model and adopted policies to liberalize the economy and banking sector under an Economic Recovery Program supported by the International Monetary Fund. This policy shift resulted in unprecedented economic growth during the period 1991–1997, averaging 7.1 %. The buoyancy of the economy encouraged many commercial banks to extend more credit to the private sector. The ratio of credit to GDP rose from 19.8 % in 1991 to approximately 50 % by 1997. Meanwhile, credit to the private sector increased sixfold from G$6.7 billion in 1991 to G$44.9 billion by 1997. However, these positive trends were reversed from 1997 due to political instability, contraction in the real economy, and unfavorable external circumstances, which adversely affected

key export sectors that the commercial banks supported with credit (see Grenade and Pasha 2012). As a result, the level of NPLs increased markedly. The total NPLs of the banking system, which amounted to G$786 million in 1994, expanded to reach G$21 billion (or 45 % of total loans and advances) at end-2001. The sensitivity of impaired loans to performance of the economy and external shock is clearly depicted in Fig. 9.1. The figure shows strong co-movement between NPL and GDP growth rates and REER.

Given the widespread default on loans during the mid-1990s, several commercial banks adopted cautious lending policies. Consequently, credit growth slowed dramatically as commercial banks shifted to safer investments, mainly treasury bills. Figure 9.2 shows the contraction in credit. Based on Fig. 9.2, credit growth reduced continually from 47 % in 1995 to below 1 % by 2004. The ratio of loans to asset also reduced from 45 % to 31 % over the corresponding period. The strong co-movements between NPLs and the various bank-specific and macroeconomic factors are not only clearly visible from the figures above but are confirmed by our correlation analysis. Table 9.2 presents the correlation coefficient between ratio of NPLs/total loan and bank-specific and macroeconomic variables.

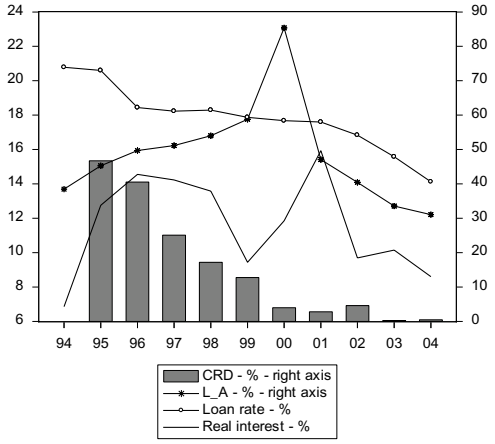

Fig. 9.2 Trend of growth in loans and advance (CDR), loan-to-asset ratio (L_A), loan rate and real interest rate. *Source*: Annual Reports of Commercial Banks (various years)

Table 9.2 Correlation analysis, 1994–2004

Variables	*Small bank*	*Large banks*	*All banks*
Bank specific variables			
Loan to asset ratio	0.21	0.19	0.20
Credit growth	–0.33	–0.28	–0.33
Real interest rate	0.06	0.07	0.07
Macroeconomic variables			
Real GDP growth	–0.40	–0.39	–0.41
Inflation rate	–0.26	–0.27	–0.28
Real effective exchange rate	0.10	0.09	0.09

Source: Bank of Guyana Annual Report (various years) and the Annual Reports of Commercial Banks (various years)

Table 9.2 shows a positive association between the ratio of loan to asset and NPLs; suggesting that banks with a greater risk appetite incurred higher NPLs. The association between real interest rates and NPLs is also positive but weak as reflected in the low correlation coefficient.

Growth in loans and advances exhibits a fairly strong negative association with nonperforming loans. While the literature suggests a positive association, our peculiar results probably reflect the conservative lending stance adopted by commercial banks due to the high levels of default by farmers and general slowdown on the economy. The social/political instability that characterized the late 1990s and which continued during the early to mid-2000s also contributed to the marked reduction in the level of loans and advances extended by the banking sector.

Our correlation analysis reveals a fairly strong negative association between NPLs and growth in real GDP; which confirms our a priori expectation. Contrary to the existing literature, Table 9.2 shows a negative association between inflation and the ratio of NPLs to total loans. This unique situation may be explained by the indexation of wages to inflation in Guyana. The labor unions in Guyana usually negotiate wage increases based on the inflation rate. During the sample period, the unions were able to successfully negotiate higher wages for their member that covered the rate of inflation.

Table 9.2 shows that there are positive co-movements between the ratio of NPLs and REER. However, the magnitude of the correlation coefficient indicates that the co-movements between the REER and NPLs are not as strong as those between growth in real GDP and nonperforming loans. This suggests that international competitiveness had a less pronounced

impact on NPLs when compared to the slowdown in the real economy during our sample period.

9.4 Discussion of Regression Results

In an effort to identify the determinants of NPLs we estimate a fixed effect panel model. Tables 9.3 and 9.4 summarize the results of our regression model. A lagged dependent variable is included on the right-hand side of the model and it is estimated with appropriate robust coefficient covariances or PCSEs. As noted earlier, this is done to address the methodological challenges that are generally associated with panel models (see Khemraj and Pasha 2014). We estimate the model with a balanced panel dataset covering the period 1994–2004.

The variable $L\_Ai_{,t}$, which captures the risk appetite of the commercial banks, is positive and significant at the 15 % and 5 % levels of significance in our general and parsimonious models, respectively (see Tables 9.3 and 9.4). These results are consistent with previous studies and may be interpreted to mean that banks with high risk tolerance are likely to incur greater levels of NPLs (see Sinkey and Greenawalt 1991).

The coefficient of the variable $SIZE_{i,t}$ is not statistically significant at any acceptable level of significance (see Tables 9.3 and 9.4). Our evidence conflicts with previous studies (such as Rajan and Dhal 2003; Salas and Saurina 2002; Hu et al. 2004) and suggests that large banks are not necessarily more effective in terms of screening loan customers when compared to their smaller counterparts.

Credit growth is negative and significantly related to NPLs at the 1 % level of significance in time t, $t-1$, and $t-2$. These results are inconsistent with previous studies that provide evidence of a positive relationship between credit growth and NPLs (see Salas and Saurina 2002; Jimenez and Saurina 2006). We interpret our results to mean that commercial banks with aggressive lending policies are likely to incur lower nonperforming loans.

Consistent with previous studies, we find a significant positive contemporaneous relationship between real interest rate ($RIR_{i,t}$) and NPLs (see Sinkey and Greenawalt 1991; Fofack 2005; Jimenez and Saurina 2006). Indeed, Tables 9.3 and 9.4 show that the real interest rate variable ($RIR_{i,t}$) is significant at the 15 % level of significance in the general and parsimonious models. Our results suggest that loan delinquency is likely to increase when commercial banks adjust real interest rates upward.

Table 9.3 Regression results

Variables	*Coefficient*	*Std. error*[a]	*t-statistics*	*Prob.*
Bank specific factors				
$LnNPL\_A_{i,t-1}$	0.231329	0.091067	2.540206	0.0171
$lnL\_A_{i,t}$	0.933447	0.608620	1.533711	0.1367
$lnSIZE_{i,t}$	0.157875	0.383693	0.411462	0.6840
ΔLOANS	−0.010862	0.002624	−4.138843	0.0003
$\Delta LOANS_{i,t-1}$	−0.012695	0.002079	−6.106473	0.0000
$\Delta LOANS_{i,t-2}$	−0.008616	0.002497	−3.450496	0.0019
$RIR_{i,t}$	0.806953	0.502583	1.605612	0.1200
$RIR_{i,t-1}$	0.381330	0.426080	0.894975	0.3787
Macro-factors				
INF_t	−0.002097	0.086632	−0.024211	0.9809
INF_{t-1}	0.070132	0.128910	0.544040	0.5909
ΔGDP_t	−0.049554	0.036561	−1.355406	0.1865
ΔGDP_{t-1}	−0.006514	0.034384	−0.189455	0.8512
REER	1.591487	1.046019	1.521471	0.1398
$REER_{t-1}$	2.689959	0.840546	3.200254	0.0035
Fixed Effects				
Bank 1	−9.781574			
Bank 2	−9.920805			
Bank 3	−9.678762			
Bank 4	−12.54788			
Bank 5	−9.963629			
Bank 6	−10.88915			
Diagnostic test				
R-squared	0.956505			

This table shows the results of the fixed effect regression model which is estimated with panel corrected standard errors (PCSE) and a balanced panel dataset from 1994 to 2004

[a]Represent panel corrected standard errors (PCSEs)

$$lnNPL\_A_{i,t} = \beta_1 lnNPL\_A_{i,t-1} + \beta_2 lnL\_A_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 \Delta LOANS_{i,t} + \beta_5 \Delta LOANS_{i,t-1} + \beta_6 \Delta LOANS_{i,t-2} + \beta_7 lnRIR_t + \beta_8 lnRIR_{t-1} + \beta_9 lnINF_t + \beta_{10} lnINF_{t-1} + \beta_{11} \Delta GDP_t + \beta_{12} \Delta GDP_{t-1} + \beta_{13} lnREER_t + \beta_{14} lnREER_{t-1} + \eta_i + \varepsilon_{i,t}$$

$$i = 1,\ldots N,\ t = 1,\ldots T \quad \ldots(9.3)$$

where: $lnNPL\_A_{i,t}$ and $lnNPL\_A_{i,t}$ represents the natural log of the ratio of non-performing loans to total loans for bank i in year t and $t-1$; ΔGDP_t and ΔGDP_{t-1} represents the annual growth in real GDP at time t and $t-1$ respectively; $lnRIR_t$ and $lnRIR_{t-1}$ denotes the natural log of the real interest rates (measured as the difference between the weighted average lending rate and the annual inflation rate) at time t and $t-1$; $lnREER_t$ and $lnREER_{t-1}$ indicates the natural log of the real effective exchange rate at time t and $t-1$; $lnINF_t$ and $lnINF_{t-1}$ is the natural log of the annual inflation rate at time t and $t-1$; $SIZE_{i,t}$ is the ratio of the relative market share of each bank's assets that capture the size of the institution at time t; $lnl\_A_{i,t}$ is the natural log of the loans to total asset ratio for bank i in year t; $\Delta LOANS_{i,t}$, $\Delta LOANS_{i,t-1}$ and $\Delta LOANS_{i,t-2}$ represent the growth in loans for bank i in year t, $t-1$,*and* $t-2$ respectively; and $\varepsilon_{i,t}$ is the error term which should be normally distributed with zero mean and constant variance. In the model η *is* fixed effect coefficients

Table 9.4 Regression results: the parsimonious model

Variables	*Coefficient*	*Std. error*[a]	*t-statistics*	*Prob.*
Bank specific factors				
$LnNPL\_A_{i,t-1}$	0.253678	0.084641	2.997096	0.0052
$lnL\_A_{i,t}$	–0.927715	0.411203	–2.256099	0.0310
$lnSIZE_{i,t}$	–	–	–	–
ΔLOANS	–0.010817	0.002462	–4.394326	0.0001
$\Delta LOANS_{i,t-1}$	–0.012556	0.001892	–6.636234	0.0000
$\Delta LOANS_{i,t-2}$	–0.008432	0.002234	–3.774699	0.0007
$RIR_{i,t}$	0.592864	0.389024	1.523979	0.1373
$RIR_{i,t-1}$	–	–	–	–
Macro-factors				
INF_t	–	–	–	–
INF_{t-1}	–	–	–	–
ΔGDP_t	–0.051873	0.029788	–1.741394	0.0912
ΔGDP_{t-1}	–	–	–	–
REER	1.413999	0.790145	1.789542	0.0830
$REER_{t-1}$	2.583651	0.747548	3.456166	0.0016
Fixed Effects				
Bank 1	–7.507684			
Bank 2	–7.574109			
Bank 3	–7.542794			
Bank 4	–10.57218			
Bank 5	–7.730316			
Bank 6	–8.824282			
Diagnostic test				
R-squared	0.9565052			

This table shows the results of the fixed effect regression model which is estimated with panel corrected standard errors (PCSE) and a balanced panel dataset from 1994 to 2004

[a]Represent panel corrected standard errors (PCSEs)

$$lnNPL\_A_{i,t} = \beta_1 lnNPL\_A_{i,t-1} + \beta_2 lnL\_A_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 \Delta LOANS_{i,t} + \beta_5 \Delta LOANS_{i,t-1} + \beta_6 \Delta LOANS_{i,t-2} + \beta_7 lnRIR_t + \beta_8 lnRIR_{t-1} + \beta_9 lnINF_t + \beta_{10} lnINF_{t-1} + \beta_{11} \Delta GDP_t + \beta_{12} \Delta GDP_{t-1} + \beta_{13} lnREER_t + \beta_{14} lnREER_{t-1} + \eta + \varepsilon_{i,t}$$

$i = 1, \ldots N,\ t = 1, \ldots T \ldots$ (9.4) where: $\ln NPL_{i,t}$ and $\ln NPL_{i,t}$ represents the natural log of the ratio of non-performing loans to total loans for bank i in year t and $t-1$; ΔGDP_t and ΔGDP_{t-1} represents the annual growth in real GDP at time t and $t-1$ respectively; $\ln RIR_t$ and $\ln RIR_{t-1}$ denotes the natural log of the real interest rates (measured as the difference between the weighted average lending rate and the annual inflation rate) at time t and $t-1$; $\ln REER_t$ and $\ln REER_{t-1}$ indicates the natural log of the real effective exchange rate at time t and $t-1$; $\ln INF_t$ and $\ln INF_{t-1}$ is the natural log of the annual inflation rate at time t and $t-1$; $SIZE_{i,t}$ is the ratio of the relative market share of each bank's assets that capture the size of the institution at time t; $lnl\_A_{i,t}$ is the natural log of the loans to total asset ratio for bank i in year t; $\Delta LOANS_{i,t}$, $\Delta LOANS_{i,t-1}$ and $\Delta LOANS_{i,t-2}$ represent the growth in loans for bank i in year t, $t-1$,and $t-2$ respectively; and $\varepsilon_{i,t}$ is the error term which should be normally distributed with zero mean and constant variance. In the model η *is* fixed effect coefficients

Based on Tables 9.3 and 9.4, the REER is positively and significantly related to NPLs at varying levels of significance. This suggests that the international competitiveness of the domestic economy is an important determinant of credit risk. In other words, whenever there is deterioration in the competitiveness in the local economy, the level of NPLs emanating from the key export-oriented economic sectors is likely to increase. It is important to note that our results are consistent with Fofack (2005). More importantly, it captures high level of default by farmers following the decline in competitiveness for agricultural export commodities, especially rice. Given the large exposure of commercial banks to the agriculture sector the level of NPLs increased exponentially. It is noteworthy that the Guyanese economy is heavily dependent on a few export sectors and is therefore influenced by external shocks (see Grenade and Pasha 2012; Khemraj et al. 2013).

Table 9.4 shows a significant negative contemporaneous relationship between GDP_t and NPLs. Similar to previous studies, we interpret our findings to mean that contraction in the real economy is likely to contribute to an instantaneous increase in the NPLs of commercial banks and vice versa (see Salas and Saurina 2002; Rajan and Dhal 2003; Fofack 2005; Jimenez and Saurina 2006). Our results are not surprising given the dependence of the Guyanese economy on a few primary sectors and high exposure of commercial banks to these sectors. It therefore follows that when the economy contracts due to the poor performance of key sectors, the debt-servicing capacity of borrowers is normally impaired. Thus, NPLs expand when there is an economic downturn and reduce when the economy accelerates.

The relationship between inflation and NPLs is not statistically significant in our general or parsimonious models (see Tables 9.3 and 9.4). This means that NPLs is not affected by changes in general price levels. A possible explanation for this phenomenon is indexing of wages to inflation and practice of businesses to transfer price increases to customers in order to protect their income.

9.5 Conclusion and Policy Implications

This chapter attempts to ascertain the determinants of NPLs in the Guyanese banking sector using a panel dataset and econometric model similar to Jimenez and Saurina (2006). Our empirical results support the view that macroeconomic factors, such as, the REER and growth in

real GDP impacts significantly on the level of NPLs. In particular, we find that the REER has a strong positive relationship with the levels of NPLs reported by commercial banks, suggesting that the international competitiveness of the domestic economy is an important determinant of the loan quality of these the banking systems. Whenever the international competitiveness of the domestic economy deteriorates—as reflected by an appreciation in the REER—this translates into higher bad loans. We also find evidence of a significant inverse relationship between GDP growth rates and NPLs. This means that strong performance in the real economy contributes to lower NPLs. Our results show that the impact of real GDP growth is not only strong but instantaneous. These results are plausible given the openness and undiversified nature of the Guyanese economy and the fact that commercial banks are highly exposed to a few primary export sectors. Contrary to previous studies, however, our empirical results show that inflation is not an important determinant of NPLs. One possible explanation for this phenomenon is indexing of wages to inflation. Another is the practice of businesses to transfer price increases to customers in order to preserve their income.

With respect to the bank-specific variables, we find that banks that charge relatively higher real interest rates and undertake greater risks tend to incur more bad loans. This is evident from the significant positive associations between NPLs and the $RIR_{i,t}$ and $L\_A_{i,t}$ variables. However, contrary to international evidence our results show that large banks are not necessarily more effective in screening loan customers when compared to their smaller counterparts—since there is no significant relationship between the size of a banking institution and the level of NPLs. We also find that banks that are more aggressive in the credit market are likely to incur lower NPLs, which conflicts with previous studies.

Based on our findings, it therefore follows that commercial banks should pay attention to their internal lending policies and practices, as well as macroeconomic factors. Specifically, commercial banks should consider the international competitiveness of the domestic economy since this may impair the ability of borrowers to repay their loans. These lending institutions also need to consider the health of the economy when extending loans, given the reality that loan delinquencies are higher during periods of economic downturn. Finally, banks should constantly review lending rates given that loan delinquencies are influenced by the real interest rates.

Currently, the monitoring framework of the Bank of Guyana (BOG) is limited to the capital adequacy, liquidity, profitability, and asset quality

of the banking system. Based on our findings, it is important for BOG to expand its monitoring framework to include macroeconomic prudential indicators such as GDP and REER when assessing the stability and soundness of the banking system.

Since our results for Guyana are encouraging, the authors will replicate this study for other countries in the Caribbean. In order to extend the literature on nonperforming loans, the authors plan to incorporate corporate governance and the regulatory environment in our future research. This decision is motivated by two primary reasons: (1) the financial crisis in the USA was blamed on deregulation and the weak regulatory framework; and (2) ethics seem to be at the heart of the financial crisis in the USA. While there are reasons to suspect that other financial crises occurred because of these factors, they were ignored in previous studies.

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CHAPTER 10

Financial Flows and Productivity in Eastern Europe: Implications for Growth and Policy

Lucas Bernard and Unurjargal Nyambuu

10.1 Introduction

Tom Palmer, Director, The Cato Institute, has written (Palmer 1990) that "one of the reasons that [he is] so excited about what is happening in Central and Eastern Europe is that [he sees] a very real chance that in the next 10 to 20 years an intellectual and political culture that is more liberal than the one we now have in Western Europe or North America will develop in those countries. [He does not] mean necessarily a more liberal system; we must remember that Central and Eastern Europe are starting from a different base. The seeds of liberal intellectual and political ideas that have been planted there may sprout; produce mighty trees; and, if we are lucky, drop seeds back into our societies to reinfuse us with the spirit of liberty." Further, Stanford's Francis Fukuyama in his recent book, *The Origins of Political Order* (Fukuyama 2011), discusses some of the political mythologies of economic growth. In his list, he includes such concepts as:

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(1) The connections between rule-of-law and growth
(2) Stable democracy and growth
(3) Social mobilization and growth

These are economic memes which appear in almost every discussion of Eastern Europe. Key to the discussion of such concepts is the underlying supposition that growth is, in general, a good thing for a society and for the individuals in that society. There is considerable debate as to the relationship between the concepts. For example, much of the recent economic growth in countries such as South Korea, Taiwan, the People's Republic of China, and Singapore has been achieved under very undemocratic regimes. In Eastern Europe, by contrast, more democratic institutions have officially emerged. However, whatever the connection, the presumption remains that growth is necessary and good. Within the difficult region of Eastern Europe, we would like to examine some of the economic theories that underlie the dynamics of growth and their local impact on their respective countries. We say "difficult" because it is not easy to access data and the region is politically complex; thus, we are forced to look at things obliquely, as it were. Thus, we are interested in Tom Palmer's comment and seek to discover how, if true, it might manifest itself in Eastern European economies.

Every schoolchild learns that economic output is, for the most part, contingent upon two factors, labor, L, and capital, K (Romer 2001). Under appropriate assumptions, usually a Cobb-Douglas production function, the "Solow model," as it is called, implies that there is a trade-off between the two at stability—the balanced growth path. Further, per capita growth is only achieved when an exogenous technology parameter, A, is applied. Technology, in this sense, has a rather abstract interpretation, which, loosely, might be considered a measure of gross productivity. We do not argue for the correctness of this model, only for its ubiquity. In fact, Fukuyama states that such models "are severely reductionist and are of questionable value in explaining how growth actually happens in developing countries." (Fukuyama 2011).

In the first section of this chapter, we will discuss some of the large-scale financial economic characteristics of Eastern European economies. We will then attempt to describe what they might mean for these economies on a local scale. Because this region has undergone radical change in recent years, it is difficult to get meaningful data in all cases. Thus, some of our arguments will be based on comparisons with Western European econo-

mies and with the USA. The basis for this is that from an ethnographic, demographic, and climatological point of view, the regions are similar. It is not as if we were comparing, for example, Belgium with Myanmar. Rather we are comparing Poland with Germany, rather similar areas with respect to their noneconomic macroscopic properties. We will then undertake a discussion of wage-shares, which we believe are tightly correlated to the local economy, at least how it is perceived by citizens.

The wage-share, loosely defined, is the percentage of Gross Domestic product (GDP) that may be thought of as income to workers. Obviously, many variations are possible, for example, the ratio of the real wage to labor productivity (Flaschel et al. 1998). However delineated, dynamically, it is roughly a measure of how the benefits of growth are shared with workers. This is of particular interest given the current situation with respect to globalization and to certain structural and institutional changes (which we will discuss next) (Arpaia and Pichelmann 2008). Not surprisingly, one might expect to see some cyclicality in this metric. Specifically, we would expect values which move inversely with the business cycle (Goodwin 1967).

Recent decades have seen radical changes in the technology parameter, but these changes are of several types and we believe some discussion of this is important in understanding the import of wage-share measures. We define four broad subdivisions: industrial/manufacturing processes, shipping/logistics, finance, and political synergies, for example, Eurozone. These broad interpretations of "technology" are particularly relevant to Eastern Europe because, particularly in the case of the financial and the political, they frame the discussion. To wit, EU membership or lack of, together with its attendant requirements for aspirants, is frequently parameterized in financial/economic terms.

10.2 Macroeconomic Indicators

We first present some of the macroeconomic indicators reflecting the economic performance and development of Eastern European countries. These include GDP, Inflation, Trade (export and import), and Exchange rate data. An extended discussion may be found in Gevorkyan (2011).

At the beginning of the 1990s, most Eastern European countries underwent volatile economic growth. Some were newly founded independent countries first experiencing official vulnerability to market-economy forces and exposure to the world economy at large. Although the new challenges were daunting, for the most part, all these countries' growth

picked up and, since the end of the 1990s, these have continued to grow. Similar to the rest of the world, this region was hit by the recent financial crisis of 2008, but recovery has been observed in most countries. We collected macroeconomic data from the World Bank (2015) and they are illustrated in the preceding and in Figs. 10.1 and 10.2.

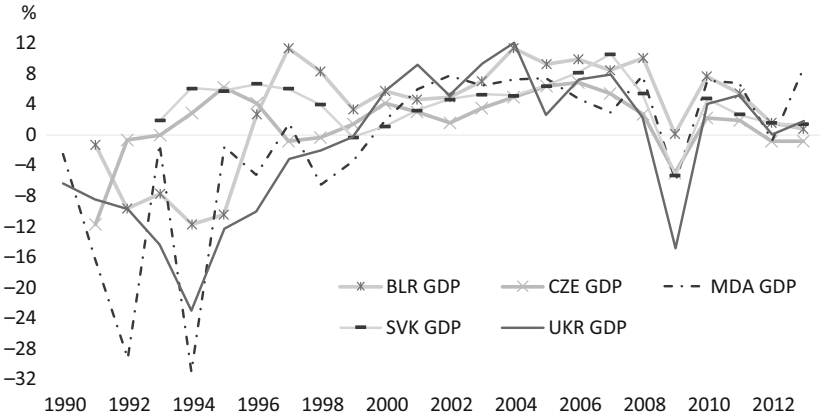

Fig. 10.1 GDP Growth Rate for Group 1 (Annual). *Source*: Created using data from The World Bank

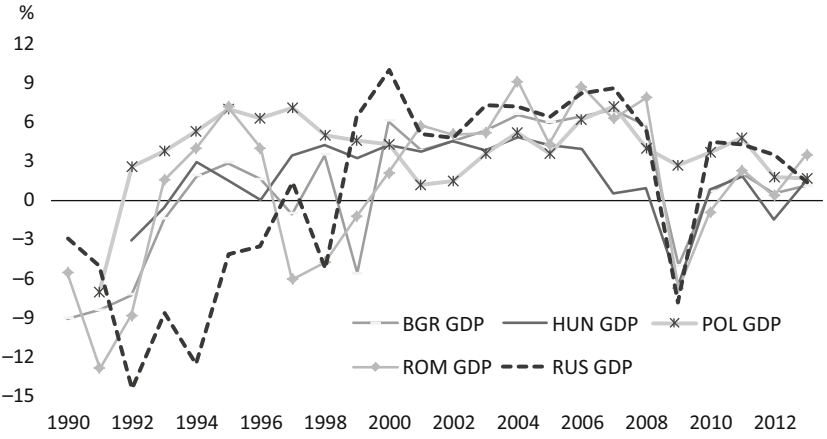

Fig. 10.2 GDP Growth Rate for Group 2 (Annual). *Source*: Created using data from The World Bank

GDP growth for the following countries is presented: Bulgaria (BGR), Poland (POL), Russia (RUS), Hungary (HUN), Romania (ROM), Belarus (BLR), Moldova (MDA), Ukraine (UKR), Czech Republic (CZE), and Slovakia (SVK). These form our representative set for the Eastern European economic region. Note that we are not segregating those with tight EU relationships from those without, because we are deliberately looking at the region holistically for now. The choice of countries was partly determined by where reliable data could be found and partly based on the representative nature of each country for its subregion (in some cases, e.g., Poland, a region of only one country). As we can see, they all follow a similar overall path, particularly in recent years. Owing to the fractured nature of the processes leading to their entering Western-style economic activity, the earlier data are more dissonant.

Quality of life is a direction we want to head in and, for that, per capita GDP is an important measure. Since the early 1990s, all the countries examined had per capita GDP of less than $5000, but this has increased for all significantly, especially since the early 2000s. The Czech Republic has the highest GDP per person (almost $20,000) in 2014, whereas Moldova has the lowest (see Fig. 10.3).

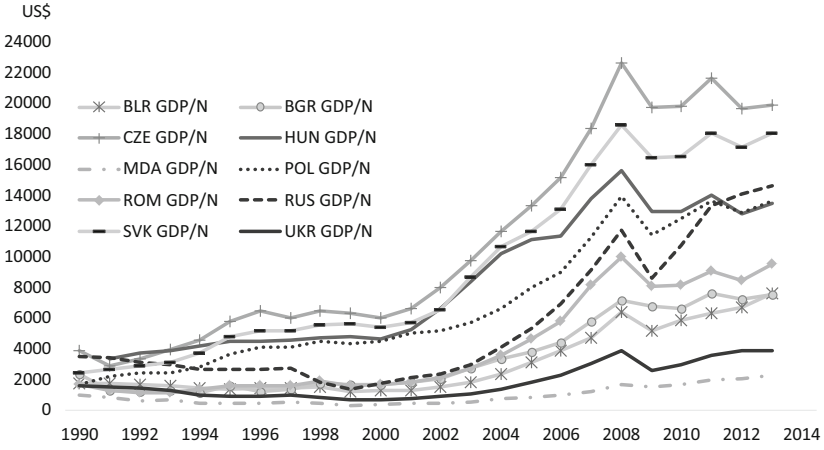

Fig. 10.3 GDP per capita, current USD. *Source*: Created using data from The World Bank

Clearly, inflation is highly important, not only from a perspective of livability, but in terms of exchange rates (Fig. 10.4).

Most Eastern European countries have a current account surplus and its share in GDP has shown an increasing trend. During the financial crisis (2007–2008), all countries were hit, as their economies depend on external demand. Thus, the sharp decline in exports led to current account deficits during the crisis. But recovery from the crisis is shown in the improvement of the current account in recent years (see Fig. 10.5). Please note that the "current account" consists of net exports of goods and services, net primary income, and net secondary income. More discussion regarding what makes for "net exporters" and "net importers" can be found in Gevorkyan 2011.

As we have mentioned, these countries are dependent on trade, thus they are very sensitive to exchange rates. However, the volatility can be misleading as it is mostly volatile with respect to the USD; in fact, for most countries, the local currency has been depreciating against the USD (or USD is appreciating against the local currency [LCU]). This makes their imports more costly; LCU is converted to pay for the imported goods. An official exchange rate, as determined by national authorities, (average) as LCU per US$ is shown in Fig. 10.6.

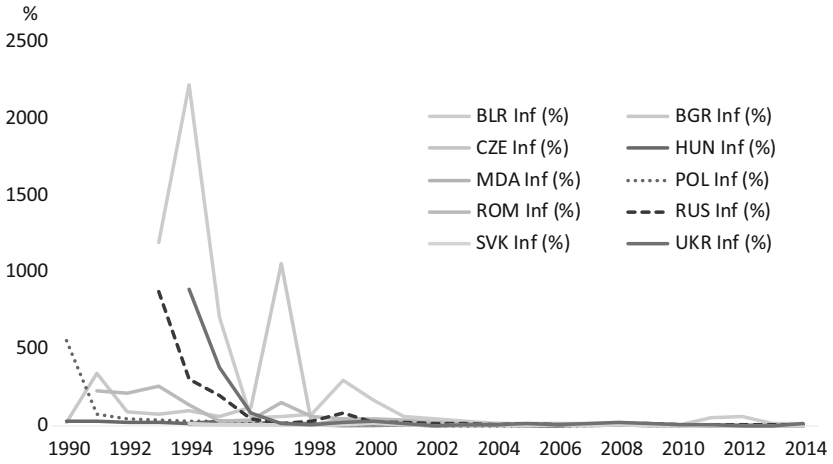

Fig. 10.4 Inflation. *Source*: Created using data from The World Bank

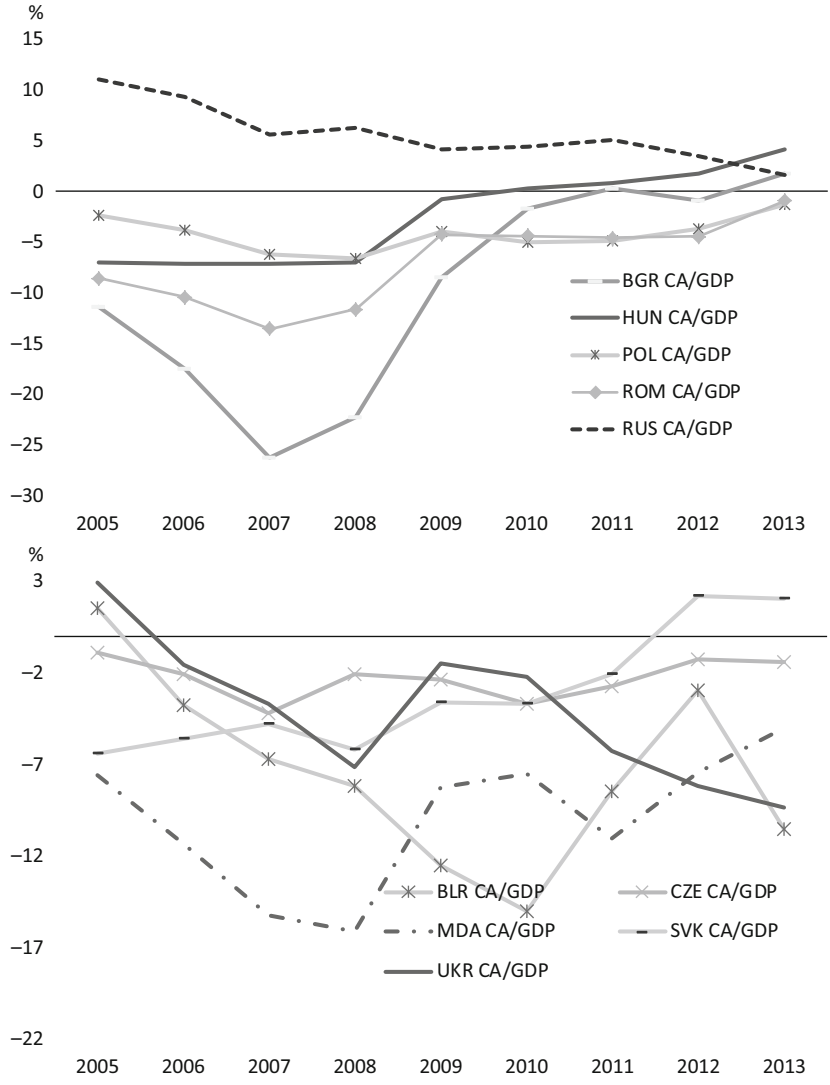

Fig. 10.5 Current Account in GDP (%). *Source*: Created using data from The World Bank

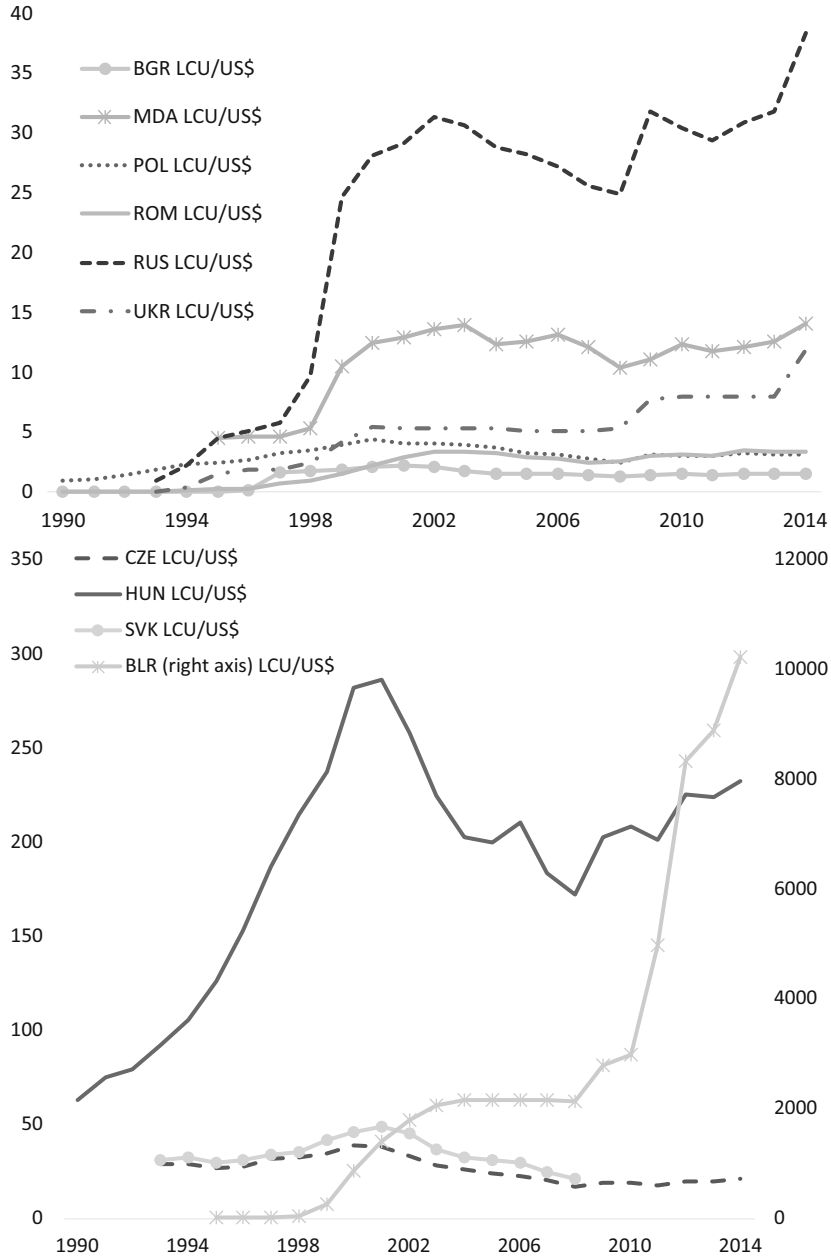

Fig. 10.6 Official Exchange Rate, LCU per USD. *Source*: Created using data from The World Bank

When these countries opened up to the world economy, many workers left the country to work abroad, seeking higher salaries in Europe and Russia. These countries then received large sums of remittances from their workers abroad. This is one of the major income sources for households and contributes to the current account and GDP growth. Moldova is an exceptional case where the received personal remittances reached 35 % of GDP in 2006. There was a temporary decline in these remittances during the period of the crisis, but the trend is picking up (see Fig. 10.7). According to the World Bank (2015), personal remittances include all the current transfers received by resident households from nonresident households (see Gevorkyan and Gevorkyan (2012) for additional details on remittances and labor migration patterns in the region).

From these data, we can conclude the following very general things: all the ingredients for growth are present. Quality of life, it would be assumed, should follow. Yet, these are macro data and do not necessarily reveal how citizens perceive these changes. As we have experienced in the West, inequality can underlie very impressive macroeconomic data.

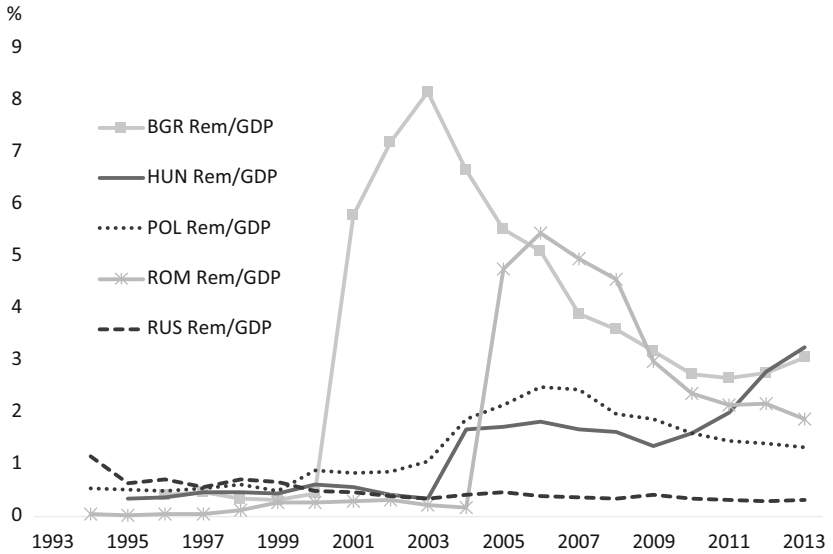

Fig. 10.7 Personal Remittances, Received (% of GDP). *Source*: Created using data from The World Bank

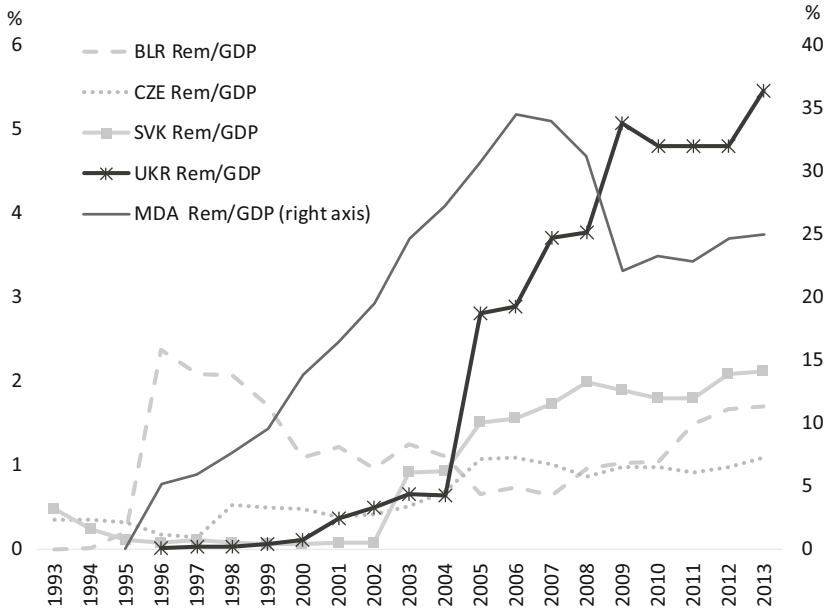

Fig. 10.7 Continued

10.2.1 International Financial Flows

According to the Balance of Payments Manual, foreign direct investment (FDI) is defined as "the net inflow of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor." We present net inflows (new investment inflows less disinvestment) in Eastern European economies from foreign investors in Fig. 10.8. For most countries, FDI inflows have increased following the opening of their economies in the early 1990s. However, during the crisis period FDI inflows have declined, but regenerated as the economy recovered.

Portfolio investment, as shown in Fig. 10.9, includes transactions in equity and debt securities. The size of the portfolio investment flows are relatively low compared to other developing economies, except for Russia. We also observe significant fluctuations in the trends, which can reflect the less developed equity and capital markets in some of these countries.

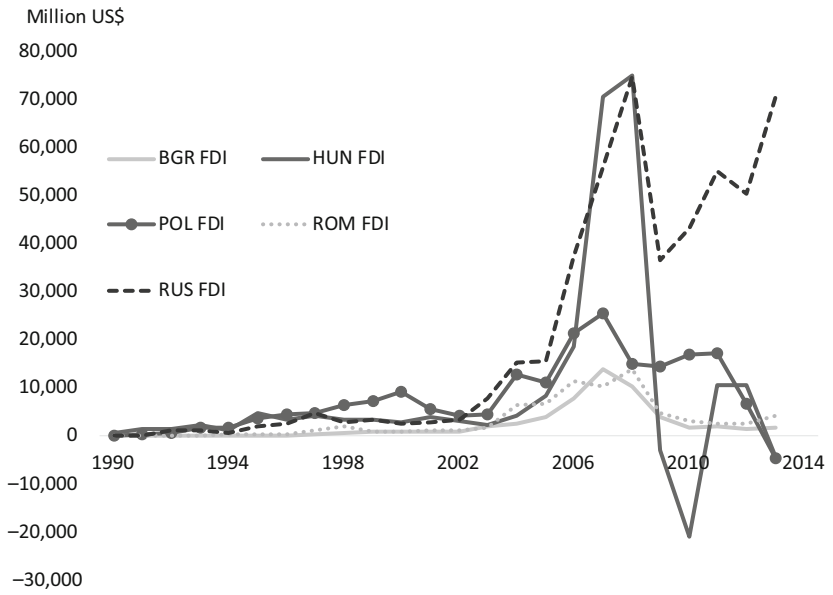

Fig. 10.8 Foreign Direct Investment (Net Inflows, mln USD). *Source*: Created using data from The World Bank

The net financial account is shown in Fig. 10.10, reflecting net acquisition and disposal of financial assets and liabilities. We can observe the residents in these countries finance the net lending to (or borrowing from) nonresidents. For some countries, these financial account flows are very volatile. For example, Russia, Poland, Belarus, Czech Republic, Slovak Republic, and Ukraine all have shown great fluctuations in their financial flows, increasing and suddenly declining in the following period. These trends indicate instability in the external financing of the economy and how these transactions can affect the economy; they thus make the economy very vulnerable, especially during crisis periods.

For the case of Eastern Europe, we have undertaken to compare these countries with their Western counterparts on a different level. We introduce this idea in the next section.

These Eastern European countries borrow extensively from abroad to finance their large consumption of foreign goods and services. As shown in Fig. 10.11, external debt stock as percentage of Gross National Income

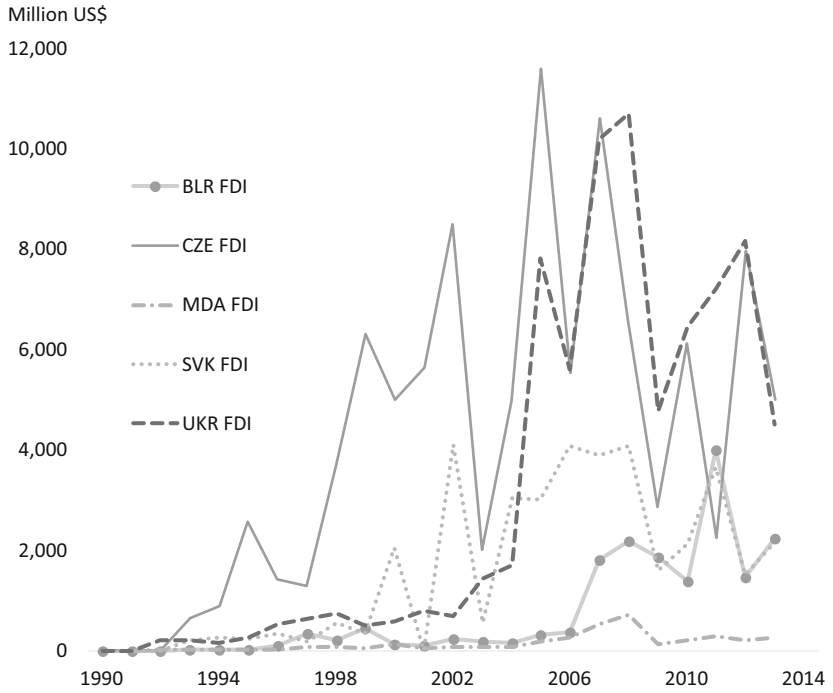

Fig. 10.8 Continued

(GNI) has increased significantly for most countries since the early 1990s. Note that, according to the World Bank (2015), external debt includes "debt owed to nonresidents repayable in currency, goods, or services. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt." For some countries such as Hungary, this ratio has reached an alarmingly high percentage, for example, above 170% for Hungary, above 100% in Bulgaria, and almost 80% for other countries, in recent years. As shown in Nyambuu and Bernard (2015), these surging ratios of the external debt can make a country very vulnerable to any kind of shock and may cause the country to default on its debt. The World Bank (2015) defines GNI as "the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad."

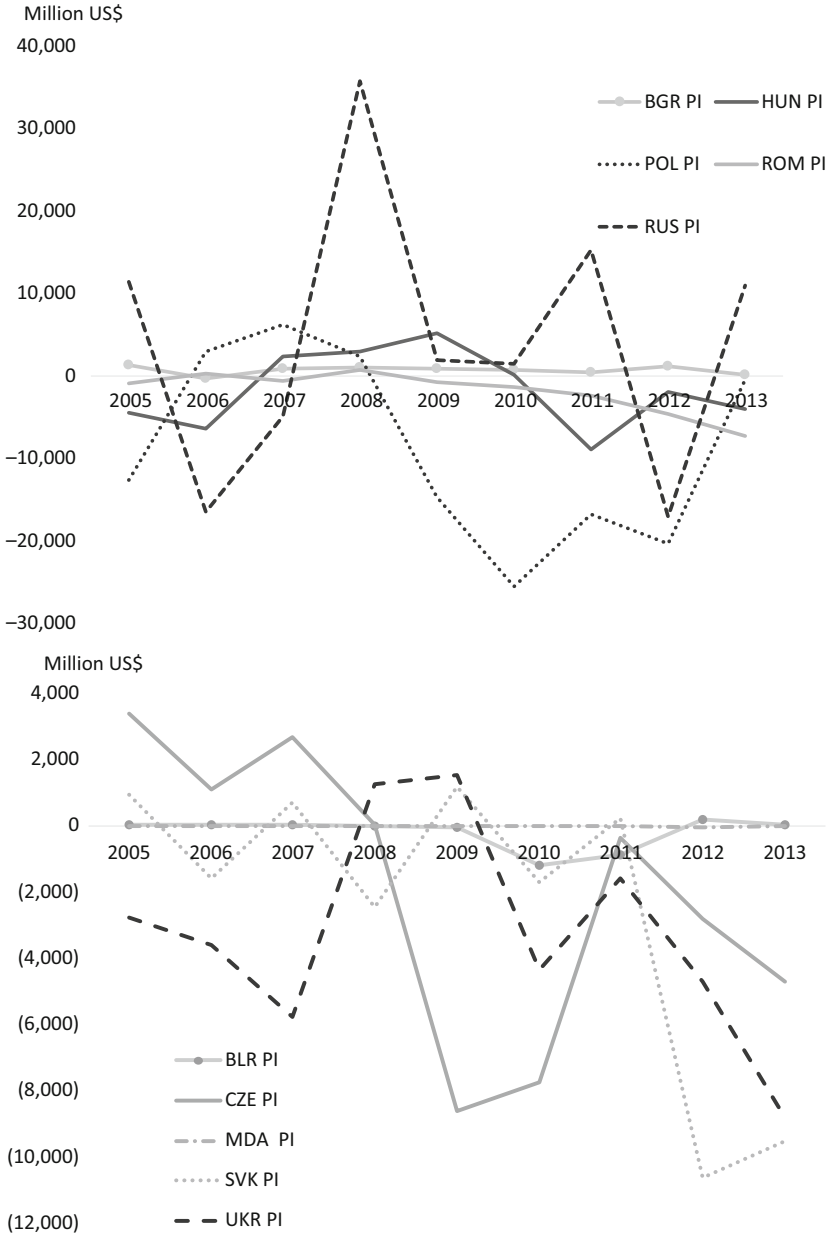

Fig. 10.9 Portfolio Investment (Net mln USD). *Source*: Created using data from The World Bank

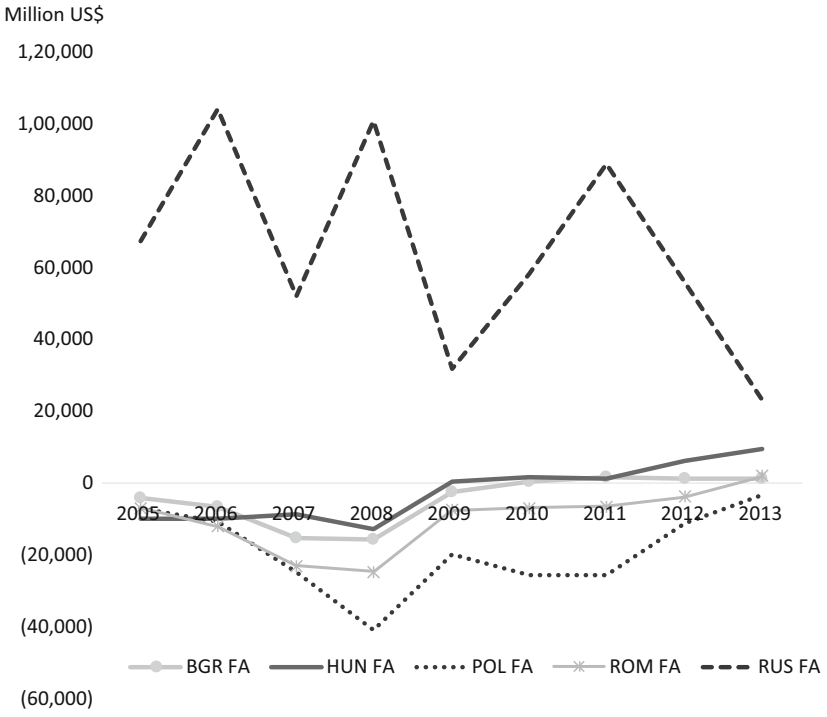

Fig. 10.10 Financial Account (Net mln USD). *Source*: Created using data from The World Bank

10.3 Technological Trends and Financial Pricing Models

To return to our investigation of Tom Palmer's query about whether there is something special going on in Eastern Europe that the West can learn from, we begin with a little historical background. We outline the four "technological" trends we alluded to in the Introduction and show how they are interrelated. We then discuss the issue of wage-share, that is, that portion of GDP that accrues to workers. This is important because, in the extreme, a highly productive economy with almost no inflation and high per capita GDP is possible and consistent with workers earning almost no wages. We are interested in seeing the extent to which the good macroeconomic numbers we have outlined actually benefit (or not) the Eastern European worker.

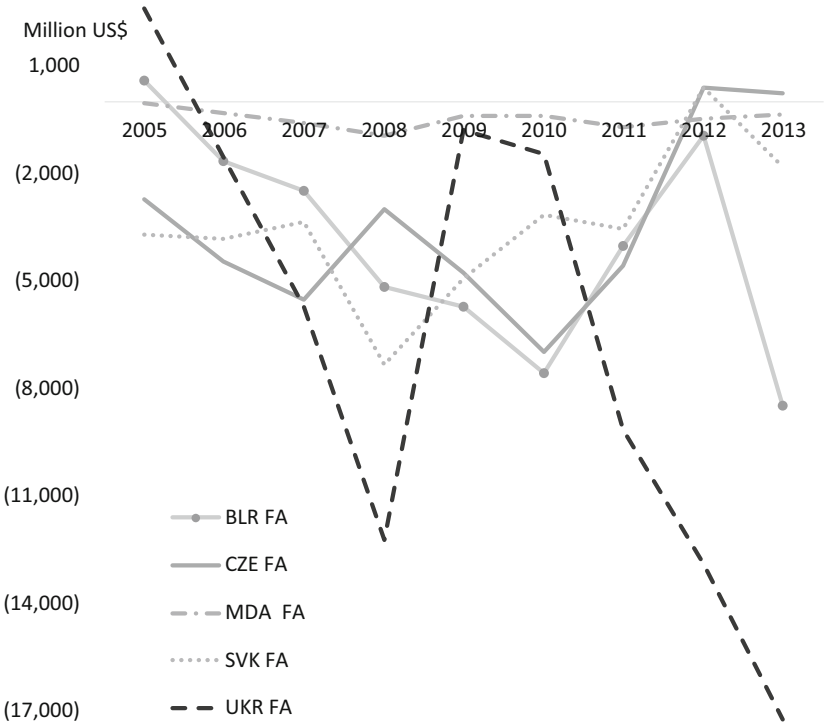

Fig. 10.10 Continued

First, we must discuss the mechanics of "technology," as outlined previously. Consider the first category's quintessential case: the transistor. Although the transistor has been around for a while, electronic/solid-state revolution of the 1980s really laid the groundwork for much of the technological improvements of the more recent decades (Netravali 1997). We can see, from the following graph (Fig. 10.12), how a 100-fold decrease in costs combined with a 20-fold decrease in size. Further, processing capability of the smaller and cheaper hardware improved 100,000 times!

For the second case, consider that in the 1950s, 60–75% of the cost of shipping was made up of portside costs, and about 37% of total costs (Levinson 2006). Modern computer (transistor)-based logistics systems, utilizing the shipping container, have created a situation where it is now profitable to export waste paper from the USA—almost $8 billion per year (US Statistical Abstract 2010).

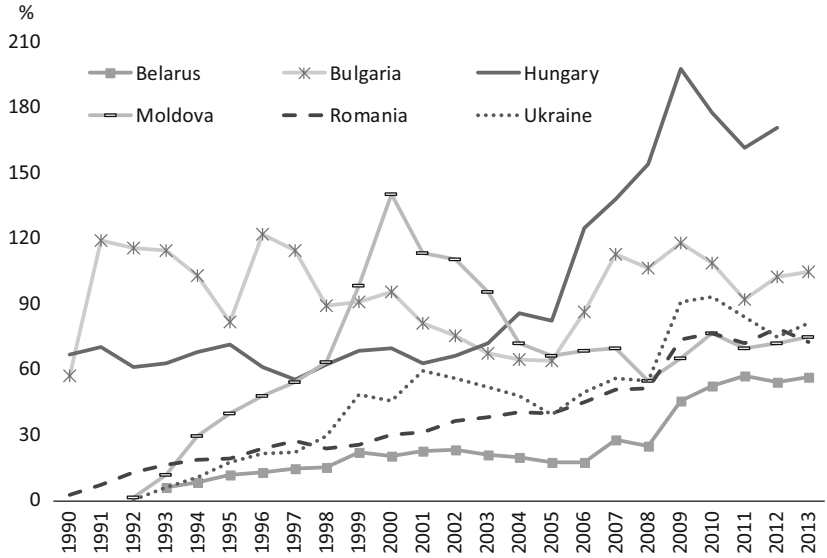

Fig. 10.11 External Debt (% of GNI). *Source*: Created using data from The World Bank

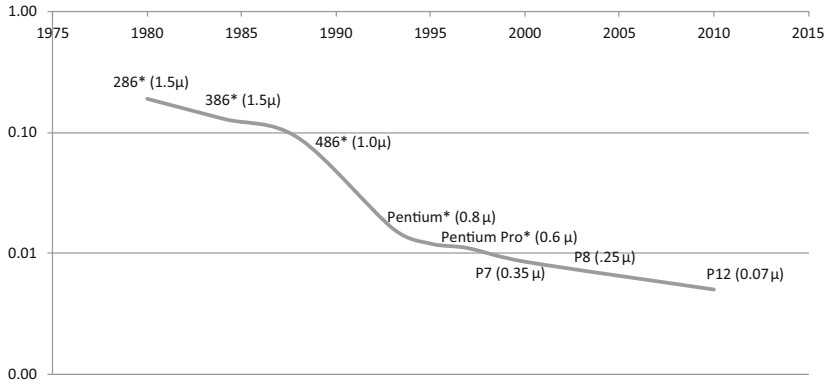

Fig. 10.12 Transistor Cost (Cents)—Logarithmic Scale. Transistor Cost (cents)—logarithmic scale. *Pentium, 286, 386, and 486 are registered trademarks of Intel Corporation. *Source*: Created using the data from Kurzweil (2005, 62)

The computer/Internet revolution allowed for the synergy of microprocessor technology, on the one hand, with manufacturing/shipping, on the other. But not only did this marriage of hardware and software result in increases in productivity in manufacturing and shipping, it also allowed for the creation of the information industry, for example, Bloomberg and Reuters. A new synergy, the availability of real-time information and high-speed computation, allowed for the growth of new financial products.

For our financial category, although the Black–Scholes pricing model for equity options dates from the 1970s (Black and Scholes 1973), it was not until the advent of high-speed computers, linked to real-time information networks, that structured financial products, for example, forward-flow securitizations, became a reality. Forward-flow securitizations, which are structured financial products that use future incomes as collateral for loans, are a good example because they involve all of the global synergies we are discussing (Bernard et al. 2012).

The following chart (Fig. 10.13) illustrates the growth of the collateralized default obligation (CDO) industry from 2000 to 2014 using data from The Securities Industry and Financial Markets Association.

Lastly, the past several decades have witnessed the creation of the North American Free Trade Agreement (NAFTA), a trilateral trade bloc in North America, the European Union (EU), an economic and political

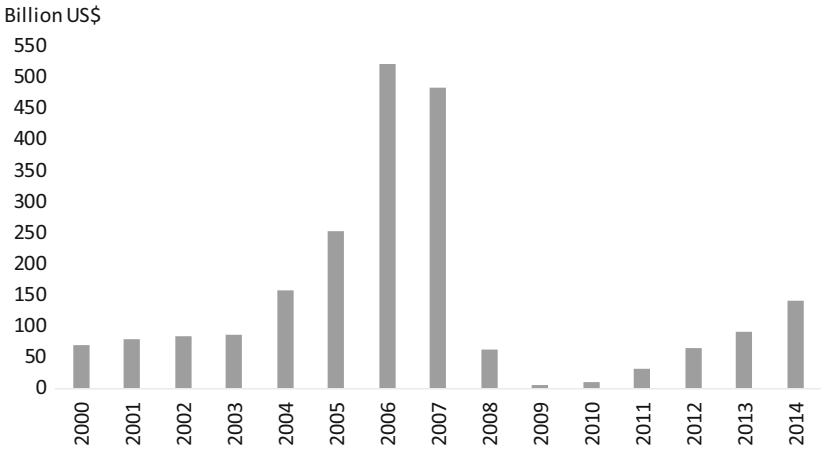

Fig. 10.13 Global CDO Issuance (Bln USD). *Source*: Created using data from the Securities Industry and Financial Markets Association

confederation of 28 European nations, and the Euro, the official currency of 19 of the 28 EU members.

The combination of all we have described, along with other similar trends and institutions, constitute "Globalization," clearly the single largest increase to Solow's famous "*A*" ever. The question is: Has this boost to global productivity impacted Eastern Europe and has this growth factor actually resulted in any improvement to the economic conditions of the average Eastern European citizen? In particular, has it manifested itself differently in Eastern Europe than in the West? Note: we are not discussing the obvious benefits of medical technology and suchlike. Rather, we are wondering if the technological improvements in manufacturing are simply allowing for more of a skill-based labor force (constancy in the wage-share) or if some percentage of the productivity-based gains is being diverted out of the so-called real economy. We live in a time of increasing unemployment, massive issues surrounding debt, both private and sovereign, and inequality. The wage-share is a relevant metric and the question is important. On the other hand, wage-share is, at best, a "complex" measure. Perhaps the correct approach, as suggested by Arpaia and Pichelmann (2008), is hinted at by Solow himself in the title of his famous article: "A Skeptical Note on the Constancy of Relative Shares" (Solow 1958).

10.4 Wage-Share: Definition and Measurement

How national income is distributed plays a fundamental role in determining income inequality. Wage-share, which represents the portion of national income accruing to workers, is integral to the analysis of economic inequality (Glyn 2009). The reversal of trends in wage-share, which shifted from a rising trend to a generally declining trend over the past few decades, seems to have partially led to a rise in personal income inequality. Possible explanations of this long-term decline in labors share can be related to factors that have weakened the bargaining position of labor, such as technological change, globalization and deregulation of capital, labor, and capital markets. Two of the authors have undertaken a more technical analysis of wage-share trends in another paper (Nyambuu et al. 2012). There, we consider the econometric aspects of the data analysis. In this chapter, we concentrate on the stylized facts and implications for growth and policy in Eastern European economies as they interact with world markets and global competition.

In this chapter, we use annual aggregate wage-shares for our chosen countries, from 1970 to 2007. Note that there are not always data available for all countries; we have used what we could find and what we trust. Some of the wage-shares are calculated by using the EU KLEMS database by taking the ratio of compensation of employees (in millions of Euros) to gross value added (GVA) at current basic prices (in millions of Euros) for total industries. We also consider a number of individual sectors.

Obviously, there are many technical issues related to the measurement of wage-share, as discussed in our working paper. Theoretically, wage-share can be simply found as the ratio of income from employment to total income. In an actual calculation, however, a couple of measurement problems arise that can have a significant influence on the empirical findings. The most common approach is to estimate labor's share from the ratio of employee compensation in GDP as in Gollin (2002) and to determine profit as the residual. The advantage of this approach is that both numerator and denominator are usually readily available for many countries from national account data sets. Such a pragmatic calculation does entail several problems regarding the adequacy of the measured variables. For example, the residual, as suggested above, would not only contain corporate profits, but also include rental income, net interest income, proprietors' income, indirect taxes less subsidies, and depreciation.

In order to have wage-shares for sectors or industries one often uses GVA, which differs from GDP by excluding taxes and subsidies on products. As GDP, GVA can be valued at basic prices, at producer prices, and at factor costs. GVA at basic prices is defined as output valued at basic prices less intermediate consumption valued at purchasers' prices. GVA at producers' prices is defined as output valued at producers' prices less intermediate consumption valued at purchasers' prices. GVA at factor cost can be derived from either of the measures of GVA, as described above, by subtracting the value of any taxes on production, less subsidies on production, payable out of gross value (UN 2009).

Another possible denominator would be to use a country's net domestic product (NDP) to account for depreciation. Furthermore, the treatment of self-employed (proprietor's) income poses a problem. Self-employed income is not accounted for as employee compensation (labor) even though parts of this income may be considered a return on labor. Thus, no adjustment of the data for self-employed income would lead to constant underestimation of the wage-share.

It is clear that wage-share is, at best, a problematic and crude metric. Nonetheless, it is interesting to see what sort of patterns may turn up in the data. This is particularly true because of the amount of discussion which has been focused on wage-share, explicitly and implicitly, over many years.

10.5 Wage-Share: Empirical Results and Preliminary Interpretation

In his classic work, *The End of Work* (Rifkin 1995), Jeremy Rifkin outlined the history of the impact of "mechanization" on the workplace, from the protests of the nineteenth-century Luddites to the dawn of the Internet age. However, perhaps the most classical starting point for a technical analysis is with the Goodwin growth cycle theory (Goodwin 1967) that postulates an interaction of employment and wage-share. It looked like a business cycle model when it was first proposed but, in fact, empirically it seems to operate also on a medium time scale (Semmler 1986).

Goodwin postulated cycles driven by growth and income distribution. Low growth, generated by low profits and investment, generates unemployment, which in turn limits wage growth as compared to productivity. This gives rise to lowering the wage-share: low wage-share means high profit-share and slowly rising investment, which reaches a turning point as employment and wage growth make the wage-share rise and the profit-share fall. By utilizing nonlinear differential equations, originally developed by Lotka and Volterra for models of interacting populations, we can rewrite the Goodwin model of wage–employment dynamics as follows:

$$\dot{x} = P(x,y) = (a - by)x \tag{10.1}$$

$$\dot{y} = Q(x,y) = (cx - d)y \tag{10.2}$$

or as

$$\frac{\dot{x}}{x} = a - by \tag{10.3}$$

$$\frac{\dot{y}}{y} = cx - d \tag{10.4}$$

where $\dot{x}$ represents the time rate of change of the ratio of the employed to the total labor force and $\dot{y}$ is the change of the wage-share. Both variables depend on the level of x and the constants $a, b, c, d > 0$. The coefficient a denotes the trend of employment if all income is reinvested $(y = 0)$ and d is the fall in real wage if $(x = 0)$. The symbol by denotes the influence of the wage-share on the employment ratio, and cx the positive influence of employment on the wage-share. Due to this interaction of the variables, the employment ratio is prevented from rising and the wage-share from falling without limits.

For a growth model with trends as represented by Goodwin, the coefficients can be interpreted as follows: $a = b - (m + n)$, where b is the output/capital ratio (Y/K), m is the growth rate of productivity, and n is the growth rate of the labor force. All of those are taken as constants. Assuming a linearized wage function (for instance, $\frac{\dot{w}}{w} = -c + cx$) and with m the growth rate of productivity as before, we obtain for the growth rate of the wage-share the term $\frac{\dot{y}}{y} = \frac{\dot{w}}{w} - m$, with $d = e + m$. Thus, the second pair of differential equations can be written as:

$$\frac{\dot{x}}{x} = b(1 - y) - (m + n) \tag{10.5}$$

$$\frac{\dot{y}}{y} = cx - (c + m) \tag{10.6}$$

which is, indeed, equivalent to the first equation of the (above) system, except that it is written in terms of growth rates. The core of the last system shows that the change of the employment ratio depends on the profit-share ($1-y$) and that the change of the wage-share depends on the employment ratio. The basic structure of this model represents the interacting variables of the employment ratio and wage-share as dynamically connected.

Typically, for a Lotka–Voltera system as described, one would derive a cyclical phase diagram. Yet, for our data, we see wildly different results. In plots of our data with number of employees on the x-axis and wage-share on the y-axis, we found no meaningful cycles or any other discernable patterns. At first, this looks like pure chaos, but this is only because we have not analyzed the data more carefully. It is often a mistake to think that

only one process is at work when, in fact, there may be many. Clearly, a simple business cycle model is not the full explanation here.

We considered a sector-based analysis of our data. Wage-share, one would expect, should be sensitive to different industries. For example, as the time span of our data set extends from the 1970s through the present, we would expect the wage-shares in the agricultural sector to look quite different from the computer-related sector. Similarly, automotive manufacturing should be characterized, one might expect, as distinct from the legal sector. As the bulk of the technological changes in agriculture would seem to have occurred decades before our data set, one might not expect the same sorts of changes as in the highly robot-based automotive sector. Yet this sort of reasoning is a bit simplistic. Unfortunately, sector-based data was not readily available for Eastern Europe, although they do exist for the West. Further, although the business-cycle-based representation was fairly chaotic, the sector-based approach also yields much confusion. We see no cross-country patterns.

10.6 Wage-Share: A Broader Basis for Analysis

As we have mentioned earlier, the processes that give rise to changes in wage-share are more complex than either the business-cycle model of Goodwin (or similar) or a simple response to changes in technological aspects of manufacturing, among others. While both of these are clearly factors, even if not obviously shown in the data, one needs to take a broader perspective as regards "technology" and the "categories" by which to attempt to organize our data.

- First of all, the sector divisions are highly changeable. What was meant by "computer" in 1975 is hardly the same thing as what we mean by this term today. The same may be said for the other sectors we have chosen, indeed for any sectors.
- Second, the country-specific data are a rather archaic category in the context of global manufacturing and particularly for the Eastern European countries, where nationhood itself has been a rather fluid concept in recent years. Even in the West, there is much ambiguity. Consider, for example, a company such as British Petroleum, whose headquarters are in London, yet whose majority stockholders are American, whose operations span the globe, and whose employees

may be largely from other countries. In what sense should its "numbers" accrue to any particular country's national accounting system?

- Third, in addition to the technological factors of industrial/manufacturing processes, globalization has had profound impacts on shipping/logistics and finance. Further, political reorganizations such as EU/Euro and NAFTA synergistically interact with each other, resulting in efficiencies that are not easy to classify according to nationality and/or sector.

Thus, it is the net combination of all these factors, taken together; in a word: productivity. We consider worker productivity as the best aggregate measure and study possible relationships between worker productivity and wage-share. In the first set of graphs we look at general trends in worker productivity.

We will first consider a group of Western countries and then compare with the Eastern European countries. From Fig. 10.14, we can see that

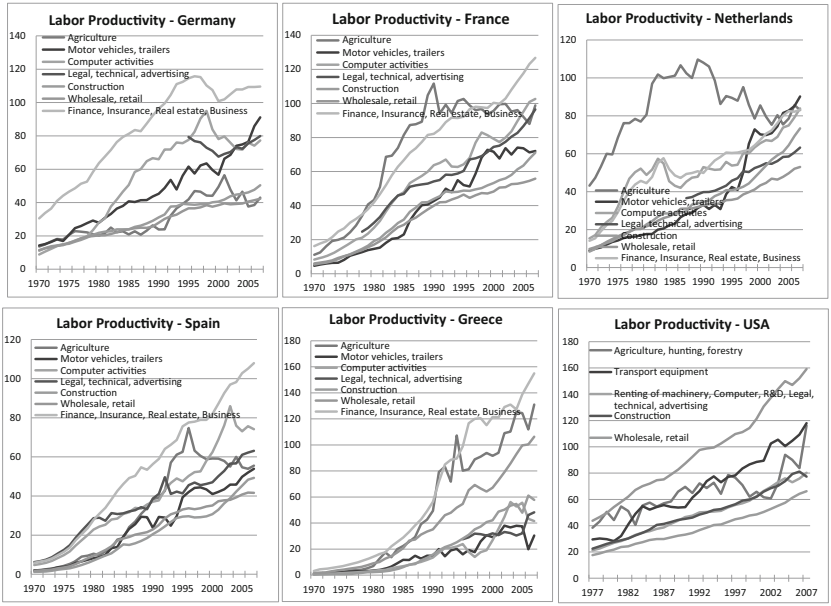

Fig. 10.14 Labor Productivity by Sectors. *Source*: Created using data from The EU KLEMS

worker productivity is generally increasing over the past several decades. This is no surprise for the reasons stated earlier.

Recalling the example of the structured financial product from the introductory section, it is the marriage of not only the Internet with the PC, but also the result of new markets that were only able to develop in that context. Further, it critically depends upon international trade agreements, shipping and logistical issues, among others. In the case of standardized financial products, for example, a mortgage-backed security, an entire industry can develop out of the product. But what has this to do with productivity? A single manager in a large agricultural company, for example, the Cargill Corporation, can "move" millions of tons of product that would have required a small army in earlier decades. It is efficiencies such as these that were a large part of the driving force behind such things as NAFTA and the Euro.

In Fig. 10.15, wage share by sectors are shown for Germany, Greece, France, Netherlands, Spain, and the United States. In all these countries,

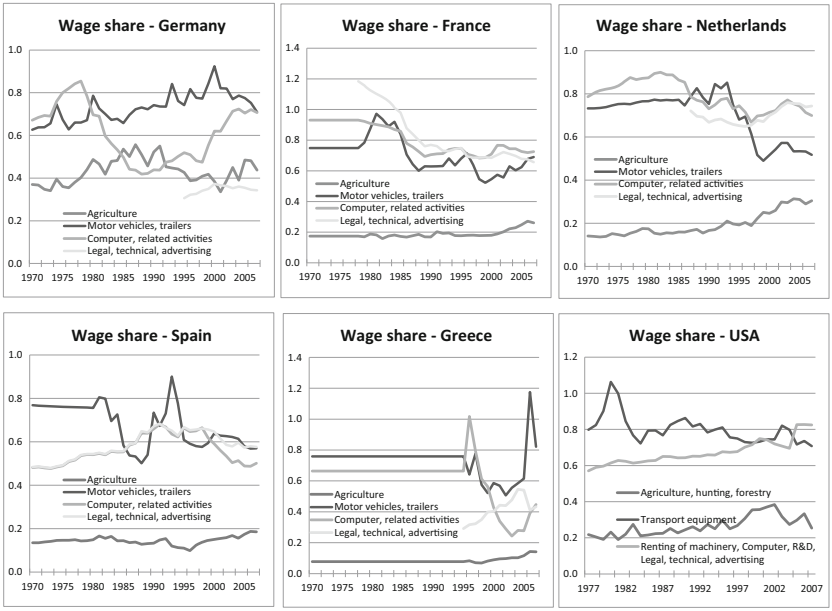

Fig. 10.15 Wage-Share by Sectors in the West. *Source*: Created using data from The EU KLEMS

the agricultural sector has a lower wage share as compared to other sectors and shows an increasing trend. Motor vehicle and transportation equipment as well as computer and related activities have relatively high wage shares in most countries. But there is a dark side to these synergies. Consider shipping in pre-container times: longshoremen, longshoremen's unions, stevedores, among others. All of this has been replaced with a few robotic cranes. A single man can unload an entire freighter in a few hours. Computers control the order of the arriving trucks so that they arrive just at the moment that "their" container is being unloaded, among others.

We now turn our attention to the connection between aggregate wage-share and productivity. In these graphs, we plot aggregate wage-share against worker productivity per worker (Fig. 10.16).

In all cases, with the exception of Greece, as labor productivity increases, aggregate wage-share markedly increases as well. However, above a certain threshold, there is an equally marked decrease.

"Skilled Work, Without the Worker" is the title of a recent article in *The New York Times*; it describes how "the falling costs and growing sophistication of robots have touched off a renewed debate among

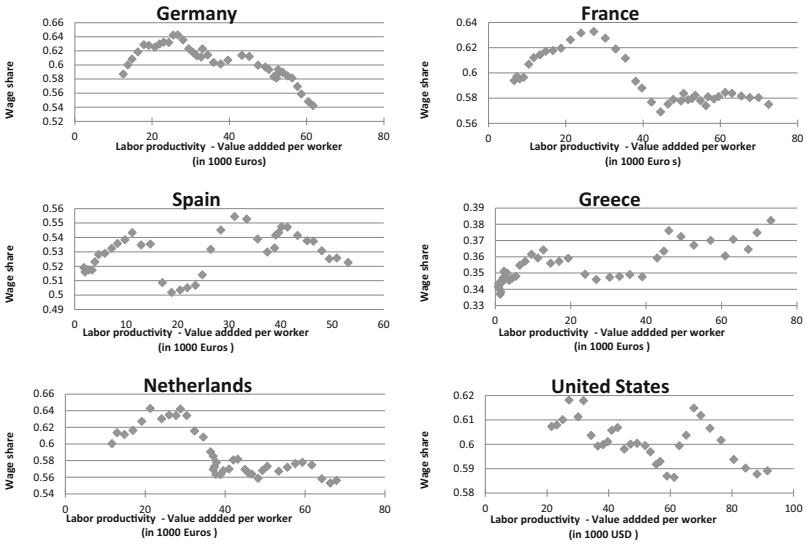

Fig. 10.16 Wage Share and Labor Productivity, per worker. *Source*: Created using data from The EU KLEMS

economists and technologists over how quickly jobs will be lost … The pace and scale of this encroachment into human skills is relatively recent and has profound economic implications … the advent of low-cost automation foretells changes on the scale of the revolution in agricultural technology over the last century, when *farming employment in the United States fell from 40 percent of the work force to about 2 percent today*. The analogy is not only to the industrialization of agriculture but also to the electrification of manufacturing in the past century" (*The New York Times* 2012).

We now return to Eastern Europe. While Western Europe seems to show, at best, a flat wage-share curve over time, Eastern Europe seems to

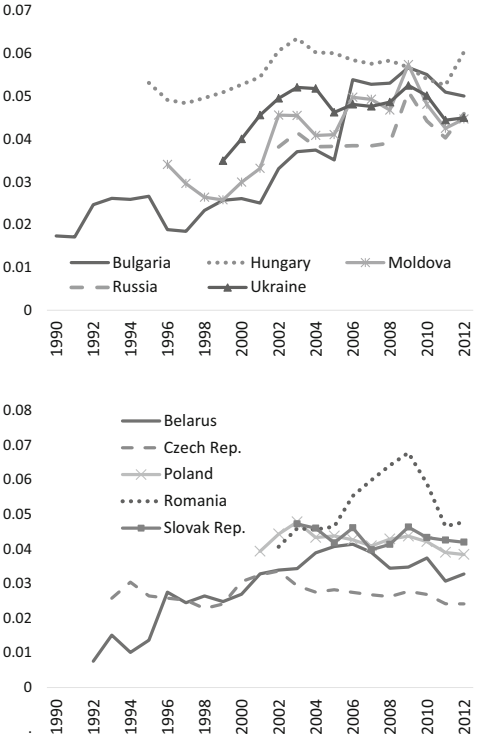

Fig. 10.17 Wage Shares for Eastern Europe. *Source*: Created using data from The World bank

have an increasing curve (Fig. 10.17). However, we think it would be a mistake to infer this. The time period includes the transition to a market-based economy and this one-time event is the more likely causal agent. Here we used World Bank (2015) database and calculated the wage-share by dividing the compensation of employee with GDP.

A more detailed description of wage-shares is possible in some cases. For certain Eastern European countries, especially EU Member States, we have more detailed data available. In these cases, we can break down wage-shares by economic sector. In Fig. 10.18, we illustrate sectoral wage-share for Hungary

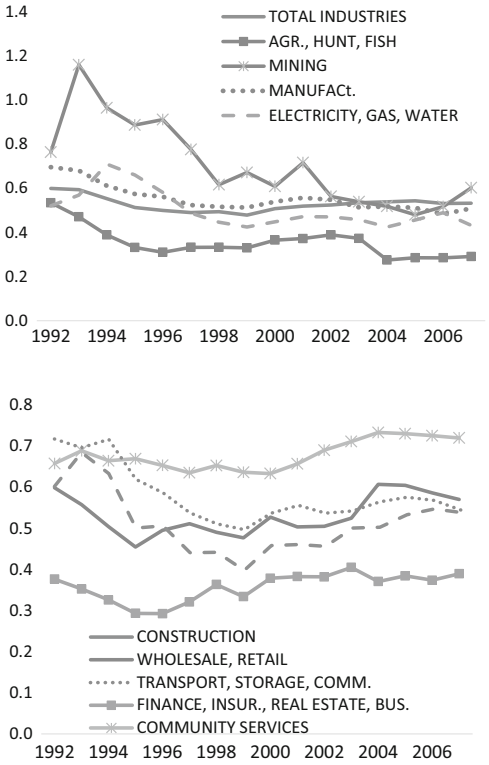

Fig. 10.18 Sectoral Wage-Share for Hungary. *Source*: Created using data from The EU KLEMS

based on EU KLEMS database and calculated by dividing the compensation of employee by the GVA (using the same methodology we adopted in non-Eastern European country analysis). Note that Hungary was chosen because we were able to obtain data for Hungary. While for some sectors wage-share is showing a declining trend as in mining and agricultural sectors, other sectors such as financial real estate and business services, construction, education services have demonstrated an increasing trend over time.

Productivity in different sectors and industries are shown for Hungary in Fig. 10.19. Similar to other countries, productivity mea-

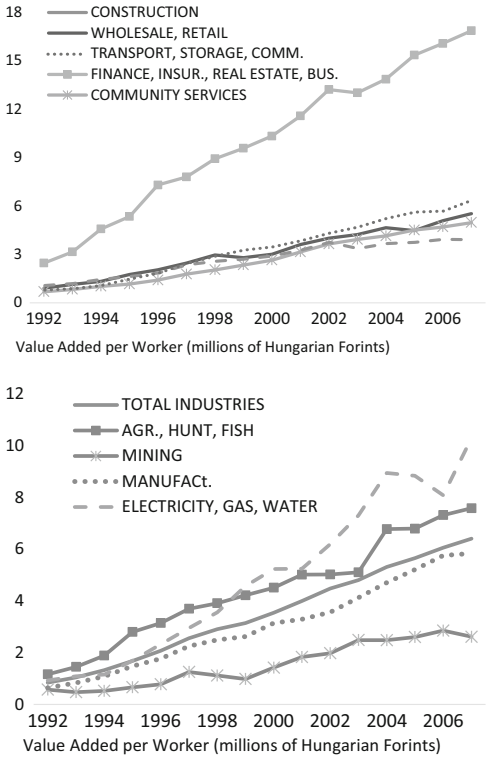

Fig. 10.19 Sectoral Productivity for Hungary. *Source*: Created using data from The EU KLEMS

sured as value added per worker, has been steadily rising for all the sectors over time.

In the next series, we have done the same plot as we did for Western European countries: wage-share as a function of productivity. In these figures, wage-share is calculated based on data obtained from the World Bank (2015) measured as compensation of employee as share of GDP. Labor

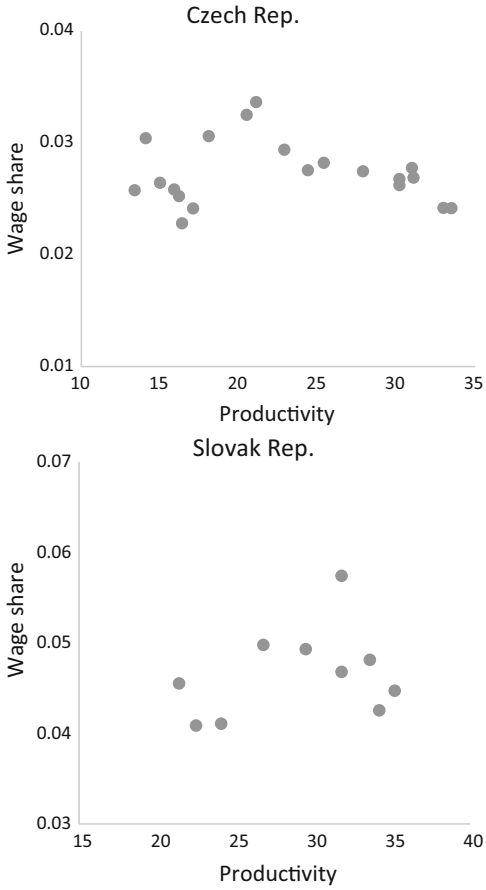

Fig. 10.20 Wage-Share and Productivity in Eastern Europe. Created using data from OECD

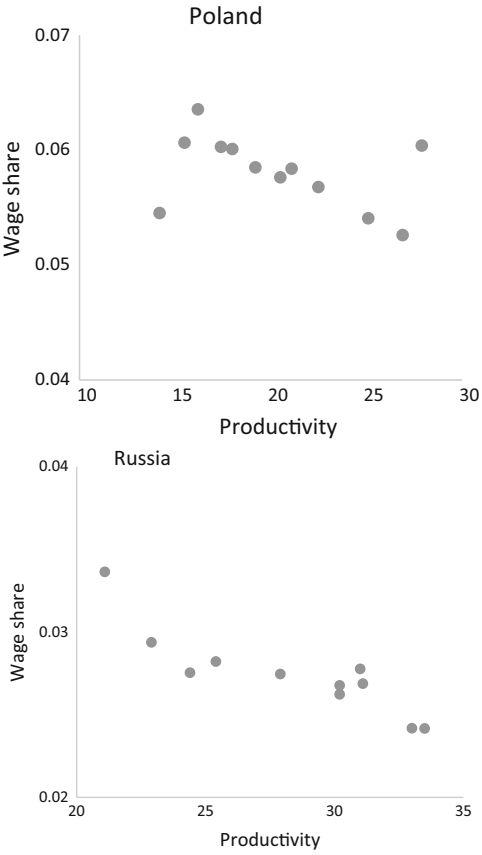

Fig. 10.20 Continued

productivity is from the OECD database measured as GDP per hour worked (Fig. 10.20).

Labor productivity and wage-share are plotted in Fig. 10.21 for different sectors in Hungary. It shows on average a decreasing trend. Here, we again used the EU KLEMS database and the methodology described for the analysis of non-Eastern European countries.

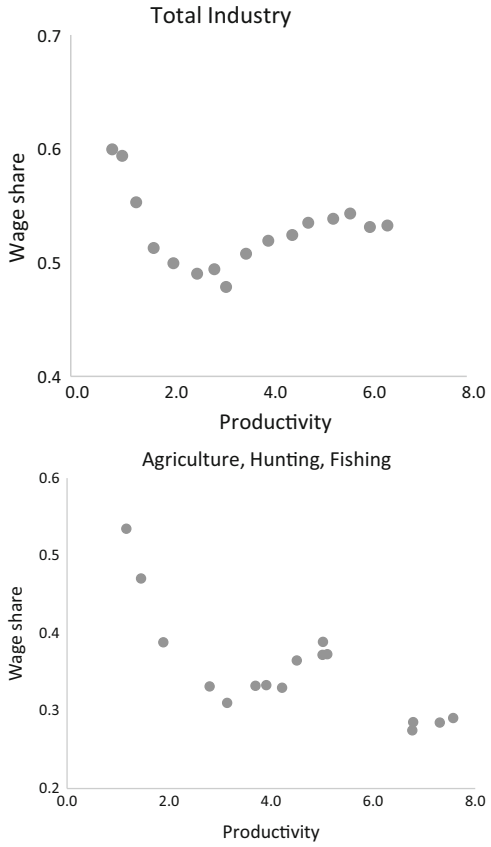

Fig. 10.21 Sectoral Wage Share and Productivity for Hungary. *Source*: Created using data from The EU KLEMS

10.7 Conclusion

Our conclusion is that the better organized the economy is, regardless if it is in Eastern or Western Europe, and the better data we have, wage-share falls with increasing productivity. The decline in wage-shares is real and transcends countries, sectors, and policy. We seem to be entering a new phase of history in which there is simply less and less work that needs to be done. The decline seems to be connected to the rapid increase in technological advantage in its broadest interpre-

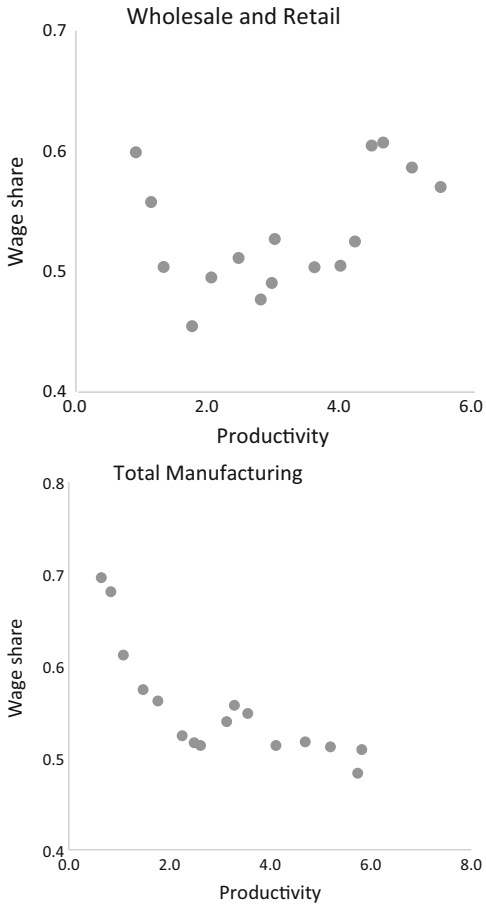

Fig. 10.21 Continued

tation. Temporarily, it is recognized as an increase in the profitability of many companies, hence the rising stock market. Unfortunately, this downward spiral in jobs will ultimately lead to decreased spending and thus, in the long run, declining profits. Growing technology and worker productivity only makes sense, on the macroscale, if one grows GDP at a pace fast enough to sustain it. This is quite consistent with Thomas Piketty's (2014) point about the return on capital exceeding the growth

rate of the economy overall. Thus, this is part of the inequality story and Eastern Europe is not immune. Over time, many jobs will be replaced with low-pay positions. Technology and efficiencies have only served to concentrate wealth in the hands of a few. Thus, a "radical" rethinking of how societies are organized is needed.

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CHAPTER 11

The Changing Character of Financial Flows to Sub-Saharan Africa

Ingrid Harvold Kvangraven

11.1 Introduction

This chapter brings many of the topics covered in this book together in an overview of the unprecedented financial flows to sub-Saharan Africa since the global financial crisis in 2008. As this region is often overlooked in discussions on finance and development, this chapter provides a basis for further analysis and research. While the Economist Intelligence Unit (2012) and others write about the possibility of an African "economic miracle," this chapter offers a more sober perspective on developments in the region, pointing to both risks and opportunities related to the changing character of financial flows. Trends in financial flows to sub-Saharan Africa since the financial crisis involve both a drastic increase in private capital and a recent decline in aid and nonconcessional lending. Furthermore, the nature of capital flows to the region is changing in terms of types of capital attracted, origin countries and types of countries taking part in international finance.

This chapter starts by considering some general macroeconomic trends in the region of sub-Saharan Africa and the core structure of the economies

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in the region as a whole, such as trends in growth, current account balances, export diversification, domestic debt issuance and foreign reserve accumulation. Next, the chapter goes into the specifics of the nature of financial flows to the region such as aid, foreign direct investment (FDI), export earnings and loans. Thereafter, the chapter analyzes the risks and opportunities these new developments offer, given the countries' economic structures and the global environment in which they find themselves, raising a cause for concern. Finally, some concluding observations are offered.

11.2 The Economics Structures: Overview and Trends

Since the mid-1990s, sub-Saharan African economies have experienced positive and strong economic growth, as evidenced by World Bank data presented in Fig. 11.1. However, while the soaring economic growth has led leading media outlets to dub the subcontinent an economic miracle, inequality in the region is also the highest in the world (Jayadev et al. 2015) and exports are highly concentrated (UNDP 2011).

In fact, export dependency and export concentration is rising faster in sub-Saharan Africa than other regions of developing countries, with

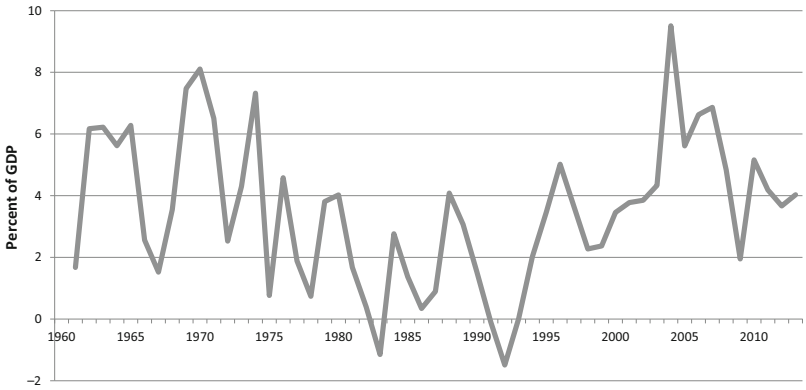

Fig. 11.1 Average GDP growth (annual per cent) in sub-Saharan Africa. *Source*: Author's derivation based on World Development Indicators (2015)

a 73 % increase between 1995 and 2008 (UNDP 2011). Moreover, as Fig. 11.2 illustrates, trade has become more important for sub-Saharan African countries over the past decade, accounting for more than 60 % of the region's Gross Domestic Product (GDP) since 2000 and exports for more than 30 %. As is evident from Fig. 11.2, there was a fall in the export share to GDP in sub-Saharan Africa from 2008 to 2009, due to falling oil prices as well as weakened demand in the wake of the 2008 financial crisis (WTO 2010). According to the UNDP (2011), this was, in fact, the biggest fall among developing regions.

Furthermore, African countries' reliance on a narrow range of commodities in addition to a narrow range of markets makes them especially vulnerable to volatility in these markets (TWN 2010). There has been a clear increase in concentration since 2000, as illustrated by the concentration and diversification indices of merchandise exports and imports presented in Fig. 11.3. The export concentration index reflects the Herfindahl–Hirschmann index measure of the degree of export concentration within a country, where higher values indicate that exports are concentrated in fewer sectors. Notably, it is important to consider that this indicator can be vulnerable to fluctuations in relative prices, as a rise in commodity prices may make commodity exporters look more concentrated.

What is more, the diversification index signals whether the structure of exports or imports by product of a given country or group of coun-

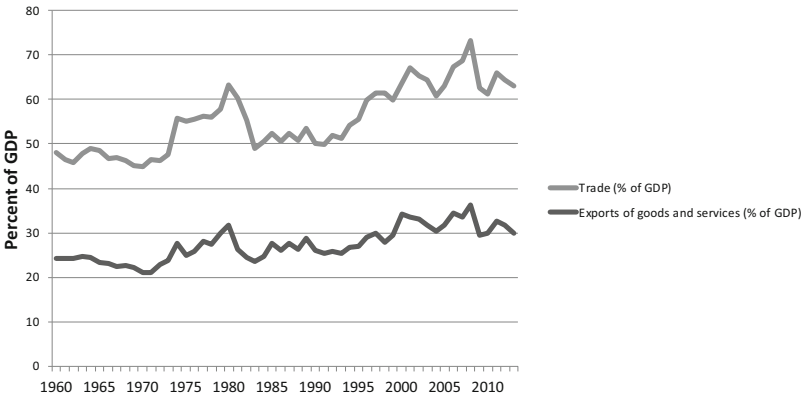

Fig. 11.2 Trade as per cent of GDP in sub-Saharan Africa. *Source*: Author's derivation based on World Development Indicators (2015)

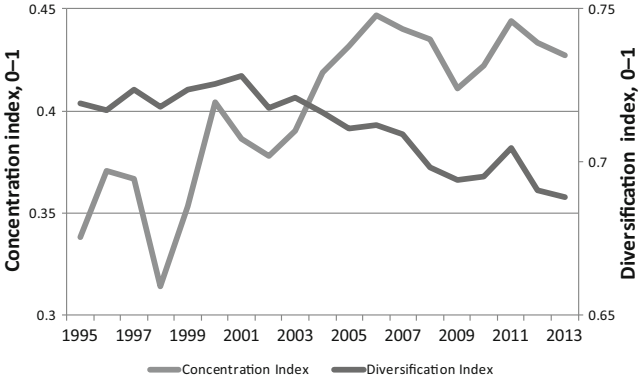

Fig. 11.3 Export concentration and diversification in sub-Saharan Africa. *Source*: Calculated with numbers from UNCTAD Statistics (http://unctadstat.unctad.org)

tries differs from that of the rest of the world. An index value closer to 1 indicates a bigger difference from the world average. Thus, Fig. 11.3 illustrates that while exports have become more concentrated, the composition of exports in the region is moving closer to the global average, although very slowly.

Notably, many sub-Saharan African countries are rich in natural resources and are heavily dependent on commodity exports (IIF 2013). This makes them vulnerable to price swings and fluctuation in external demand. While Prebisch (1950) and Singer (1950) observed half a century ago that terms of trade are likely to deteriorate for developing countries as prices of primary commodities drop, commodity prices have actually been booming over the past decade (IMF 2013a). Nonetheless, they have been falling since 2013 and are projected to fall further during the next few years.

Although the expansion of commodity sectors is often thought to undermine industrial development, the development of industry in many of the currently industrialized economies happened in close synergy with the growing exploitation of natural resources (Morris et al. 2012). Morris et al. argue that sub-Saharan African countries could take advantage of the commodity price boom to create linkages to the rest of the economy, and thereby boost their economy as a whole. Unfortunately, they find that in many countries, such as Angola, Botswana and Tanzania, the linkages created through commodity exports is very limited, although the linkages are quite broad and deep in South Africa. Furthermore, they find that the

shallowness of linkages in sub-Saharan Africa overall is more evident than in other regions of the global economy.

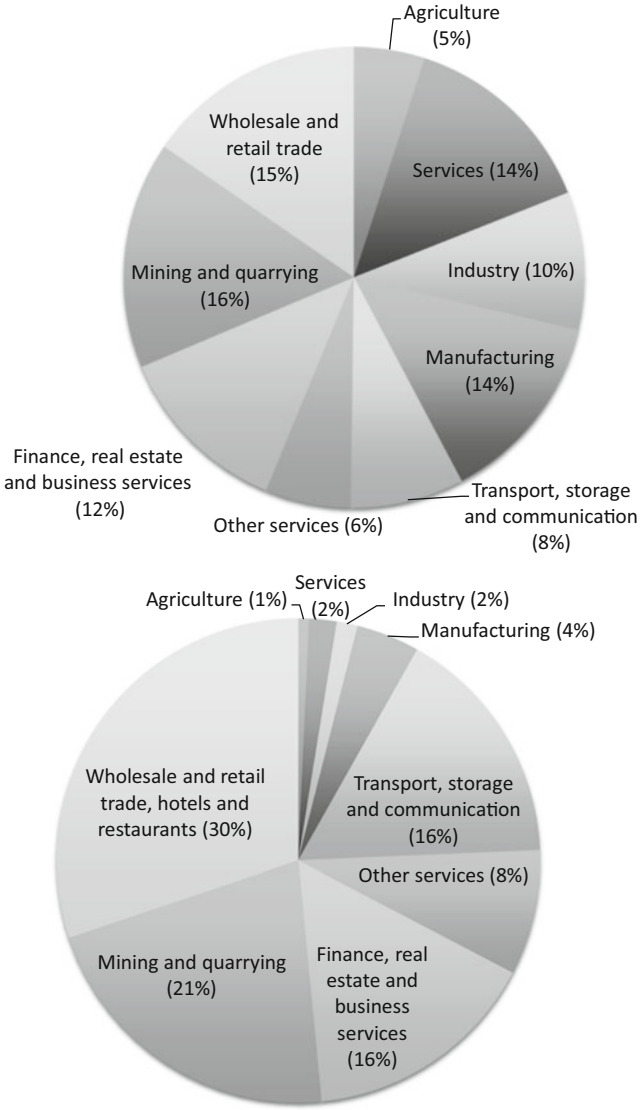

Fig. 11.4 Value added, percent of GDP in 2000. *Source*: Author's derivations based on AfDB Socio Economic Database (2010)

Furthermore, Fig. 11.4 illustrates the changing composition of value-added of different sectors, as percent of GDP, between 2000 and 2010. It illustrates that wholesale/retail, mining, transportation and services, particularly financial services, have seen a marked increase over the past decade. Meanwhile, agriculture, industry and manufacturing have declined as proportions of value-added in GDP. Moreover, the charts illustrate that services and mining have become the sectors with the largest value-added contribution to GDP.

What is more, while tax mobilization remains low and practically stagnant in the region (Keen and Mansour 2009), many countries are taking other measures both to raise domestic funds and to insure themselves against external economic shocks. Many countries are doing the former by issuing domestic debt and the latter by building up foreign reserves. The fact that countries are building up debt in local currency and under local jurisdiction is a trend that is prevalent in emerging and developing economies in general (Akyüz 2015) and a range of IMF papers argue that developing the domestic debt market can help strengthen money and financial markets (e.g. Abbas and Christensen 2007; IMF 2007, 2013b). The argument is that issuing domestic debt can support liquidity management operations of the central bank, provide an investment alternative for investors with little risk of default, and support the general development of the domestic financial market (Fig. 11.5). Furthermore, domestic debt is generally considered to be a safer source of finance than external debt, due to the currency mismatches involved with external debt (Panizza 2008; Ocampo and Tovar 2008; Eichengreen et al. 2005; Rodrik 2008; Bua et al. 2013).

Eichengreen and Hausmann (1999) were among the first scholars to pay attention to issues of debt composition and currency denomination. They coined the term the "original sin," which they define as when a country cannot use its own currency to borrow abroad, or even to borrow long-term domestically. Eichengreen et al. (2005) find that the extent to which debt is denominated in foreign currency is a key determinant of the stability of

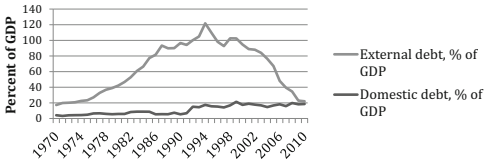

Fig. 11.5 Domestic and external debt in sub-Saharan Africa. *Source*: Panizza (2010)

output, the volatility of capital flows, the management of exchange rates and credit ratings. They find that output fluctuations are wider in countries with the original sin and that capital flows are more volatile. As many Latin American countries have developed their local bond markets substantially with many positive spillover effects, Ocampo and Tovar (2008) have come to term domestic debt a *promising and sustainable financing alternative*.

Strikingly, international investors' unbending search for yield and appetite for risk has also brought them into domestic bond markets in sub-Saharan Africa (Bua et al. 2013). In both Zambia and Ghana, for example, there have been sharp increases in foreign investment in government bonds in the domestic market, mainly in the short-term treasury bills. This may make the host economies more susceptible to market volatility, as having more resident creditors could lead to less exposure to sudden reversals of capital flows (Calvo 2005).

Besides, domestic debt may have repercussions on fiscal and debt sustainability, as domestic debt is generally more expensive for developing countries than external financing (2013a; IIF 2013; Fischer and Easterly 1990). For instance, Ghana's ten-year international bond issued in 2013 had an interest rate of about 7.9 %, while a five-year local bond yields more than 20 %. Notably, as Fig. 11.6 illustrates, the interest rates on domestic treasury bills may vary widely from country to country, as the interest rates on Malawi's T-bills are more than twice as high as Kenya's. Nonetheless, while for many countries, maturities remain short and yields high, some sub-Saharan African countries have been able to lengthen the maturities of their domestic debt and lower the borrowing costs (Bua et al. 2013). However, the investor base remains concentrated, with commercial banks and the Central Bank dominating. Meanwhile, external debt has increased slightly since 2008, although debt-to-GDP ratios

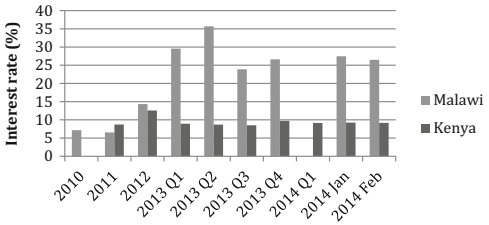

Fig. 11.6 Interest rates on Kenyan treasury bills vs. Malawian treasury bills. *Source*: Author's derivations based on IMF International Financial Statistics (IFS)

are still low due to debt relief granted through the Heavily Indebted Poor Country Initiative in the 2000s (IMF 2013a).

When it comes to foreign reserves, sub-Saharan African countries have been using international reserve assets to prevent and mitigate external shocks and to boost investor confidence. As Fig. 11.7 illustrates, there has been a drastic increase in reserves since 2000, from 17 % of total external debt in 2000 to 74 % in 2008. However, since the 2008 crisis the reserves have dropped to around 45 % of total external debt.

Note that the massive reserve accumulation by developing economies as a whole goes against mainstream economic theory, which argues that the need for international reserves should diminish as countries gain access to international financial markets. This is because such access would theoretically improve the flow of savings to capital-scarce countries, thereby allowing them to a greater extent to respond to balance-of-payments shocks by exchange rate adjustments (Levine 1996). However, in reality, capital account liberalization has been accompanied by an *increase* in reserve accumulation. In fact, Aizenman and Lee (2005) and Choi et al. (2007) find that there is an empirical correlation between capital account liberalization and reserve holdings.

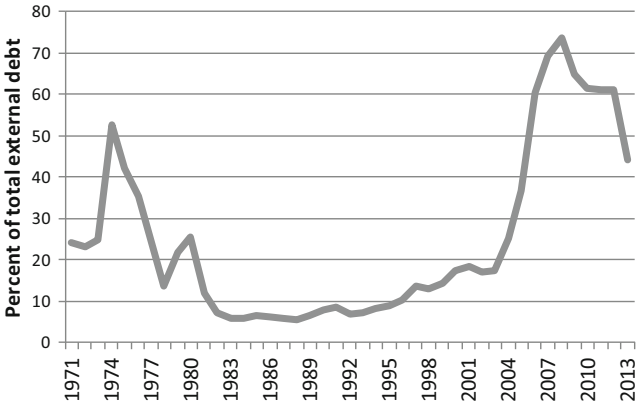

Fig. 11.7 Sub-Saharan Africa: Total reserves (per cent of total external debt). *Source*: Author's derivation based on World Development Indicators (2015)

Furthermore, as countries do not spend the absorbed capital inflows on current payments, but rather into reserves, this has led to a current account worsening. As Figs. 11.8 and 11.9 illustrate, both the region's fiscal balance and current account balance have been negative since the financial crisis of 2008. Notably, according to the IMF (2014), sub-Saharan African countries' spending on infrastructure and development is one of the reasons for the fiscal deficits. Notably, oil exporters and non-oil exporters have been affected differently by shocks, as illustrated in Fig. 11.8.

11.3 Changing Financial Flows: From Public to Private

Although the surge in private capital flows to developing countries in the 1990s largely bypassed sub-Saharan Africa (Bhattacharya et al. 1997), toward the 2000s the subcontinent started to experience substantial and unprecedented inflows of private capital, as evidenced by Figs. 11.10, 11.13, and 11.14. Particularly since the financial crisis of 2008, many countries in the region have benefitted from an increase in investor interest (IMF 2014). However, with normalization of monetary policy in the USA and a slowdown in emerging markets, investor interest may dampen.

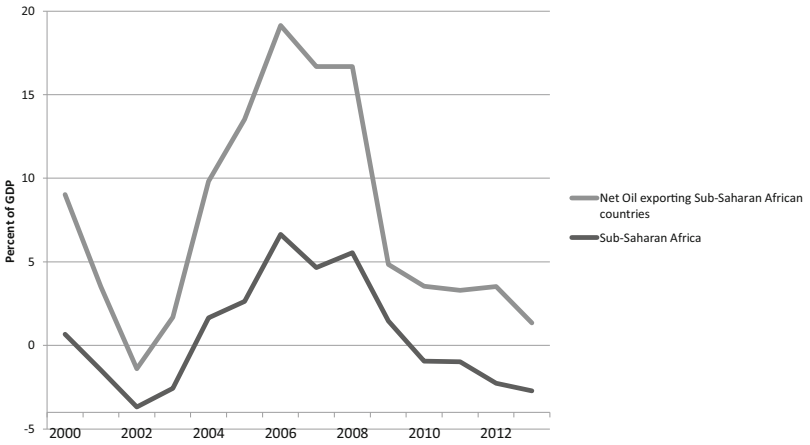

Fig. 11.8 Sub-Saharan Africa: Current account balance (As per cent of GDP). *Source*: Author's derivations based on AfDB Socio Economic Database

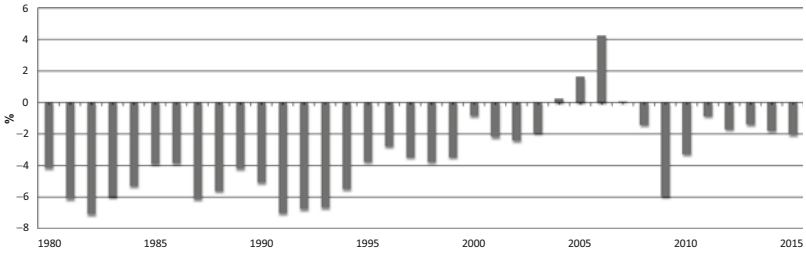

Fig. 11.9 Sub-Saharan Africa: Central government, fiscal balance (per cent of GDP). *Source*: Author's derivations based on AfDB Socio Economic Database

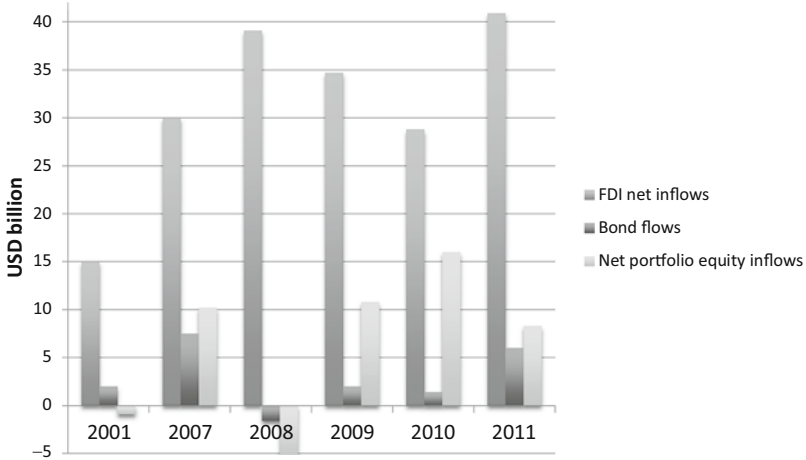

Fig. 11.10 Private capital flows to sub-Saharan Africa, 2001–2011 (USD billion). *Source*: Author's derivations based on Hou et al. (2013)

Notably, new types of private capital flows have emerged, such as bond flows and portfolio investment, and as Fig. 11.10 illustrates, the volume of financial flows has started increasing since the initial downturn following the financial crisis of 2008. In fact, total capital flows to the region have increased from $20 billion in 1990 to more than $120 billion in 2012 (Sy and Rakotondrazaka 2015). A large part of this increase is due to an increase in private capital flows and an increase in remittances. Furthermore, there have been significant increases in private capital inflows to Africa since the end of 2008. Levels are now at record-high and above precrisis levels. In fact, foreign investment in sub-Saharan Africa doubled between 2010 and

2012 compared to 2000 through 2007 period (IMF 2013a). It is worth noting that as private capital flows play an increasingly important role in the region, the volumes and volatility of private capital flows can also affect growth prospects of the countries in question.

Furthermore, when discussing financial flows to sub-Saharan Africa, it is worth keeping in mind that the countries within the region are quite different. There are subgroups that have more in common with each other that can be analyzed together, and there are certain countries that exhibit different trends from the rest of the region. Figure 11.11 shows four mutually exclusive country groups, namely oil-exporting, middle-income (MICs), low-income (LICs) and fragile countries, as defined by the IMF Regional Economic Outlook for sub-Saharan Africa. The financial sources reported are official development assistance (ODA), private capital, government revenue and remittances. Interestingly, Fig. 11.11 shows that although there has been a notable decline in ODA since the crisis (see Fig. 11.12), ODA still has an important role to play for LICs and fragile states. It is mainly middle-income countries that are experiencing the sharpest decline in ODA as a share of total external flows. Note that government revenue is the most substantial source of financing for all groups.

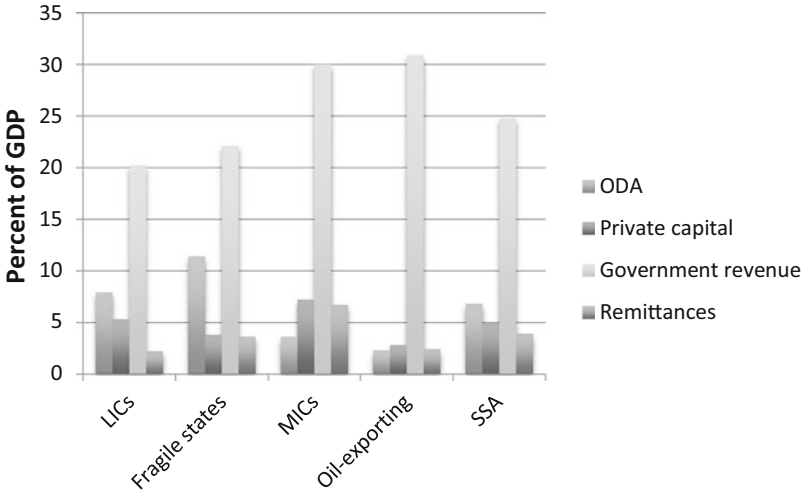

Fig. 11.11 Financial flows to sub-Saharan Africa broken down by country groups (Average 1990–2012). *Source*: Author's derivations based on Sy and Rakotondrazaka (2015)

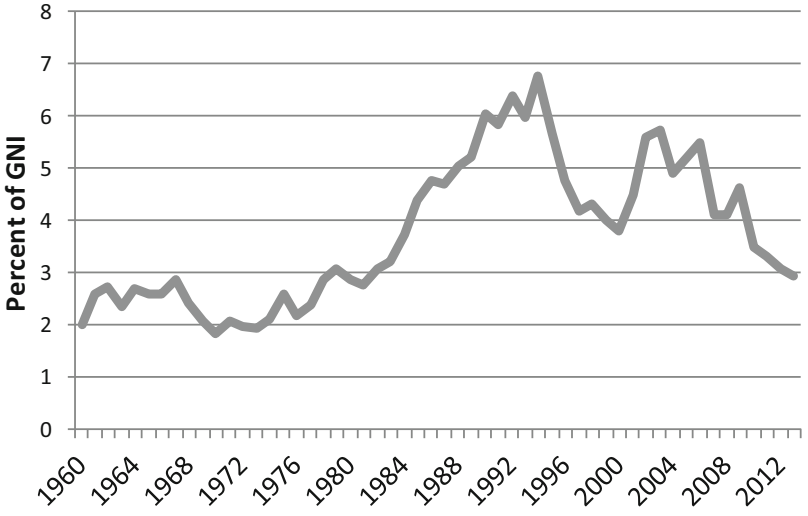

Fig. 11.12 Sub-Saharan Africa: Net ODA received (per cent of GNI). *Source*: Author's derivation based on World Development Indicators (2015)

Meanwhile, Fig. 11.13 illustrates the rise in remittances to the region. The rise in remittances has been a worldwide trend, and although the flows to sub-Saharan Africa are lower than those to many other regions in absolute and per capita terms, many African countries are among the largest recipients of remittances relative to their GDP (Singh et al. 2009). What is more, for several sub-Saharan countries, remittances account for a substantial portion of their foreign exchange. Although remittances are generally considered to be less volatile than other private capital flows, the decline in remittances since the 2008 crisis is evidenced by Fig. 11.13. Note that these official statistics do not account for informal remittances, so the true values are likely to be higher than depicted in this graph.

When it comes to FDI, which has traditionally been the largest source of private finance to sub-Saharan countries, it is clear that it has risen sharply since the 1990s, from 0.4 % of GDP in 1990 to 2.3 % of GDP in 2013, with a peak of 4.5 % of GDP in 2001 (see Fig. 11.14). According to the Economist Intelligence Unit (2012), reasons why African countries have been seen as attractive FDI destinations over the past decade are vast. The most important are the continent's emerging middle class and changing consumption patterns, its high growth and high commodity prices. Less important factors are increasing political stability and improved fiscal and monetary policy.

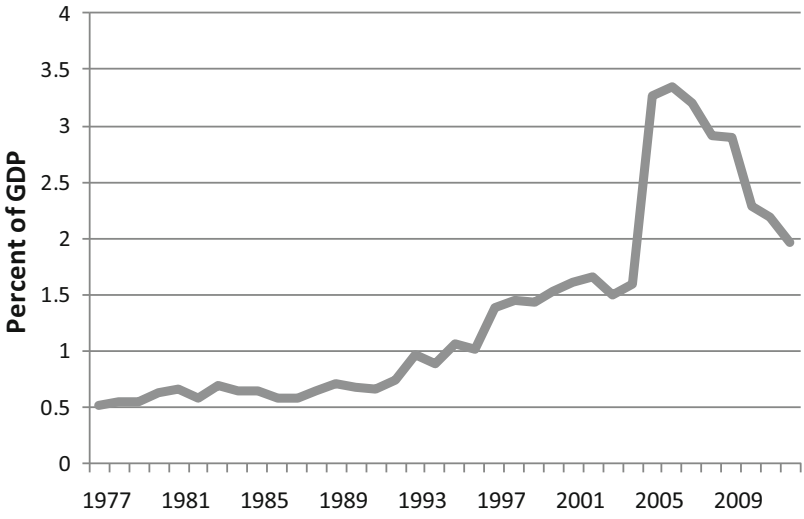

Fig. 11.13 Sub-Saharan Africa: Personal remittances, received (per cent of GDP). *Source*: Author's derivation based on World Development Indicators (2015)

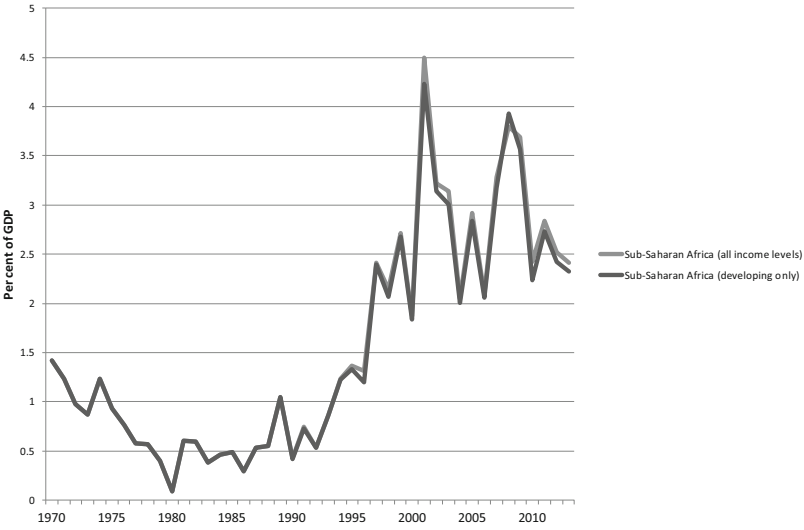

Fig. 11.14 Foreign direct investment, new inflows (per cent of GDP). *Source*: Author's derivation based on World Development Indicators (2015)

It is worth noting that the gains in FDI are highly concentrated geographically and by sector (Hou et al. 2013). Around three fourths of the investments go to resource-rich countries and extractive industries. Furthermore, it is unclear whether this investment provides benefits to local firms and employment markets. Furthermore, in Africa the middle-income countries are the ones that have benefited the most from FDI, particularly South Africa and Nigeria. In fact, between 1990 and 2000, 50 % of the FDI to sub-Saharan Africa went to South Africa and Nigeria (Sy and Rakotondrazaka 2015). These two countries still receive about half of the total FDI of the region and the top ten FDI recipients receive 85 %. Meanwhile, some of the small economies on the continent have the highest FDI-to-GDP ratio, such as Liberia, with FDI accounting for 26 % of GDP on average between 2000 and 2012. While Liberia has the largest FDI-to-GDP ratio, Sao Tome and Principe has the second largest ratio, with Gambia, Cape Verde, Lesotho and Sierra Leone close behind.

Notably, the origins of the investments have also been changing, with Brazil, Russia, India, and China (BRICS) making an inroad to the region (UNCTA D 2013). In 2010, BRICS accounted for 25 % of FDI inflow to sub-Saharan Africa, while Europe still accounted for 41 %. However, while BRICS are among the top investors in the region, only 4 % of BRICS FDI goes to Africa, meaning the BRICS are more important to Africa than Africa is to the BRICS. Furthermore, Chinese FDI flows have grown quickly since the mid-2000s. In fact, Weisbrod and Whalley (2012) produce results that suggest that a significant portion of growth in sub-Saharan Africa between 2005 and 2008 can be attributed to Chinese inward investment. However, as with other types of FDI, Chinese investment is particularly concentrated in the oil and nonfuel minerals sectors and it is particularly directed to resource-rich countries (Hou et al. 2013).

The types of loans that flow to the region have also changed substantially over the past decades. While loans can clearly be beneficial for a country's economic development, in order to loosen financial bottlenecks that may hamper growth, much depends on how the money is spent. For example, Aghion and Bolton (1997) and Rogoff (1990) find that there is no clear link between sovereign borrowing and poverty reduction. Furthermore, Sachs (1986) shows that high debt levels may divert scarce resources from developmental investments to debt service obligations. Note that Fig. 11.15 shows that interest payments on external debt has grown from approximately 5 to 8 billion USD between 2009 and 2013.

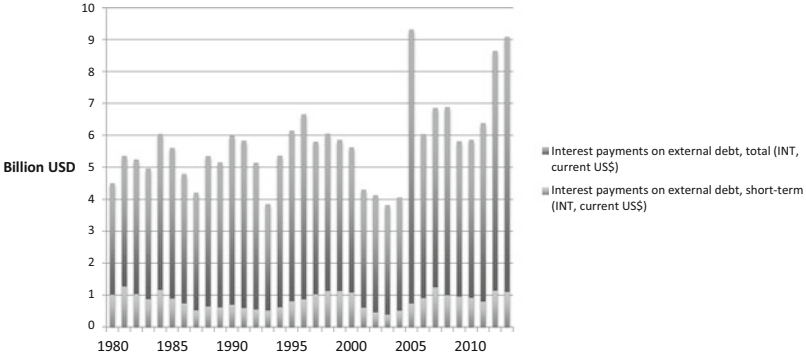

Fig. 11.15 Sub-Saharan Africa interest payments on external debt (short term and total). *Source*: Author's derivations based on World Bank, International Debt Statistics

Cross-border lending to sub-Saharan Africa has also increased significantly over the past decade, but most of it is directed to middle-income countries (BIS 2013). Among resource-rich countries, Liberia, Nigeria and Angola have been the main recipients, and their inflows have increased monumentally. In fact, cross-border lending has doubled to Liberia, tripled to Angola, and been multiplied by six to Nigeria between 2000 and 2012.

Furthermore, the past decade has seen an increase in first-time bond issues in sub-Saharan Africa. In fact, when Seychelles issued its bond in 2006, it was the first sub-Saharan country, other than South Africa, to issue foreign-currency-denominated bonds in 30 years. Since then, many countries have followed suit. Nonetheless, bond flows have been concentrated in middle-income countries. Since 2006, the sub-Saharan countries excluding South Africa have issued a total of $15 billion in international sovereign bonds, including Seychelles, the Republic of Congo, Cote d'Ivoire, Ethiopia, Gabon, Ghana, Kenya, Namibia, Nigeria, Rwanda, Senegal and Zambia (Sy 2015).

What is more, private external long-term debt increased from 17 % to 24 % of total external long-term debt between 2008 and 2011, as graph in Fig. 11.16 illustrates. This is a part of the general trend in the region of private sector flows becoming more prominent than public flows.

Meanwhile, portfolio equity inflow to sub-Saharan Africa has been volatile over the past ten years. The inflow reached a high in 2006, but due to the financial crisis there was a 40 % decline in 2007 and in 2008 the flows actually reversed. Notably, the region's equity markets were not immune

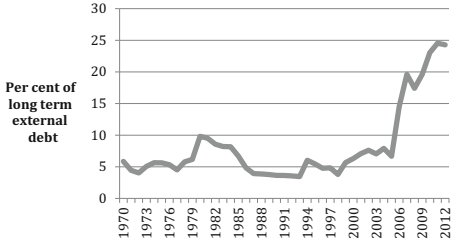

Fig. 11.16 Sub-Saharan Africa: Private external long-term debt as per cent of total long term external debt. *Source*: Author's derivations based on AfDB Socio Economic Database

to financial contagion during the crisis. Furthermore, the stock markets in countries like Nigeria and Kenya were hit hard by the euro zone crisis, as they experienced large sell-offs due to global flight to safety. Nevertheless, stock markets in sub-Saharan Africa have generally made progress over the past decade. Even so, sub-Saharan stock markets are still relatively thin and illiquid (Hou et al. 2013).

The increase in financial flows is taking place in a climate of widespread liberalization of international capital flows and greater openness to foreign financial institutions (Akyüz 2015). Note that the internationalization of finance has resulted in an increase in foreign presence in the bond, equity and credit markets of sub-Saharan countries. Particularly higher interest rates and their asset markets have made them highly attractive to international investors since the early 2000s.

Finally, a serious and under-researched problem for many African countries is capital flight. Capital flight is often defined as the unrecorded and (mostly) untaxed illicit leakage of capital and resources out of a country (Kapoor 2007). This is also how capital flight is used in this chapter. Others may understand capital flight as sudden short-term capital outflows, both illicit and licit, or as stocks of wealth held abroad by citizens of a developing country (Epstein 2005). Several scholars have identified a revolving door phenomenon in sub-Saharan countries; where up to 80 % of public loans are channeled out of the country as private assets through capital flights (e.g. Ajayi and Khan 2000; Boyce and Ndikumana 2001, 2011; Cerra et al. 2008). It is therefore imperative to keep in mind when analyzing capital flows to sub-Saharan Africa that there is always the very real risk of capital flowing back out again through illicit channels.

11.4 Risks and Opportunities

The new dominant inflows in the region—private capital flows and portfolio flows—are clearly more volatile than ODA and remittances. The fact that these volatile flows are increasing while the financial linkages between sub-Saharan Africa and the rest of the global economy are being strengthened is a cause for concern. In this situation, African countries are more vulnerable to financial shocks from global boom–bust cycles. Nevertheless, the individual countries' balance of payments, net foreign assets, external debt and international reserve position will determine the impact of such shocks. For example, countries that are heavily dependent on foreign capital will be prone to liquidity and solvency crises as well as domestic financial turmoil. However, the high commodity prices and high inflows of capital could also be an opportunity for sub-Saharan African countries to take advantage of this funding to pursue industrial diversification, technological advancement and poverty reduction.

However, rather than diversification, there seems to be a *concentration* of economic activity and of exports. As an economy's vulnerability to exogenous economic shocks is largely determined by how exposed it is to the global economy (Rodrik 2004), sub-Saharan African countries' increased exposure to trade makes them more vulnerable to shocks to both export and import prices. Furthermore, an increased dependence on exports results in significant fluctuations in export earnings, and export revenue volatility is usually strongly linked to growth volatility (UNDP 2011). This poses many challenges to sub-Saharan exporters; especially since commodity prices have been falling since 2013 (IMF 2013a). Overdependence on primary commodity exports and derivative price volatility are destabilizing factors that exacerbate already fragile macroeconomic conditions of the sub-Saharan exporter markets (Gevorkyan and Gevorkyan 2012). African countries' reliance on a narrow range of commodities in addition to a narrow range of markets clearly makes them vulnerable to volatility in these markets.

Furthermore, as Morris et al. (2012) find, sub-Saharan African countries have in large part failed to take advantage of the commodity price boom, and have generally not been able to create many linkages to the rest of the economy, except for a few countries such as South Africa. The fact that the shallowness of linkages in sub-Saharan Africa overall is more evident than in other regions of the global economy, makes them

more vulnerable to commodity price swings. In fact, dependence on primary commodities has caused structural imbalances for many African countries.

In addition, export-to-GDP ratios often exhibit procyclical behavior, with exports rising faster as growth is high and falling quicker when growth rates fall (UNDP 2011). Since sub-Saharan countries are both very open and have highly concentrated export bases, this makes them particularly vulnerable to falling commodity prices and reduced demand in advanced countries, as well as reduced demand in China.

Furthermore, as African countries are taking advantage of the expansion in global liquidity, lower interest rates and improvements in global risk appetite by entering the international capital market and issuing Eurobonds, they are also taking on additional risks (Guscina et al. 2014). Notably, the development in sub-Saharan Africa is in line with Minsky's (1992) theory that over-leveraging and destabilization generally happen in boom periods (eventually causing recurring crises).

Furthermore, while in analyzing Latin American debt markets Ocampo and Tovar (2008) came to term domestic debt a promising and sustainable financing alternative, the structure of domestic debt in sub-Saharan Africa does not provide the same foundation for optimism. Evidence presented in this chapter shows that interest rates are high and that foreign investors are increasingly entering the domestic debt markets, making the economies more vulnerable to sudden short-term capital outflows in the face of an economic shock. This suggests that many sub-Saharan countries are still vulnerable to the original sin, which is often correlated with instability of output and volatility of capital flows.

Another notable trend is the extent of reserve accumulation in the region. Instead of directing the increase in capital flows to productive investments, a large portion of the inflows is going to reserves, which in turn has led to a current account worsening. In fact, the region's fiscal balance and current account balance have been negative since the financial crisis. Finally, as many developing countries have adopted more flexible exchange rate regimes, accumulating international reserves and borrowing in local currency will not necessarily help against external shocks that might result from the normalization of monetary policy in the USA. Needless to say, tightening of global financial conditions could trigger further volatility. Increased risk aversion from foreign investors may lead to a reversal of capital outflows, thereby putting pressure on countries with large external financing needs.

The question of what drives capital flows to developing countries has been viewed from several angles, from Solow's (1956) thesis that capital flows from capital-abundant to capital-scarce economies, various versions of that thesis (e.g. Lucas 1990), to the current debate on illicit capital flight from poor to rich (e.g. Boyce and Ndikumana 2011). Also, Pettis (2001) makes the argument that international loans have been driven by external events rather than domestic politics since the 1820s. In short, he argues that it is the domestic condition in rich countries that drives these flows, rather than the investment climate in the developing economies. If this is indeed the case, sub-Saharan African countries are in an even more vulnerable position, as investment may dry up as soon as the advanced countries start recovering.

Furthermore, in addition to the quantity of financial flows, it is also necessary to consider the quality of finance (see Sy 2015). Better finance relates to the mitigation of risks related to the volatility and short-term nature of external capital flows. Ways of mitigating these risks could be to prioritize more stable and long-term finance from, for example, sovereign wealth funds or development finance institutions.

What is more, even with more and better finance, how the money is spent is also essential for economic development. As both Islam (2004) and Heintz and Pollin (2008) illustrate, there is no automatic link between growth and economic development, and targeted investments in employment-generating sectors is necessary for growth to be pro-poor and developmental. Unfortunately, the lion's share of FDI today goes to extractive industries, with few linkages and few opportunities for job creation.

In short, in order to benefit from the increased private capital flows to the region, the sub-Saharan countries will need to increase export diversification, reduce reliance on natural resources, boost domestic demand, curb capital flight and strengthen national frameworks for domestic resource mobilization. As domestic resources provide most of sustainable development finance, strengthening domestic tax systems and expanding the tax base should naturally be a priority for African countries. This has also been recommended by the United Nations High-Level Panel on the Post-2015 Development Agenda. Furthermore, the shocking volume of illicit capital flight poses risk of the capital flows entering the region, leaving again through hidden channels.

11.5 Concluding Observations

Overall, this chapter presents a subcontinent undergoing historic transformations with respect to financial flows. One of the essential characteristics is that private capital flows are becoming more important in the region and the importance of public flows is diminishing. Capital flows beyond FDI will likely be important for the middle-income countries on the subcontinent, whereas fragile states are likely to continue to rely on ODA. While new and growing capital flows offer increasing opportunities for African countries to finance development, the globally integrated sub-Saharan economies' reliance on commodity exports makes them vulnerable to external shocks. Furthermore, most of the new types of capital flows are going to middle-income countries and resource-rich economies.

In short, this review illustrates that although there are certainly opportunities associated with the increase in financial flows to the region, sub-Saharan growth does not appear to constitute an "economic miracle," as there are many risks associated with the new capital flows and with the economic structure of many of the countries in question. Finally, keep in mind that the cursory review of the data presented in this chapter hides some important differences among countries in the region.

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CHAPTER 12

Oil Prices and Bank Profitability: Evidence from Major Oil-Exporting Countries in the Middle East and North Africa

Heiko Hesse and Tigran Poghosyan

12.1 Introduction

The global financial crisis of 2008/2009, accompanied by the sharp fall in oil prices, has hit hard many of the oil-exporting countries in the Middle East and North Africa (MENA). Exports, government revenues, and fiscal balances have dramatically fallen, declining Growth Domestic Product (GDP) growth and equity/real estate prices have put strains on both corporate and bank balance sheets and credit growth to the private sector has significantly worsened. In some countries, governments had to intervene in the domestic financial sector with deposit guarantees, liquidity support, capital injections, or equity purchases (via their government-owned

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vehicles such as Sovereign Wealth Funds), as financial sector indicators worsened. In particular, banks that lent heavily for real estate purposes and equity purchases have suffered losses with the collapse of these asset prices.

Given the dependence of these countries on oil exports, the link between oil prices and bank performance and stability is of high policy interest not only during the current crisis but also during previous boom–bust oil cycles. Do oil prices influence bank performance and if so, what could be the relevant channels by which bank behavior is affected? Or is there no direct link between oil prices and bank performance if macroeconomic and bank-specific factors are accounted for? Is there any difference in bank performance of commercial versus investment and Islamic banks given that Islamic banks operate according to *Shariah* principles? What is the impact of the global financial crisis on bank profitability and its link to oil prices? The purpose of this chapter is to provide the first empirical evidence on these issues.

Oil prices affect the economy through both direct and indirect channels. In a direct channel, for instance, oil price shocks could affect bank profitability directly via increased oil-related lending, business activity, or excess liquidity in the banking system. Indirectly, since oil receipts form a large part of external and government income in MENA countries, prospects of oil income affect fiscal spending, which in turn influences corporate and bank profitability via lending to the private sector. Another indirect channel operates via expectations and the overall business sentiment in the country. Higher oil prices could lead to higher domestic demand, which will feed back into higher bank confidence, lending, and low nonperforming loans. On the aggregate supply side, the productive capacity of countries is also likely to be expanded with new public and private investments fueled by high oil prices, pushing growth rates even further. This can be illustrated on the example of the precrisis boom. Between 2005 and 2008, bolstered by high oil prices, oil-exporting countries have engaged in large investment programs to diversify the domestic economy and develop human capital. Financial institutions reaped sizable profits and appeared financially stable with sound capital adequacy levels and low nonperforming loans.

Our results for 11 MENA countries (Algeria, Bahrain, Iran, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Sudan, United Arab Emirates [UAE], and Yemen) for the period 1994–2008 suggest that oil prices affect bank profitability indirectly, via macro channels. In terms of different bank types, we find that investment banks have the highest exposure and sensitivity to oil price shocks, which is likely to be driven by their buoyant advising, fee, trading, and other such income during oil price booms and bolstered by

excess oil-related liquidity entering the financial system. We also find some tentative evidence that the global financial crisis has diminished the positive impact of oil price shocks on bank profitability.

How does our research relate to the existing academic literature? Studies on bank profitability have covered a wide range of countries and regions. For instance, Flamini et al. (2009) cover sub-Saharan Africa; Athanasoglu et al. (2008) cover Greece; Athanasoglu et al. (2006), South Eastern Europe; Demirgüç-Kunt and Huizinga (1998) over 80 countries; while Gelos (2006) examines Latin America; Angbazo (1997) and Berger et al. (1987), USA; and Saunders and Schumacher (2000), the EU and USA. In general, the literature finds that bank profitability depends on both bank-specific and macroeconomic factors. In terms of bank-specific factors, credit risk has been found to be negatively linked to profitability (Miller and Noulas 1997). Deficient risk management functions and poor asset quality feed into higher amounts of unpaid loans, which negatively impacts profitability. The results for the liquidity–profitability relationship have been mixed (Molyneux and Thornton 1992; Bourke 1989).

In addition, researchers found a positive relationship between size and bank performance (Short 1979; Smirlock 1985; Demirguc-Kunt and Huizinga 2000; Goddard et al. 2004). Larger banks tend to be more able to raise cheaper capital, making them more profitable. There is also some evidence of decreasing benefits from economies of scale and cost savings the larger a bank becomes (Bourke 1989).

More efficient banks have higher profits (Bourke 1989; Molyneux and Thornton 1992) while bank profitability can also be quite persistent (Athanasoglou et al. 2008), implying a certain level of concentration and market power in the banking industry, both in input and output markets. Findings on ownership have been mixed (Short 1979; Bourke 1989; Molyneux and Thornton 1992; Flamini et al. 2009).

In terms of macroeconomic variables, researchers have found a link between inflation, interest rates, and profitability (Bourke 1989; Molyneux and Thornton 1992), as well as the business cycle and bank performance (Demirguc-Kunt and Huizinga 2000; Bikker and Haixia 2002; Flamini et al. 2009). Banks are typically able to adjust interest rates if inflation (expectation) increases, which might feed back into higher revenues and profits.

The empirical academic literature on differences in commercial and Islamic banks is very scarce and mainly touches upon financial stability (Cihak and Hesse 2008) and does not examine their relationship with oil—the main revenue source for government in these oil-exporting

countries. Conceptually, since Islamic banks often tend to fund themselves with sukuk besides *Shariah*-compliant deposits, and higher oil prices are associated with higher liquidity and therefore deposits inflows than can be intermediated into lending, a positive relationship between oil prices and bank performance for Islamic banks is likely. But with oil prices falling from their peak of $140 a barrel recently, the reduced oil liquidity has not only hit Islamic banks but also their conventional peers. Hence, unless conventional banks have invested in subprime related products, the differential impact of oil prices on commercial versus Islamic banks is not certain *a priori*. It is likely that Islamic banks that focus on a stable deposit base might suffer less than Islamic banks relying mainly on wholesale funding, especially when liquidity becomes scarce after adverse oil price shocks. Similarly, one would expect that investment banks with wholesale funded business models and higher leverage than their conventional and Islamic banking peers will be negatively expected from a liquidity squeeze.

This chapter makes several important contributions to the literature on bank performance. *First*, as far as we know, no study has explicitly looked at oil-exporting countries and bank profitability. *Second*, including oil price changes and shocks as a systemic variable into this framework is novel and by using different definitions for the shocks ensures robustness of the results. *Third*, we explore the impact of bank specialization on bank profitability. The business models of commercial, investment, and Islamic banks are likely to exhibit differences, so it is important to control for bank specialization. *Finally*, most of the literature makes use of a linear panel framework with a few exceptions. We adopt dynamic panel methods (system Generalized Method of Moments (GMM)) to control for the persistence of profitability and endogeneity in the model.

The chapter is organized as follows. Section 12.2 provides the data description and introduces different measures for the oil price shock; it discusses the hypothesis-testing strategy and econometric methodology. Section 12.3 examines the results, while Sect. 12.4 concludes and offers policy implications.

12.2 Methodology and Data

12.2.1 Estimation Methodology and Hypothesis-Testing Strategy

We adopt dynamic panel data techniques in our empirical analysis for the following reasons. *First*, a common empirical regularity in data suggests that bank profits are highly persistent due to imperfect competition (both in the output and input markets), informational opacity, and serial correlation in

regional/macroeconomic shocks (Berger et al. 2000). The system GMM panel data technique of Blundell and Bond (1998) used in our analysis is designed to account for such persistence by including the lagged dependent variable among regressors and correcting for endogeneity bias. We have experimented also with pooled Ordinary Least Squares (OLS) and fixed-effects specifications and found support for upward bias (pooled OLS) and downward bias (fixed-effects model), confirming the appropriateness of using system GMM method in our setup. *Second*, some of the bank-specific determinants of bank profitability (such as capitalization) are likely to be endogenous variables (Athanasoglou et al. 2008), which makes application of alternative estimation techniques (such as, pooled OLS and fixed-effects methods) inappropriate. On the contrary, the system GMM methodology allows instrumenting for the endogenous variables and provides consistent estimates. Finally, the estimation methods based on the OLS principle are vulnerable to the omitted variable bias if some important determinants of bank profitability are not included among explanatory variables. The system GMM method is robust to the omitted variable problem. Taking first-differences of the regression equation removes the unobserved time-invariant bank-specific effects so there will be no omitted variable bias across time-invariant factors. Robustness against omitted variable bias problem is a particularly useful property for our empirical-testing strategy (see below).

There are two types of GMM estimators that have been frequently used. The first one is the first-difference GMM estimator, developed by Arellano and Bond (1991), which uses first-differenced equations with suitable lagged levels as instruments. The second one is the system GMM estimator, developed by Arellano and Bover (1995) and Blundell and Bond (1998), which augments the former by addition of equations in levels with lagged first-differences as instruments.

In our framework, the system GMM estimator is more suited to estimate bank profitability equations than the first-differenced GMM estimator applied by some authors previously (e.g., Flamini et al. 2009). As discussed, many explanatory variables such as profitability are highly persistent so their lagged levels might only be very weak instruments for the first-differenced equations. In this situation, the first-differenced GMM estimator potentially suffers from a downward bias (Blundell and Bond 1998), so the additional set of first-differenced instruments and equations in levels make the system GMM estimator more efficient by overcoming the weak instrument problem inherent to the first-differenced GMM estimator.

Our empirical specification takes the following general form:

$$y_{ijt} = \alpha + \beta y_{ijt-1} + \gamma bank_{ijt} + \theta macro_{jt} + \delta oil_t + \mu_i + \varepsilon_{ijt}$$

where i, j, and t indices denote bank, country, and time, respectively; y is the bank profitability variable; *bank* and *macro* are vectors of bank-specific and country-specific determinants of bank profitability; and *oil* denotes a measure of oil price shock. Apart from state dependence (y_{ijt-1}) and observed heterogeneity ($bank_{ijt}$, $macro_{jt}$, and oil_t), the model also accounts for bank-specific unobserved heterogeneity, $\mu_i \sim N(0,\sigma_\mu)$, and random idiosyncratic errors, $\varepsilon_{ijt} \sim N(0,\sigma_\varepsilon)$.

The empirical specification above suggests that oil price shocks can affect bank profitability directly (coefficient δ) and indirectly (through their impact on macro variables and, ultimately, coefficient θ). Therefore, distinguishing between these two effects might be difficult if all explanatory variables enter the model simultaneously. To test for the hypotheses of direct and indirect impact of oil price shocks, we adopt the following empirical-testing strategy (see Fig. 12.1).

We start by including only bank-specific and oil price shock variables into the specification (1). If the impact of oil prices is insignificant, then we conclude that oil prices are not related to bank profitability. Otherwise,

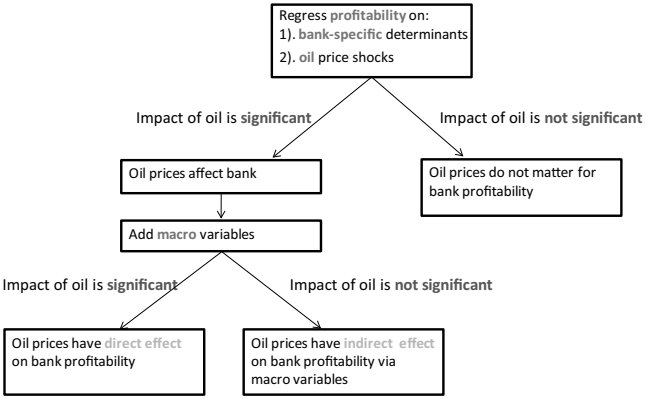

Fig. 12.1 Hypothesis testing strategy

if the impact of oil price shocks turns out to be significant, we would go one step further to distinguish between the direct and indirect effects of oil price shocks. For this reason, we would introduce country-specific variables—that proxy for possible transmission channels of oil prices—into the model. If the impact of oil prices remains significant when country-specific variables enter the specification, then we would conclude that oil prices have a direct impact on bank profitability. Otherwise, we conclude that the impact of oil prices is indirect and channeled through country-specific variables. It is important to note that the causality runs from oil price shocks to country-specific variables, and not in the reverse order, because the share of oil-exporting countries in the global economy is not that large to drive world oil prices.

12.2.2 Data

We use annual data for 11 MENA countries (Algeria, Bahrain, Iran, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Sudan, UAE, and Yemen) for the period 1994–2008. The data set consists of information on three levels of aggregation: bank, country, and supranational (i.e., oil prices, common to all countries). Descriptive statistics of all variables are reported in Table 12.1.

12.2.2.1 Bank-Specific Data

The bank-level variables are obtained from the Bankscope database. We use balance sheets and income statements of 145 banks in MENA countries, out of which 87 banks are commercial, 40 are Islamic, and 18 are investment. To avoid possible outliers for such a heterogeneous sample, we exclude the 1st and 99th percentile of bank-level observations from the sample.

The *dependent variable* is the return on assets (ROA), measured as the ratio of bank profits to total assets. Mean values of ROA across countries reported in Table 12.2 suggest several important regularities.

First, the numbers are relatively high for MENA countries compared to the corresponding figures in developed economies. This finding reiterates results for other emerging markets (see, e.g., Flamini et al. 2009 for sub-Saharan Africa) and can be interpreted as a premium charged by banks for operating in an environment characterized by a generally higher level of risk. Second, profitability varies to a great extent across countries,

Table 12.1 Descriptive statistics

Variable	*Formula*	*Exp. impact*	*Mean*	*St. Dev.*	*Median*	*Min*	*Max*
Dependent							
Return on assets	Profits/total assets		2.25	2.13	1.96	−6.35	17.99
Bank-specific							
Capitalization	Capital/total assets	+	0.16	0.12	0.13	0.02	0.94
Liquidity	Liquid assets/deposits	+	0.72	0.73	0.54	0.05	8.67
Credit risk	Loan loss reserves/loans	−	0.08	0.10	0.05	0.00	0.63
Inefficiency	Costs/income	−	44.50	19.02	41.67	9.77	171.26
Size	Total assets (log)	?	14.39	1.64	14.39	10.17	17.46
Country-specific							
Inflation	CPI inflation	+	0.92	1.43	0.60	−2.54	18.49
GDP growth	Real GDP growth	+	6.11	5.04	5.49	−5.32	35.85
Fiscal stance	Gov. surplus/GDP	+	6.39	12.27	2.95	−14.03	42.86
Institutional devel.	CPIA index (World Bank)	+	4.33	0.12	4.36	3.50	4.46
Concentration	Herfindahl index (assets)	?	174.79	83.30	147.78	102.94	355.17
Supra-national (oil)							
CH	Annual growth rates		12.99	21.51	14.60	−41.02	49.64
HP	Dev. from HP		0.24	6.22	−0.70	−11.31	14.01
HM	Hamilton (2003) definition		2.21	2.88	1.67	0.00	12.44
F	Dev. from 12m forward rate		11.08	22.60	13.46	−45.78	48.75

Notes: data is winsorized at 1% and 99% percentiles to control for outliers

which emphasizes the importance of differences in macro environment as well as industry and bank-specific factors for bank profitability. Figures reported in Table 12.3 suggest that profitability also varies across banks having different organizational structure, with investment banks being generally more profitable, compared to commercial and Islamic banks. Finally, both for different organizational types and for each country, we observe decline of bank profitability in 2008, which has been triggered by the global financial crisis. In particular, countries such as Bahrain, Kuwait,

Table 12.2 Mean bank profitability across countries

	Algeria	*Bahrain*	*Iran*	*Kuwait*	*Libya*	*Oman*	*Qatar*	*Saudi Arabia*	*Sudan*	*UAE*	*Yemen*
1994	0.142	1.854	0.105	1.863	−0.560	2.038	1.200	1.326	0.720	2.282	1.396
1995	0.362	2.449	0.050	2.722	−0.425	2.560	1.360	1.611	0.980	2.006	0.924
1996	0.296	2.692	0.122	3.502	−0.010	3.381	1.618	1.923	1.932	2.610	0.635
1997	0.383	2.673	−0.012	5.362	0.145	4.325	2.639	2.145	1.129	2.519	1.060
1998	0.700	2.492	0.376	0.892	0.220	3.329	1.976	2.201	1.050	2.480	0.925
1999	0.868	2.439	0.321	3.921	0.343	1.993	1.966	1.945	0.946	2.724	1.466
2000	0.886	3.097	2.049	3.241	0.626	2.411	0.946	2.295	1.145	2.280	1.139
2001	0.894	3.210	2.945	2.351	0.239	2.471	1.815	2.918	0.606	2.251	0.690
2002	0.743	1.670	2.747	2.894	0.774	3.893	3.409	2.456	0.965	0.016	0.552
2003	0.932	2.974	2.981	7.028	0.322	4.366	3.183	2.784	1.389	2.035	0.609
2004	0.533	5.814	2.666	7.276	0.356	4.139	2.977	4.743	2.005	3.057	0.695
2005	1.451	7.670	1.602	11.947	0.574	4.834	4.614	6.702	2.969	4.768	1.177
2006	1.064	5.010	1.545	6.286	0.637	4.071	4.098	5.329	2.668	4.105	1.678
2007	1.441	7.035	1.533	8.086	1.767	4.028	4.117	4.459	2.030	3.862	1.650
2008	2.530	0.719	–	−0.979	–	2.733	3.764	2.025	2.820	1.797	1.215

Notes: reported are averages of individual bank returns on assets

Saudi Arabia, or UAE, where the banking sector has played a prominent role in recent years, have seen their aggregate profitability levels sharply decline during the financial crisis. Incidentally, this was the year when oil prices have peaked, suggesting a possible break in the relationship between oil prices and bank profitability in 2008.

Following previous literature, we use the following bank-specific determinants of profitability:

Capitalization

We use the ratio of equity to total assets to proxy bank capitalization. This factor is expected to have a positive impact on bank profitability, because more capitalization provides a signal to the market that bank owners are investing more into the bank expecting better performance in the future. One should also bear in mind a possible reverse causation from higher profitability to more capitalization, since banks frequently put aside part of their profits to boost capitalization (Athanasoglou et al. 2008). For this reason, we model bank capitalization as an endogenous variable in the system GMM setup.

Table 12.3 Mean bank profitability across bank specialization

	Commercial	*Investment*	*Islamic*
1994	1.770	1.733	2.090
1995	1.779	2.409	1.637
1996	1.959	2.718	2.235
1997	1.981	3.967	2.434
1998	1.862	2.189	1.479
1999	1.759	2.771	1.215
2000	1.740	1.800	1.359
2001	1.579	0.458	–0.015
2002	1.889	1.930	1.325
2003	1.889	7.629	1.467
2004	2.626	9.390	2.089
2005	3.231	14.322	4.199
2006	2.786	7.231	4.158
2007	2.587	9.591	3.846
2008	1.891	2.337	3.017

Notes: reported are averages of individual bank returns on assets

Liquidity
We proxy bank liquidity by the ratio of liquid assets to deposits. This measure indicates how much coverage deposit liabilities of banks have in terms of liquid assets. Higher ratio indicates more liquidity, implying that banks are doing a better job in terms of liquidity management and, thus, are better performers. Therefore, we expect a positive relationship between liquidity and profitability.

Credit Risk
We proxy bank credit risk by the ratio of loan loss reserves to total loans. We acknowledge that a better credit risk measure could be the ratio of nonperforming loans to total loans. However, data on nonperforming loans in Bankscope database are filled out very poorly, for which reason we opted for this measure. We expect a negative effect of credit risk, since higher risk exposure is normally associated with lower profitability due to write-offs of existing loans. Following Athanasoglou et al. (2008), we model this variable as predetermined, since supervisory authorities usually set up specific standards for loan loss provisions in advance and bank managers try to meet these standards in their daily operations.

Inefficiency
Bank inefficiency is proxied by the cost-to-income ratio. This is a simple measure indicating how well banks manage their total costs (such as overhead expenses) relative to their income and higher values indicate more inefficiency. It was used as a proxy for bank efficiency in numerous banking studies (see, e.g., Maudos and de Guevara 2004). We expect a negative association between inefficiency and profitability, since more efficient banks are expected to have larger scope for generating extra income.

Size
Bank size proxied by the logarithm of total assets is expected to have a nonlinear effect on bank profitability (Boyd and Runkle 1993; Miller and Noulas 1997). On the one hand, larger banks have better opportunities for exploiting scale economies and hence are expected to have higher revenues. On the other hand, the burden of bureaucracy goes up with the size of the bank, especially accelerating for mega-large banks. Hence,

the impact of size on profitability is expected to reverse its sign after a size certain threshold. We use both level and squared values of this measure to capture this nonlinear effect.

12.2.2.2 Country-Specific Data

The country-level variables are obtained from the IMF's International Financial Statistics, World Bank's World Development Indicators, and Bankscope databases. As it was shown previously, bank profitability varies to a great extent across MENA countries, which is partially attributed to the country-specific heterogeneity in terms of economic and institutional environment. Hence, we control for the following country-specific determinants of bank profitability:

Inflation

We use Consumer Price Index (CPI) inflation to control for economic uncertainty in the country, which is expected to have a positive effect on bank profitability, since according to the basic finance rule a higher return is expected for operating in a more risky environment. Another reason why inflation can have a positive effect on bank profitability is the mismatch between banks and businesses in terms of ability to predict inflation. Typically, banks are able to adjust interest rates in advance to avoid extra costs associated with inflation. A positive association between inflation and bank profitability was reported also in previous studies (see, e.g., Bourke 1989; Molyneux and Thornton 1992; Demirgüç-Kunt and Huizinga 1998).

GDP Growth

Another important variable influencing bank profitability is the economic activity in the country, proxied in our study by real GDP growth. Banks are typically able to expand lending when the economy is booming and generate more fee income due to increased activity in the stock market. In addition, banks generate less nonperforming loans when businesses are doing well, which boosts profitability. Margins are also typically growing in periods of economic growth, contributing even further to bank profitability. Hence, consistent with previous findings (see, e.g., Demirgüç-Kunt and Huizinga 1998; Bikker and Haixia 2002; Athanasoglou et al. 2008), we

expect a positive association between bank profitability and economic activity.

Fiscal Stance

Governments in most oil-exporting countries heavily rely on oil production related state revenues. Therefore, we introduce the ratio of public surplus to GDP as an additional macro control variable important to oil-exporting countries, which is expected to have a positive effect on bank profitability.

Institutional Development

The level of institutional development is expected to be positively associated with the ability of banks to generate income (Demirgüç-Kunt and Huizinga 1998). We proxy institutional development by the World Bank's Country Policy and Institutional Assessment composite index. This index rates countries against 16 criteria clustered in four groups: (1) economic management, (2) structural policies, (3) policies for social inclusion and equity, and (4) public sector management and institutions. Higher level of index indicates better institutional policies, which is expected to have positive association with bank profitability.

Concentration

There are two competing theories exploring the relationship between the level of concentration in the banking industry and bank profitability. According to the structure–conduct–performance (SCP) theory, higher concentration boosts bank profitability, since more concentration might imply greater market power and ability to generate higher profits. In contrast to the SCP, the efficiency market hypothesis suggests that banks in more concentrated industries are the most efficient ones, which have survived competition with their peers. Therefore, higher concentration does not necessarily imply market power and relationship between concentration and profitability does not have to be positive.

We proxy market concentration by the Herfindahl index (in terms of bank assets). We do not have any prior regarding the impact of this variable on profitability.

12.2.2.3 Data on Oil Prices

The recent rapid increase in oil prices has spurred a series of studies that discuss appropriate measures of oil price shocks (see, e.g., Kilian 2008; Hamilton 2008). Since there is no agreement in the literature on a single measure that would constitute an oil price shock, we employ four different indicators using daily Brent oil spot and 12-month forward rates collected from Bloomberg.

The *average annual growth rate* is calculated using the arithmetic mean of daily 12-month growth rates of spot prices (p_t):

$$CH_t = \frac{\sum_{i=1}^{365}\left[\log\left(p_{t,i}\right) - \log\left(p_{t-1,i}\right)\right] \times 100}{365} \tag{12.1}$$

This is the simplest possible measure, showing the magnitude of oil price changes over the course of the year. However, this measure does not distinguish whether changes in oil prices were in line with changes in fundamentals. To exploit this dimension, we utilize *deviations of oil prices from their underlying trend* (proxied by the Hodrick-Prescott filter, $p^{HP}{}_t$):

$$HP_t = \frac{\sum_{i=1}^{365}\left[\log\left(p_{t,i}\right) - \log\left(p^{HP}{}_{t-1,i}\right)\right] \times 100}{365} \tag{12.2}$$

and *deviation of oil prices from their expected value* (proxied by the 12-month forward rate, $p^f{}_t$):

$$F_t = \frac{\sum_{i=1}^{365}\left[\log\left(p_{t,i}\right) - \log\left(p^{f}{}_{t-1,i}\right)\right] \times 100}{365} \tag{12.3}$$

These measures are simple indicators suggesting the extent to which changes in oil prices cannot be explained by changes in underlying forces driving oil prices. Lastly, we exploit the *net oil price increase* measure introduced to the literature by Hamilton (2003):

$$HM_t = \frac{\sum_{i=1}^{365} \max\left[0, p_{t,i} - \max_{i=\{1,365\}}\left[p_{t-1,i}\right]\right]}{365} \tag{12.4}$$

Hamilton (2003) shows that although the price of oil itself is not exogenous to macroeconomic developments, its nonlinear transformation (amount by which current oil price exceeds its maximum value in the course of the previous year) is exogenous.

Figure 12.2 displays the dynamics of oil prices and four measures of oil price shocks discussed above for the 1994–2008 period. It shows that in most cases, these measures point to the same direction in terms of oil price shock. For instance, all four indicators suggest that the year 2008 features a positive oil price shock, while the year 2001 (the beginning of the Gulf war) features a negative oil price shock, which is in line with common intuition. Only for few years predictions of these different measures do not match, but this is due to the contradictory outcome from only one of the measures.

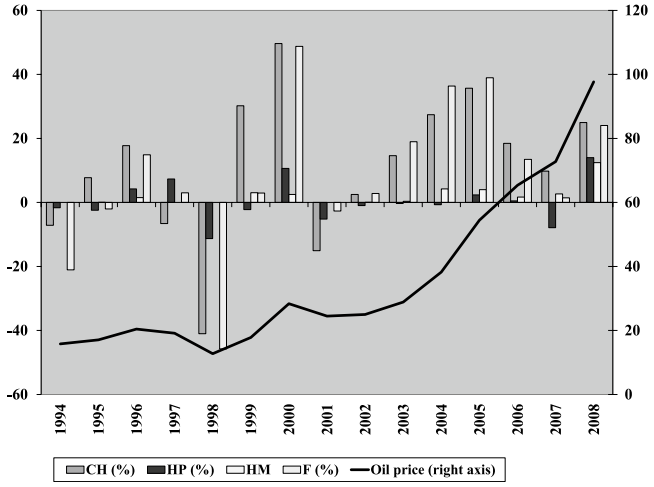

Fig. 12.2 Dynamics of four measures of the oil price shock

The correlation of oil price shocks with macroeconomic variables (inflation, GDP growth, and fiscal stance) appears to be quite high (see Fig. 12.3). This high correlation indicates that oil prices have important effect on macroeconomic development in oil-exporting MENA countries. It is important to note that high correlation in this setup also indicates causality from oil price shocks to macroeconomic variables, and not vice versa, since economies of oil-exporting MENA countries are not sufficiently large to have feedback effect on international developments in oil prices. Therefore, indirect effect from oil price shocks to bank profitability via effects on macroeconomic variables is possible and will be tested in the next section.

12.3 Estimation Results

12.3.1 Do Oil Prices Matter?

We start by regressing profitability on its bank-specific determinants and oil price shocks using pre-2008 data to abstract from the impact of the global financial crisis (see Table 12.4). The results suggest that the impact of the oil price shock on profitability is positive and significant regardless of the definition of the oil price shock. This robust result suggests that oil

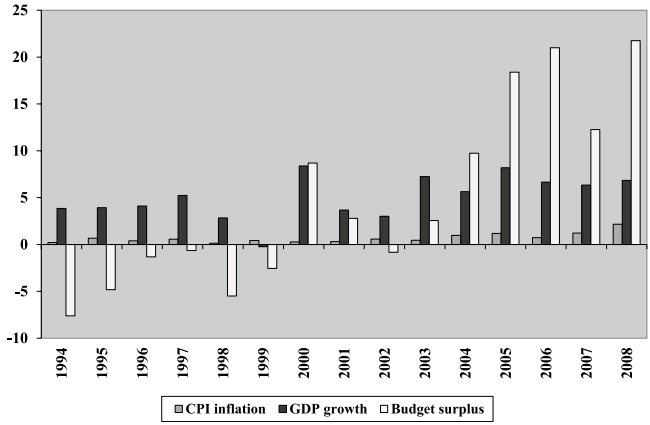

Fig. 12.3 Correlation of macro variables and oil price shocks

Table 12.4 Do oil prices matter?

	Annual growth (average)	*Deviation from HP filter*	*Hamilton (2003) oil shock*	*Deviation from forward rate*
Bank-specific variables				
ROA (lagged)	0.3070***	0.3043***	0.3073***	0.3170***
Capitalization	6.4704**	6.5959***	6.2857**	6.3775**
Liquidity	0.8064**	0.8032**	0.8206**	0.8038**
Credit risk	−1.3340	−1.4421	−1.2557	−1.3144
Inefficiency	−0.0528***	−0.0534***	−0.0514***	−0.0517***
Size	1.0441	0.9888	1.0513	0.9999
Size^2	−0.0316	−0.0289	−0.0324	−0.0301
Oil price shock	0.0035**	0.0128*	0.0614**	0.0049**
Model specification				
Number of obs.	898	898	898	898
Hansen test of OIR (p-value)	0.9899	0.9903	0.9960	0.9960
2nd order AC test (p-value)	0.6057	0.7068	0.6683	0.6922

Notes: Estimations are performed using Blundell and Bond (1998) system robust GMM estimator. Capitalization is modeled as endogenous variable, and credit risk as predetermined variable

***, **, and * indicate significance at 10%, 5%, and 1% levels, respectively

prices are indeed relevant for bank profitability in MENA countries that largely depend on oil production. Whether this impact is direct or indirect is the question that we will try to address later.

Among bank-specific determinants of profitability, we find a positive significant effect of capitalization and liquidity, and a negative significant effect of inefficiency, which is in line with our priors and the academic literature. The impact of credit risk and size was found to be insignificant. These results are robust across all four specifications.

For the lagged impact of profitability, we find a significant coefficient close to 0.3. This indicates the existence of market power in the MENA countries' banking industries, but the departure from perfect competition is not very large. A bit weaker evidence of profit persistence was found for sub-Saharan African countries by Flamini et al. (2009), and for Greek banks by Athanasoglou et al. (2008).

12.3.2 *Which Banks Are Affected?*

To differentiate the impact of oil price shocks on banks having different organizational structures, we introduce interaction terms for oil price shocks with commercial, Islamic, and investment banks. Results reported in Table 12.5 suggest that the significant impact of oil price shocks is mainly channeled through investment banks. Apparently, investment banks benefit the most from the boost in economic activity (fee income, launch of new investment projects, cheaper access to liquidity via wholesale funding market) triggered by positive oil price shocks.

Similarly to the previous results, the hypothesis of overidentifying restrictions cannot be rejected based on the Hansen's J-test. Another test supporting the appropriateness of our specification is the second-order autocorrelation test, which is insignificant in all specifications.

Table 12.5 Which banks are most affected?

	Annual growth (average)	*Deviation from HP filter*	*Hamilton (2003) oil shock*	*Deviation from forward rate*
Bank-specific variables				
ROA (lagged)	0.3023***	0.3047***	0.2831***	0.3114***
Capitalization	6.2564***	6.8821***	5.3152***	6.4127***
Liquidity	0.8013**	0.7698**	0.8254**	0.8179**
Credit risk	−1.6760	−1.6893	−1.8019	−1.7608
Inefficiency	−0.0528***	−0.0531***	−0.0519***	−0.0515***
Size	0.9672	1.107	0.4858	0.9019
Size^2	−0.0292	−0.0335	−0.013	−0.0271
Oil price shock interaction terms				
Commercial banks	−0.0004	0.0065	0.0122	0.0018
Investment banks	0.0357**	0.0813**	0.6720**	0.0369**
Islamic banks	−0.0047	−0.0207	−0.1915	−0.0079
Model specification				
Number of obs.	898	898	898	898
Hansen test of OIR (p-value)	0.9888	0.9875	0.9872	0.9909
2nd order AC test (p-value)	0.1962	0.4812	0.1710	0.2316

Notes: Estimations are performed using Blundell and Bond (1998) system robust GMM estimator. Capitalization is modeled as endogenous variable, and credit risk as predetermined variable

***, **, and * indicate significance at 10%, 5%, and 1% levels, respectively

12.3.3 Is There a Direct Effect of Oil Prices on Bank Profitability?

To distinguish between direct and indirect effects of oil price shocks, we augment the baseline specification by a set of country-specific variables. Estimation results reported in Table 12.6 suggest that the impact of oil prices becomes insignificant when country-specific variables are accounted for. This implies that there is no direct effect from oil price shocks and the overall impact is channeled through macro variables. In particular, inflation and the fiscal stance appear to be the main macro drivers of bank profitability.

Table 12.6 Is there an indirect oil price effect?

	Annual growth (average)	*Deviation from HP filter*	*Hamilton (2003) oil shock*	*Deviation from forward rate*
Bank-specific variables				
ROA (lagged)	0.2254**	0.2310**	0.2279**	0.2393**
Capitalization	5.2450**	5.2462**	5.1671**	5.1953**
Liquidity	0.8977**	0.8940**	0.9050**	0.8996**
Credit risk	−0.9558	−1.0138	−0.9419	−0.9534
Inefficiency	−0.0478***	−0.0467***	−0.0474***	−0.0466***
Size	2.1593	2.1287	2.1329	2.1621
Size^2	−0.0768	−0.0751	−0.0761	−0.0764
Macro variables				
Inflation	0.2233**	0.2550**	0.2219**	0.2365**
Real GDP growth	−0.0143	−0.0217	−0.0137	−0.0193
Fiscal stance	0.0315**	0.0293**	0.0313**	0.0279*
Concentration	−0.0038	−0.0035	−0.0038	−0.0037
Institutional devel.	−0.5806	−0.0089	−0.4249	−0.2136
Oil price shock	0.0002	0.0116	0.0107	0.0027
Model specification				
Number of obs.	898	898	898	898
Hansen test of OIR (p-value)	0.9889	0.9889	0.9895	0.9908
2nd order AC test (p-value)	0.8117	0.8237	0.8149	0.7876

Notes: Estimations are performed using Blundell and Bond (1998) system robust GMM estimator. Capitalization is modeled as endogenous variable, and credit risk as predetermined variable

***, **, and * indicate significance at 10%, 5%, and 1% levels, respectively

12.3.4 *Has the Global Financial Crisis Had an Impact?*

The preliminary examination of descriptive statistics suggests that the relationship between oil price shocks and bank profitability might have been broken in 2008, when positive oil price shocks have coincided with a rapid decline in bank profitability in MENA countries due to the global financial crisis. To evaluate the impact of the financial crisis we reestimate the first model for the total sample (covering also the 2008 data). Estimation results reported in Table 12.7 provide support for the hypothesis of a weakened relationship, since the oil price shock coefficients become insignificant for two out of four specifications.

This result emphasizes the importance of accounting for the impact of multiple global shocks when analyzing the relationship between oil prices and bank profitability. A decomposition of the impact by banking groups provides outcomes similar to the ones for the pre-2008 sample (see Table 12.8).

Table 12.7 Has the financial crisis had an impact?

	Annual growth (average)	*Deviation from HP filter*	*Hamilton (2003) oil shock*	*Deviation from forward rate*
Bank-specific variables				
ROA (lagged)	0.3091***	0.3005***	0.2999***	0.3170***
Capitalization	7.1781***	7.3261***	7.4165***	7.1011***
Liquidity	0.7497**	0.7529**	0.7360**	0.7499**
Credit risk	−1.0973	−1.1440	−1.1905	−1.0802
Inefficiency	−0.0557***	−0.0570***	−0.0573***	−0.0548***
Size	1.254	1.2648	1.2007	1.2298
Size^2	−0.0406	−0.0406	−0.0378	−0.0398
Oil price shock	0.0031**	−0.0007	−0.0154	0.0043**
Model specification				
Number of obs.	956	956	956	956
Hansen test of OIR (p-value)	0.9940	0.9938	0.9950	0.9920
2nd order AC test (p-value)	0.8677	0.8680	0.8009	0.9579

Notes: Estimations are performed using Blundell and Bond (1998) system robust GMM estimator. Capitalization is modeled as endogenous variable, and credit risk as predetermined variable

***, **, and * indicate significance at 10%, 5%, and 1% levels, respectively

Table 12.8 Which banks are most affected? (total sample, including year 2008)

	Annual growth (average)	*Deviation from HP filter*	*Hamilton (2003) oil shock*	*Deviation from forward rate*
Bank-specific variables				
ROA (lagged)	0.2409**	0.2351**	0.2169**	0.2488**
Capitalization	5.5260**	5.8606**	5.8266**	5.6624**
Liquidity	0.8517**	0.8233**	0.8053**	0.8709**
Credit risk	−1.1469	−0.9657	−1.1542	−1.2612
Inefficiency	−0.0521***	−0.0519***	−0.0505***	−0.0512***
Size	1.8069	1.8975	2.1063	1.7782
Size^2	−0.0671	−0.0709	−0.0747	−0.0661
Macro variables				
Inflation	−0.0028	−0.0035	−0.0033	−0.0030
Real GDP growth	0.1698*	0.1661**	0.2666**	0.1770**
Fiscal stance	−0.0132	−0.0102	−0.0114	−0.0214*
Concentration	0.0307**	0.0365**	0.0369**	0.0281*
Institutional devel.	0.2739	−0.1660	−1.0001	0.5630
Oil price shock interaction terms				
Commercial banks	−0.0032	−0.0094	−0.0499*	−0.0006
Investment banks	0.0310**	0.0562	0.2406	0.0342**
Islamic banks	−0.0100	−0.0615	−0.1961*	−0.0131
Model specification				
Number of obs.	956	956	956	956
Hansen test of OIR (p-value)	0.9929	0.9952	0.9949	0.9938
2nd order AC test (p-value)	0.3224	0.3689	0.3408	0.2687

Notes: Estimations are performed using Blundell and Bond (1998) system robust GMM estimator. Capitalization is modeled as endogenous variable, and credit risk as predetermined variable

***, **, and * indicate significance at 10%, 5%, and 1% levels, respectively

12.4 Conclusions

The importance of oil prices for the economic development of oil-exporting countries is widely acknowledged. However, the impact of oil price shocks on bank performance has lacked a rigorous empirical analysis so far. This chapter fills this gap by providing a quantitative assessment of the impact of oil price shocks on bank profitability in oil-exporting MENA countries.

We distinguish between direct and indirect channels through which oil price shocks may affect bank profitability. The former channel assumes that oil price shocks could affect bank profitability directly via increased oil-related lending or business activity. The indirect channel suggests that the impact is transmitted through macroeconomic and institutional characteristics of the countries bolstered by increased expectations and business sentiment in the country. The estimation results lend support for the indirect channel hypothesis. We find no evidence supporting the direct channel hypothesis.

Among the organization structure of banks, we find that the impact of oil prices is most evident for investment banks, while there is little evidence supporting that commercial and Islamic banks are also affected to the same extent. This result suggests that oil price shocks largely affect investment activity in oil-exporting MENA countries. However, this result should be interpreted with caution, since we do not control for the impact of house prices, which might be very influential determinants of profitability for Islamic banks. In addition, given the heterogeneity of the bank balance sheet data across the countries, we might not be fully capturing this relationship between bank type and oil price shocks.

We also find that the relationship between oil price shocks and bank profitability has been distorted by the global financial crisis, when positive oil price shocks have coincided with declining bank profits in 2008. This finding suggests that the impact of global shocks other than oil price developments should be taken into account when analyzing the relationship between oil price shocks and bank profitability.

Our findings have interesting policy implications, since they provide the first evidence of a systemic importance of oil price shocks for bank performance in oil-exporting countries. There has been anecdotal evidence of this link but it has not been tested formally in an empirical setting. In particular, these findings suggest that oil price shocks could be used for macro prudential regulation purposes in MENA countries, since oil prices are easier to monitor than commonly used measures of business cycle (such as deviations of GDP from its potential level). For instance, tying bank capitalization to oil price shocks can help to mitigate procyclical bank lending and allow banks to use their capital cushions created during boom periods for lending purposes during downturns. Given the recent sharp decline in oil prices, it would be also of interest to analyze its impact on bank profitability once data become available.

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