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Inflation Pressures and Monetary Policy Options in Emerging and Developing Countries: A Cross Regional Perspective

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Monetary and Capital Markets Department

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Abstract

This paper analyzes the monetary policy response to rising inflation in emerging and developing countries associated with the food and oil price shocks in 2007 and the first half of 2008. It reviews inflation developments in a sample of countries covering all regions and a broad range of monetary and exchange rate policy regimes; discusses the underlying causes of inflation; provides a synthesis of policy responses taken against the background of the conflicting objectives and trade-offs, the uncertainties regarding the nature of the shocks, and the additional challenges brought on by the global financial turmoil; and presents considerations for policy.

This Working Paper should not be reported as representing the views of the IMF.

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

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I. INTRODUCTION

- 1. The surge in food and energy prices and the subsequent increase in inflation have posed a major challenge to central banks.** In particular, many emerging and developing countries have faced a substantial acceleration of inflation since early 2007, raising concerns about the credibility of monetary policy. In these countries, combating inflationary pressures has been more challenging than in advanced countries, in part reflecting a larger share of food and fuel products in the consumption basket, and also because of a preference for less flexible exchange rates and an inclination to give growth priority relative to other macroeconomic policy objectives in many cases. At the same time, many central banks lack independence and institutional capacity. Markets are also generally less well-developed, undermining monetary policy transmission.
- 2. The surge in food and energy prices was also the first significant test of inflation targeting (IT) regimes in emerging market countries.** Most emerging market IT countries have overshot their official inflation targets while grappling with the task of finding the most appropriate policy action given the uncertainty about the nature of the shock. With the growing downside risks to economic growth and worsening conditions in the global financial markets, the sharp pick up in inflation has raised difficult questions about the inflation-growth trade-off and whether to modify some features of the IT framework. Some commentators have even questioned the very *raison d'être* of the IT regime and suggested its abandonment.
- 3. The upsurge of inflation has also highlighted the complex challenges facing policymakers in an increasingly globalized world.** Coming from a recently benign inflation environment, many policymakers seem to have been caught off-guard. Central banks are facing new policy challenges, stemming from a difficult combination of global financial turmoil, economic slowdown, volatility in commodity markets, reversal of capital inflows, exchange rate depreciation, and inflation pressures. Although central bank communication has improved in recent years, the current environment is significantly more difficult and uncertain, and requires a renewed effort to credibly explain central bank actions.
- 4. The paper covers developments in 2007 and the first half of 2008,** complementing other recent work by the Fund² on the recent inflationary episode in emerging and developing countries. It reviews inflation developments in a sample of 50 countries covering all regions and a broad range of monetary and exchange rate policy regimes. It discusses the underlying causes of inflation and provides a synthesis of policy responses. It considers the conflicting objectives and trade-offs, the uncertainties regarding the nature of the shocks, and the additional challenges brought on by the global financial turmoil.
- 5. The main objectives of the paper are to:** (i) bring a cross-regional perspective to the analysis of inflation developments (Section II); (ii) evaluate the impact of monetary policy responses (Section III); and (iii) present considerations that may help to inform policy advice to the Fund's member countries (Section IV). The paper should be seen as complementary to Chapter 3 of the Fall 2008 World Economic Outlook (WEO), which also examines inflation

² See, International Monetary Fund, "Food and Fuel Prices—Recent Developments, Macroeconomic Impact, and Policy Responses," and October 2008 World Economic Outlook (WEO) and Regional Economic Outlooks.

developments in the context of the overall macro situation and implications for the monetary policy stance. It differs from the WEO in its focus on the operational aspects of monetary and exchange rate policies as they seek to deal with the present shocks.

6. **The main findings of the paper are the following:** Both aggregate demand pressures and surging commodity prices played a role in rising inflation in emerging and developing countries. Inflation pressures became broad-based in most countries, with second round effects following the initial shock to fuel and food prices. Most central banks tightened monetary policy with a view to constraining aggregate demand and anchoring inflation expectations, although the timing and speed of the tightening efforts varied significantly. It is early to fully gauge the impact of the policy response to date, given the need to take account of delays in monetary policy actions in many countries, possible lags in transmission, and an often accommodative monetary policy stance, with interest rate hikes falling short of the rise in inflation.

7. **Looking beyond the period covered by the paper, the ongoing slowdown of the global economy will help to dampen inflation, but monetary policy-makers need to remain vigilant.** Headline inflation has eased since May 2008 in some countries, reflecting the slowing of economic activity and a partial reversal of the increase in commodity prices. In many countries, however, demand pressures are still evident, the credibility of monetary policy is weak, capital outflows have led to exchange rate depreciation with a pass-through to inflation, and monetary and credit aggregates have increased sharply. Central banks will thus need to continue to credibly demonstrate their commitment to bringing inflation back to target levels.

8. **In this environment, the communication strategy becomes crucial in limiting the damage to credibility.** Circumstances are difficult and give rise to new communication challenges in keeping inflation expectations well anchored, and calls for greater efforts to credibly explain central bank actions while emphasizing a continuing commitment to meeting inflation objectives.

9. **Supporting measures can avoid overburdening monetary policy.** These include allowing the exchange rate to appreciate, where possible, maintaining a supportive fiscal policy stance, and reducing wage and price pressures through greater labor market flexibility, productivity matching wage policies, and structural reforms to boost productivity and competitiveness.

II. CROSS REGIONAL DEVELOPMENTS IN INFLATION

10. **Inflation pressures rose sharply since mid-2007 in emerging market and developing economies.** Average headline inflation in the first six months of 2008 in these countries reached about 9 percent (y/y)—with the highest rates observed in oil exporting countries. The comparable figure for advanced countries is about 4 percent (y/y) (Figure 1). By region, Middle-Eastern countries, followed by emerging Europe, have, on average, faced stronger inflation pressures when compared to the other regions (Table 1 and Figure 2). Appendix I and Appendix Table 1 provide additional information on cross-regional inflation developments and their underlying drivers.

Table 1. Sample Countries and Summary Statistics on Inflation and Monetary Policy

Exchange regime	Anchor/Policy Framework	Inflation target 1/	Latest inflation			Latest policy rate 3/			Exchange rate (-: appreciation)			Food and fuel share		
			Headline	Change in headline since		Policy rate	Real rate (minus headline inflation)		Dollar	Euro	Nominal effective exchange rate	Food	Food	
				July 2007	Core 2/		Real rate (minus core inflation)	Real rate (minus core inflation)						
Latin America													31.5	4.9
Brazil	Independently floating	Inflation targeting framework	4.5±2	9.3	3.9	7.5	8.44	-0.4	1.3	-5.0	9.0	-6.2	...	...
Chile	Independently floating	Inflation targeting framework	3±1	9.5	5.6	8.7	6.75	-2.8	-2.0	-0.6	14.4	-9.7	27.2	4.0
Colombia	Managed floating	Inflation targeting framework	3.5-4.5	7.2	1.4	5.6	10.00	2.8	4.4	-7.0	6.9	-8.2	30.0	1.1
Costa Rica	Crawling band	Exchange rate target: U.S. dollar	8±1	12.8	4.1	11.4	...	...	...	0.2	13.4	-1.5	17.0	18.2
Dominican Republic	Managed floating	Other	4-6	12.2	7.0	...	9.00	-3.2	...	4.6	20.3	3.0	...	...
Guatemala	Managed floating	Inflation targeting framework	5.5±1.5	13.3	7.9	12.5	6.75	-6.5	-5.7	-1.9	12.8	-3.2	38.8	2.0
Honduras	Conventional peg	Exchange rate target: U.S. dollar	5-6	12.2	5.9	...	9.00	-3.2	...	0.0	15.0	0.0	31.8	2.9
Mexico	Independently floating	Inflation targeting framework	3±1	5.3	1.1	5.0	8.00	2.7	3.0	-6.5	7.5	-3.2	...	...
Peru	Managed floating	Inflation targeting framework	2±1	5.7	3.5	4.5	6.25	0.6	1.8	-6.2	7.9	-11.1	47.5	3.9
Uruguay	Managed floating	Other	3-7	8.4	0.4	8.0	7.25	-1.2	-0.8	-17.9	-5.6	-16.6	28.5	2.5
Emerging Eastern Europe													30.0	7.2
Bulgaria	Currency board	Exchange rate target: ERM/Euro	3.1	15.3	6.9	12.8	4.96	-10.3	-7.9	-13.0	0.0	-11.9	22.6	11.4
Croatia	Conventional peg	Exchange rate target: Euro	3	7.6	5.4	5.3	9.00	1.4	3.7	-13.9	-1.0	-12.4	30.3	...
Czech Republic	Independently floating	Inflation targeting framework	3±1	6.7	4.2	4.6	3.75	-2.9	-0.8	-25.9	-14.8	-21.9	16.5	...
Estonia	Currency board	Exchange rate target: ERM-II	9.8†	11.4	5.1	8.5	6.38	-5.1	-2.1	-11.5	0.2	-13.0	...	...
Hungary	Independently floating	Inflation targeting framework	3±1	6.7	-1.7	7.2	8.50	1.8	1.3	-18.1	-5.8	-11.7	17.0	6.3
Israel	Independently floating	Inflation targeting framework	2.0±1	5.4	5.1	2.6	3.75	-1.7	1.2	-24.9	-15.0	-20.6	...	...
Latvia	Conventional peg	Exchange rate target: ERM-II	6	17.7	8.2	12.7	6.00	-11.7	-6.7	-13.2	-0.2	-12.0	...	...
Lithuania	Currency board	Exchange rate target: ERM-II	8.6	12.4	7.4	7.1	5.00	-7.4	-2.1	-13.3	-0.3	-12.1	32.6	13.3
Poland	Independently floating	Inflation targeting framework	2.5±1	4.7	2.4	2.6	6.00	1.3	3.4	-23.4	-11.9	-20.3	27.2	3.9
Romania	Managed floating	Inflation targeting framework	3.5±1	8.6	4.6	10.4	10.25	1.6	-0.1	0.1	15.1	2.9	37.5	7.4
Russia	Conventional peg	Exchange rate target: Composites	10.5	15.1	6.4	9.5	11.00	-4.1	1.6	-8.4	5.4	-7.1	...	...
Serbia, Republic of	Managed floating	Lite inflation targeting framework	3-6 †	15.9	11.8	8.0	15.75	-0.2	7.7	-8.5	3.5	-12.6	...	...
Slovak Republic	Horizontal bands	Inflation targeting framework	2.5±1	4.6	2.4	2.5	4.25	-0.4	1.8	-20.8	-10.4	-16.7	...	...
Turkey	Independently floating	Inflation targeting framework	7.5±2	10.6	3.7	6.5	16.75	6.1	10.2	-4.4	10.0	-5.9	...	...
Ukraine	Managed floating	Other	9.6	31.1	17.5	9.8	12.00	-19.1	2.2	-4.0	10.4	-0.6	56.0	1.0
Emerging Asia													23.7	11.8
China	Crawling peg	Exchange rate target: U.S. dollar	4.8	7.7	2.1	...	4.14	-3.6	...	-9.4	4.2	-8.0	33.2	...
Hong Kong SAR	Currency board	Exchange rate target: U.S. dollar	...	5.6	4.1	3.8	3.50	-2.1	-0.3	-0.3	14.7	-0.2	...	...
India	Managed floating	Other	5.5	7.8	1.3	...	9.00	1.2	...	6.2	22.2	4.2	26.9	7.0
Indonesia	Managed floating	Inflation targeting framework	4.5±1	10.4	4.3	8.7	9.00	-1.4	0.3	0.4	15.5	2.3	33.9	7.1
Korea	Independently floating	Inflation targeting framework	3.0±0.5	5.5	3.0	4.3	5.25	-0.3	0.9	13.5	30.5	13.4	13.0	10.0
Malaysia	Managed floating	Other	2.5-3.0	3.8	2.2	2.8	3.50	-0.3	0.7	-6.1	6.2	-8.1	30.0	11.8
Philippines	Independently floating	Inflation targeting framework	3.5±1	11.4	8.8	7.9	5.75	-5.6	-2.2	-1.9	12.9	-6.0	...	...
Singapore	Managed floating	Other	4.5-5.5 †	7.4	4.9	6.5	1.32	-6.1	-5.2	-9.9	3.6	-9.9	5.0	23.0
Thailand	Managed floating	Inflation targeting framework	0.3-5 ‡	8.9	7.1	3.6	3.50	-5.4	-0.1	-0.5	14.4	-4.7	...	...
Vietnam	Conventional peg	Exchange rate target: U.S. dollar	<6.5-9	26.8	18.4	3.7	14.00	-12.8	10.3	0.2	13.6	0.2	...	...
Africa													33.0	4.7
Botswana	Crawling peg	Adjusted according to a set of indicators	4-7	12.1	4.5	9.1	15.00	2.9	5.9	6.0	24.8	4.9	...	...
Cameroon	Conventional peg	Cooperative arrangement: CEMAC	4†	5.2	6.3	2.0	5.25	0.1	3.3	-13.0	0.0	-11.8	21.7	3.7
Ghana	Managed floating	Other	6-8	15.3	5.2	11.4	16.00	0.7	4.6	4.8	21.6	4.9	...	...
Mozambique	Managed floating	Other	<12	10.4	1.2	5.1	12.00	1.6	6.9	-6.2	9.5	-6.7	...	...
Nigeria	Managed floating	Other	8†	9.7	4.9	1.2	10.25	0.6	9.1	-7.2	8.5	-7.3	63.8	7.4
Senegal	Conventional peg	Cooperative arrangement: WAEMU	2†	6.1	-0.8	6.0	4.25	-1.8	-1.8	-13.0	0.0	-11.8	40.3	6.3
South Africa	Independently floating	Inflation targeting framework	3-6	11.7	4.7	6.1	11.50	-0.2	5.4	10.2	28.6	9.3	25.7	4.3
Uganda	Managed floating	Other	5	8.7	3.0	12.0	15.01	6.3	3.0	-2.0	10.1	-0.3	13.5	1.6
Middle East													38.4	5.8
Armenia	Managed floating	Lite inflation targeting framework	4±1.5	10.2	8.0	5.7	7.25	-2.9	1.6	-10.2	-1.0	-9.2	48.0	3.5
Egypt	Managed floating	Other	...	20.2	12.6	...	9.00	-11.2	...	-4.9	11.0	-5.4	38.9	...
Jordan	Conventional peg	Exchange rate target: U.S. dollar	8-9†	16.6	12.9	4.9	6.75	-9.9	1.9	0.0	17.8	0.1	39.7	13.2
Kazakhstan	Conventional peg	Exchange rate target: U.S. dollar	7.9-9.9	20.0	11.1	0.3	11.00	-9.0	10.7	-2.3	11.7	-1.3	...	...
Kuwait	Conventional peg	Exchange rate target: Composites	...	7.5	2.6	5.0	5.75	-1.8	0.7	-6.0	7.9	-7.1	18.3	...
Kyrgyz Republic	Conventional peg	Exchange rate target: U.S. dollar	12-15	27.0	20.4	12.6	8.73	-18.3	-3.9	-5.0	12.1	-4.1	47.2	0.8
Saudi Arabia	Conventional peg	Exchange rate target: U.S. dollar	...	10.5	6.6	4.8	1.83	-8.6	-3.0	0.1	17.9	0.1	...	...

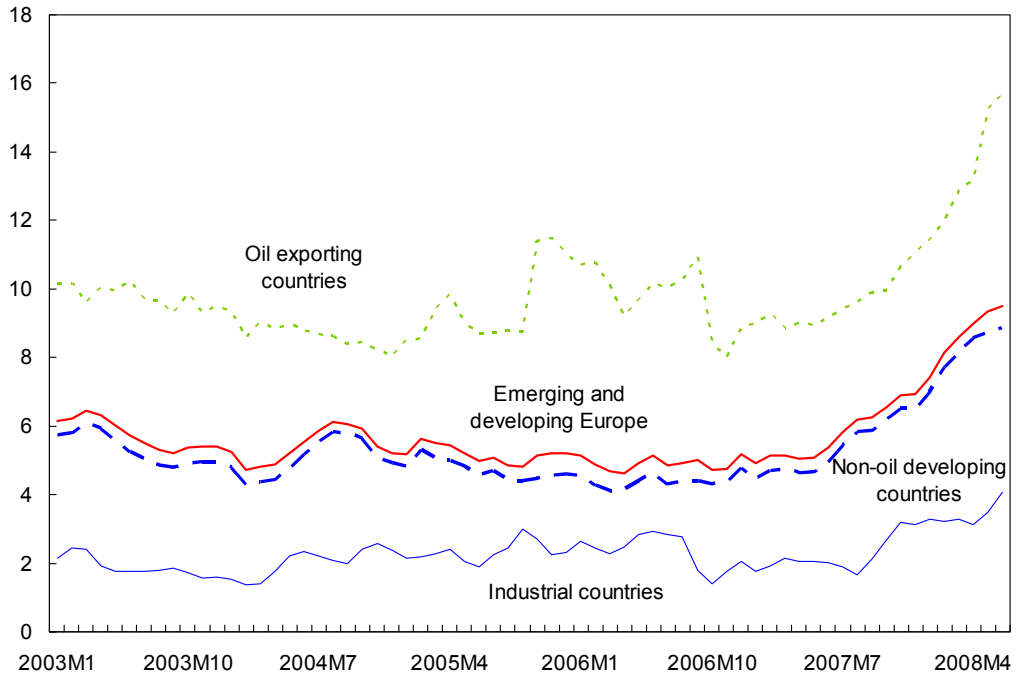
Sources: IMF International Financial Statistics, area departments, and central bank websites.

1/ In non-inflation targeting countries, the figures reflect the official inflation objective. † Inflation forecast from official entity. ‡ Targets core inflation.

2/ For Euro area, where data are available, HICP excluding energy, food, alcohol and tobacco. For the other countries, the data are mostly the authorities' published data.

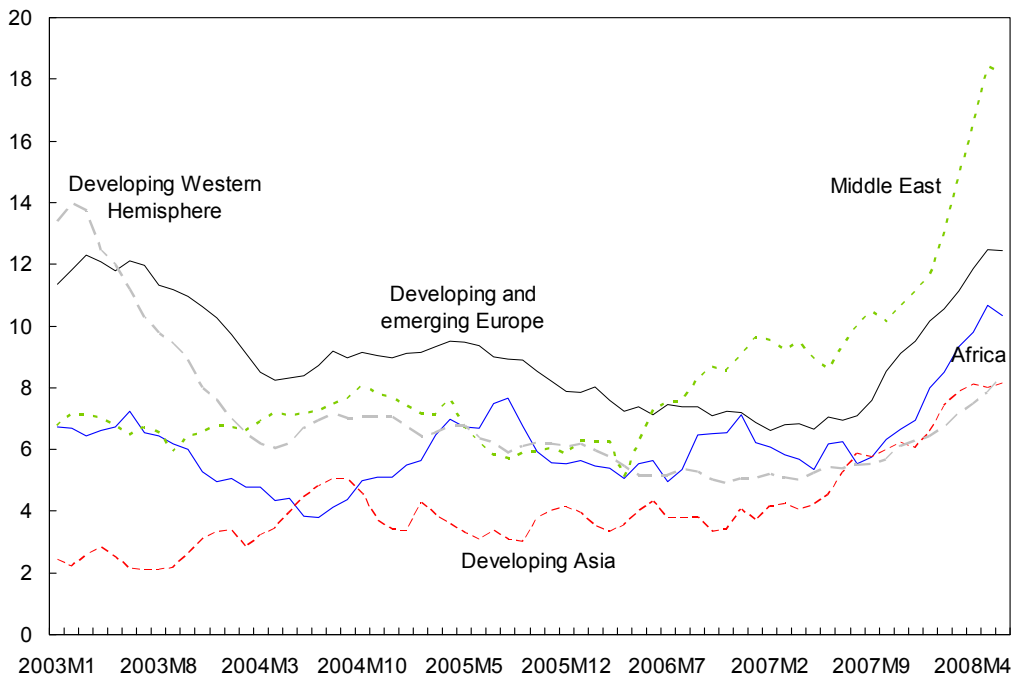
3/ For Bulgaria, Estonia, Latvia, Lithuania, Senegal, and Saudi Arabia, short-term market rates.

Figure 1. Headline Inflation by Country Group; Jan. 2003–Jun. 2008 1/
(Monthly data; year-on-year percentage change)



Sources: IMF, *International Financial Statistics*.
1/ Country groups follow IFS classification.

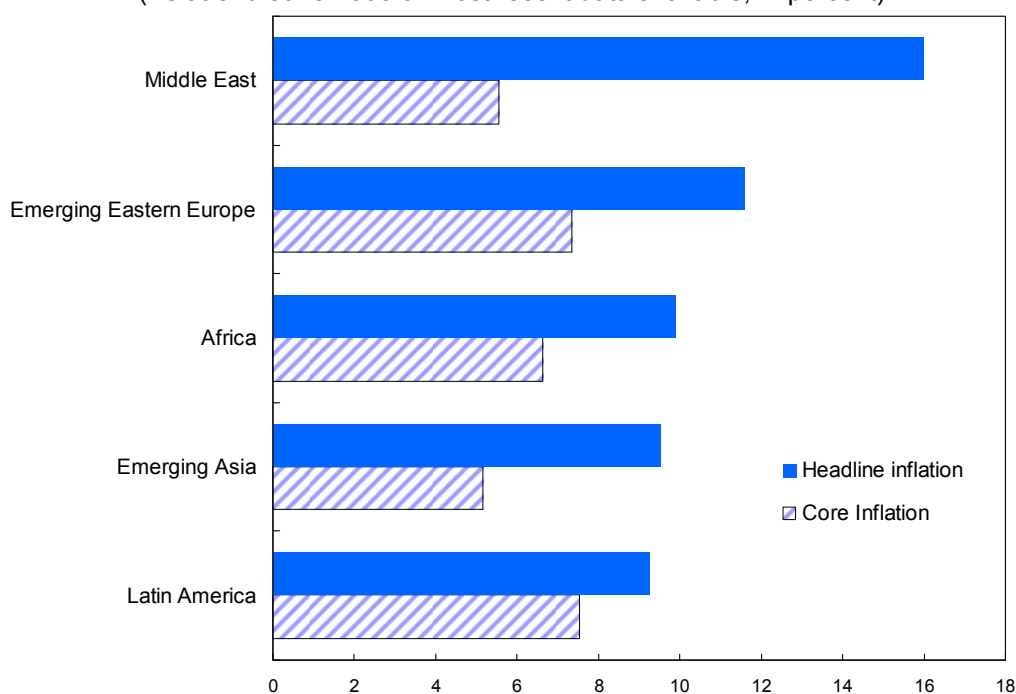
Figure 2. Headline Inflation by Geographic Region; Jan. 2003–Jun. 2008 1/
(Monthly data; year-on-year percentage change)



Sources: IMF, *International Financial Statistics*.
1/ Country groups follow IFS classification.

11. **There is evidence that surging fuel and food prices were an important driver of higher inflation in emerging and developing countries,³ which themselves have been driven by a combination of supply and global excess demand factors.** On average, headline inflation rose more sharply than core inflation (excluding fuel and food in most cases), especially in Middle Eastern countries, and there is a large gap between these two inflation indicators (Figure 3). However, the cross-sectional correlation between accumulated inflation⁴ and the shares of food and fuel in the CPI basket is not statistically significant (Figures 4 and 5), likely reflecting different food and fuel subsidies and the imposition of price controls in some countries (e.g., Malaysia and China).⁵ Different macroeconomic policy stances may also have played a role.

Figure 3. Headline and Core Inflation by Geographic Region
(As at end-June 2008 or most recent data available; In percent)



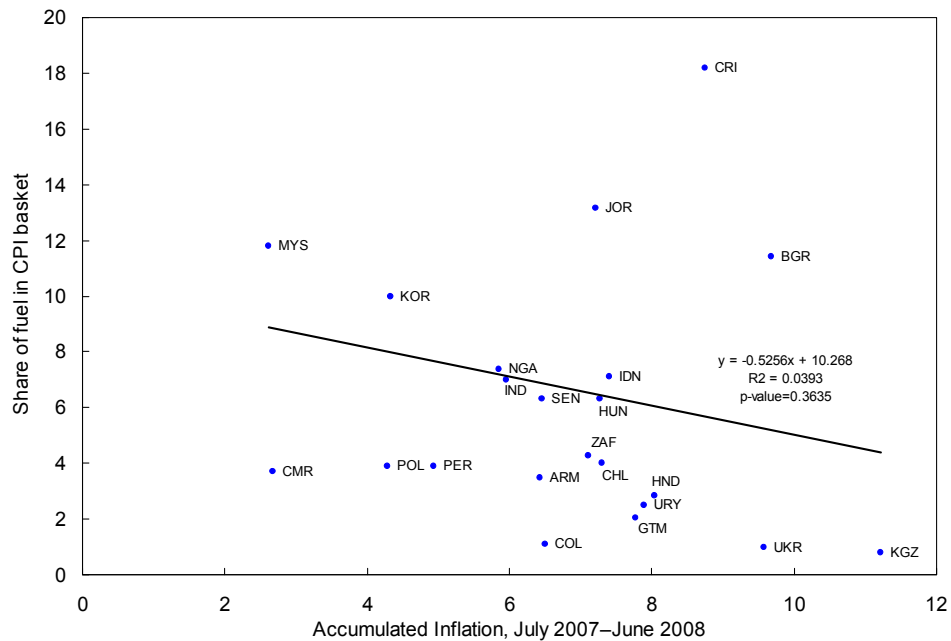
Sources: IMF, *International Financial Statistics*; and central bank websites.

³ Appendix II provides econometric estimates.

⁴ Accumulated inflation is defined as the percent change in CPI between July 2007 and April 2008 for all countries except Cameroon (Jan 2008), Kuwait (Dec 2007), Nigeria, South Africa, Singapore, China, India, Malaysia, Ukraine, Russia, Romania (March 2008). In cases where, due to publication lags, inflation is available but the CPI is not, this is calculated by summing month-on-month inflation. Unless otherwise specified, the latest observations on various variables reflect the status at end-June 2008 (most), end-May 2008 (China, Hong Kong SAR SAR, India, Indonesia, Israel, Malaysia, Nigeria, Russia, Singapore, South Africa, and Ukraine), end-April 2008 (Ghana, Saudi Arabia, and Uganda), or end-2007 (Kuwait).

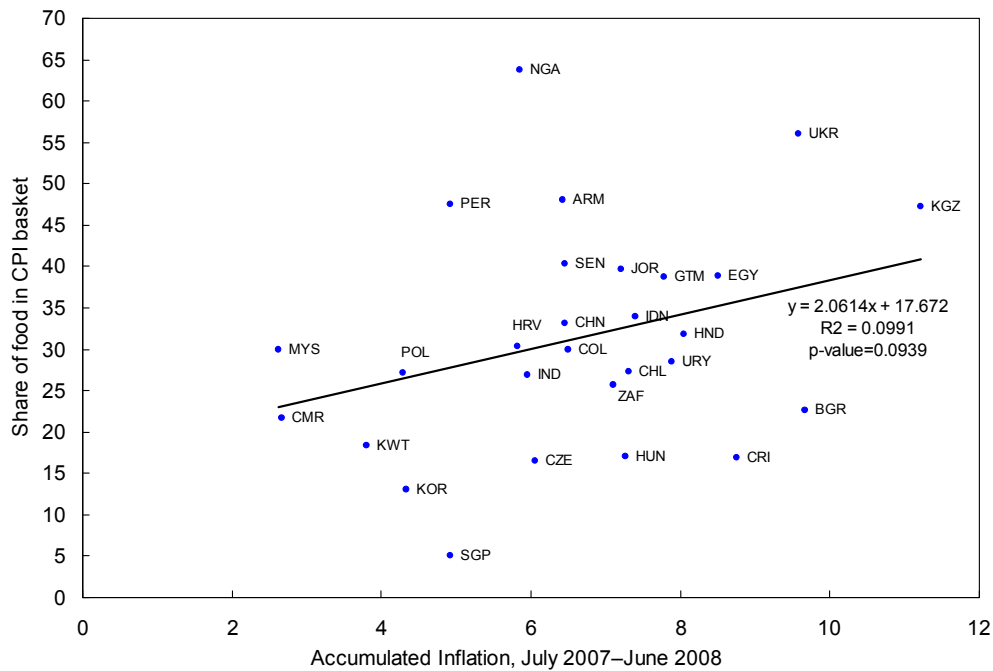
⁵ Fuel and food items together account for about 40 percent of CPI baskets in the emerging and developing countries in the sample. SM/08/182 (6/19/08) and SM/08/299 (9/9/08) provide details on such measures.

Figure 4. Accumulated Inflation, July 2007–June 2008, and Share of Fuel in CPI 1/ (In percent)



Sources: IMF, *International Financial Statistics*, and Research Department data.
1/ Includes the 25 of the “selected 50 countries” for which data for fuel share in CPI basket are available.

Figure 5. Accumulated Inflation since July 2007 and Share of Food in CPI 1/ (In percent)

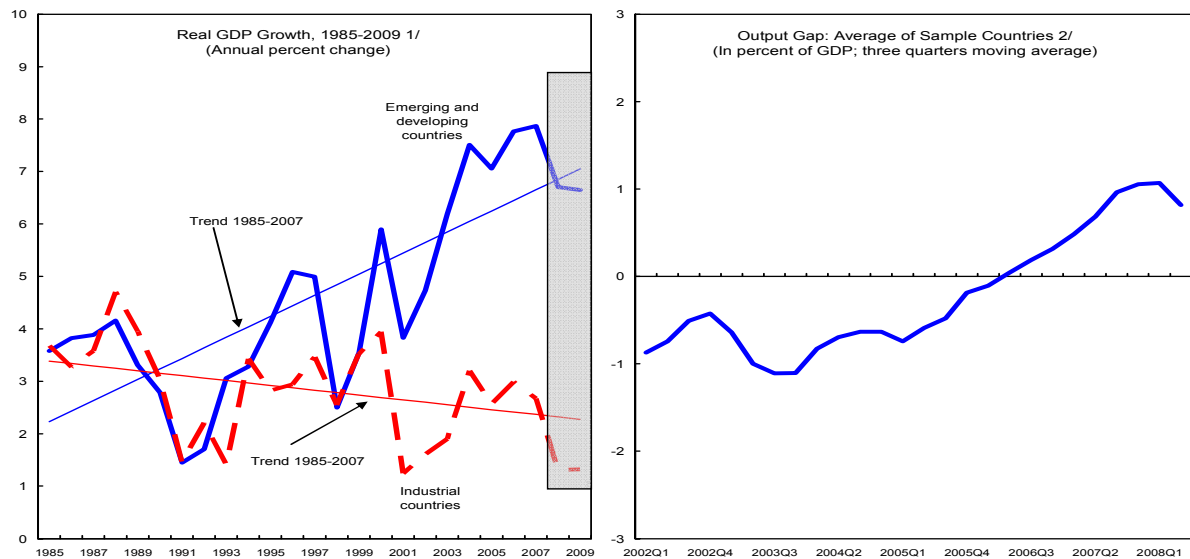


Sources: IMF, *International Financial Statistics*, and Research Department data.
1/ Includes the 25 of the “selected 50 countries” for which data for fuel share in CPI basket are available.

12. **The available data also point to demand pressures as an important factor in higher inflation, in particular core inflation.**⁶

- Over the last few years, emerging market and developing countries grew above trend, in marked contrast to advanced countries (Figure 6). The estimated average output gap of a selected group of emerging market countries has risen, although it seems to have started to taper off recently, reflecting the recent slowdown in economic growth in many emerging market countries (Figure 7).
- Rapid growth of credit to the private sector and capital inflows apparently contributed to buoyant demand. Figure 8 shows a positive correlation between the real growth of private sector credit and the increase in inflation.

Figure 6. Indicators of Excess Demand Pressures in Emerging Market Countries



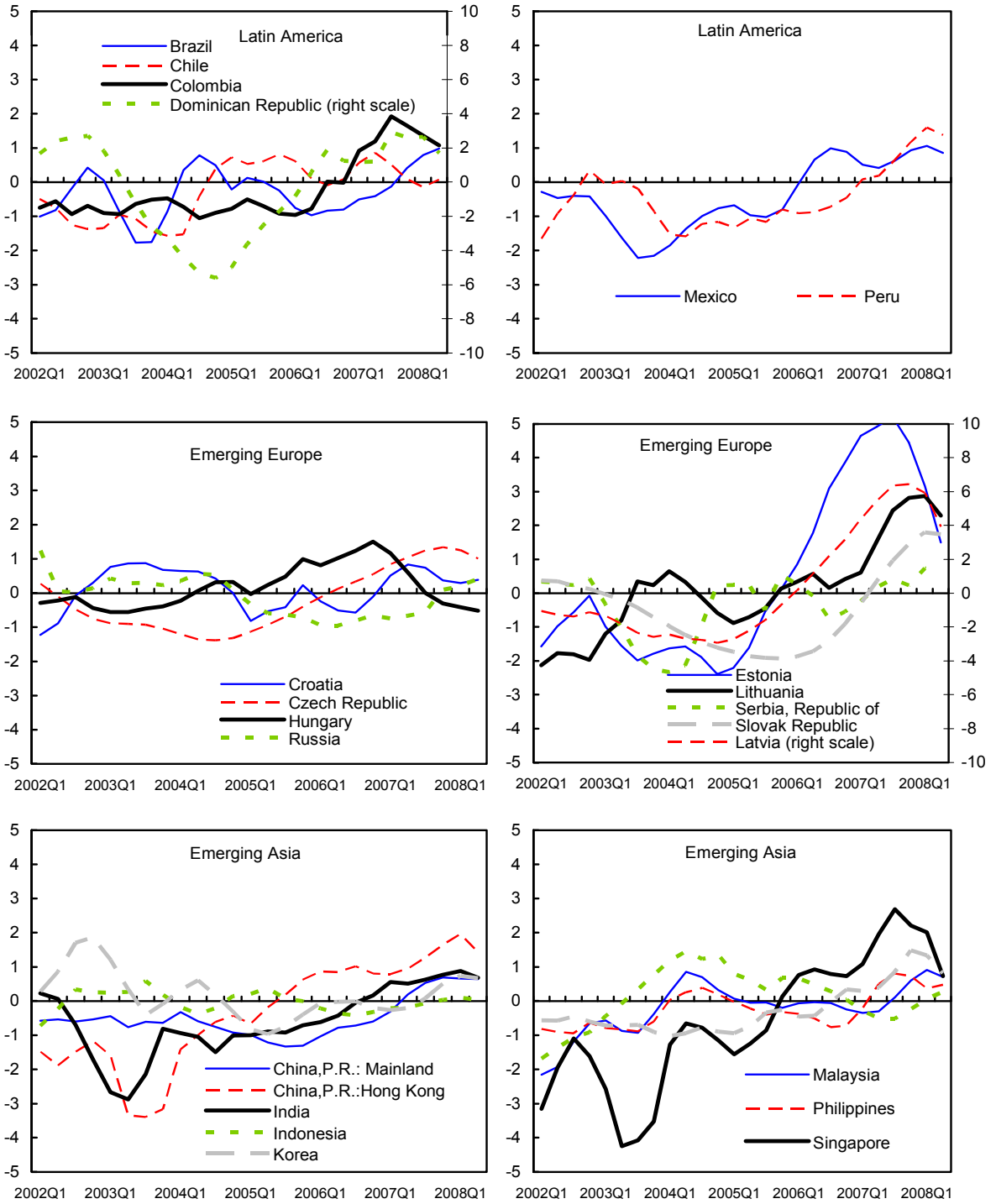
Sources: IMF World Economic Outlook (WEO), and authors' estimations.

1/ Includes all countries reported in WEO. Shaded areas indicate WEO projections.

2/ The output gap is estimated using HP filter for the countries where quarterly data are available. It excludes Dominican Republic, Venezuela, and Latvia.

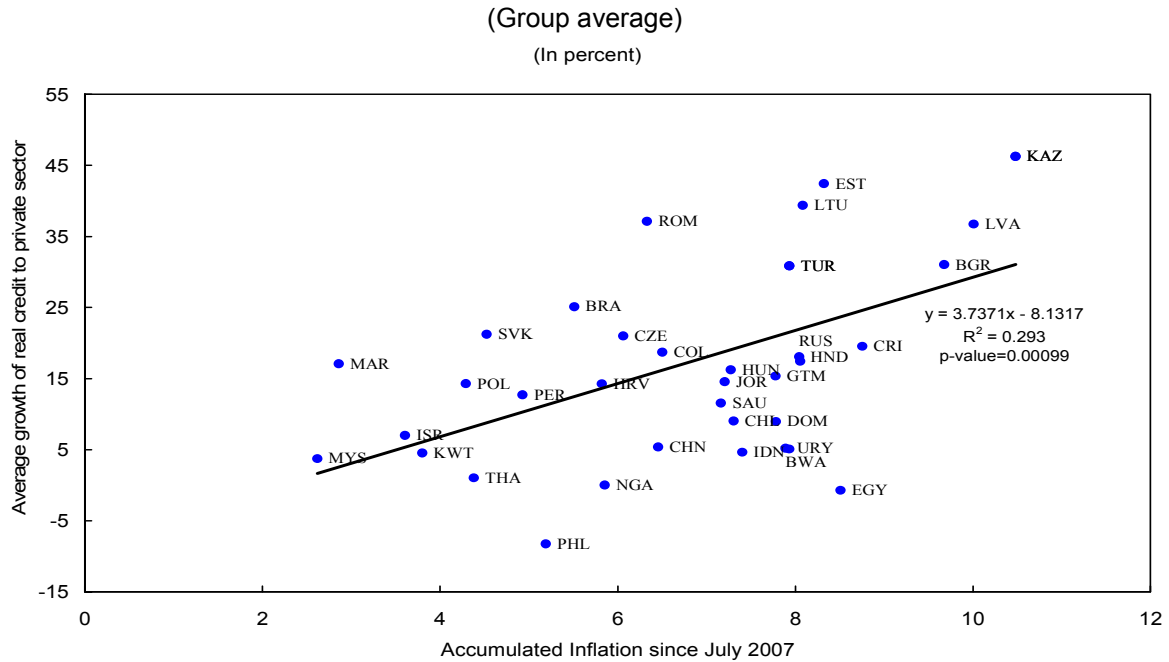
⁶ In a number of countries, depreciation of the local currency also contributed to price pressures (e.g., Romania, Serbia, Turkey, Ghana, South Africa, Korea, Kazakhstan), as well as one-off factors, such as administrative price and VAT increases (e.g., Czech Republic, Estonia, and Latvia, Botswana, Indonesia, Singapore, Egypt). EU-required regulated price adjustments and indirect tax rises also contributed in Europe. In some countries (e.g., in new member states), rising inflation has been a part of the convergence process.

Figure 7: Regional Developments in Output Gap, 2002Q1–2008Q2
 1/
 (In percent of GDP; 3 quarter moving average)



Source: Authors' estimates.
 1/ Calculated using the Hodrick-Prescott filter.

Figure 8. Average Growth of Real Credit to Private Sector and Accumulated Inflation, July 2007–June 2008 1/



- Recent country reports and monetary and inflation reports of country authorities provide additional indications of demand pressures:
 - Labor markets tightened and wage pressures increased in several countries, reflecting growing supply constraints to meet aggregate demand. In some cases, wage pressures partly reflected increased emigration to advanced countries (particularly apparent in Central and Eastern Europe). Capacity constraints also became more binding in other countries (e.g., Brazil, Colombia, and Costa Rica). Supply bottlenecks for housing contributed to overheating in some Middle Eastern countries (e.g., Kuwait, and Saudi Arabia).
 - Some countries, especially oil exporters, made use of greater scope for expansionary fiscal policies (e.g., Russia, Ukraine, and Saudi Arabia). Expansionary fiscal policies also contributed to overheating pressures in Estonia and Kuwait. High commodity prices provided a positive terms of trade boost to domestic demand in the oil producing countries.

13. **As a result, inflation pressures became more broad-based in most countries.** Except in China, Israel, and Malaysia, core or underlying inflation (excluding food and energy) rose along with headline inflation, suggesting second round effects. In many countries, available information also suggests that inflation expectations have increased in 2008. Econometric evidence shows that lower interest rates and domestic credit growth have been associated with higher inflation, and that second round effects may be increasing in 2007-08, compared to 2005-06 (Appendix II).

14. Differences in the severity of inflation pressures across countries appear to have been related in part to exchange rate and monetary policy arrangements.

- The pick up in inflation was particularly marked in countries with soft exchange rate pegs (Figure 9), where monetary policy is or was geared to maintaining the exchange rate target. As a result, domestic inflation largely reflected rising international prices for goods and services. Some countries with hard pegs also experienced sharp increases in inflation (Bulgaria and the Baltic countries). The increase in inflation was slightly higher on average in countries with soft pegs to the U.S. dollar, compared with those with pegs to the euro or a currency basket.
- IT countries with floating exchange rates experienced a smaller rise in inflation on average compared to non-IT countries (most of which target monetary aggregates or the exchange rate, Figure 10). However even here, actual inflation exceeded official targets by significant margins (Figure 11), with the IT emerging market countries facing the first real challenge to the credibility of their IT regimes.

III. POLICY RESPONSES TO INFLATION PRESSURES

A. Policy Actions to Date

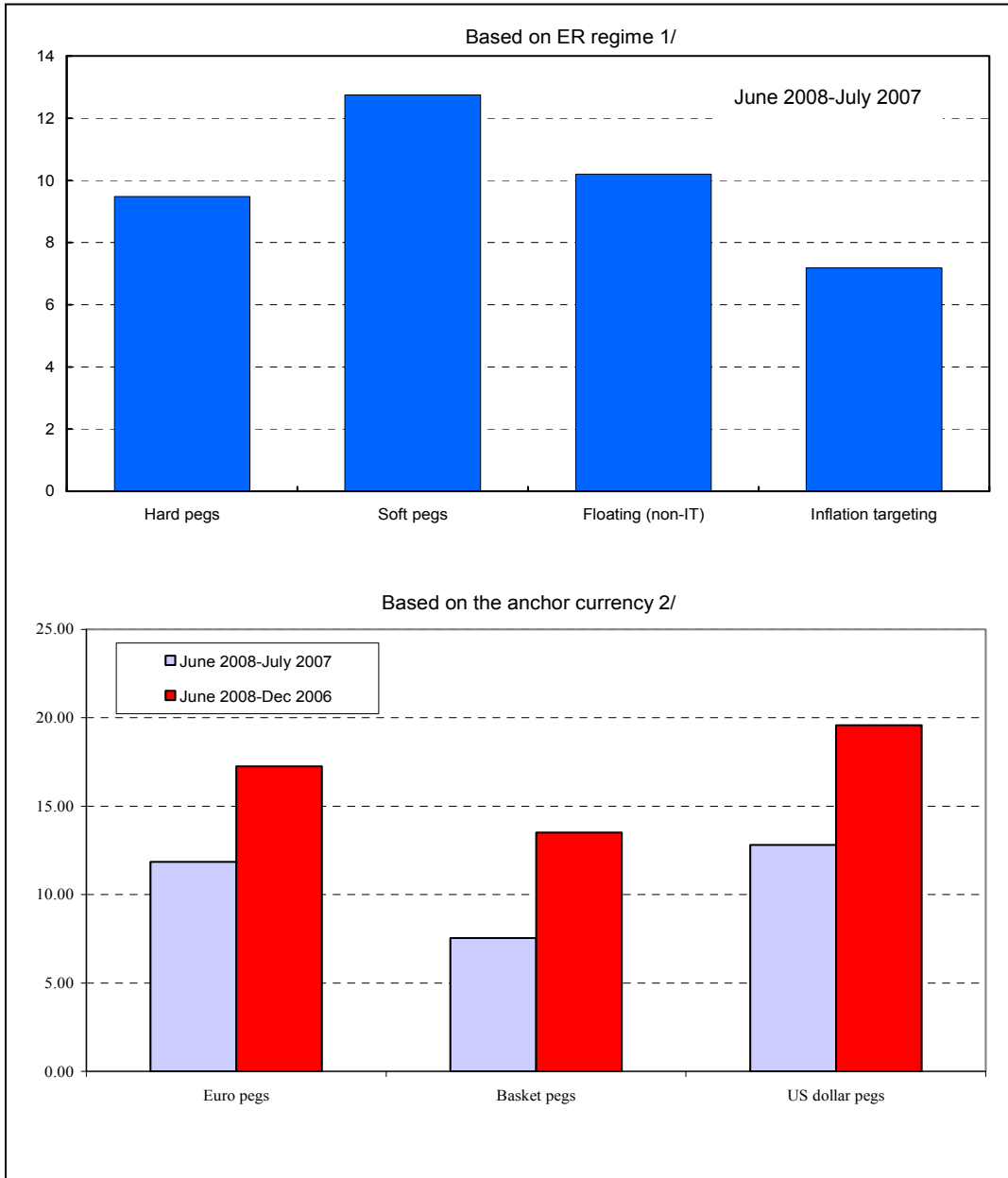
15. Faced with the rapid increase in inflation, most central banks tightened monetary policy (see Appendix III for summary information on the various policy actions). Underlying the tightening efforts were concerns that the sharp rise in food and energy prices was leading to second round effects, including wage pressures, particularly in those countries where strong demand and tighter capacity constraints had been evident. However, the extent and speed of monetary tightening differed significantly across countries:

- Relatively few countries in the sample raised interest rates aggressively from 2007 levels (Figures 12a and 12b), including IT countries (Brazil, Romania, Serbia,⁷ and South Africa) and non-IT countries experiencing very high inflation (Ukraine and Vietnam), while others tightened moderately. In some cases, monetary policy was eased in 2007 to counter potential spillovers from a global economic slowdown (Dominican Republic, Indonesia, Israel, Philippines, Romania), while in others policy sought to slow short-term capital inflows (Costa Rica). Where inflation pressures were less marked (Malaysia, Thailand), interest rates were kept on hold. In a number of countries, the room to raise interest rates was limited by the pegged exchange rate regimes (Estonia, Latvia, and Lithuania, Hong Kong SAR, Kuwait, Jordan, Saudi Arabia), under which interest rates were guided by the monetary policy of the anchor country.⁸

⁷ In Serbia, interest rate increases were mostly due to high political uncertainties in the first half of 2008.

⁸ In fact, the policy rates were eased in a number of countries, especially those pegged to the U.S. dollar, resulting in a decline in both nominal and real rates (e.g., Jordan, Kuwait, Saudi Arabia).

Figure 9. Change in Inflation by Exchange Rate Regime and Monetary Policy Framework (Group average, In percent)

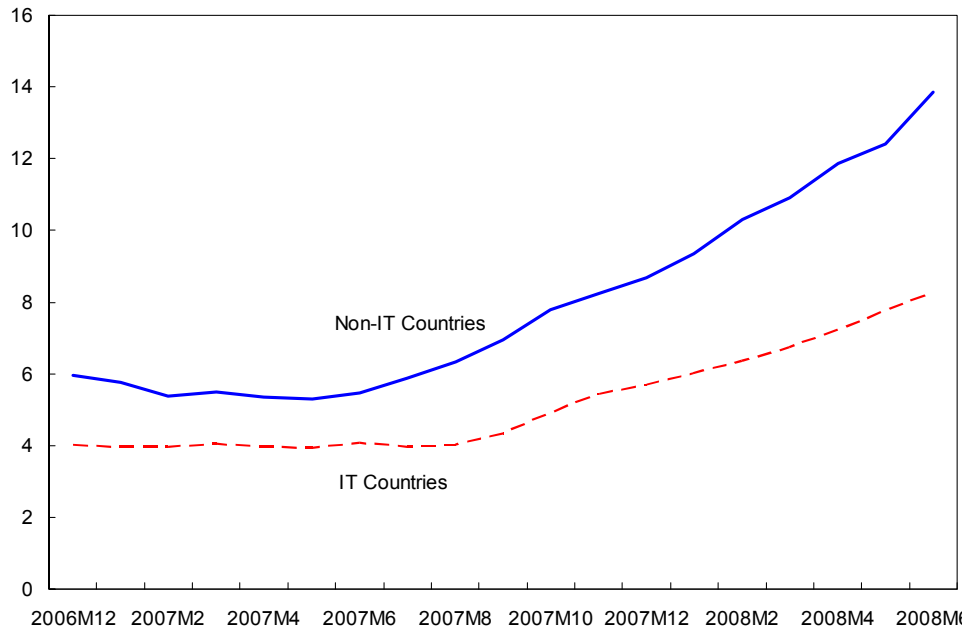


Sources: IMF, *IFS*, and 2008 *Annual Report on Exchange Arrangements and Exchange Restrictions*.

1/ Includes the selected 50 countries only.

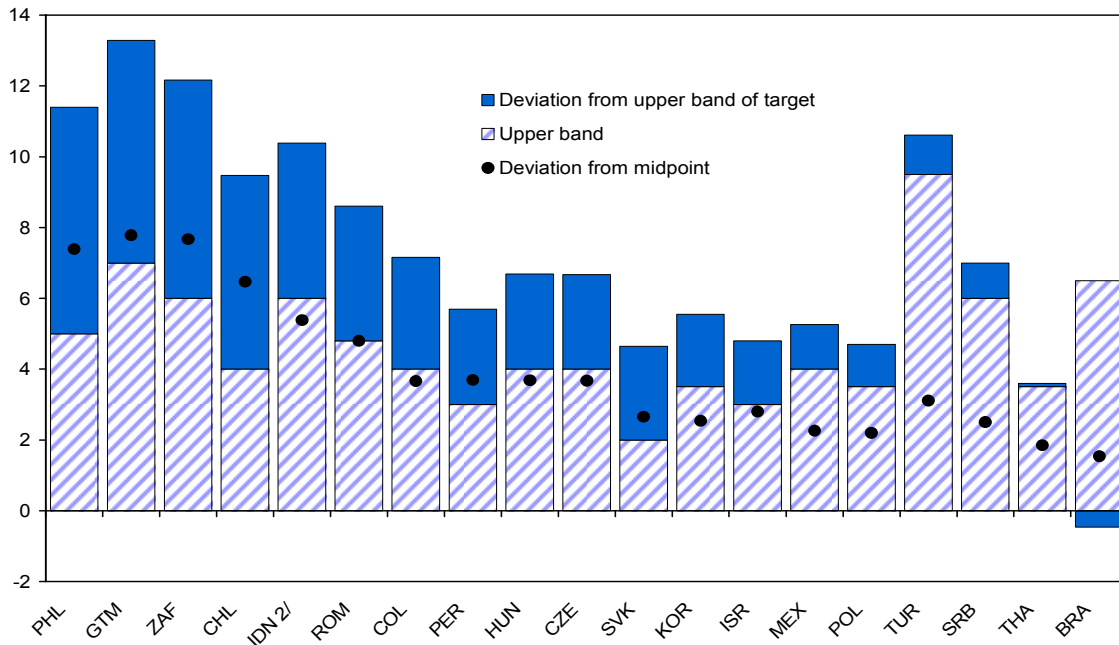
2/ Includes the pegged regimes within the selected 50 countries only.

Figure 10. Average CPI Inflation in IT and non-IT Countries; Jan. 2006–Jun. 2008 1/ (Monthly data; Year-on-year percentage change)



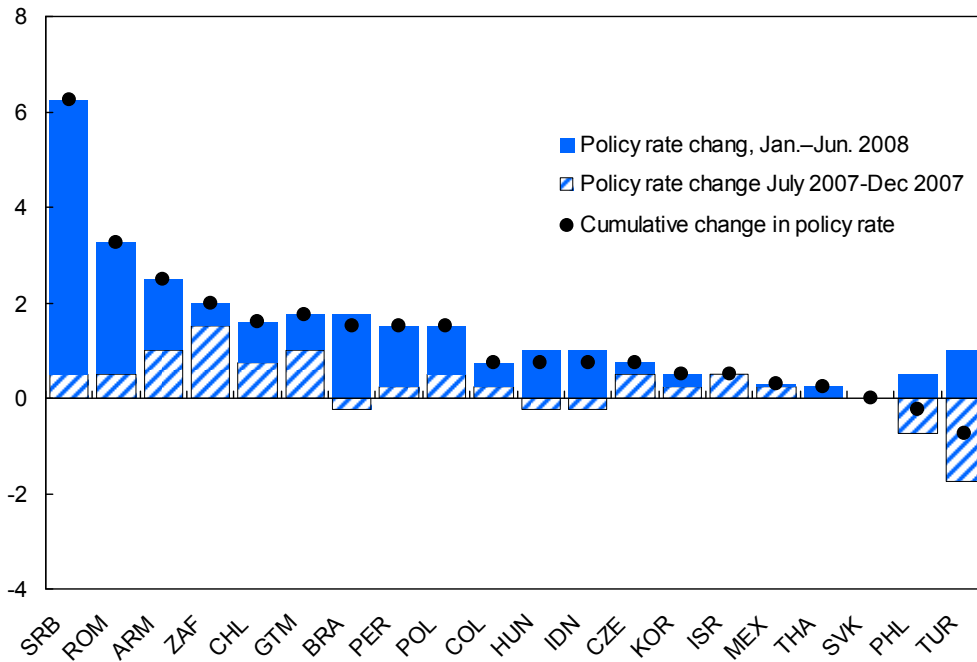
Sources: IMF, *International Financial Statistics*.
1/ Includes the selected 50 countries only.

Figure 11. IT Countries: Actual versus Targeted Inflation, June 2008 (In percent) 1/



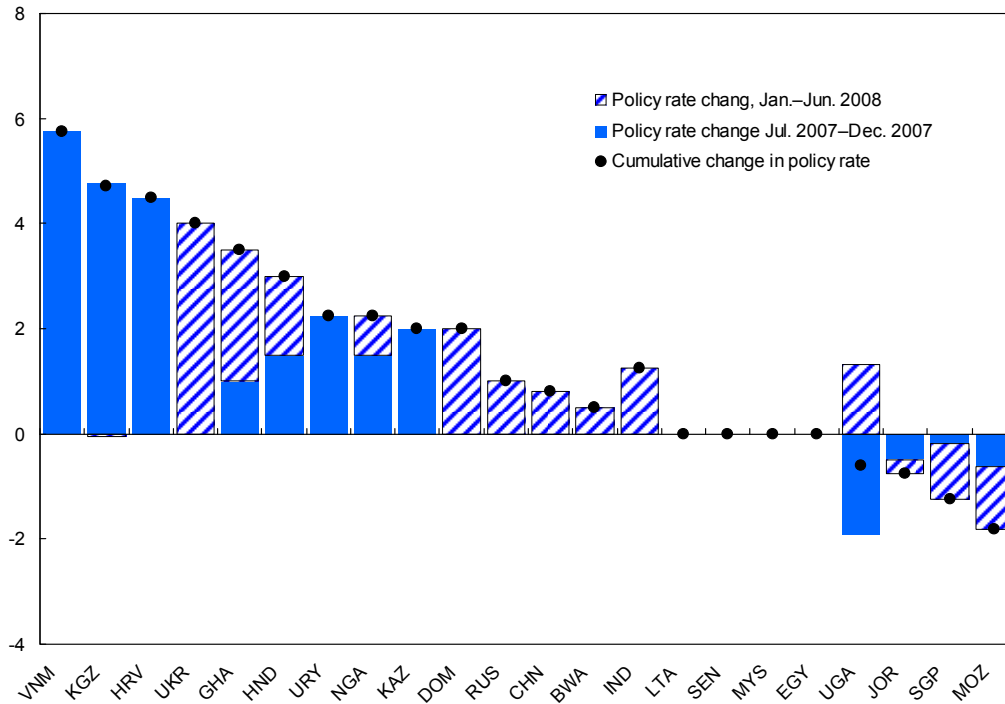
Sources: IMF, *International Financial Statistics*, and central banks.
1/ The height of the combined bars indicates current inflation.
2/ As at end-May 2008.

Figure 12a. IT Countries: Policy Rate Changes, July 2007–June 2008
(In percent)



Sources: *International Financial Statistics*; and central bank websites.

Figure 12b. Non-IT Countries: Policy Rate Changes, July 2007–June 2008
(In percent)



Sources: *International Financial Statistics*; and central bank websites.

- Only a few countries started tightening as early as 2007. These include Colombia, Chile, Honduras, and Mexico, Peru; Czech Republic, Poland, and Romania; China, and Korea; and South Africa. The majority of the remaining countries started

tightening during the first or second quarter of 2008, possibly suggesting that some central banks viewed higher headline inflation as temporary, reflecting an adverse supply shock, and/or underestimated demand pressures or second round effects.⁹

- Some countries tightened monetary policy using other tools (in addition to or in place of higher interest rates), reflecting (to different degrees) capital inflows, weak monetary transmission, or costly sterilization. They increased reserve requirements (e.g., Bulgaria, Croatia, Russia; China, India, Vietnam; Colombia, Honduras, Peru, Uruguay; and Saudi Arabia), imposed credit controls (e.g., China, Bulgaria, Croatia), or raised reserve requirements on external liabilities to limit capital inflows (Croatia, Russia, Serbia, Ukraine; Colombia, Peru and Uruguay).¹⁰

16. **With the exception of Guatemala and Turkey, none of the IT countries revised the officially announced inflation targets in response to rising inflation** (Appendix IV). Guatemala increased the mid-point and range of its official target in December 2007. Turkey, after extending the target horizon and revising the inflation forecast, raised its target over 2009-11.¹¹ All other IT countries maintained the original targets and the associated parameters (such as target band width, the targeted index, and the target horizon), partly reflecting concerns about damaging credibility, hence possibly unmooring inflation expectations. While tightening monetary policy to limit second round effects and reiterating the commitment to price stability, most IT countries have enhanced communication, explaining the nature of the supply shock and the central bank's policy response. A few combined higher interest rates with higher reserve requirements and other direct instruments of monetary policy (Colombia, Peru). A tight fiscal stance supported these efforts in some countries (e.g., Hungary, Poland).

17. **Exchange rate policy played some role in containing inflation pressures in a number of countries, particularly where there is strong exchange rate pass-through to inflation.** A negative relationship was in fact observed between the rise in inflation and nominal exchange rate appreciation since end-2006 (Figure 13).

- In some IT countries, nominal appreciation of the domestic currency limited the pass-through of imported inflation pressures (Czech Republic, Hungary, Israel, Poland, Slovakia, Brazil, Colombia, Peru), while in some others depreciation of the currencies vis-à-vis the euro validated inflation (Romania, Turkey).

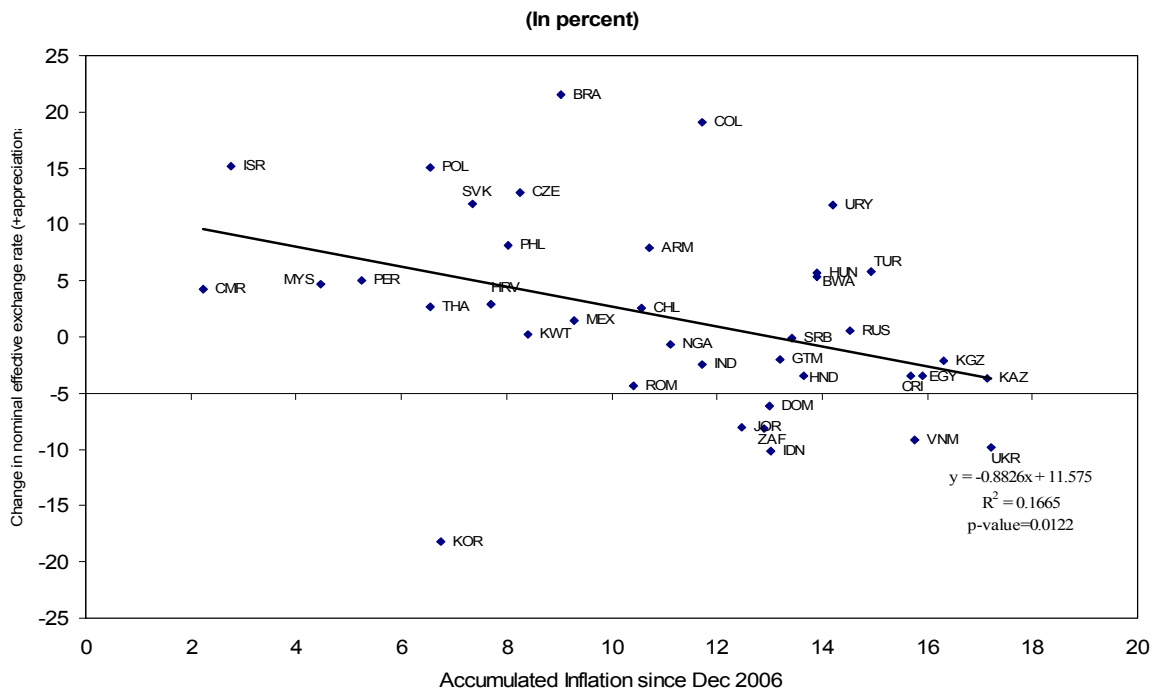
⁹ In Slovakia, for instance, interest rates were kept unchanged, as the authorities judged that cost-push factors were the main reasons underlying temporarily higher inflation.

¹⁰ Some of these measures were taken in response to the already ongoing financial sector or overheating concerns associated with heavy capital inflows and/or rapid credit growth (and not directly in response to food and fuel price shocks).

¹¹ The Turkish authorities considered that the expectation that supply shocks would exert persistent upward inflation pressures justified a revision over an extended period. They also noted that the new targets should be seen as ceilings, as opposed to the former point targets. Unlike point targets, the CBT would allow inflation to undershoot the ceilings (see Appendix V for details on Turkey's revision of the inflation target).

- Some non-oil emerging market countries with managed floating or soft pegs also let their exchange rates appreciate in response to capital inflows (e.g., China, Croatia, Ukraine, Uruguay, and Egypt). However, the size of the appreciation varied widely across countries, in part because of intervention in foreign exchange markets, which in turn reflected concerns about the adverse impact of appreciation on the export sector.
- In a number of other countries with hard or soft pegs, exchange rate policy constrained the absorption of the price shocks. The implications of the exchange rate arrangement for inflation developments would, of course, depend on many other factors, including structural characteristics of the economies in question.

Figure 13. Accumulated Inflation and Nominal Effective Exchange Rate, Dec. 2006–Jun. 2008



Source: IMF International Financial Statistics and Information Notice System.

18. Fiscal policy by and large provided only limited support to countering inflation.¹²

In a few cases, fiscal policy was tightened to lessen the impact of demand pressures on inflation. In many others, fiscal policy was not supportive, owing among other things to subsidies that reduced the impact of price increases on poor segments of the populations. In several cases, the subsidies predated the pick up in inflation but were raised with the surge in global fuel and food prices.

¹² This paper does not provide an in-depth discussion of the role of fiscal policy. For further information, see International Monetary Fund, “Food and Fuel Prices—Recent Developments, Macroeconomic Impact, and Policy Responses.”

19. **Many countries also resorted to other non-monetary measures in response to rising fuel and food prices.** These included lowering import tariffs; raising export taxes or imposing export quotas or bans to protect domestic supplies; reducing domestic consumption taxes on selected items; and tightening price controls (Appendix III). Some of these countries also started raising administered prices toward market levels, reflecting fiscal concerns (e.g., Indonesia and Vietnam), and some raised taxes on selected items (Czech Republic, Lithuania, Poland, Turkey).

B. How Have the Measures Worked Thus Far?

20. **It is too early to gauge the ultimate impact of monetary tightening, given the lagged effect of monetary policy and the highly uncertain global economic environment.** Although headline inflation pressures began to ease around May 2008 in some countries, partly reflecting a decline in commodity prices, second-round effects have prevented a quick reduction in inflation. Many of the forces underlying the surge in inflation remained in place and kept inflation high compared to its pre-shock levels. Moreover, recent policy measures will take time to have an effect. Countries with IT regimes continued to exceed the mid-points, or even upper bands, of their official targets. In many cases, markets viewed monetary policy measures as too little and too late, with the benefit of hindsight.¹³ With the interest rate hikes falling short of the pick up in inflation, low or negative real interest rates led to an accommodative monetary stance (Figure 14), even as exchange rates have appreciated in some cases.

21. **Inflation expectations remained elevated in most countries.** Inflation expectations for 2008 (as provided in Consensus Forecasts) rose above the official targets (Figure 15). However, the size of the increase in inflation expectations varied, and was associated with the level of real interest rates: inflation expectations seem to have risen more in countries where real policy rates have declined the most.¹⁴ Inflation expectations seem to be relatively well contained in a few IT countries (e.g., Czech Republic, Hungary, Israel, Poland, Brazil, Korea, Mexico), and seem to have come down for 2009 from their 2008 levels in most IT countries, notwithstanding the continued rise in inflation beyond the targets. The latter is supported by the limited data available on inflation expectations derived from inflation-linked bonds, which suggest that inflation expectations for a selected group of IT countries (Brazil, Colombia, Korea, Mexico, Poland, South Africa, Turkey) have peaked around July-August 2008, approaching levels observed early this year.

22. **Inflation pressures also did not respond much to administrative measures to tighten liquidity.** While controls on bank credit or reserve requirements have arguably helped slow bank lending to the private sector in a number of countries, the impact on overall credit, including from other sources (such as direct borrowing from abroad or nonbank financial institutions) has been less marked. The impact of the measures on aggregate demand and inflation is therefore ambiguous, although from a counterfactual point of view,

¹³ A JP Morgan conference on July 17, in which staff of the Fund's Monetary and Capital Markets Department participated, highlighted these concerns.

¹⁴ See also IMF (2008b).

demand and inflation pressures could perhaps have been stronger in the absence of such measures (see also Enoch and Ötker-Robe, 2007).

Figure 14. Accumulated Inflation and Real ST Interest Rate, Jul. 2007–Jun. 2008 1/

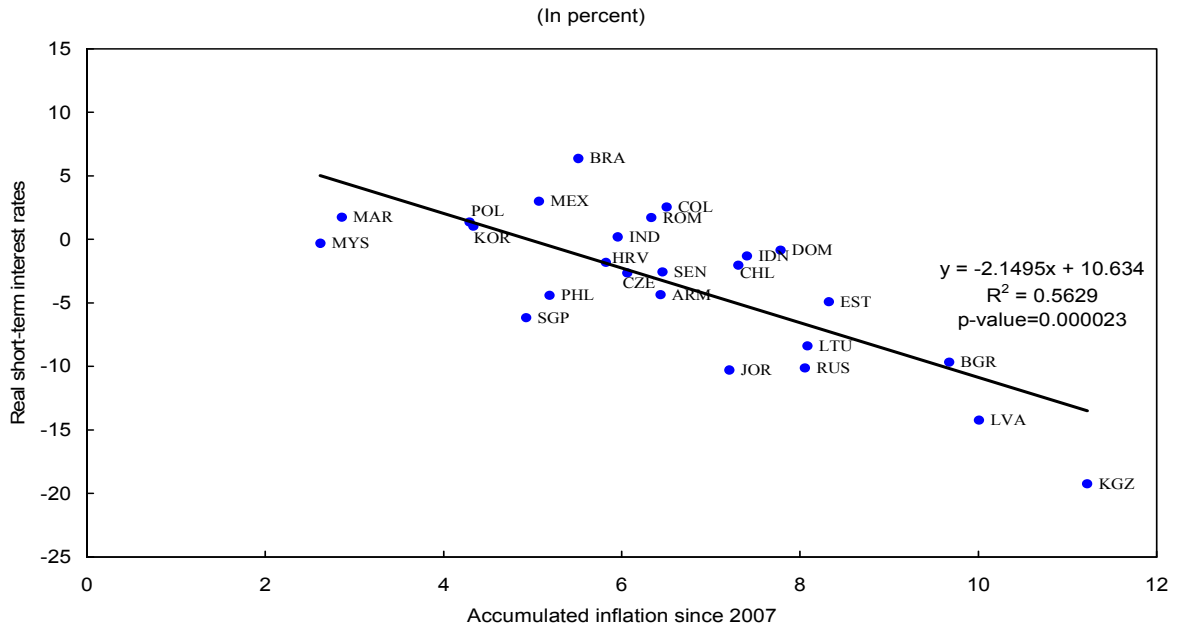
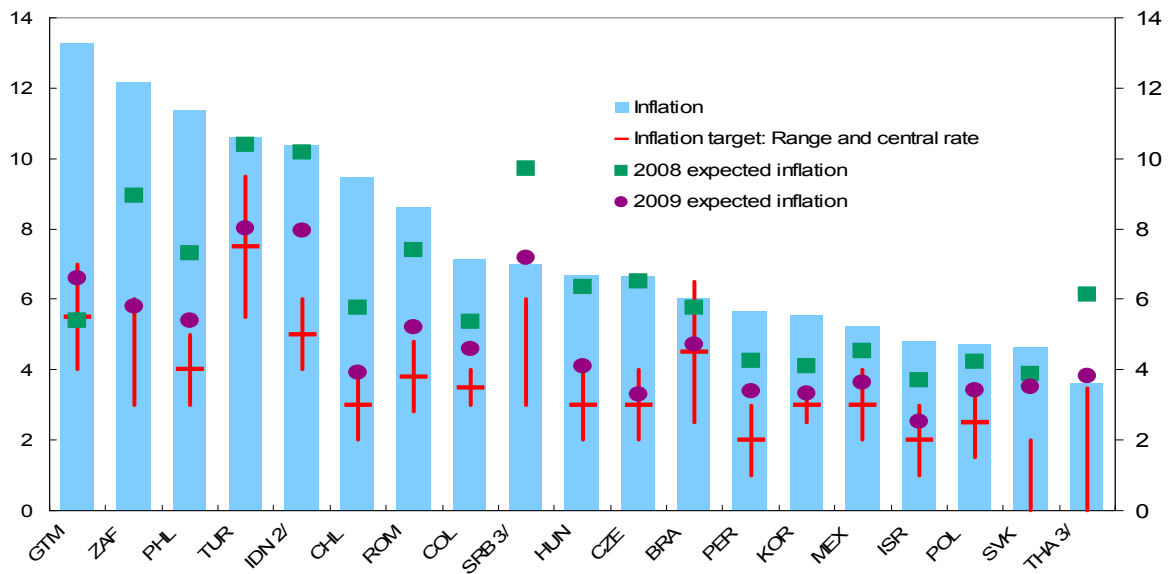


Figure 15. Inflation Expectations for 2008 and 2009 vs. Actual and Targeted Inflation (June 2008, In percent) 1/



Sources: IMF International Financial Statistics, Consensus Forecast reports, and national central bank websites.

23. The delayed and relatively modest actions may reflect several policy dilemmas and concerns:

- **Conflicts with growth objectives.** Many countries faced difficult choices between raising interest rates to fight inflation and maintaining stronger growth. These choices were made more difficult by uncertainties about the nature of the shocks. In particular, there were difficulties in judging whether the fuel and food price shocks were temporary. Some country authorities continue to believe that the inflation surge was the result of a temporary supply shock with a limited risk of second-round effects that did not warrant a monetary policy response. There are also increasing concerns about a global economic slowdown.
- **Conflict with financial stability concerns.** Many countries have also been facing a difficult dilemma between raising interest rates to counter inflation and coping with the current financial crisis that is affecting both developed and emerging market economies. In some instances, central banks feared that taking aggressive action might jeopardize their limited independence, while in others there were concerns about higher interest rates exacerbating the potential impact of global liquidity conditions on their domestic financial systems. The recent deepening of the crisis has likely shifted policymakers' focus farther away from inflation concerns, toward limiting financial instability and its implications for worsening growth prospects.
- **Conflict with exchange rate policy.** Many countries have given priority to exchange rate stability. These include countries with hard or soft pegs as well as those who have been reluctant to see more rapid and extensive appreciation of the exchange rate. In particular, a number of countries with floating exchange rates have been hesitant to raise interest rates more aggressively owing to fears that such a move could lead to further exchange rate appreciation and capital inflows, fueling credit growth and higher inflation.

IV. MENU OF OPTIONS FOR POLICY ADVICE

24. Policymakers are facing a very challenging environment, with major domestic and external shocks. Commodity prices, although significantly off their peaks, remain high and volatile (WEO, 2008). Thus, while headline inflation may ease (as already observed in a number of countries in Europe and Asia), there is a lingering risk of second round effects. This risk is particularly great for countries where underlying inflation has been rising as a result of both the spillover of the first round effects of high commodity prices and excess aggregate demand pressures. At the same time, financial markets are experiencing a deepening crisis that is spreading from advanced countries to emerging market economies, worsening economic growth prospects but also leading to capital outflows and exchange rate depreciation that may to some extent be passed through to inflation.

25. While these concerns will overshadow policy making, central banks in a number of emerging market and developing countries need to balance these risks against those of inflation pressures. In particular, monetary policy makers will need to remain vigilant and signal a strong commitment to bringing inflation back to its pre-shock levels, particularly

where excess demand pressures have been evident and the nature of the price shocks has been uncertain. Successive deviations from official inflation objectives have hurt the credibility of many emerging market central banks and require appropriate monetary policy actions to anchor inflation expectations. Where inflation expectations remain high or rise further, the extent of an eventual tightening could be greater and the adjustment more costly. It is also important that central banks be forward looking in their policy responses, taking account of projections for the next 12 to 18 months, while being mindful of the relative probabilities and costs of severe but plausible outcomes.

26. **To the extent that a tightening of monetary policy is needed, it should be implemented using good operational practices** (see Appendix VI for more details):

- **Indirect instruments should be used to the extent possible.** Mopping up or maintaining tight liquidity, where needed, should be done primarily via open market operations. If short-term capital inflows increase, sterilization should be used as required.
- **Non-remunerated reserve requirements (NRR) on bank deposits and credit controls should be used only as a last resort.** NRRs are a tax on the financial system and, like credit controls, distort financial transactions and encourage disintermediation towards offshore markets or activities that are less-well regulated or supervised.¹⁵
- **Even so, it may be necessary to use NRR on a temporary basis when there are no other good options,** for example when (i) the interest rate channel is weak or non-existent given shallow financial markets, no independent monetary policy, or a high degree of financial dollarization; or (ii) when first-best monetary policy tools need to be supplemented under heavy capital inflows given the large quasi fiscal costs associated with significant sterilized intervention. To minimize side effects, central banks could accelerate their efforts to improve the monetary transmission mechanism by deepening financial markets so as to reduce the need to resort to such tools, and phase them out when inflation pressures subside.
- **Controls on capital inflows aimed at limiting the consequences of large inflows involve significant administrative costs—to control, extend, and change regulations—and their effectiveness is at best short-lived.** The experiences of Thailand and Colombia in the 1990s, which imposed unremunerated reserve requirements on certain categories of inflows, provide examples of how little such controls will accomplish, especially in countries with somewhat more developed financial markets. Capital controls should, by and large, only be imposed to buy time in a balance of payments or financial crisis, and would not be helpful in the circumstances now facing most countries.¹⁶

¹⁵ See, for example, Alexander, Baliño, and Enoch (1995); and Enoch and Ötker-Robe (2007).

¹⁶ For extensive discussion on the use of capital controls, see Ariyoshi, Habermeier, Laurens, Ötker-Robe, Canales-Kriljenko, and Kirilenko (2000). For a summary, see Appendix VII.

- **Policy decisions need to be appropriately communicated.** With central banks facing new communication challenges stemming from the difficult combination of rising inflation, slowing economic growth, and a deepening financial crisis in mature markets, the current environment is significantly more difficult and uncertain, and requires a renewed effort to credibly explain central bank actions. This is particularly important where central banks may need to provide additional liquidity to markets to stem market volatility while keeping inflation expectations well anchored. In doing so, they need to clearly communicate continuing commitment to price stability, while explaining how short term actions are consistent with this objective (Shimizu, 2008).

27. **Supporting measures are needed to avoid overburdening monetary policy.** First, even though demand pressures may be easing with the downturn in global economic activity, an appropriate fiscal policy stance could help manage aggregate demand. Second, productivity matching wage policies and curtailing backward looking indexation schemes would help to limit the contribution of wage pressures to inflation, especially in, but not limited to, those countries that have benefited from the supply shock. Third, structural reforms to boost productivity growth, enhance competitiveness, and increase labor market flexibility could add to the production capacity of the economy, helping in turn to reduce wage and price pressures in tight labor markets. Support from fiscal and incomes policies would also help avoid the risk of destabilizing exchange rate movements. The remainder of this section discusses the modalities of needed monetary policy actions.

A. Considerations for Inflation Targeting Central Banks

28. **Country experiences with IT suggest that well-established policy credibility is essential in coping with unfavorable supply shocks.** When expectations are well anchored, the increase in inflation from unfavorable supply shocks has relatively little effect on inflation expectations and hence minor second round effects, and policy does not have to be as restrictive as otherwise. Lack of fully established credibility would therefore call for stronger policy actions to counter inflation pressures, and the central bank would need to be prepared to be more pro-active in raising interest rates to bring about more visible reductions in inflation.¹⁷

29. **The role of central bank credibility in responding to a rise in inflation can be illustrated quantitatively.** Using a simple dynamic general equilibrium model calibrated to an emerging market economy faced with oil and food shocks, illustrative simulations show that low credibility associated with a delayed reaction to higher inflation can lead to inflation expectations becoming more entrenched at higher levels. The result would be an inevitable increase in interest rates that generates a larger output loss compared with an earlier reaction to rising headline inflation (see Appendix VIII, as well as Alichì and others, 2008).¹⁸

¹⁷ See also Alichì, Chen, Clinton, Freedman, Kamenik, Kisinbay, and Laxton (2008); Argov, Epstein, Karam, Laxton, and Rose (2007); and WEO (2008).

¹⁸ Uncertainty about the duration and nature of the shocks also means that there is a risk of tightening monetary policy excessively. A quick interest rate response may exacerbate stagflation by unduly depressing output if the oil shock turned out to be temporary, while a delayed reaction could be costly in terms of higher inflation and inflation expectations, should the shock turn out to be permanent. The ultimate policy choice will generally be a
(continued...)

30. **IT central banks then need to be especially careful to avoid losing credibility and undermining the future effectiveness of monetary policy.** The following considerations may be useful in shaping their policy response:

- **Official inflation targets should not be revised upward.** Such a move would undermine the credibility of a monetary policy framework in which the overriding objective is to achieve low inflation or price stability, and not to hit the targets per se. Markets could perceive central banks as being more accommodative of higher inflation and loosening monetary policy, and given the already fragile state of central bank credibility in many IT countries (as evident from the rise in inflation expectations), a further weakening of credibility could easily unanchor inflation expectations.¹⁹ A higher inflation target (or a range) will also not guarantee that real interest rates will be lower. In fact, the central bank may need to tighten even more aggressively to limit losses of monetary policy credibility, and higher nominal and real interest rates may in turn affect financial stability with perverse effects on the economy.^{20 21}
- **Widening the target band around an unchanged mid-point target is also likely to be counterproductive.** The target bands are used mostly for accountability purposes, as a trigger point for explanations when the mid-point target is missed. Widening the band may reduce the need to provide explanations and may allow the central bank to deal with the uncertainty associated with the supply shock without breaching its target. However, the implications for credibility would not be very different from those of raising the target. By widening the band, the central bank could be perceived as signaling that it is willing to tolerate a higher level of inflation. In addition to the technical difficulties in determining the “appropriate” width of the target band, the move could also validate higher inflation expectations, with the new upper limit potentially becoming the focal point for inflation expectations.

function of the weight assigned to inflation vs. growth objective, given the policymakers’ judgement about the nature of the shock (see Appendix VIII for illustrative simulations).

¹⁹ Anecdotal evidence suggests that in countries with low monetary policy credibility, modifying the targets is likely to do more damage to credibility than overshooting the original targets, especially when there are legitimate external factors that partly explain the breach. In fact, following the upward revision to Turkey’s inflation target, market analysts noted that the target revision suggested a lack of commitment to price stability. The Turkish lira and stock prices fell and yields on lira-denominated bonds rose to a 14-month high of 20 percent. Some investors remain concerned about the central bank’s determination to meet its end-2009 target (JP Morgan, July 16, 2008). Appendix V provides more details.

²⁰ Appendix VIII also provides illustrative simulations suggesting that raising the inflation target temporarily has ambiguous effects, with the overall inflation rates rising as inflation expectations adjust. While interest rates do not have to rise as much initially, they would have to increase eventually to bring inflation back down.

²¹ This does not mean, however, that the inflation target should never be revised. Central banks may adjust their targets downward. It has been also argued that the existence of downward nominal rigidities could also imply that the optimal inflation target increases with the extent of macroeconomic volatility. When there are strong indications that the current commodity price shock is a symptom of a permanent increase in volatility, a case could be made for higher optimal inflation targets in the future.

- **IT central banks could lengthen the announced period for the achievement of the longer-term target (or “target horizon”).** In principle, the target horizon should match the lags in the transmission mechanism. Having a longer-term horizon can be critical at the current juncture, where IT countries are subject to shocks that can result in significant and persistent upward revisions to the official inflation forecast, and in a slower return of inflation to the medium/long-term target. Having a relatively short target horizon can be counter-productive and undermine credibility, especially if this posture fails to provide sufficient time for policy actions to affect inflation, also in view of transmission lags.²²
 - **Similarly, the “policy horizon” could be longer, especially following a supply shock, for countries that are disinflating when policy credibility is still low.** Hit by a negative supply shock, the authorities could communicate, with well-articulated arguments, that the period over which they expect to return to the long run target inflation rate is likely to be longer.²³ This approach is consistent with the view that, when the economy is hit by shocks, monetary policy should not try to bring inflation in a tight range in the short run, since doing so would result in excessive fluctuations in economic activity and might damage perceptions of the competence and credibility of the central bank.²⁴ Instead, “when shocks to the economy are sufficiently large, inflation may have to approach the target gradually over time and this could be longer than the two years that is usually assumed as a reasonable time horizon for monetary policy to have its intended effect on inflation” (Mishkin, 2008).
 - **Inflation forecasts have a role, in this connection, in anchoring short-term expectations,** by describing how the central bank sees the inflation-output trade-off and the resulting ideal path towards the medium term objective. Central banks can update and use the inflation forecast as the intermediate target and a communication tool to signal how long inflation will take to return to the long-term target. On the other hand, the medium term objective—the inflation target—sets the overall strategy and direction and should not be changed.
31. **If the authorities nonetheless decide to revise the target, the following steps may help to maintain credibility and mitigate negative effects:**

- The authorities should communicate to the public that monetary policy remains firmly focused on controlling inflation in the medium-term.

²² See Freedman, Laxton, and Ötoker-Robe (2008).

²³ Most central banks extend the policy horizons and explain the reasons for doing so in balancing inflation-output volatility following supply shocks (see Freedman, Laxton, and Ötoker-Robe, 2008, for illustrative model-based simulations to show optimal interest rate responses and inflation forecast paths in response to a supply shock). This more “flexible” approach seems to be the direction a number of central banks have been taking (e.g., the Norges Bank, Riksbank, Bank of Israel), in which the horizon over which inflation returns to its target might have to vary, depending on the shocks to the economy.

²⁴ The output-inflation trade-off tends to be particularly serious when monetary policy credibility is low.

- To counter perceptions that adjusting the target signals a lack of commitment to low inflation, the central bank should adopt an ambitious plan for bringing inflation back to the revised target. In the short-term, policy may need to be tightened more aggressively to ensure that the target adjustment is not interpreted as an abandonment of the anchor objective. Brazil's experience with revising the targets upward during 2003-04 is illustrative in this regard (Box 1).
- If possible, the new target should also be set below long-term inflation expectations.

Box 1. Brazil's Experience with Revisions to the Inflation Target in 2002–2004

After adopting an IT framework following the 1999 currency crisis and breaching the inflation targets for two years in a row, Brazil revised the official inflation target upward. The adjustment followed the central bank's shifting the target downwards every year. The target was revised up in January 2003 from 4 percent to 8.5 percent for 2003 and from 3.75 percent to 5.5 percent for 2004. The revision was carried out as part of an approach to guide 2003 monetary policy by an "adjusted target" that involved the *partial* accommodation of the inflation inertia inherited from the past, and the accommodation of first-round effects of a certain class of identifiable supply shocks (see Bevilaqua and Loyo, 2004). The new methodology served to indicate explicitly the trajectory through which inflation should be expected to return to target over the following two years; however, the targets for any year could be adjusted in the course of that year to accommodate the first-round effects of certain supply shocks.

The target revision followed a steep depreciation (44 percent in 2002) of the domestic currency, which spurred inflation from less than 8 percent in June 2002 to nearly 13 percent in December 2002. The currency depreciation was the result of a deep confidence crisis associated with the presidential campaign, notably worries about the direction of economic policy under a prospective President Luis Inacio da Silva, and was exacerbated by various external shocks.

The target revision was accompanied by substantial monetary tightening and other supportive policies which helped support the credibility of the inflation target. The BCB increased the policy rate from 18.5 percent to 25 percent during the second semester of 2002 ahead of the target revision. Rates were increased further in early 2003 to reach 26.5 percent. In February, the interest rate hike was complemented by an increase in the reserve requirements of commercial banks. In March, the rate was kept unchanged but an upward bias was announced. The new government implemented a prudent fiscal policy and gave de facto independence to the BCB.

These policies eventually paid off. Initially, expectations for 2004 inflation remained stubbornly at 8 percent. It was only when the MPC decided, at its April meeting, to maintain rates at 26.5 percent for the third month in a row, that inflation expectations started to fall, for both 2003 and 2004 horizons. The pressure on the real subsided and inflation started to decline. Starting from June, the MPC opted for a modest 50 basis point rate cut, followed by a further 150 basis point cut in July after inflation expectations had fallen to 10.4 percent for 2003 and 6.5 percent for 2004. At the end of June, the government adopted the 5.5 percent adjusted target as the official inflation target for 2004. Unlike the adjusted targets, official targets were firm, not contingent, but a ± 2.5 percent margin was set around them. It was felt that it was time to return to firm targets, which were more easily understood by the general public, while maintaining the originally planned trajectory of convergence to the long-run targets. An official target of 4.5 percent for 2005 was also announced, with ± 2.5 percent tolerance margins. In June and July, helped by the appreciation of the real, monthly inflation rates fell significantly. The level of activity also reached a trough in the second quarter.

Brazil's experience suggests that it is possible to restore the credibility of the regime, even when the inflation targets are missed repeatedly and revised upward, provided that: there are legitimate reasons for the misses and the authorities accompany the target revision with an appropriate degree of monetary tightening, fiscal prudence, and measures to strengthen central bank autonomy, along with adherence to a planned trajectory of convergence to the long-run targets.

32. Central bank communications are particularly crucial in the current circumstances, especially when inflation targets have been overshoot and other considerations may be affecting decision-making.

- **To limit damage to credibility, the main message to convey is that monetary policy remains focused on price stability.** The central bank should also explain the reasons for tightening policy, stressing that the change in its policy stance reflects uncertainties about the duration of the shock and the associated risks, and that the size

of the shock may be too large to bring inflation quickly back to its medium-term target without monetary action. The latter is particularly relevant for countries where overheating pressures and capacity constraints are contributing to rising inflation.

- **The central bank could also explicitly recognize that shocks do occur and reaffirm the medium term nature of the target.** In public statements as well as in inflation reports, central banks should explain their views on: (i) the nature of the shock; (ii) the impact on inflation developments and hence why the inflation rate is deviating from the targets; (iii) policy implementation lags; (iv) a credible policy path that shows how inflation will be brought back to its longer-term target; and (v) the time horizon over which this is expected to occur.
- **The risks associated with a delayed policy response could also be reduced by frequent monitoring and communication of the various components of inflation.** Frequent analyses of the effects of commodity prices on core inflation and expectations could help in assessing the extent of second round effects and the underlying pressures unrelated to the supply shock. With food and energy making up a very significant component of the CPI basket (up to 70 percent) in some countries, central banks also need to guard against the risk of underestimating core inflation (hence failing to identify second round effects), including by using various indicators of inflation and varied application of techniques to estimate core inflation.

B. Considerations for Non-Inflation Targeting Central Banks

33. **Except where monetary policy is fully endogenous, monetary and exchange rate targeting central banks should signal a strong commitment to bringing back inflation to the pre-shock levels.**

- **Monetary targeting central banks should keep intermediate targets unchanged.**²⁵ In addition to tightening the monetary stance, they should allow the exchange rate to appreciate gradually to compensate for imported inflation, especially in those countries that have benefited from the oil shock. If tightening monetary policy induces capital inflows, sterilized intervention may be warranted.
- **Countries with a soft exchange rate target have little room for maneuver on monetary policy and will need to rely mainly on fiscal policy to fight inflation.** The central bank might raise interest rates to moderate possible demand pressures, if there is any scope to do so within the constraints of the exchange rate objective.

²⁵ Under monetary targeting, a supply shock raises the trade-off between the cost of increased inflation and the benefit of lower unemployment (see, e.g., Poole, 1970). Whether monetary policy could be used to temper the recessionary consequences of a supply shock has been widely debated in the literature, especially after the first oil-shock in 1970s (e.g., Gordon, 1979 and 1984; Fischer, 1983), with the case for and against monetary accommodation depending, inter alia, on the extent of wage indexation (e.g., under real-wage rigidity, accommodating monetary policy would only add to inflationary pressure with little benefit for real output). Also, depending on the size and the impact on the economy of a supply shock, the change in the monetary policy stance required to avert a downturn may be of such a magnitude to become practically unfeasible (e.g., Hamilton and Herrera, 2004), and in any case need to be weighed against the potential loss in policy credibility.

Capital inflows triggered by higher interest rates could be absorbed with sterilized intervention, as needed, in the short-run. Capital controls may seem appealing in some cases, but are likely to be either of limited effectiveness (if modest in scope) or highly distortionary (if comprehensive).

34. When monetary policy is fully endogenous—fixed exchange rates and hard pegs under sufficient capital mobility—monetary policy options are even more constrained.

Barring a change in the exchange rate arrangement, other macroeconomic policies need to be used to fight inflation.²⁶ Changes in the exchange rate arrangement could also be contemplated where warranted, for example, if an anchor currency is no longer thought to be a suitable font of nominal stability. The transition from fixed to floating needs to be properly managed and based on certain other pre-requisites if it is to be successful (see IMF, 2004, and Ötker-Robe and Vávra, 2007, and Appendix IX for a summary).

35. Non-IT central banks should also enhance institutional capacity to boost the effectiveness of the policy response. In particular, efforts should focus on enhancing communication and transparency and the operational framework for monetary policy.

- **In view of the uncertain environment, especially with the ongoing global financial turmoil and economic slowdown, improving central bank communications is critical.** Non-IT central banks should regularly explain to market participants the current dynamics of inflation, monetary policy responses, and lay out the expected possible outcomes. They should also extract information from market data, especially about inflation expectations, to help measure the impact of the current policy response and to improve the timing of policy decisions.
- **Central banks should make available to the markets on an understandable, accessible, and timely basis the rationale and the information underlying their policy decisions.** Central banks should also explain how inflation developments are taken into account in their monetary policy actions. Increased transparency fosters the effectiveness of monetary policy and reinforces policy credibility. Higher credibility in turn lowers the sacrifice ratio, that is, the output cost associated with reducing inflation.²⁷
- **Non-IT central banks should also improve the operational framework for monetary policy, where needed.** This implies strengthening systemic liquidity forecasting and management with the aim of strengthening the effect of adjustments in the operational variable (e.g., a short-term policy rate) on the intermediate target, and ultimately on inflation. Central banks should rely primarily on indirect instruments of monetary policy in managing liquidity. As a supporting measure, they

²⁶ There may be scope for adjusting the peg by changing the anchor currency or adopting a basket in lieu of a single currency. A forthcoming Fund working paper addresses these issues using a DSGE model (Roger, Restrepo, and Garcia, forthcoming).

²⁷ See Appendix VI for literature references that support these arguments, as well as Appendix II, which provides empirical support. Importantly, these results seem to be driven by increased effectiveness in the working of the monetary policy transmission mechanism.

should foster the development of financial markets to improve monetary policy transmission and reduce the need for direct instruments.

V. CONCLUDING REMARKS AND POLICY IMPLICATIONS

36. This paper has reviewed inflation developments through mid-2008 in a sample of 50 emerging and developing countries and discussed their underlying causes, accompanying challenges, and the associated policy actions. The key conclusions are as follows:

- Both aggregate demand pressures and surging commodity prices played a role in rising inflation in many emerging and developing countries. Growing capacity constraints and tighter labor markets also contributed to inflation pressures, with second round effects.
- Although official inflation targets were overshoot by most emerging market IT countries—the first real challenge to the credibility of the IT regimes—IT countries have in general seen inflation rise by less. Currency appreciations under the more flexible exchange rate regimes and a greater degree of central bank independence and transparency have generally been associated with lower inflation.
- Most central banks have tightened monetary policy to constrain aggregate demand and anchor inflation expectations, though the timing and speed of the monetary policy actions varied significantly. The effect of monetary tightening has been limited at the time of the writing, given the delayed actions in many countries, lags in policy transmission, and the magnitude of the tightening.
- Although headline inflation pressures have eased somewhat since May 2008 in some countries, in part reflecting the decline in commodity prices, inflation continues to remain high in many others. Second-round effects may prevent a quick reduction in inflation, and recent policy measures may take time to have an effect. Going forward, capital outflows and the associated exchange rate depreciation may contribute to inflation in a number of countries despite the slowdown in global growth.
- Central banks need to signal a strong commitment to bringing inflation back over time to the pre-shock rates. Monetary policy makers will need to be vigilant, and further tightening may still be needed in some countries, particularly where demand pressures are still evident and credibility of monetary policy is weak.
- The recent inflationary episode has shown the importance of policy credibility in limiting the risk of higher inflation becoming entrenched in inflation expectations. Absent fully-established credibility, stronger policy action is needed. Central banks need to be proactive and forward looking, acting in response to projected conditions while being mindful of the relative probabilities and costs of severe but plausible outcomes.
- When monetary policy is fully endogenous, as under hard exchange rate pegs, other macroeconomic policies need to be used to control inflation. Changes in the exchange rate arrangement could also be contemplated if an anchor currency no longer provides adequate nominal stability.

- IT central banks should not change inflation targets, but could extend the horizon over which inflation converges to the medium-term target. A temporarily longer horizon would help avoid adverse effects on inflation expectations and excessive fluctuations in economic activity that may in turn weaken credibility. Close monitoring of second round effects is critical to correctly calibrating and timing policy actions.
- Communications are crucial in limiting the damage to credibility associated with overshooting (or revising) inflation targets. New communication challenges arise from the difficult combination of higher inflation, slowing economic growth, and a deepening financial crisis. These call for stepped-up efforts to explain central bank actions and renewed emphasis on a continued commitment to low inflation.
- Direct or administrative monetary policy tools should be used only as a last resort, and only temporarily. To reduce the need for such tools, central banks should seek to improve the monetary transmission mechanism, including through financial market development. Allowing the exchange rate to appreciate, greater support from fiscal policy, and productivity matching wage policies would help mitigate wage and price pressures, while also helping avoid overburdening monetary policy.

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APPENDIX I. CROSS REGIONAL INFLATION DEVELOPMENTS²⁸

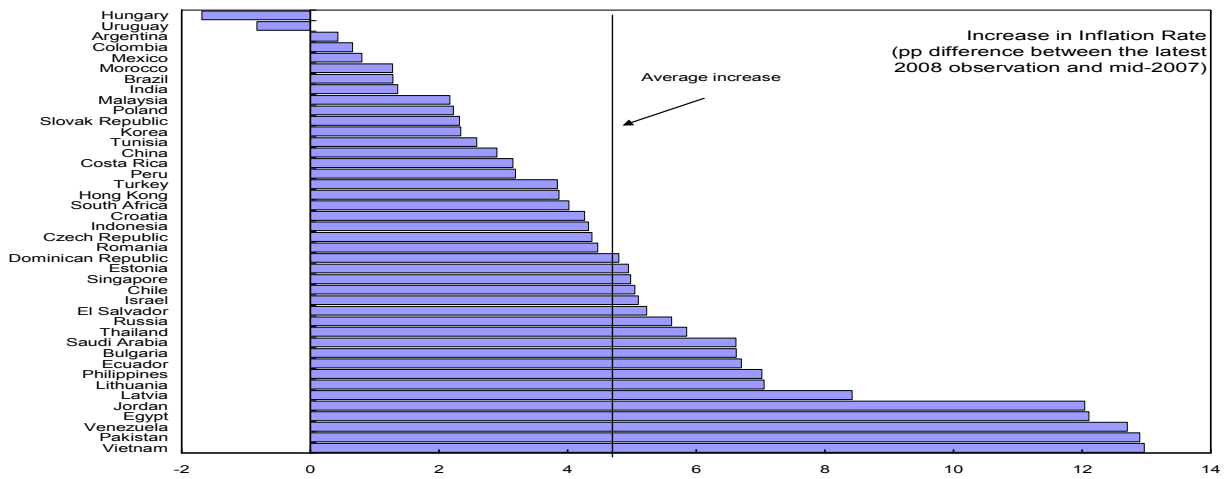
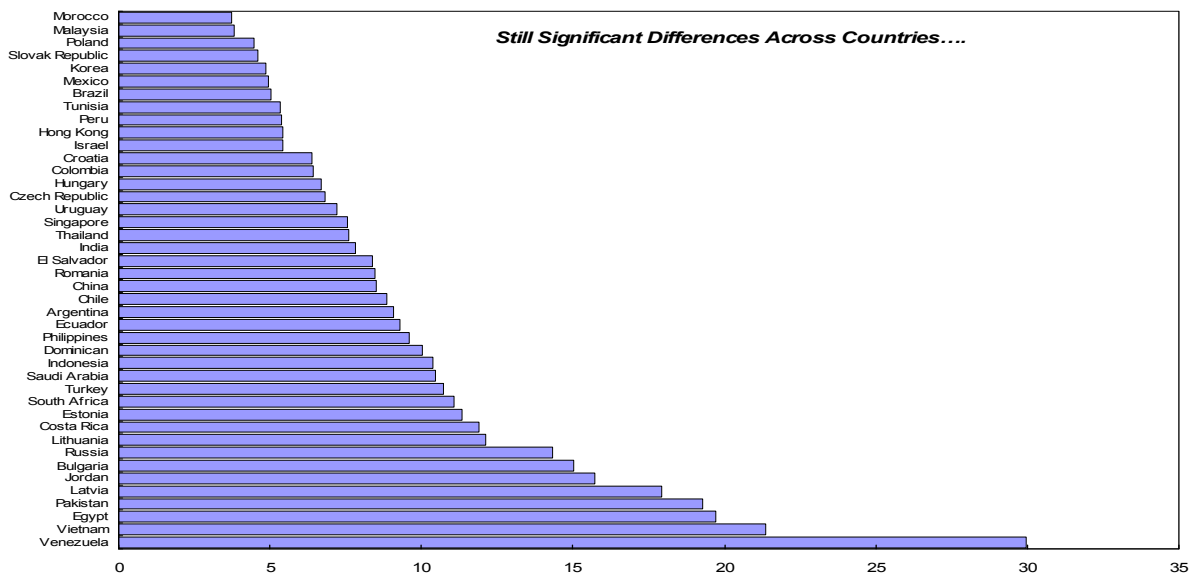
1. **Inflation pressures rose sharply since mid-2007 in emerging market and developing economies.** By region, Middle-East and emerging European countries faced stronger inflation pressures than other regions, although there were significant differences in the severity of the pressures within the regions (Appendix Figure 1). While surging food and energy prices were a common driver in all regions, aggregate demand pressures also contributed to inflation pressures (Appendix Table 1). As a result, inflation pressures became more broad-based in most countries. Except in China, Israel, and Malaysia, core or underlying inflation (excluding food and energy) rose along with headline inflation, suggesting second round effects. Inflation expectations also rose.
2. **In emerging and developing Europe,** central banks faced rising inflation pressures since mid-2007, against the background of slowing growth and a global credit crunch. The pick up in inflation was most substantial in countries where the local currencies are either pegged (e.g., Bulgaria, Estonia, Latvia, Lithuania, Ukraine) or had depreciated vis-à-vis the euro (e.g., Serbia, Ukraine). Inflation rates were in the double digits in Bulgaria, the Baltics, Russia, Serbia, Turkey, and Ukraine, rising well above the Maastricht criteria in most new EU countries, thereby threatening the prospects for euro adoption (Bulgaria, Estonia, Hungary, Latvia, Lithuania, Romania). In countries pursuing IT regimes, actual inflation rates exceeded the upper limits of the official targets. Core inflation rose in many European countries, with indications of second round effects. There has been some slowdown in the pace of inflation since May 2008, reflecting the decline in commodity prices, as well as more sluggish economic activity.
3. **In emerging Asia,** similarly, inflation pressures rose, most notably since the middle of 2007, though the magnitude varied across the region: inflation in Vietnam surged to over 20 percent in the first half of 2008, and exceeded, or approached, double digits in Indonesia and Philippines, while that in Hong Kong SAR, Malaysia, and Korea was more moderate. In Indonesia, Korea, and Philippines, the official inflation targets were breached since the beginning of 2008, while inflation in Thailand remained within its target range during the first half of the year. Core inflation was also up in many of the countries in the sample, and inflation expectations increased in all. Similar slowdown were observed in the pace of inflation in emerging Asia since about May 2008, reflecting falling commodity prices.
4. **In Latin America,** inflation pressures also rose, albeit more modestly than in Europe, Asia, and the Middle East. Inflation pressures also varied across the region, with the largest pick-up in Chile, Guatemala, Honduras, and Dominican Republic (with double digit rates in the last three). Inflation accelerated at the fastest pace in the formally dollarized countries (El Salvador, Ecuador, and Panama, from less than 3 percent on average to more than 9 percent since end-2006) vis-à-vis countries with other monetary regimes. Among the six IT countries of the region, Chile and Guatemala showed the largest deviations from official targets, while Brazil's inflation remained within its target. Core inflation and inflation expectations also rose. Second round effects were present in all countries.

²⁸ As of August 2008.

5. **In the middle-east and central Asia**, inflation accelerated sharply and reached historical highs. Most Gulf oil producers had double digit rates, as well as Armenia, Egypt, Jordan, Kazakhstan, Kyrgyz Republic. In Egypt, inflation soared to almost 20 percent, the highest in almost 10 years, and in Kyrgyz Republic jumped by more than 20 percentage points since end-2006, to 24 percent.

6. **In Africa**, as well, inflation reached double digit levels in Botswana, Ghana, and South Africa. In South Africa, inflation surged to near five-year highs, with the official inflation target missed 12 months in a row, providing the most severe challenge to the authorities since the inception of IT. In Botswana and Ghana as well, inflation exceeded the upper band of the inflation objectives.

Appendix Figure 1. Inflation Performance in Emerging World, June 2008
(In percent)



Sources: IFS, staff calculations.

Appendix Table 1. Fund Staff and the Authorities' Analysis on the Nature and Drivers of Inflation

	Nature of inflation				Drivers of inflation					
	Headline inflation up	Core inflation up	Inflation exp's up	Second round effects ¹	Rising food prices	Rising fuel prices	Aggregate demand pressures	Wages up with tight labor markets	Exchange rate depreciation	One off factors (adm price, VAT)
Europe										
Bulgaria	√	√		√	√	√	√	√		
Croatia	√	√			√	√	√			
Czech R	√	√	Decline stopped	√	√	√		√		√
Estonia	√	√		√	√	√	√	√		√
Hungary	√	√	√ (stable recently)	√	√	√		√		
Israel	√			√	√	√		√		
Latvia	√		√	√	√	√	√	√		√
Lithuania	√	√	√		√	√	√	√		
Poland	√	√	√	Likely	√	√	√	√		
Romania	√	√	√	√	√	√	√	√	√	
Russia	√	√		Not clear	√	√	√	√		
Serbia	√	√	√	√	√	√			√	
Slovakia	√	√			√	√		√		
Turkey	√	√	√	√	√	√			√	√
Ukraine	√	√	√	√	√	√	√	√		
Africa										
Botswana	√				√	√	√			√
Cameroon										
Ghana	√	√			√ (less)	√	√		√	
Nigeria										
Senegal										
S. Africa	√	√	√	√	√	√		√	√	
Uganda										
Asia										
China	√	√ (v. limited)	√		√	√	√			
Hong Kong SAR	√	√	√		√	√		√	√?	
India	√	√	√		√	√	√			
Indonesia	√	√	√		√	√	√			√
Korea	√	√	√		√	√	√		√	
Malaysia	√ (v. limited)	√ (v. limited)	√							
Philippines	√	√	√	√	√	√	√			
Singapore	√	√	√	√	√	√	√	√		√
Thailand	√	√ (v. limited)	√		√	√				
Vietnam	√	√	√	√	√	√	√			
Middle East and Central Asia										
Armenia	√				√	√	√			
Egypt	√				√	√	√			√
Jordan	√				√	√	√			
Kazakhstan	√				√	√	√ (initially)		√	
Kyrgyz Rep	√	√			√	√	√			
Kuwait	√				√	√	√			
S. Arabia	√				√	√	√			
Latin America										
Brazil	√	√	√	√	√	√	√	√		
Chile	√	√	√	√	√	√				
Colombia	√	√	√	√	√	√	√			
Costa Rica	√	√	√	√	√	√	√			
D. Republic	√	√	N/A	√	√	√				
Guatemala	√	√	√	√	√	√				
Honduras	√	√	N/A	√	√	√				
Mexico	√	√		Limited	√	√				
Peru	√	√	√	√	√	√				
Uruguay	√	√	√	√	√	√		√		

Sources: IMF Country Reports, selected issues; area department desks; National central bank Inflation Reports and websites; internal memos of area departments; Economy Watch Blogs, News articles.

¹ Second round effects are considered to be present when price increases have been more broad based that could lead to rising inflation expectations, higher wage pressures, and underlying (core) inflation.

APPENDIX II. ECONOMETRIC ANALYSIS OF THE DRIVERS OF INFLATION

7. **This appendix provides a brief description of the econometric exercises carried out in the context of the paper.** It analyzes the determinants of the inflationary pressures in emerging markets and developing countries, and the effectiveness of monetary policy responses. In particular, it focuses on the following questions:

- What were the main drivers of the ongoing inflationary pressures in emerging market and developing countries? Did these pressures originate from external factors associated with the recent evolution of commodity prices, or from aggregate demand pressures?
- Did second-round effects play any role in the observed surge in inflation? If so, are there any differences between countries with different monetary policy regimes?
- What were the observed effects of the ongoing monetary tightening on inflation? Are there any differences between countries with different monetary policy regimes?
- Were cross-country differences in inflation performance somewhat influenced by the institutional frameworks of monetary policy?
- What was the estimated contribution of various factors, including monetary policy tightening, to the inflationary episode?

8. **All the estimations are based on a panel dataset covering 49 emerging market and developing economies, at the monthly frequency, during Jan 2005–June 2008.**²⁹ The selection of countries reflects data availability (i.e., it includes all countries with available information), while the time coverage takes into account the span of the inflationary episode. Since the sample size has a maximum of 30 observations per country, the exercises exploit asymptotic results based on the panel dimension.

9. **The baseline model has the general form:**

$$\pi_{it} = \alpha\pi_{it-1} + x_{it}\beta + w_t\gamma + \eta_i + v_{it},$$

where π_{it} stands for the year-on-year monthly inflation, and the sub-indexes i and t represent the panel (i.e., countries) and time dimensions, respectively. The lagged dependent variable

²⁹ The list of countries includes: Armenia, Botswana, Brazil, Bulgaria, Cameroon, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Dominican Republic, Egypt, Estonia, Ghana, Guatemala, Honduras, Hong Kong SAR, Hungary, India, Indonesia, Israel, Jordan, Kazakhstan, Korea, Kuwait, Kyrgyz Republic, Latvia, Lithuania, Mexico, Mozambique, Nigeria, Peru, Philippines, Poland, Romania, Russia, Saudi Arabia, Senegal, Serbia, Republic of, Singapore, Slovak Republic, South Africa, Thailand, Turkey, Uganda, Ukraine, Uruguay, and Vietnam.

is included in the set of regressors to account for inflation inertia. In turn, the variables in the vector x_{it} (which may entail lags) capture factors associated with the monetary policy stance, aggregate demand pressures, and capacity constraints. These variables are considered to be either predetermined or endogenous. The variables in the vector w_t capture inflationary pressures originating from world commodity prices, which are common to all countries, and are treated as strictly exogenous. The term η_i refers to country-specific time-invariant factors (or fixed effects) that we do not model explicitly, and v_{it} is the country-specific error term, which has zero mean, and is assumed to be uncorrelated with its past and future realizations, and with the country fixed effects. Under this specification, the short-term inflationary impact of an increase in the explanatory variables included in the vector x is given by their corresponding β coefficient, while the long-term impact is given by $\beta/(1-\alpha)$. A similar treatment applies to the inflationary impact of the variables included in the vector w .

Baseline Exercises

10. **A number of exploratory exercises were carried out to guide the choice of variables and their lag structure.** In the selected baseline specification, the vector x of (possibly endogenous) variables includes: (i) lagged changes in the POLICY INTEREST RATE to capture inflation inertia and the monetary policy stance, and (ii) lagged CREDIT GROWTH as a proxy for aggregate demand pressures.³⁰ In turn, the vector w of strictly exogenous variables includes FOOD INFLATION AND OIL INFLATION to capture external inflationary pressures. The definition and source of these variables is provided in Appendix Table 2. Summary statistics for these variables (not reported), show that IT countries have been able to achieve lower inflation than non-IT countries with roughly comparable increases in interest rates. Also, IT countries have been more aggressive in strengthening their frameworks of central bank governance, entailing stronger CBI and higher levels of monetary policy transparency.

11. **The estimation of the selected baseline specification, using five alternative methods, is presented in Appendix Table 3.** All the regressions include a set of country dummies. Time dummies are excluded to allow the assessment of the pass-through of food and energy prices to inflation (i.e., the inclusion of time dummies would preclude this analysis, as food and energy prices are common to all countries). As a robustness check, however, a parallel set of regressions were computed, including a complete set of country and time dummies, with similar results (for the coefficients of the country-specific variables). Interestingly, the coefficients associated with the time dummies in these regressions were positive and increasing over time, providing initial evidence that countries have been exposed to a common inflationary shock, particularly after the third quarter of 2006. This is consistent with hypothesis of inflation being (at least) partially driven by the rise in commodity prices.

³⁰ The list of explanatory variables in the exploratory exercises included several measures of aggregate demand pressures and capacity constraints: GDP growth, output gap, unemployment, a measure of openness computed as the sum of exports plus imports relative to GDP, wages, fiscal deficit in percent of GDP, unit labor costs, and exchange rate depreciation. In general, these series were available at the annual frequency only, limiting their usefulness in the regressions. The rate of exchange rate DEPRECIATION was also included in preliminary exercises, but the associated coefficients were not statistically significant.

Appendix Table 2. List of Variables Used in the Estimations

Variable	Units	Description	Source
Food Inflation	Percent	Yearly change in the index of food prices (2000=100)	IFS Series 76 EXDZF
Oil Inflation	Percent	Yearly change in the index of average crude prices (2000=100)	IFS Series 76 AADZF
Share of Food in CPI	Percent	The share of food in the CPI basket (latest observation)	Central bank websites, and staff estimates.
Share of Fuel in CPI	Percent	The share of fuel in the CPI basket (latest observation)	Central bank websites, and staff estimates.
Policy Interest Rate	Percent	The policy interest rate	Central bank websites
Inflation	Percent	CPI Inflation	IFS and central bank websites
Core Inflation	Percent	Core CPI Inflation	GDS, and central bank websites
Credit Growth	Percent	Growth of credit to the private	IFS Series 22D
Turnover	Number of central bank governors per year	Turnover rate of central bank governors	Crowe-Meade (2007)
CBI Index	Index number	Central bank independence index	Crowe-Meade (2007)
CBT Index	Index number	Central bank transparency index	Crowe-Meade (2007)

Appendix Table 3. Results from the Baseline Specification

	[1]	[2]	[3]	[4]	[5]
	Pooled OLS	Within Groups	Difference GMM	System GMM	System GMM
	Dependent: Inflation	Dependent: Inflation	Dependent: Inflation	Dependent: Inflation	Dependent: Diff. in Inflation
L. Inflation	0.971 [0.016]**	0.928 [0.025]**	0.658 [0.099]**	0.967 [0.029]**	
L11D. Policy Interest Rate	-0.143 [0.080]	-0.163 [0.076]*	-0.217 [0.081]*	-0.183 [0.079]*	-0.174 [0.080]*
L11. Credit growth	0.008 [0.002]**	0.010 [0.005]	0.087 [0.029]**	0.024 [0.008]**	0.016 [0.006]**
Food Inflation	0.013 [0.003]**	0.015 [0.004]**	0.014 [0.009]	0.009 [0.004]*	0.009 [0.004]*
Oil Inflation	0.005 [0.002]**	0.006 [0.002]**	0.010 [0.003]**	0.006 [0.002]**	0.005 [0.002]**
Constant	-0.201 [0.086]*	-0.055 [0.231]		-0.533 [0.146]**	-0.505 [0.134]**
Observations	1242	1242	1193	1242	1242
R-squared	0.95	0.89			
Number of Country ID		49	49	49	49

Robust standard errors in brackets

* significant at 5%; ** significant at 1%

12. **The results indicate that the signs of the coefficients are stable across the five estimation methods and consistent with economic theory.** In particular, monetary policy tightening is associated with a drop in inflation, with a lag of about one year (see below). Aggregate demand pressures and higher commodity prices are also shown to have a positive

effect on inflation. In terms of magnitude, the point estimates of the coefficients and their significance levels are broadly stable across the five estimation methods. As expected, the autoregressive coefficient resulting from the Pooled OLS in column [1] is higher than the Within Groups estimate in column [2], reflecting known biases associated with the inclusion of the lagged dependent variable. Since the autoregressive coefficient in these two estimations is too close to one, the regression is computed again in column [3], after applying first differences to both sides of the equation to achieve stationarity, and using GMM to account for endogeneity. This estimation treats INFLATION, the POLICY INTEREST RATE and CREDIT GROWTH as endogenous, using their lagged levels (2 to 4 lags) as instruments.³¹ In turn, the estimations under column [5] and [6] further exploit information from the equations in levels, using System GMM.³²

13. **Overall, the specification presented in column [3] is likely to produce the more consistent point estimates.** However, it precludes us from testing some of the questions posed above, as differencing the right-hand side variables removes time-invariant institutional variables associated with central bank governance that we also want to test. Therefore, we use the point estimates of specification [3] as the basis for the analysis whenever possible, and resort to the specification [5] in the tests involving variables that vary exclusively along the cross-sectional dimension.

Selected Tests

What were the main drivers of observed inflation?

14. **The regression results suggest that the observed inflationary pressures have been driven by a combination of aggregate demand pressures, proxied by credit growth, and increases in food and energy prices.** Using the coefficients presented in column [3] of Appendix Table 3, a one percent increase in credit growth leads to an 8.7 basis point increase in inflation on impact, and a cumulative increase of 25.4 basis points in the long-run (i.e., $8.7 \times 1 / (1 - 0.658)$). On the other hand, the results suggest that the role of FOOD INFLATION and OIL INFLATION in the inflationary episode has not been as important as commonly believed. In particular, a 1 percent increase in oil prices translates into a 1 basis point increase in inflation on impact and a cumulative increase of 2.9 basis points in the long-run.³³ The pass-through of food prices into inflation is of similar magnitude.

³¹ We computed a parallel set of regressions treating these three variables as predetermined, with similar results.

³² The p-values of the Sargan tests of over-identifying restrictions cannot reject the null, indicating that the instruments used in the GMM estimations are valid. In turn, the p-values of the Arellano-Bond tests indicate the presence of first order autocorrelation of the differenced residuals but cannot reject the null of no second-order autocorrelation, which is reassuring for parameter consistency, and justifies the inclusion of the (one) lagged dependent variable.

³³ A back-of-the-envelope calculation of the contribution of food and oil prices to inflation also indicates that food and oil prices have been relatively less important than internal demand pressures (see below).

Appendix Table 4. A Further Look at the Pass-Through of Food and Energy Prices

	[1]	[2]	[3]	[4]	[5]
	Pooled OLS Dependent: Inflation	Within Groups Dependent: Inflation	Difference GMM Dependent: Inflation	System GMM Dependent: Inflation	System GMM Dependent: Diff. in Inflation
L. Inflation	0.967 [0.021]**	0.915 [0.028]**	0.676 [0.117]**	0.954 [0.027]**	
L11D. Policy Interest Rate	-0.250 [0.134]	-0.211 [0.097]*	-0.247 [0.132]	-0.188 [0.103]	-0.173 [0.102]
L11. Credit growth	0.013 [0.004]**	0.011 [0.006]	0.093 [0.035]*	0.033 [0.016]*	0.019 [0.010]
Weighted Food Inflation	0.037 [0.015]*	0.079 [0.020]**	0.043 [0.036]	0.045 [0.024]	0.042 [0.019]*
Weighted Oil Inflation	0.039 [0.012]**	0.028 [0.018]	0.099 [0.055]	0.040 [0.033]	0.028 [0.025]
Constant	-0.191 [0.108]	-0.051 [0.244]		-0.616 [0.210]**	-0.521 [0.175]**
Observations	769	769	738	769	769
R-squared	0.94	0.88			
Number of Country ID		31	31	31	31

Robust standard errors in brackets

* significant at 5%; ** significant at 1%

15. **Two additional exercises were conducted to further study the pass-through of food and energy prices into inflation.** The first (not reported) added the share of food and energy in the CPI to the set of regressors. The coefficients of these two variables were not found to be statistically significant, indicating that countries with a larger share of food and energy in their CPI baskets have not seen higher average inflation during the period studied. In the second exercise, presented in Appendix Table 4, we weighted the series of food and oil inflation by their respective shares in the CPI baskets. The target coefficients were positive and larger than those obtained in the baseline regression but not statistically significant. Overall, this evidence suggests that the pass-through of world commodity prices into headline inflation has been relatively mild, which could be due to implementation of compensatory measures—e.g., government subsidies or price controls.

Were there second-round effects?

16. **The results support the presence of second round effects.** To explore this question, we replace lagged inflation in the set of regressors by lagged core inflation, and compute a new set of regressions treating the latter as endogenous.³⁴ The target coefficient, presented in column [1] of Appendix Table 5, indicates the presence of feedback effects running from core inflation to headline inflation. In order to further assess the dynamics of these feedback effects, we estimate separate coefficients for the period January 2005–May 2007, versus June 2007–June 2008, with the use of a dummy variable. The results, presented in column [2], support the notion that feedback effects have been increasing. Lastly, we look for possible

³⁴ This comes at the cost of a reduced sample size, as core inflation is available for only 27 countries.

differences in second round effects between IT and non-IT countries in these two sub-periods, by adding an interaction with an INFLATION TARGETERS dummy, which equals one for IT-countries and zero for non-IT countries.³⁵ The results, in column [3], corroborate the existence of second-round effects, and provide some evidence that these effects are somewhat lower among IT countries.

Appendix Table 5. Are Second-Round Effects Kicking In?

	[1]	[2]	[3]
	Difference GMM	Difference GMM	Difference GMM
	Dependent: Inflation	Dependent: Inflation	Dependent: Inflation
L.Core Inflation	0.332 [0.191]*		
Core Inflation 2005-07		0.330 [0.197]*	0.167 [0.428]
Core Inflation 2007-08		0.848 [0.388]**	0.938 [0.556]*
Inflation Targeters*Core Inflation 2005-07			0.172 [0.439]
Inflation Targeters*Core Inflation 2007-08			-0.958 [0.578]*
Observations	715	715	715
Number of Country ID	27	27	27

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

This table shows the coefficients of a set of variables added to the specification presented in Table A-2 column [3]. Results for the omitted coefficients are similar to those reported previously.

What have been the effects of the ongoing monetary tightening on inflation?

17. The baseline regressions provide evidence that countries with a more aggressive monetary tightening during the sample period have been able to attain lower inflation. A one percentage point increase in the policy interest rate leads to an estimated 21.7 basis point drop in inflation on impact, and a long-run effect of 63.5 basis points. The response of inflation, however, comes with a lag of about 4 to 5 quarters. Appendix Table 6 presents the re-estimation of the preferred specifications—after including a full set of lagged differences of the policy interest rate (spanning 5 to 14 lags)—which shows negative coefficients between the 10th and the 14th lag, and statistically significant results around the the 4th quarter (hence the choice of 11 lags in the preferred specification). These results indicate that the

³⁵ The group of non-IT countries encompasses an assorted collection of monetary anchoring regimes, including: exchange rate target (ERM/Euro); exchange rate target (ERM-II); exchange rate target (U.S. dollar); exchange rate target (euro); monetary aggregate target; exchange rate target: composites; narrow money targets (M1); reserve target; adjusted according to a set of indicators; cooperative arrangement (CEMAC); cooperative arrangement (WAEMU); and multiple indicators/other regimes.

effects on inflation of the monetary tightening initiated in the third quarter of 2007 have not yet fully materialized.

Appendix Table 6. Speed of Transmission of Monetary Policy

	[1]	[2]	[3]	[4]
	Difference GMM Dependent: Inflation	Difference GMM Dependent: Inflation	System GMM Dependent: Diff. in Inflation	System GMM Dependent: Diff. in Inflation
L. Inflation	0.518 [0.129]***	0.658 [0.099]***		
L5D. Policy Interest Rate	0.187 [0.193]		0.047 [0.094]	
L6D. Policy Interest Rate	0.127 [0.212]		-0.060 [0.100]	
L7D. Policy Interest Rate	0.305 [0.270]		-0.035 [0.087]	
L8D. Policy Interest Rate	0.268 [0.252]		-0.008 [0.083]	
L9D. Policy Interest Rate	0.368 [0.302]		-0.032 [0.071]	
L10D. Policy Interest Rate	-0.180 [0.323]		-0.234 [0.093]**	
L11D. Policy Interest Rate	-0.488 [0.431]	-0.217 [0.081]**	-0.348 [0.109]***	-0.174 [0.080]**
L12D. Policy Interest Rate	-1.354 [0.980]		-0.336 [0.296]	
L13D. Policy Interest Rate	-0.964 [1.117]		-0.233 [0.274]	
L14D. Policy Interest Rate	-1.797 [1.184]		-0.453 [0.239]*	
L11. Credit growth	0.133 [0.046]***	0.087 [0.029]***	0.021 [0.007]***	0.016 [0.006]***
Food Inflation	0.023 [0.011]**	0.014 [0.009]	0.006 [0.005]	0.009 [0.004]**
Oil Inflation	0.009 [0.004]**	0.010 [0.003]***	0.004 [0.002]*	0.005 [0.002]***
Constant			-0.539 [0.172]***	-0.505 [0.134]***
Observations	1043	1193	1090	1242
Number of Country ID	47	49	47	49

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Do institutional frameworks of central bank governance matter?

18. **The results show that countries that have more strongly pursued central bank reform have been able to attain lower inflation rates.** We exploit three measures of central bank governance assembled by Crowe and Meade (2007). These include: (i) an index of CENTRAL BANK INDEPENDENCE (CBI) based on the methodology of Cukierman, Webb, and Neyapti (1992); (ii) an index CENTRAL BANK TRANSPARENCY based on the methodology proposed by Blinder *et al.* (2001); and (iii) an index of the TURNOVER rate of central bank governors as a measure of effective CBI. The database contains two observations for each

variable in each country, which allows us to compute their change in time as a measure of improvements in central bank governance. We add these indicators to the set of regressors, one at a time to avoid multicollinearity, and re-estimate the baseline regression. The results are supportive of our priors (columns [1] to [3] of Appendix Table 7).

Appendix Table 7. Is there Any Role for the Institutional Framework of Monetary Policy?

	[1]	[2]	[3]	[4]	[5]	[6]
	GMM Dependent: Diff. Inflation	GMM Dependent: Diff. Inflation	GMM Dependent: Diff. Inflation	GMM Dependent: Diff. Inflation	GMM Dependent: Diff. Inflation	GMM Dependent: Diff. Inflation
Change in CBI Index	-0.382 [0.224]*			-0.554 [0.257]**		
Change in Transparency Index		-0.246 [0.106]**			-0.320 [0.132]**	
Change in Turnover			0.237 [0.440]			0.560 [0.533]
L11D.Policy Rate*Governance Indicator				-2.964 [1.358]**	2.126 [1.112]*	2.871 [1.034]***
Observations	668	398	614	668	398	614
Number of Country ID	26	14	24	26	14	24

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

19. **The data also show that greater central bank independence and transparency increase the effectiveness of monetary policy.** We compute a new set of regressions, adding an interacting term between the POLICY INTEREST RATE and the change in each of the three indicators of central bank governance. The results, presented in columns [4] to [6] of Appendix Table 7, support the idea that improvements in the institutional framework of monetary policy have been associated with a more effective monetary policy. The positive coefficient on the interaction between the POLICY INTEREST RATE and the TRANSPARENCY INDEX at the bottom of column [5] implies decreasing marginal benefits associated with monetary policy transparency. Overall, these results suggest that the observed differences in inflationary performance between IT versus non-IT countries may be partly explained by differences in the institutional frameworks of monetary policy, as the former have moved more aggressively in this front.

What was the contribution of the selected factors to observed inflation?

20. **This question can be answered with a back-of-the-envelope calculation, using the coefficients of the baseline regressions.** As a reference, we compute the sample averages of inflation and the other target variables at two points in time, June 2007 and June 2008, take their differences, and combine the results with the coefficients obtained in the baseline regressions, to obtain an estimate of the contribution of each explanatory variable to the observed change in inflation. To account for uncertainty in model selection and parameter estimation, we use the coefficients of the two preferred specifications. The results are presented between brackets in column [4] of Appendix Table 8. In parallel, to account for potential differences in the response of inflation to monetary policy (and other explanatory variables) between IT versus non-IT countries, we computed separate regressions for these

two groups of countries and used the corresponding coefficients to obtain an alternative set of results, which are presented in column [5] of Appendix Table 8.

21. **The results indicate that IT countries were able to achieve lower inflation rates than non-IT countries with similar increases in policy rates.** Between June 2007 and June 2008, inflation increased by 4.6 percentage points for the entire sample. On average, the change in inflation among IT countries in the year prior to June 2008 was 3.5 percent, compared with 7.6 percent for non-IT countries. The IT countries also experienced lower rates of credit growth. On the other hand, the average increase in policy rates was similar for the two groups. Going to the results, the estimated contribution of food and oil prices to the increase in inflation is relatively small, as they jointly explain between 1.0–1.5 percentage points. There is more uncertainty on the magnitude of inflation attributable to aggregate demand pressures (proxied by credit growth), as the estimates range between 0.5–2.5 percentage points. Overall, the results are consistent with the notion that the ongoing monetary policy tightening is only beginning to dent inflation, and could explain a drop of about 0.2–0.3 percentage points. The results also support the idea that the effects of monetary policy tightening on inflation have been stronger among IT countries.

Concluding Remarks

22. **Overall, the empirical evidence presented here suggests that the inflationary episode studied here was driven by a combination of external and internal factors.** The econometric estimates confirm that countries have been exposed to a large common inflationary shock associated with commodity prices. This shock has since abated. The results also indicate that internal demand pressures, captured in the econometric specifications by the growth of bank credit, have played an important role. With the slowing of global growth in the second half of 2008, these pressures may also begin to abate. Countries tightening monetary policy more aggressively are attaining lower inflation rates. The effects of monetary policy on inflation seem to come with a lag of about 4 quarters, implying that the recent monetary policy tightening is only beginning to dent inflation.

23. **Between June 2007–June 2008, the average increase in policy rates has been comparable between IT and non-IT countries, at around 1.2 percentage points.** Also, the levels of average policy rates have been roughly similar across these two groups. However, due to differences in inflationary performance, real interest rates have become negative among non-IT countries. Further monetary tightening appears to be necessary.

24. **Second round-effects, measured by the effect of lagged core inflation on headline inflation, have been increasing over time, doubling in 2007–08 relative to 2005–06.** This increase has been somewhat lower for IT countries, vis-à-vis non-IT countries, but the differences are not statistically significant.

25. **Countries engaging in a more aggressive reform of their institutional monetary policy frameworks during the 1990s have been able to attain lower inflation rates in the current upsurge.** In particular, countries with stronger improvements in their central bank independence and in monetary policy transparency are performing better in terms of

inflation. More importantly, this result seems to be driven by increased effectiveness in the workings of monetary policy transmission.

Appendix Table 8. Estimated Contribution of Selected Factors to Inflation, in percent

	[1]	[2]	[3]	[4]	[5]
	Jun-07	Jun-08	Difference	Estimated Contribution to Inflation 1/	Estimated Contribution to Inflation 2/
Entire Sample					
Inflation	5.1	9.7	4.6		
Policy Interest Rate	7.4	8.6	1.2	[-0.2 -0.3]	
Credit Growth	28.6	25.5	-3.1	[0.5 2.5]	
Food Inflation	7.6	44.5	36.9	[0.4 0.6]	
Oil Inflation	-0.1	92.9	93.0	[0.5 0.9]	
Inflation Targeters					
Inflation	4.0	7.4	3.5		
Policy Interest Rate	7.1	8.4	1.2	[-0.2 -0.3]	[-0.5 -0.5]
Credit Growth	22.2	10.2	-12.0	[0.4 1.9]	[-0.2 0.2]
Food Inflation	7.6	44.5	36.9	[0.4 0.6]	[0.5 0.7]
Oil Inflation	-0.1	92.9	93.0	[0.5 0.9]	[0.2 0.5]
Other Monetary Regimes					
Inflation	5.9	13.5	7.6		
Policy Interest Rate	7.6	8.8	1.2	[-0.2 -0.3]	[-0.1 -0.1]
Credit Growth	33.1	29.4	-3.7	[0.5 2.9]	[0.5 3.5]
Food Inflation	7.6	44.5	36.9	[0.4 0.6]	[0.2 0.5]
Oil Inflation	-0.1	92.9	93.0	[0.5 0.9]	[0.5 1.1]

1/ Based on the results presented in Table A-2, columns [3] and [5].

2/ Based on the results of separate regressions for IT versus non-IT countries.

**APPENDIX III. POLICY RESPONSES TO RISING INFLATION PRESSURES
(AS OF JUNE 2008)**

	Policy rate hike/stepped up sterilization	Direct measures ¹	Prudential measures for credit	Inflation target adjusted	ER apprec (wrt mid- 2007)	Tight fiscal policy	Other policies ²
Europe							
Bulgaria	√	√ (1, 3)	√			√	10
Croatia		√ (1, 2, 3)	√		√	√?	2, 3, 5
Czech R	√				√		4
Estonia			√			√	
Hungary	√		√		√	√	6
Israel	√				√		3
Latvia		√ (1 lowered)	√			√	3
Lithuania			√				3 (food), 4 (fuel)
Poland	√				√	√	4, 10 (gradual)
Romania	√		√				
Russia	√	√ (1,2)					2, 5, 8, 9
Serbia	√	√ (2?)	√				2
Slovakia					√		9
Turkey	√			√ ³			4
Ukraine	√	√ (2)	√	√ ⁴	√	√ only recently	2, 5, 6 (exp'd), 7
Africa							
Botswana	√						
Cameroon							
Ghana	√						
Nigeria							
Senegal							
S. Africa	√						
Uganda							
Asia							
China	√	√ (2,3)			√		5, 9
Hong Kong SAR							
India	√	√ (1)					2, 8, 9
Indonesia	√						9, 10
Korea	√						3
Malaysia					√		9, 10
Philippines	√						5, 6, 8
Singapore					√		6
Thailand	√						
Vietnam	√	√ (1, 3)					2, 4, 5, 9, 10
Middle east and central Asia							
Armenia	√		√		√		
Egypt	√				√		2, 5, 7, 8
Jordan							3, 5, 6, 8
Kazakhstan			√				2
Kyrgyz Rep.	√				√		2, 3, 6, 8
Kuwait			√		√		
S. Arabia		√ (1)					5, 6, 8
Latin America							
Brazil	√		√		√		2, 8
Chile	√						3, 6
Colombia	√	√ (1, 2)			√		
Costa Rica	√			√ ⁴			
D. Republic	√			√ ⁴			5, 8

	Policy rate hike/stepped up sterilization	Direct measures ¹	Prudential measures for credit	Inflation target adjusted	ER apprec (wrt mid-2007)	Tight fiscal policy	Other policies ²
Guatemala	√			√ ⁴			
Honduras	√	√ (1, 3)		√ ⁴			10
Mexico	√				√		5, 9
Peru	√	√ (1, 2)			√		3, 8
Uruguay	√	√ (1, 2)		√ ⁴	√		3, 5, 9

¹ 1 = Reserve requirements, 2 = capital control, 3 = credit controls.

² 1 = higher tax on energy; 2 = higher tax or restrictions on exports; 3 = lower VAT, sales taxes on selected items (food, energy etc); 4 = higher VAT, other taxes on selected items; 5 = increased subsidies (explicit or implicit) on agriculture/energy items; 6 = social safety nets; 7 = increase in min wage; 8 = lower import tariffs; 9 = price controls or moral suasion to keep prices low; 10 = increase in administered prices. Some of these policy changes were not taken in response to, but coincided with, the period of inflation pressures.

³ Initially the target horizon and inflation forecast, subsequently the target level adjusted upward.

⁴ Official inflation objective/forecast adjusted upward.

Sources: IMF Country Reports, selected issues; area department desks; National central bank Inflation Reports and websites; internal memos of area departments; Economy Watch Blogs, news articles.

APPENDIX IV. EMERGING IT COUNTRIES: POLICY RESPONSES TO DATE

26. **Countries implementing IT regimes have experienced significant inflation pressures since mid-2007.** The significant rise in inflation is the first significant test of the IT regime, with most IT countries overshooting their official inflation targets (see Appendix Figure 2). Many IT countries have thus faced unprecedented policy challenges in responding to inflation pressures.

27. **None of the countries with IT regimes revised the officially announced inflation targets in response to rising inflation, except Guatemala and Turkey** (as of end-August 2008). Despite a repeated overshooting of the targets over the past year or so, the authorities kept the official targets (and their parameters—target band width, the index targeted, target horizon, etc.) unchanged, in part to avoid damage to the credibility of commitment to price stability and the risk of unanchoring inflation expectations.

- Despite strong pressure from the government to revise the target upward, the Hungarian National Bank resisted an adjustment, given the potential negative effects on market sentiment, Hungary’s reputation regarding its euro accession plans, and on the Bank’s policy credibility.³⁶ Similarly, the South African Reserve Bank (SARB) rejected calls for an upward adjustment of its official target or its various features, given potential adverse implications for long term inflation expectations, wage and price setting behavior, the value of the rand, and credibility. The proposals to invoke the “explanation clause” were also rejected by the SARB, since this clause, while allowing the central bank to be outside of the target range, did not relieve it of the responsibility for explaining why inflation was out of the target range and what it was doing to get inflation back within the range.
- In June 2008, Turkey, revised upward the official target for 2009-2011, after extending the target horizon and revising the inflation forecast. It was argued that by better aligning the rising inflation forecasts with the targets, less ambitious (higher) targets might reduce the risk of future overshooting, create less need to explain why the targets were being missed, and might lessen potential market confusion over the gap between forecasts and the target. It was felt that large and persistent deviations from the target due to shocks beyond the control of monetary policy would undermine the credibility of the targets. The expectation that supply shocks would exert persistent upward inflation pressures was seen to justify a revision affecting an extended period. The authorities also noted that these new targets should be seen as ceilings, as opposed to the former point targets. Unlike point targets, where both positive and negative shocks trigger a symmetric response, the CBT would allow inflation to undershoot the ceilings, which would also indicate the tolerance level for first round effects.

³⁶ On August 25, the government and the central bank agreed to maintain the inflation target at 3 percent (with a one percent tolerance band around it) for the next three years (or until ERM II entry).

- In December 2007, Guatemala adjusted upward both the mid-point and the target range of its official target by 50 basis points. This change reflected a higher inflation forecast in the context of the monetary program for 2008.

28. **The IT countries that did not modify the official targets coped with rising inflation in a number of other ways** (Appendix Table 9). The majority tightened policy rates to anchor inflation expectations, limit second round effects, reiterate a commitment to price stability, and maintain the IT regime (Czech Republic, Hungary, Israel, Poland, Romania; Indonesia, Philippines; Brazil, Chile, Colombia, Mexico, Peru; South Africa). Some central banks emphasized that when there is a deviation from the target, the time taken to return to it could differ depending on the circumstances and the state of the economy. In some, nominal or real exchange rate appreciation helped limit the pass-through of imported inflation pressures (Czech Republic, Hungary, Israel, Poland, Slovakia, Brazil, Colombia, Peru). A few countries combined higher interest rates with prudential measures (Romania) or higher reserve requirements and other direct instruments of monetary policy (Colombia, Peru). A tight fiscal stance provided support in some cases (Hungary, Poland).

Appendix Table 9. Emerging IT Countries: Policy Responses, as of August 2008

Country	Target overshoot	Overshooting since	Target adjusted	Monetary/Exchange rate policy action
Latin America				
Brazil	No	...	No	<ul style="list-style-type: none"> • Raised key policy rate (175 bp since Apr 2008) • Imposed reserve requirement on leasing companies • Exchange rate appreciated
Chile*	Yes	Aug 2007	No	Raised key policy rate (275 bp since Jul 2007)
Colombia*	Yes	Early 2007	No	<ul style="list-style-type: none"> • Raised key policy rate (250 bp since Jan 2007) • Raised reserve requirements • Imposed reserve requirements on foreign liabilities • Let exchange rate appreciate
Guatemala*	Yes	n.a	Yes	<ul style="list-style-type: none"> • Raised key policy rate (200 bp since Apr 2007) • Revised the target from 5 ±1% to 5.5 ±1.5% in 2008 and to 5.5 ±1% (2009) in December 2007
Mexico*	Yes	Early 2007	No	• Raised key policy rate (100 bp since Apr 2007)
Peru*	Yes	Fall 2007	No	<ul style="list-style-type: none"> • Raised key policy rate (150 bp since Jul 2007) • Raised reserve requirement and imposed capital control • Let exchange rate appreciate
Europe				
Czech Republic*	Yes	Fall 2007	No	<ul style="list-style-type: none"> • Raised key policy rate (125 bp from Jan 2007) • Let exchange rate appreciate • Lowered the key rate 25 bp on August 7, 2008 given strong koruna appreciation and downside inflation risks
Hungary	Yes	Fall 2006	No	<ul style="list-style-type: none"> • Raised key policy rate (100 bp since Mar 2008) • Abandoned the band (Feb 2008) and let the forint float • Tight fiscal policy
Israel	Yes	End 2007	No	<ul style="list-style-type: none"> • Raised key policy rate (75 bp since May 2008) • Let exchange rate appreciate
Poland*	Yes	End 2007	No	<ul style="list-style-type: none"> • Raised key policy rate (200 bp since Apr 2007) • Let exchange rate appreciate • Tight fiscal policy
Romania*	Yes	Fall 2007	No	<ul style="list-style-type: none"> • Raised key policy rate (325 bp since Oct 2007) • Prudential measures for credit
Serbia	Yes	Early 2008	No	<ul style="list-style-type: none"> • Raised interest rates (575 bp since end-2007) • Maintained the core inflation target, reaffirming its 2008 target and setting a declining path for 2009-10
Slovak Republic	Yes	Mid 2007	No	• Revalued the exchange rate (May 2008)
Turkey	Yes	Fall 2007	Yes	<ul style="list-style-type: none"> • Raised key policy rate (150 bp since Apr 2008) • Revised the target from 4% to 7.5%, 6.5%, 5.5% in 2009, 2010, 2011.
Asia				
Indonesia	Yes	Early 2008	No	• Raised key policy rate (100 bp since May 2008)
Korea*	Yes	Late 2007	No	• Raised key policy rate (75 bp since Jun 2007)
Philippines	Yes	Early 2008	No	• Raised key policy rate (100 bp since end-2007)
Thailand	No	Mid 2008	No	• Raised key policy rate (25 bp since July 2008)
Africa				
South Africa*	Yes	Early 2007	No	<ul style="list-style-type: none"> • Raised key policy rate (450 bp since June 2006) • Reiterated commitment to price stability and IT regime • Rejected calls for revising the target, to invoke “explanation clause”, and alternative definitions of the target basket.

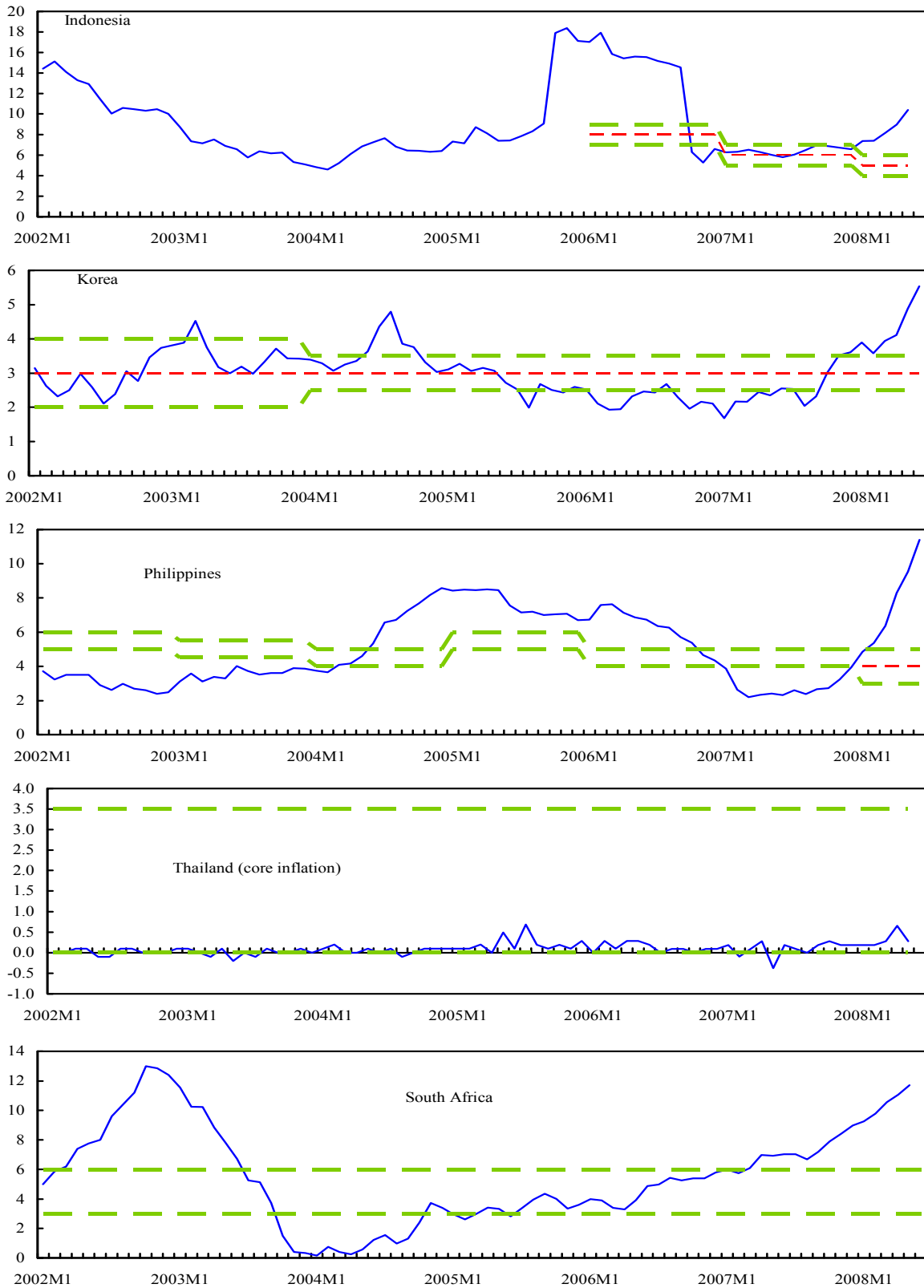
Source: Central bank websites, IMF Country Reports and desks, and news articles.

* Indicates that the country had a relatively early monetary policy response to persistent inflation pressures.

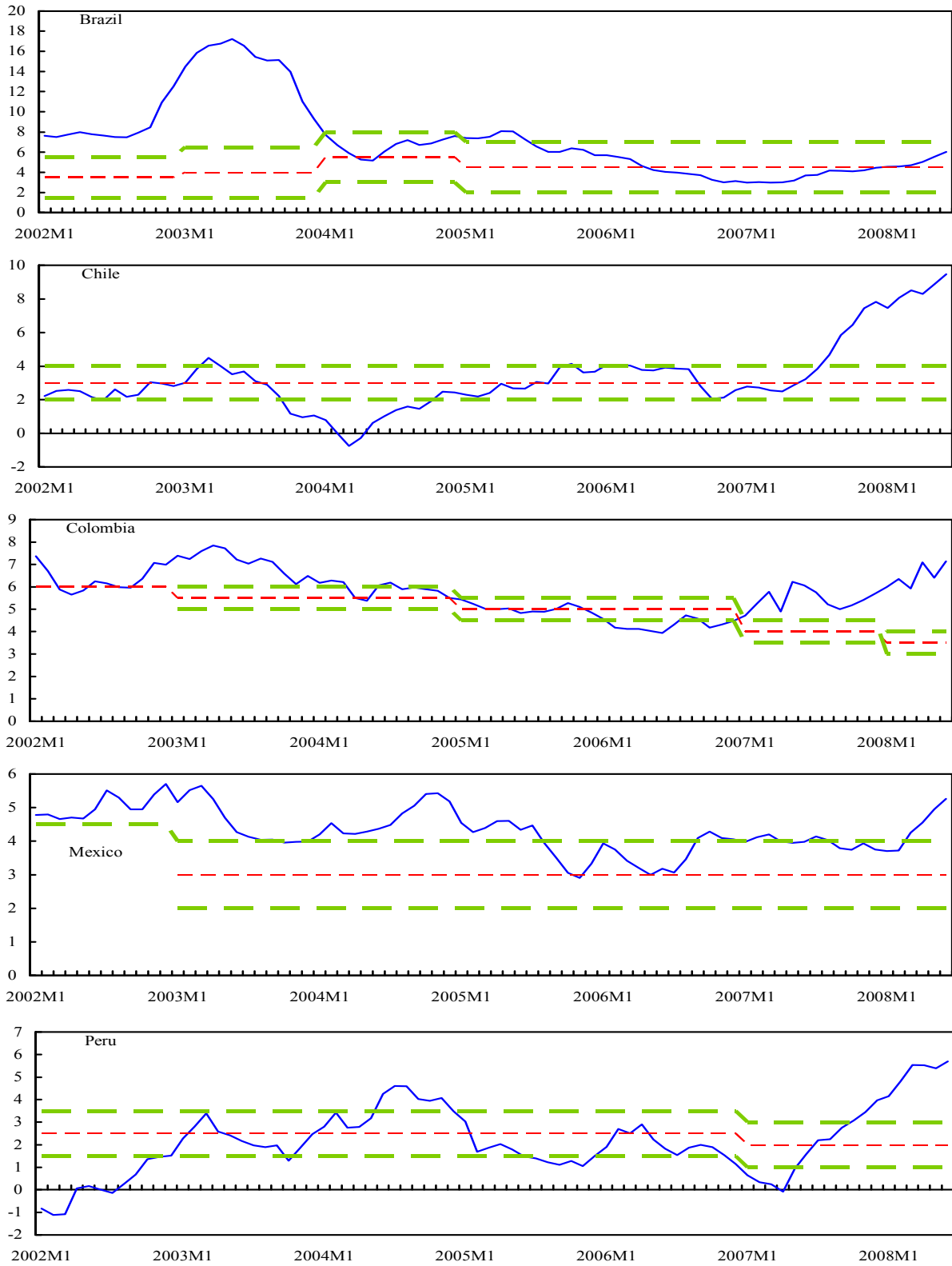
Appendix Figure 2. Europe: Evolution of Actual Inflation Rates vis-à-vis Inflation Targets, June 2008



Appendix Figure 2. Asia&Africa: Evolution of Actual Inflation vis-à-vis Inflation Targets, June 2008 (cont.)



Appendix Figure 2. Latin America: Evolution of Actual Inflation vis-à-vis Inflation Targets, June 2008 (concluded)

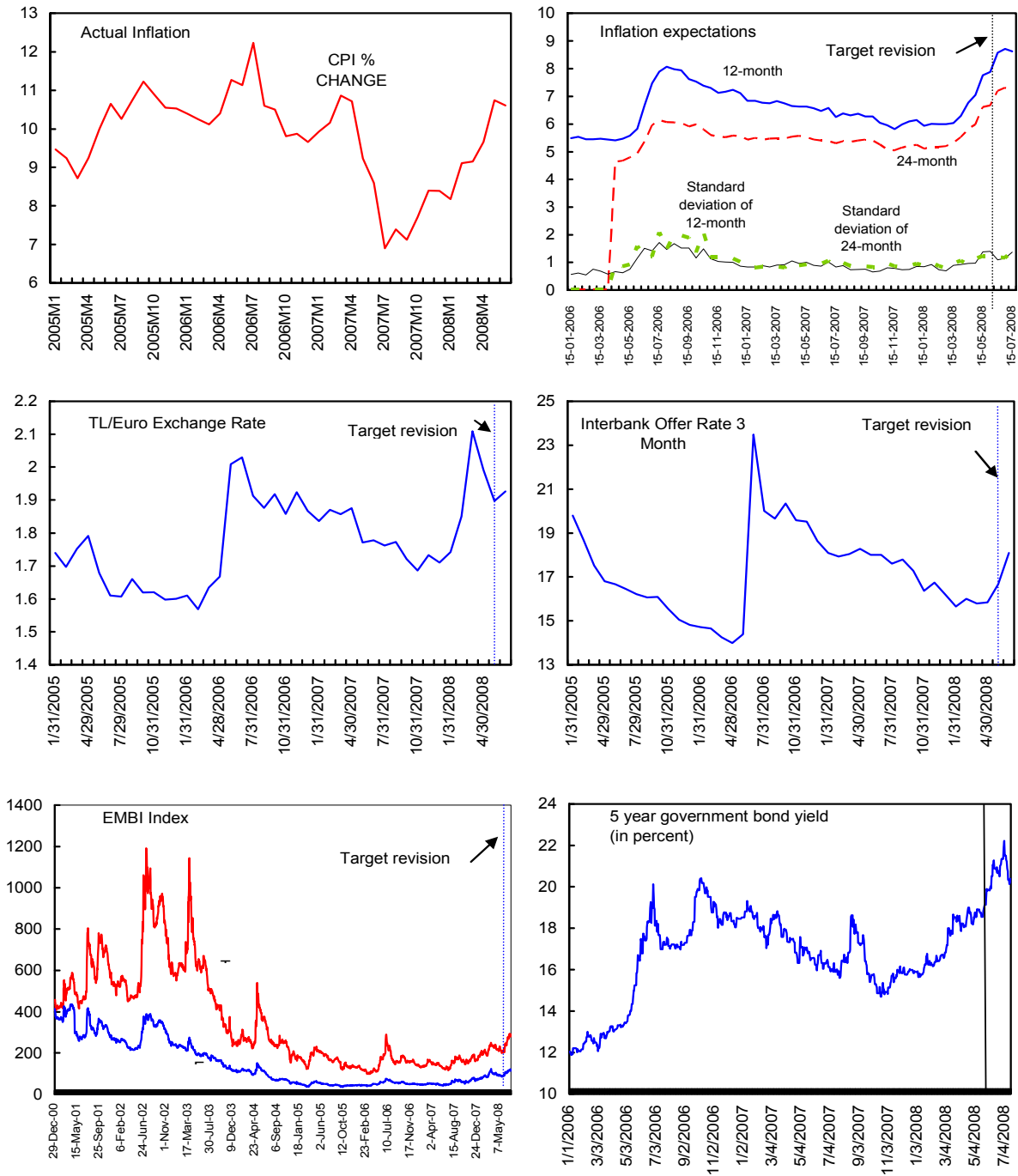


Source: IFS and national authorities.

APPENDIX V. TURKEY: REVISION TO THE INFLATION TARGET

29. **The Central Bank of Turkey (CBT) formally adopted IT in January 2006, following a period from the 2001 financial crisis under which the central bank operated under an “implicit IT” framework.** Effective implementation of sound macroeconomic policies brought inflation down to single digits, with inflation targets met for four years in a row. Since the adoption of IT, however, inflation targets were missed, prompting the CBT to publish open letters to the Government. After a surge in 2006 following the emerging markets sell-off and a sharp depreciation, inflation started to fall in the summer 2007. After judging that disinflation was back on track, the CBT started a gradual easing cycle in the fall. With the shocks to food and energy prices, inflation accelerated in late 2007, reaching 10.7 percent in June 2008, a level significantly higher than the 4 percent medium-term target.
30. **The CBT responded to the food and energy shocks in two steps:**
- The first step was announced in April 2008 at the time of inflation report publication. The CBT kept the 4 percent medium-term target, but instead emphasized the role of forecasts in the short-term. It also revised its forecasts that were significantly higher than those published previously, and higher than the market consensus. The CBT also extended its policy horizon to 3 years with a disinflation path up to 2011:Q1, arguing that hitting the 4 percent target in the usual two-year-horizon would create disruptive output volatility. The forecasts assumed a measured tightening of policy in the first half 2008 and constant rates then on, and provided two alternative scenarios under different assumptions about food and energy prices. The MPC started a tightening cycle, increasing policy rates by 50 basis in the May, June and July meetings.
 - On June 3rd, the CBT announced an upward revision to the inflation targets. The new targets were 7.5, 6.5, 5.5 percent for 2009, 2010, and 2011 respectively. The medium-term objective of 4 percent was not mentioned at the time of the revision. The CBT Governor provided the reasons for the revision and its implications for monetary policy, citing the need to have more realistic inflation figures for preparing the three year budget. He also explained that the revised targets are ceilings that indicate the tolerance level the CBT has for first round effects and that the CBT would prefer to remain under the targets, responding asymmetrically to shocks (i.e., respond strongly to inflation pressures but not necessarily to disinflationary ones)—an approach that differed from having point targets where deviations from targets on both sides were treated symmetrically.
31. **Initial market reaction to CBT announcements was not positive** (Appendix Figure 3). Following the decision to revise the target, the Turkish lira and stock prices fell and yields on lira-denominated bonds rose (by as much as 26 basis points to a 14-month high of 20.28 percent). Many commentators argued that these changes can be perceived as loosening monetary policy. Although the CBT tightened policy in subsequent meetings, inflation expectations deteriorated and long term bond yields were elevated (though the rise in domestic interest rates also coincide with a period characterized by high market volatility owing to political tensions). The CBT expectations surveys show that not only inflation expectations increased but also their standard deviation, indicating more uncertainty in expectations.

Appendix Figure 3. Turkey: Market Reactions to Inflation Target Revision



Source: Concensus forecast, IFS, Bloomberg, JP Morgan.

APPENDIX VI. RECOMMENDATIONS TO FOSTER THE EFFECTIVENESS OF MONETARY POLICY

32. **Central banks need to ensure that monetary policy can effectively counter rising inflation.** In addition to tightening monetary policy where warranted, a number of central banks need to: (i) improve the implementation of monetary policy; (ii) strengthen the operational underpinnings of monetary policy execution; and (iii) expand transparency and communication. Enhancing the effectiveness of monetary policy is critical to mitigating possible output costs that may result from higher interest rates.

33. **Monetary policy formulation and implementation should be consistent with the policy regime in place.** Central banks should make their monetary policy goal explicit and behave accordingly (see Appendix Table 10). They should identify clearly the intermediate target and the corresponding operational target they use as the key instrument in their reaction function.³⁷ When central bank reactions are inconsistent or unpredictable, market volatility and uncertainty tend to be higher because market participants cannot understand monetary policy. In this environment, market expectations about inflation may drift from central banks' targets.

Appendix Table 10. Taxonomy of Monetary Policy Regimes

	Monetary Targeting	Exchange Rate Targeting	Real Exchange Rate Targeting	Inflation Targeting
Final policy goal	Inflation	Inflation	Competitiveness/growth inflation (secondary)	Inflation
Intermediate target	Money supply	Nominal exchange rate path or range	Real exchange rate	Forecasted inflation
Operational Target	Money base/bank deposits at central bank	Nominal exchange rate/short-term interest rate	Rate of crawl	Short-term interest rate
Primary shock absorber	Nominal exchange rate	International reserves	International reserves	Nominal exchange rate
Secondary shock absorber	Interest rate	Money supply	Interest rate	International reserves

34. **There may be room for improvement in the operational underpinnings of monetary policy implementation to strengthen monetary policy transmission.**

- **Effective liquidity management and forecasting is needed to better transmit monetary policy shocks to aggregate demand and prices.** In countries with deep money markets, the central bank should use a key policy rate as an operational target to influence short-term interest rates, which would likely have effects along the rest of the yield curve.³⁸ In turn, in countries with shallow money markets and monetary

³⁷ While most inflation targeting countries are good examples of policy consistency, policy inconsistencies are found on a number of others (e.g., Vietnam, Honduras, and Nicaragua). In these countries the central bank announces targets for monetary aggregates while having in place an exchange rate targeting regime, which makes it difficult to hit the targets for monetary aggregates that are endogenous under a pegged regime.

³⁸ Examples of this interest rate are the *selic rate* in Brazil, the *monetary policy rate* in Chile, and the *policy interest rate* in Thailand.

targeting regimes, central banks can still rely on monetary aggregates as an operational variable. Changes in the operational target (a policy interest rate or a monetary aggregate) should serve to signal the stance of monetary policy and, hence, guide market expectations.

- **Countries with an exchange rate peg can still manage liquidity even though they have limited room to implement an independent monetary policy** (with the latter depending on the degree of capital mobility, asset substitutability, and flexibility of the peg arrangement). With an endogenous monetary policy, the central bank's interest rate should be linked to the policy rate in the anchor country. Maintaining interest rates at this level requires proper liquidity management and well-developed money markets. A deep, active money market is also a prerequisite for effective liquidity management by financial institutions, by increasing the liquidity of securities and making it less risky for financial institutions to take on liquidity risk. A deep money market also facilitates government cash management.³⁹

35. **For effective liquidity management, central banks should primarily use market based instruments of monetary policy.** In particular, open market operations encourage the development of money—and debt—markets, boosting the functioning of the interest rate channel of the transmission mechanism of monetary policy.

- Notwithstanding their benefits for central bank balance sheets, non-remunerated reserve requirements (NRR) on bank deposits and credit controls should only be used as a last resort. These instruments distort financial transactions and discourage intermediation away from domestic banking system towards offshore markets or activities that are less well regulated and supervised. Increasing NRR is less efficient than open market operations because central banks would not be able to calculate accurately the likely impact on interest rates—not only how much but also how fast.⁴⁰ Credit controls impair liquidity management and blur the informational content of interest rates, thereby undermining the transmission mechanism of monetary policy.
- Even then, however, it may be necessary to use NRR on a temporary basis when there are no other good options, for example when: (i) the interest rate channel is weak or nonexistent given shallow financial markets, a high degree of financial dollarization, or no independent monetary policy; or (ii) when first-best monetary instruments need to be supplemented under heavy capital inflows given their high quasi fiscal costs.⁴¹

³⁹ This is true even when the country's fiscal position is in surplus, as the government may have its assets invested abroad and it may be inefficient to liquidate those assets for short term domestic cash management purposes.

⁴⁰ Key operational aspects to bear in mind are that averaging over the maintenance period and lags in the accounting framework (calculation period ends before the maintenance period begins) buffer the impact of any instability in the supply of reserves on interbank interest rates and help banks plan their reserve holding pattern (see Gray (2008) for a set of good practices to establish NRR).

⁴¹ A number of countries have increased NRR in 2007 and 2008 (see Appendix Table 9).

- To minimize their negative side effects, central banks should (i) phase NRR out as inflationary pressures subside;⁴² and (ii) remunerate reserve requirements, subject to the position of the central bank balance sheet. In general, central banks should accelerate their efforts to improve the functioning of the monetary transmission mechanism by deepening financial markets, so as to reduce the need to resort to such tools to conduct monetary policy.⁴³

36. **An effective communication strategy and transparency are crucial to enhancing the effectiveness of monetary policy in a more uncertain environment.** While these policies have been closely associated with inflation targeting regimes,⁴⁴ they are also applicable to other monetary policy regimes. Transparency and communication are even more important when central bank credibility is at an early stage of development.

37. **Enhanced transparency and communication should aim at explaining to the market the underpinnings of monetary policy formulation and implementation.** Central banks should not only disclose their policy objectives and mandate but also behave and communicate accordingly. In addition, central banks should explain to market participants how policy reacts to economic developments, the strategy that guides central bank decisions, the likely impact of decisions on inflation and expected inflation, the assessment of inflation pressures and the principal risks to the outlook, and intentions for policy rates. Policy making bodies should meet on a regular basis, with the outcome of these meetings communicated to the public (e.g., through press releases).⁴⁵

38. **Good communication and transparency can thus facilitate monetary policy predictability and contribute to reducing inflation.**⁴⁶ Transparency increases the effectiveness of monetary policy by anchoring long-run inflation expectations, by making private agents understand the central bank's reaction function, and through greater influence on interest rate expectations and economic decisions. If market participants can anticipate

⁴² For a thorough discussion of different monetary policy instruments and its implementation in different countries, see Laurens (2007) and Alexander, Balino, and Enoch (1995).

⁴³ For selected experiences and practices on developing financial markets, see Ötker-Robe and Vávra (2007).

⁴⁴ One of the preconditions of an IT regime is that central banks are granted more independence and remain accountable to the public for their actions. Greater accountability in turn calls for increased reporting and explanation of monetary policy actions and decisions, and hence a greater need to pay attention to an effective communication strategy.

⁴⁵ While focused on inflation targeting countries, Heenan and others (2006) also provide a number of relevant recommendations to improve communications in non-inflation targeting central banks. In general, BIS (2008) illustrates communication practices in central banks across policy regimes.

⁴⁶ Geerats (2008) finds that greater transparency has been followed by lower average inflation during the last decade. Muller and Zelmer (1999), Haldane and Read (2000), Poole and Rasche (2003), Bernoth and von Hagen (2004), and Ferrero and Secchi (2007) show that transparency improves the predictability of monetary policy decisions. Chortareas, Stasavage, and Sterne (2002) show that clear communication lowers average inflation and inflation persistence, and improves the output-inflation tradeoff. Similarly, Fracasso, Genberg, and Wyplosz (2003) identify clarity, consistency, and coverage of key issues as key criteria for good central bank communication, and find a positive link between report quality and policy credibility in examining 19 IT-central banks (see Bulir, Cihak, and Smidkova, 2008).

monetary policy decisions, this may help to dampen macroeconomic fluctuations, including those of interest rates and exchange rates. In addition, if central bank policies become more predictable, expectations about inflation would more quickly align with the central bank target, thereby moderating the likely output cost resulting from monetary policy tightening.

39. At the present juncture, communication should focus on explaining the nature of the pickup in inflation, the central bank policy response, and expected inflation developments.⁴⁷ The authorities should not only reaffirm their commitment to fighting inflation but should also:

- Explain to the markets how the rise in food and energy prices is fueling inflation, and why central banks are missing their inflation targets. Central banks should elucidate the information provided by both headline and core inflation and how they are affected by the supply shock. Central banks should also provide a credible explanation of why they are overshooting inflation targets in the short-run and how they will bring inflation back to targets.
- Stress the need to tighten monetary policy, where warranted, to limit the chances of a broader impact on the general level of prices despite the possible short-term output cost. Special consideration should be given to the channels of transmission of monetary policy and the way it operates.
- Emphasize the forward-looking nature of monetary policy and the lagged impact on demand and prices of goods and services. In those countries with central banks with strong professional skills, markets would benefit from the information provided by a reliable medium-term path of inflation.

⁴⁷ For a more detailed discussion, see Shimizu (2008).

Appendix Table 11. Selected Countries: Recent Examples of Adjustments to Reserve Requirements

Country	Adjustments to reserve requirements on 2007 and 2008
Bulgaria	The Bulgarian National Bank raised reserve requirements from 8 to 12 percent in September 2007.
Russia	The Central Bank of the Russian Federation raised reserve requirements in July 1 2008: compulsory reserve requirements for commercial banks from 4.5 percent to 5 percent for retail deposits in roubles; from 5 percent to 7 percent for banks' liabilities to non-resident banks, and to 5.5 percent for other bank liabilities.
Ukraine	The National Bank of Ukraine imposed new reserve requirements on banks' foreign borrowing in late 2007.
Saudi Arabia	The reserve requirement, which had remained unchanged for 26 years, was raised in rapid successive steps from 7 percent in November 2007 to 12 percent in April 2008.
Brazil	On January 2008, the Central Bank of Brazil introduced reserve requirements on repo operations made by leasing companies, which had been raising funds by issuing debentures and transferring these funds to financial institutions. The reserve requirement is increasing gradually—5 percent every other month starting in May 2008 until reaching 25 percent by January 2009.
Colombia	The Bank of the Republic of Colombia introduced differentiated marginal reserve requirements on sight and saving deposits (27 percent) and on certificate of deposits (5 percent) in mid-2007. In June 2008, marginal reserve requirements were eliminated but reserve requirements were raised from 8.3 to 11.5 percent on sight and saving deposits and from 2.5 to 6 percent on certificates of deposits.
Honduras	The Central Bank of Honduras introduced changes in reserve requirements according to the following guidelines: <ul style="list-style-type: none"> ○ Compulsory—and remunerated—investments at the central bank equivalent to 4 percent of total liabilities in domestic currency (February 2007), with up to 2 percent accumulated using bonds from the public sector energy enterprise up to May 2008. Since February 2008, compulsory investments were increased to 9 percent, to be met up to 5 percent with government securities. ○ Reserve requirements for financial institutions providing at least 80 percent of their credit in domestic currency to support “productive” activities were reduced gradually from 12 percent in February 2008 to 7 percent in June 2008. Financial institutions providing at least 70 percent of credit in foreign currency to support “productive” activities were reduced gradually from 24 percent in February 2008 to 14 percent in June 2008.
Nicaragua	In October 2007, The Central Bank of Nicaragua reduced the legal ratio of reserve requirements from 19.25 to 16.25, thereby reversing a similar measure introduced in June 2006.
Uruguay	In April 2008, the Ministry of Finance and the Central Bank of Uruguay imposed a 100 percent reserve requirement on government deposits at the central bank and, in May 2008, they required nonresident financial institutions to maintain 35 percent of their deposits at the central bank.
China	The People's Bank of China raised reserve requirements from 11.5 percent at the end of 2006 to 17.5 percent in June 2008 in several steps.
Vietnam	The State Bank of Vietnam raised compulsory reserve requirements from 5 percent to 10 percent in June 2007 and from 10 percent to 11 percent in February 2008.

Sources: IMF Country Reports and national central bank websites.

APPENDIX VII. USE OF CONTROLS ON CAPITAL INFLOWS

40. **Capital controls may help to reconcile conflicting policy objectives when the exchange rate is fixed or heavily managed.** These arguments include: preserving monetary policy autonomy to direct monetary policy toward domestic objectives, and reduce pressures on the exchange rate. An additional, but related, motivation for capital controls has been to protect monetary and financial stability in the face of persistent capital flows, particularly when there are concerns about: (i) the inflationary consequences of large inflows, or (ii) inadequate assessment of risks by banks or the corporate sector in the context of a heavily managed exchange rate that encourages a build-up of unhedged foreign currency positions.
41. **A number of countries imposed controls on capital inflows in response to concerns about the macroeconomic implications of the increasing size and volatility of capital inflows in the 1990s** (e.g., Brazil, Chile, Colombia, Malaysia, Thailand).⁴⁸ Large and persistent capital inflows complicated monetary policy implementation, at times owing to a lack of adequate monetary instruments. In most cases, sterilization operations were the first policy response, but such operations typically entailed costs to the central bank. Furthermore, sterilization operations may have attracted further inflows as they tended to keep interest rates high. The controls on inflows were therefore used to reduce reliance on sterilization and to preserve or enhance the autonomy of monetary policy as it aimed to reduce inflation while also attempting to stabilize the exchange rate under relatively free capital movements.
42. **Prudential concerns have at times motivated the adoption of controls on capital inflows, although in most cases, macroeconomic considerations appeared to be dominant.** The controls were intended to alter the maturity composition of the inflows toward less volatile flows, in addition to reducing their overall volume. Short-term flows were seen to have potential adverse effects on macroeconomic and financial system stability, particularly as the ability of financial institutions to safely intermediate the inflows was uncertain (Colombia, Malaysia, and Thailand).
43. **Although in all cases controls were adopted for broadly similar reasons, the design of the measures varied** (Box). All five countries used some form of market-based controls (mainly in the form of direct or indirect taxation of inflows and other regulatory measures, such as asymmetric open position limits and reporting requirements), supplemented in some cases by non-market based controls (Brazil, Chile, and Malaysia).
44. **The effectiveness of the controls in achieving their intended objectives was mixed.** They seem to have had some effect initially in creating a suitable wedge between domestic and foreign interest rates while reducing pressures on the exchange rate, but in none of the countries do they appear to have achieved both objectives. While maintaining a large interest rate differential, some had to adjust their exchange rates gradually under sustained upward market pressures (Brazil, Chile, and Colombia). Real exchange rates appreciated significantly, with some deterioration in the external current balances. The controls were not effective in reducing the total level of net inflows, except in Malaysia and Thailand, but

⁴⁸ See IMF Occasional Paper 190 (2000), *Capital Controls: Country Experiences with their Use and Liberalization*. The paper was discussed in IMF Executive Board in September 1999.

seemed to be at least partly successful in reducing short-term capital inflows. Sterilization operations also had to continue to absorb the continuing inflows, with their associated costs (Brazil and Chile). The controls maintained by Brazil appear to have been largely ineffective.

Design of the Capital Inflow Controls

Brazil (1993–97) adopted an explicit tax on certain foreign exchange transactions and foreign loans, in combination with a number of administrative controls (outright prohibitions of or minimum maturity requirements on certain types of inflows). The coverage of the measures was extended as the market adopted derivatives strategies based on exempted inflows to circumvent the controls; and the tax rates were successively raised or differentiated by maturity to target short-term inflows.

Chile (1991–98) combined market-based controls (indirect taxation of inflows through an unremunerated reserve requirement (URR)) with direct (minimum stay requirement for direct and portfolio investment) and other regulatory measures (minimum rating requirement for domestic corporations borrowing abroad and extensive reporting requirements on banks for all capital account transactions). The URR was initially imposed on foreign loans (except for trade credits), but rates were raised and coverage extended to those inflows that became potential channels for short-term inflows, including foreign direct investment of a potentially speculative nature.

In **Colombia (1993–98)**, the URR was imposed on external borrowing with a maturity of less than 18 months (including certain trade credits), but was later adjusted by imposing higher rates for shorter maturities, changing the deposit term, and extending the coverage of inflows subject to the URR.

Malaysia (1994) adopted a combination of administrative (prohibition of nonresident purchases of money market securities and nontrade-related swap transactions with them) and regulatory measures (asymmetric limits on bank external liability positions for nontrade purposes, reserve requirements on foreign banks' ringgit funds).

Thailand (1995–97) adopted a number of indirect, market-based measures (asymmetric open position limits, detailed information requirements, and reserve requirements on nonresident bank accounts and baht borrowing, finance company promissory notes, and banks' offshore short-term borrowing).

45. **These experiences suggested the following conclusions:** To be effective, the coverage of the controls should be comprehensive and the controls need to be forcefully implemented. Considerable administrative costs are incurred in continuously extending, amending, and monitoring compliance with the regulations. Even then, controls may lose effectiveness over time as markets exploit the potential loopholes to channel the undesired inflows through the exempted ones. The effectiveness was limited by sophisticated financial markets that reduce circumvention costs relative to the incentives. Although the controls appeared to be effective in some countries, it is difficult to distinguish their role from those of the accompanying policies (e.g., strengthening prudential regulations, greater exchange rate flexibility).

46. **Countries also resorted to similar measures in more recent years.**⁴⁹ Croatia introduced a Chilean type control in 1998 in the form of a deposit requirement at the central

⁴⁹ The October 2007 issue of the GFSR (Chapter 3, Annexes 2 and 3) provides a review of selected country experiences with capital inflows in recent years.

bank for short-term foreign credits. While the measure seemed to help reduce the share of short-term inflows, it was difficult to assess its overall impact since the controls on longer-term financial credits and deposits were lifted in late 1998 after market turmoil. Croatia also introduced an unremunerated marginal reserve requirement on bank borrowing in 2005 to limit the rapid expansion of bank credit funded by borrowing from abroad, which has been contributing to domestic and external imbalances. The requirement has been raised in steps during 2004-06 and its coverage expanded. Thailand and Colombia introduced capital inflow controls in the form of URR in 2006-08, to curb the appreciation of their currencies caused by strong portfolio inflows.⁵⁰

47. **The effects of these newer measures have been mixed.** In Croatia, the MRR has led to a decline in bank borrowing from abroad, but banks have sought other ways to finance their activities, including by using retained earnings, injection of capital by parent banks, or directing their clients to the parent banks.⁵¹ The impact on overall inflows, credit growth, and aggregate demand has therefore been more limited. The Thai authorities had to partially reverse the capital control measure in two steps to restore investor confidence, and lifted the controls fully in February 2008. This move was expected to attract foreign capital to finance the infrastructure plans of the new government, and to help reduce inflation pressures through an appreciation of the currency. It is too early to assess the effectiveness of the Colombian measures.

⁵⁰ See IMF (2008e).

⁵¹ See IMF (2008d) and Ötker-Robe and others (2007).

APPENDIX VIII. ILLUSTRATIVE SIMULATIONS FOR POLICY RESPONSES TO OIL PRICE SHOCKS

48. This appendix simulates the implications of various policy responses to rising inflation pressures associated with oil and food price shocks, using a simple dynamic stochastic general equilibrium (DSGE) model calibrated to emerging market economies. The nature of the shocks, the model, its calibration, and policy experiments are described below.

Shocks

49. **The shocks assume the following changes in food and oil prices:** The world price of oil (energy) increases over a period of 18 months by a total of 240 percent, food by 60 percent (roughly corresponding to the changes since end-2006), and world inflation goes up by 2 percentage points over the same period. Two shock scenarios are explored: (i) a temporary level shock: prices come back to the previous levels (over another 18 months); and (ii) a permanent level shock: prices stay unchanged forever at a higher level. The movements in world oil prices are unexpected, implying that economic agents rationally expect the oil price to stay at the same level next period as in the current period.⁵²

The model

50. **The model is a new Keynesian DSGE model with features appropriate to an emerging market economy importing oil and food:** (i) oil is an input into domestic production, but also enters consumption directly; (ii) the economy has two production sectors: home goods—produced out of labor, (fixed) capital stock, and imported oil and intermediates; and export goods; (iii) consumption is the only domestic final expenditure item; (iv) there are two monopolistically competitive retail sectors: one delivering home goods to consumers and the other delivering oil to consumers and firms; (v) the labor market is imperfectly competitive; and (vi) the central bank keeps the exchange rate fixed (peg) or changes the interest rate by targeting inflation (IT). The model is closed using a risk premium that depends on net foreign liabilities (NFL) and stock of capital.

Calibration

51. **The model is calibrated to reflect properties of an emerging market economy dependent on oil and food imports:** The production function is intensive in labor and non-energy imports. Export industry is the most important income-generating sector. The share of retail profits in GDP is also high, reflecting the low degree of retail competition in many emerging markets. The share of oil (energy) in imports for consumption is scaled up to almost 20 percent in order to account for a price adjusted food content. Overall, the share of oil consumption (production plus final consumption) in GDP is about 13 percent, which is somewhat higher than the observed share (about 9 percent) – reflecting the food content adjustment in final consumption. The steady state net export and foreign asset position is

⁵² Note that the food price shock is subsumed under the oil shock, by increasing the share of oil in consumption (to reflect both oil and food consumption of households). The simulations reflect both shocks.

chosen to be very close to zero (thus falling in between the net export surpluses of Asian emerging markets and deficits elsewhere).

52. **The transition parameters were chosen so as to have reasonable responses to monetary policy shocks**—interest and exchange rate—that could be expected in an emerging market economy. The responses to monetary policy shocks were calibrated to highlight the strength of the exchange rate relative to the interest rate in the monetary transmission mechanism in many emerging markets. The calibration implies that exchange rate appreciation by 1 percent is equivalent in its impact on inflation to a 5 percentage point increase in the interest rate. The transition parameters broadly reflect the observed behavior of inflation in response to the oil and food price shocks since the end of 2006.⁵³

Policy experiments

53. **The transmission of the shocks in the subsequent experiments is the following:** The shock affects the economy through three channels: on the production side, the prices of oil (energy), food and non-energy imports go up. The shock is equivalent to a negative technology change, leading to rising marginal cost of production, lower demand for labor and capital, and imports. Because capital is fixed (a reasonable approximation over the time horizons considered here), its returns bear all the burden of adjustment. In the labor market, the adjustment is shared by lower employment and real wages, depending on the flexibility of the latter (the faster the adjustment—greater flexibility—the less is labor shedding and the smaller is the output loss).⁵⁴ Consumers see higher inflation from rising prices of imports and a perceived reduction in income (through terms of trade deterioration). Consumption falls because of a permanent/ temporary decline in income (depending on the shock type) and consumers substitute imported oil/food consumption with domestic goods. Production falls, both as a result of declining demand and supply. Inflation rises, with increases in both domestic and imported components.

54. **Unless the shock is temporary, the higher oil prices have permanent real effects on the economy.** The terms of trade worsen permanently, forcing real downward adjustments in consumption, production, and wages. The long-term levels of inflation and interest rates are not affected, while the long-term nominal exchange rate depends on the length of the shock and the nature of the policy response.

55. **A number of policy experiments were done to analyze the following issues under both the temporary and permanent shock scenarios:** (i) different propagation mechanisms under IT and a peg; (ii) different policy options under IT: reaction to headline vs. core inflation, and a temporary increase in the inflation target vs. no change in the target; and the

⁵³ The peg regimes saw their inflation rates increase by about 6 percentage points, most of which is attributable to the rising prices of oil and food. The IT regimes performed better in terms of inflation, with the inflation rate rising by around 3 percentage points. In the simulations, the interest rate hike in IT regimes varies from 100-600 basis points, which roughly corresponds to the observed reactions of the IT countries. Under a peg, the interest rates rises by about 200 basis points, resulting from a rise in the risk premium after a current account deterioration.

⁵⁴ A simulation comparing different degrees of wage flexibility was performed but is not reported here.

role of credibility; (iii) different policy options in a peg: step appreciation, step depreciation, and no change in the parity; (iv) the role of real wage flexibility in dampening the shock impact on the real sector; and (v) potential policy mistakes arising from uncertainties about the size and duration of the oil price shock.

Peg vs. inflation targeting regimes

56. **This experiment demonstrates how the impact of the oil/food price shocks depends on the prevailing monetary regime.** Under both temporary and permanent shock scenarios, the rise in the inflation rate is higher, while the output fall is smaller, under a peg regime compared with that under an IT regime (Appendix Figure 4). The policy responses discussed below determine how the transitory effects are split between a rise in inflation on one hand, and a fall in production and employment on the other. The greater interest rate response under IT dampens the inflationary impact of the shock (via both nominal appreciation and demand contraction) at the expense of lower employment and production. The larger economic downturn helps mitigate the inflation increase in the domestic sector, and nominal appreciation works against imported inflation. The peg regime (assuming no change in the parity) allows inflation to rise freely and the absence of an interest rate policy reaction mitigates the real economy impacts.

57. **The nature of the shock also affects the long run levels of the model variables.** If the shock is temporary, inflation and output (and the nominal exchange rate and interest rate) return to their steady state levels. If the shock is permanent, output stays permanently at a lower level under both regimes, while the nominal exchange remains at a more appreciated level under IT (the final level depends on how much inflation the central bank tolerates).

Policy options under the inflation targeting regime and credibility effects

58. **A key decision for an IT central bank is whether to react to an increase in headline inflation or to hold back the policy response until core inflation starts rising.** In restraining its reaction, in general reflecting concerns about macroeconomic and/or financial stability, the central bank can (i) react only to core inflation (excluding food and energy), and not to an initial pick up in headline inflation, or (ii) raise the official inflation target.

59. **Reacting to headline inflation is more effective in keeping inflation under control, at the expense of output.** Simulations comparing reaction to core vs. headline inflation (not shown here) demonstrate that if the central bank reacts to the rise in headline inflation, the rise in overall inflation can be kept smaller by raising the interest rate significantly (which would lead to a significant exchange rate appreciation), though at the expense of a larger output loss.

60. **In reacting to an increase in core inflation, the central bank may aim at trading a somewhat higher inflation for higher output and employment.** Simulations show that if the policies in attaining the future inflation targets are fully credible and the shock is relatively short-lived, the central bank can achieve a smaller decline in output by tolerating higher inflation and ignoring the full inflation impact of the shock. Such a course may also be desirable for restoring employment if wages are relatively inflexible, since higher inflation would help achieve the necessary downward adjustment in real wages faster.

61. **This trade-off crucially depends, however, on whether the central bank can preserve the credibility of its IT policies when it disregards the full inflation impact of the shock.** Appendix Figure 5 shows the impact on the inflation-output tradeoff of reacting to core inflation under full vs. imperfect credibility. Under imperfect credibility, inflation expectations become more backward-looking and increase in proportion to the degree to which the inflation target is overshoot. Inflation therefore rises more with higher inflation expectations, and output falls more given the larger interest rate reaction needed to overcome higher inflation compared to the full credibility case. Such an outcome in turn reduces the attractiveness of the option of reacting only to core inflation.⁵⁵ It should also be noted that models of this type do not incorporate permanent negative effects of higher inflation on the efficiency of resource allocation and economic growth, even though these effects may be pronounced beyond some threshold level of inflation.

62. **Disregarding the full inflation impact may be a risky strategy for many emerging market central banks in the process of establishing credibility** (e.g., lite IT'ers). This is especially so if the shock is long-lived and central bank credibility is negatively affected by running higher inflation (compared to what could have been attained by reacting to headline inflation). The risks also increase if the costs of reducing inflation are disproportionately higher than output gains obtained from tolerating higher inflation. In this case, the risks are asymmetric, since the initial output gains may be more than compensated by output losses necessary to re-establish credibility later on.

63. **Finally, limiting the interest rate policy reaction by raising the inflation target temporarily (e.g., for 2 years) produces no substantial benefit.** On the one hand, the interest rate does not have to rise as much initially (Appendix Figure 6). On the other hand, overall inflation will increase as inflation expectations adjust to the higher target. Higher inflation will prevail if the central bank does not bring the target back sufficiently soon (that is, the target is raised only temporarily), with the result that interest rates will have to increase more later on to bring down inflation to pre-shock levels. The gain in output will therefore be negligible, if any. Hence, the strategy to restore the credibility by raising the target can only succeed, if much credibility is attached to target attainment, and not to the level of inflation, or to the fact that the targets (once declared) have been modified.

Policy options in peg regimes

64. **Under a pegged exchange rate regime, the authorities' options are considered to be constrained to adjusting the parity.** The parity can be revalued to fight inflation, or devalued to support output, or kept unchanged.

- Parity revaluation helps contain inflation faster, but also leads to lower output (compared to no change or parity devaluation). Besides lower imported inflation, real and nominal interest rates rise more because of a higher risk premium associated with

⁵⁵ See also Alichí and others (2008), who find that a delayed interest rate response support demand in the short run but only at the cost of higher inflation and higher nominal interest rates for considerable time, with an erosion of credibility being a large part of the problem. The interest rate has to catch-up and eventually rise to higher levels.

the negative competitiveness effect of revaluation on net exports. The higher real interest rates and lower exports dampen production and consumption more than in the other scenarios, which helps to contain inflation faster (Appendix Figure 7).

- Under a devaluation scenario, the rise in inflation is higher and output decline lower, compared to a revaluation or no parity change scenarios. The devaluation exacerbates the inflation impact of the shock (by increasing imported inflation), but dampens the output decline by lowering real interest rates and improving competitiveness (also manifested by lower nominal interest rates and risk premium).

Impact of uncertainty about the size and duration of the shock

65. **It is possible that monetary tightening may end up being excessive ex post, given the uncertainties about the size and duration of a shock.** Appendix Figure 8 illustrates the potential policy mistakes arising from over-reacting to a temporary oil price shock mistakenly believed to be permanent, given the uncertainty about the size and duration of the oil price shock. The simulations show the response of the model economy under three different policy reactions:⁵⁶ (i) interest rates react to headline inflation, assuming the shock is permanent; (ii) interest rates ignore higher headline inflation and react only to external balance developments (raised when net exports deteriorate and vice versa); and (iii) interest rates remain unchanged.

66. **Ignoring the inflationary effects of a temporary shock by maintaining the interest rate unchanged can limit the output decline by about 2 percentage points at no appreciable deterioration in inflation performance.** The inflation profile is dominated by the first round impact of the shock without any significant second round effects that could be influenced by monetary policy. By contrast, output (suffering only from secondary and second round effects) is much more dependent on the monetary policy reaction.

67. **Not responding to the rise in inflation may be a risky strategy, however, when the shock is in fact permanent and agents realize that monetary policy is making a mistake.** This is illustrated in the second panel of the Figure, which shows the response of the model economy to a similar set of policy responses under a permanent oil price shock expected to be permanent. The monetary authority is assumed to eventually recognize its mistake and start reacting to rising inflation. As a result of the delayed reaction, inflation rises by 3 percentage points more (compared to an immediate policy reaction). Although the output decline is still lower with the delayed than immediate policy reaction, the monetary policy now faces a dilemma of how much inflation to tolerate at the benefit of higher output.

68. **In summary, quick interest rate reactions can ex post exacerbate stagflation by unduly depressing output if the oil shock turned out to be temporary, but would limit the overall rise in inflation and inflation expectations, should the shock be permanent.** Given the uncertainty policymakers typically face in assessing the duration and nature of the shocks, the policy choice will ultimately be a function of the different weights policymakers assign to the output-inflation trade-off.

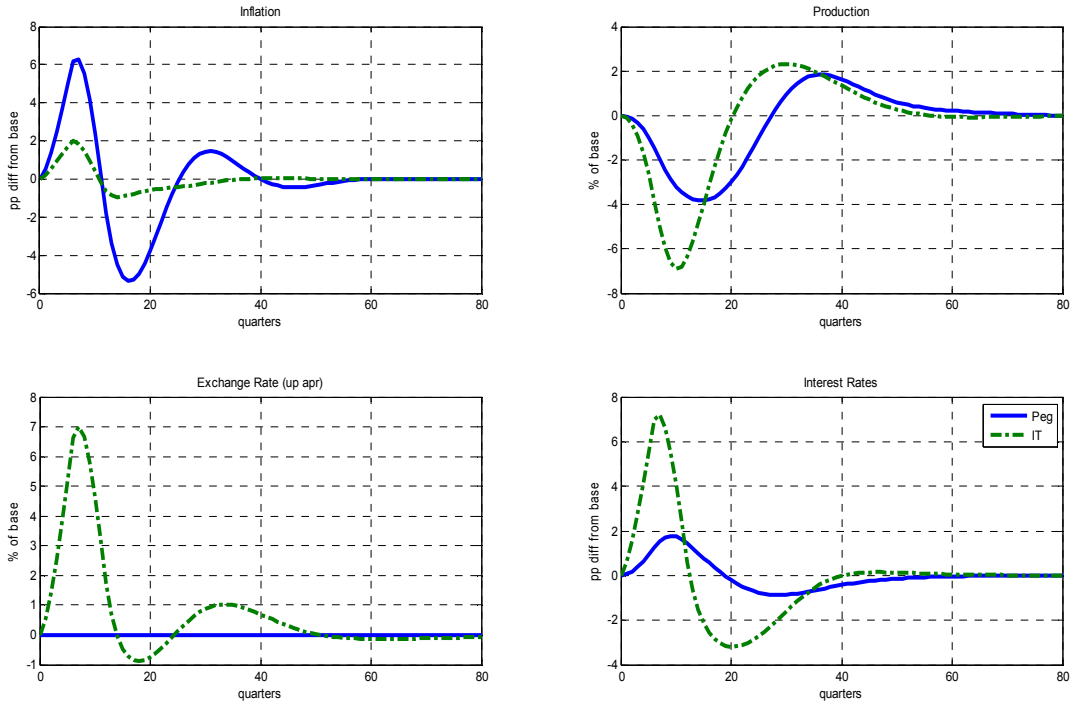
⁵⁶ In all cases the agents expect the shock to be permanent.

69. **Some key conclusions**

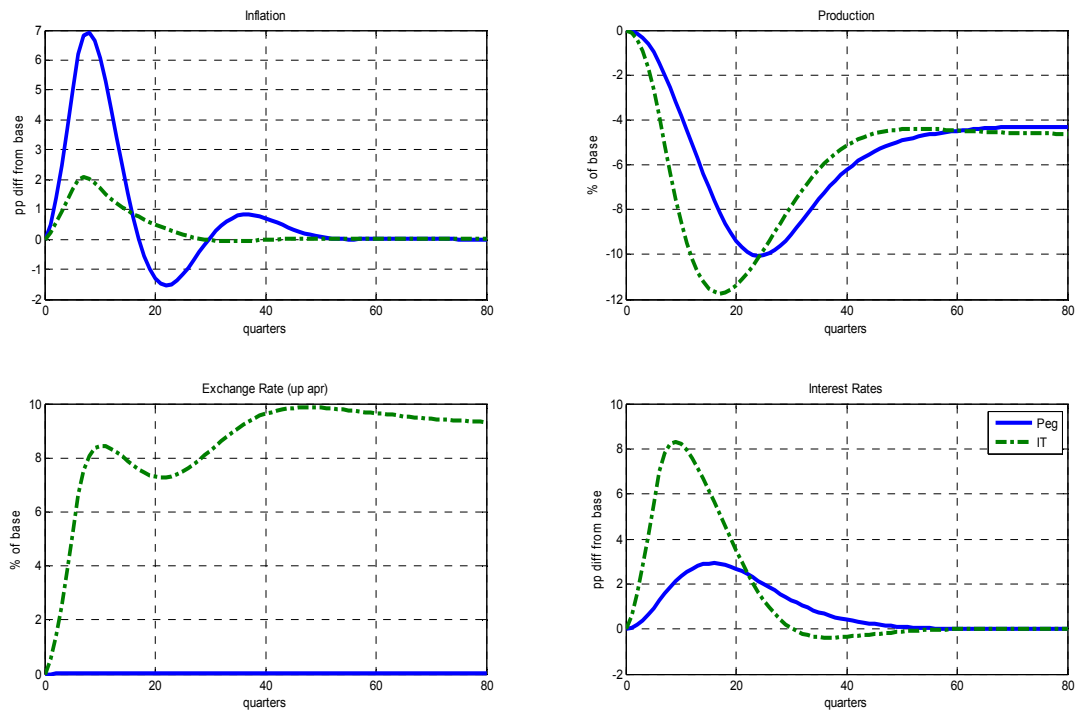
- **Model simulations to oil/food price shocks illustrate a policymaker's dilemma on how much inflation to tolerate in the face of falling output and employment.** In general, allowing for higher inflation through a looser policy (muting interest rate reaction by responding to core vs. headline inflation, raising the inflation target, etc) can mitigate the negative output and employment effects of the shock, but the outcome depends on a number of factors (e.g., the length of the shock, the monetary framework, and policy credibility). However, the model does not take account of possible long-term detrimental effects on growth of inflation beyond some threshold.
- **The nature of the shock affects the long run levels of the model variables.** With permanent shocks, the terms of trade worsen permanently forcing real adjustments in terms of lower consumption, production, and real wage. Long-term levels of inflation and interest rates will not be affected (though sizes and duration of the initial rises are bigger); that of the exchange rate will depend on shock length and policy response.
- **The impact of the price shocks depends on the monetary regime.** The rise in inflation is higher and output decline smaller under a peg vs. IT regime, with the greater interest rate response under IT dampening the inflation impact at the expense of lower employment and production. Similarly, a parity revaluation under a peg is more effective in containing inflation, though at the expense of lower output (compared to no change or parity devaluation).
- **Central bank credibility has important implications for the overall impact of the shock.** By reacting to core rather than headline inflation, the rise in interest rates and output loss can be kept smaller at the expense of higher inflation. But benefiting from this trade-off depends on how much credibility is lost when the full inflation impact of the shock is disregarded. With imperfect credibility, inflation rises more as inflation expectations rise. Output falls more given the larger interest rate reaction needed to bring inflation down compared to the full credibility case. Ignoring the full inflation impact is hence risky in the process of establishing credibility.
- **Limiting the interest rate policy reaction by raising temporarily the inflation target also produces no substantial benefit.** Overall, inflation will increase as inflation expectations adjust to the higher target, requiring a subsequent rise in interest rates to bring down inflation, and limiting eventual gains in output (if any).
- **Uncertainty about the duration and nature of the shocks means that there is a risk of tightening monetary policy excessively.** A quick interest rate response may exacerbate stagflation by unduly depressing output if the oil shock turned out to be temporary, while a delayed reaction could be costly in terms of higher inflation and inflation expectations, should the shock turns out to be permanent. The ultimate policy choice will be determined by the weight assigned to the output-inflation trade-off.

Appendix Figure 4. Different Propagation Mechanisms Under Peg and IT

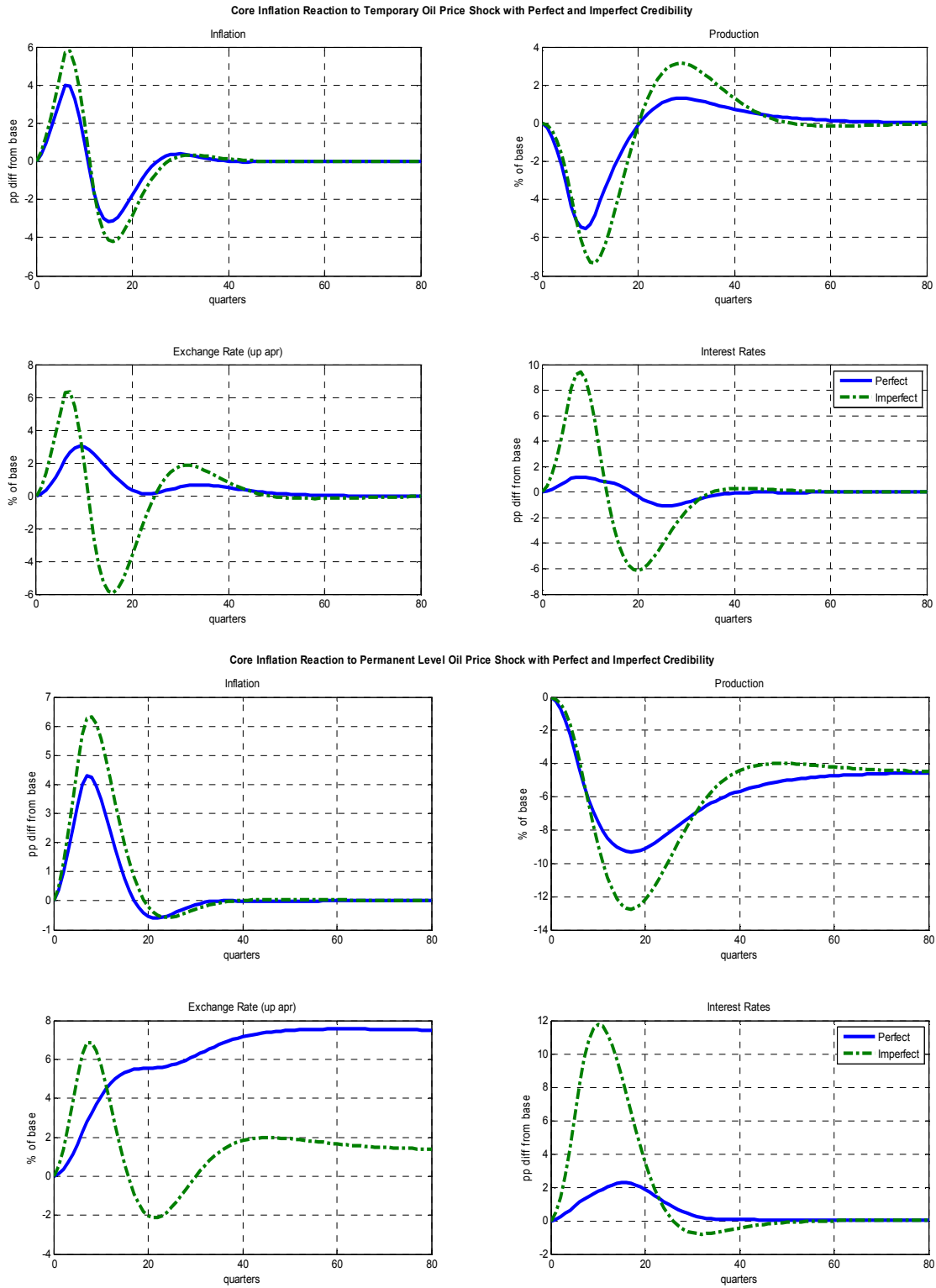
Peg vs IT in response to Temporary Oil Price Shock



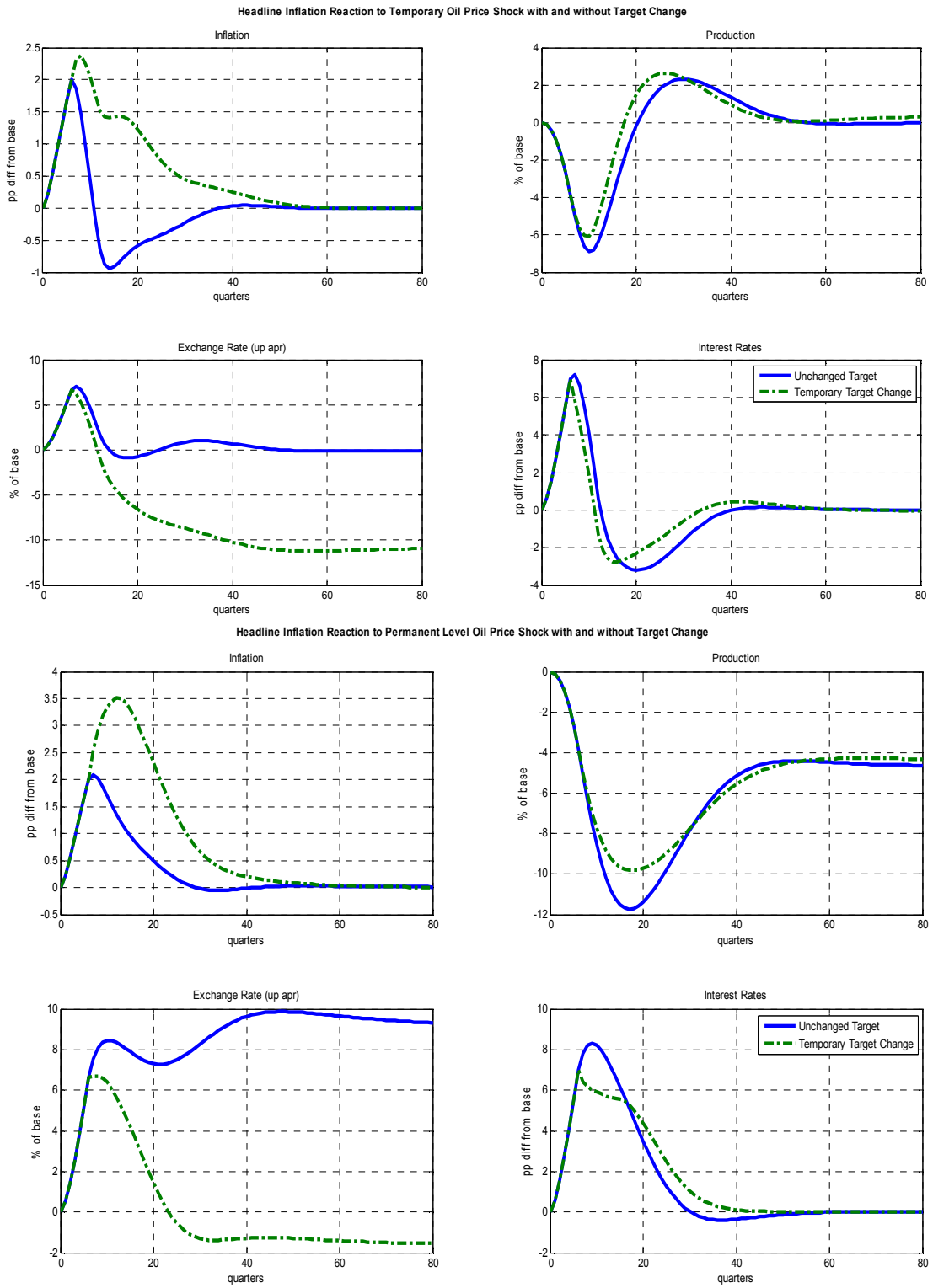
Peg vs IT in response to Permanent Level Oil Price Shock



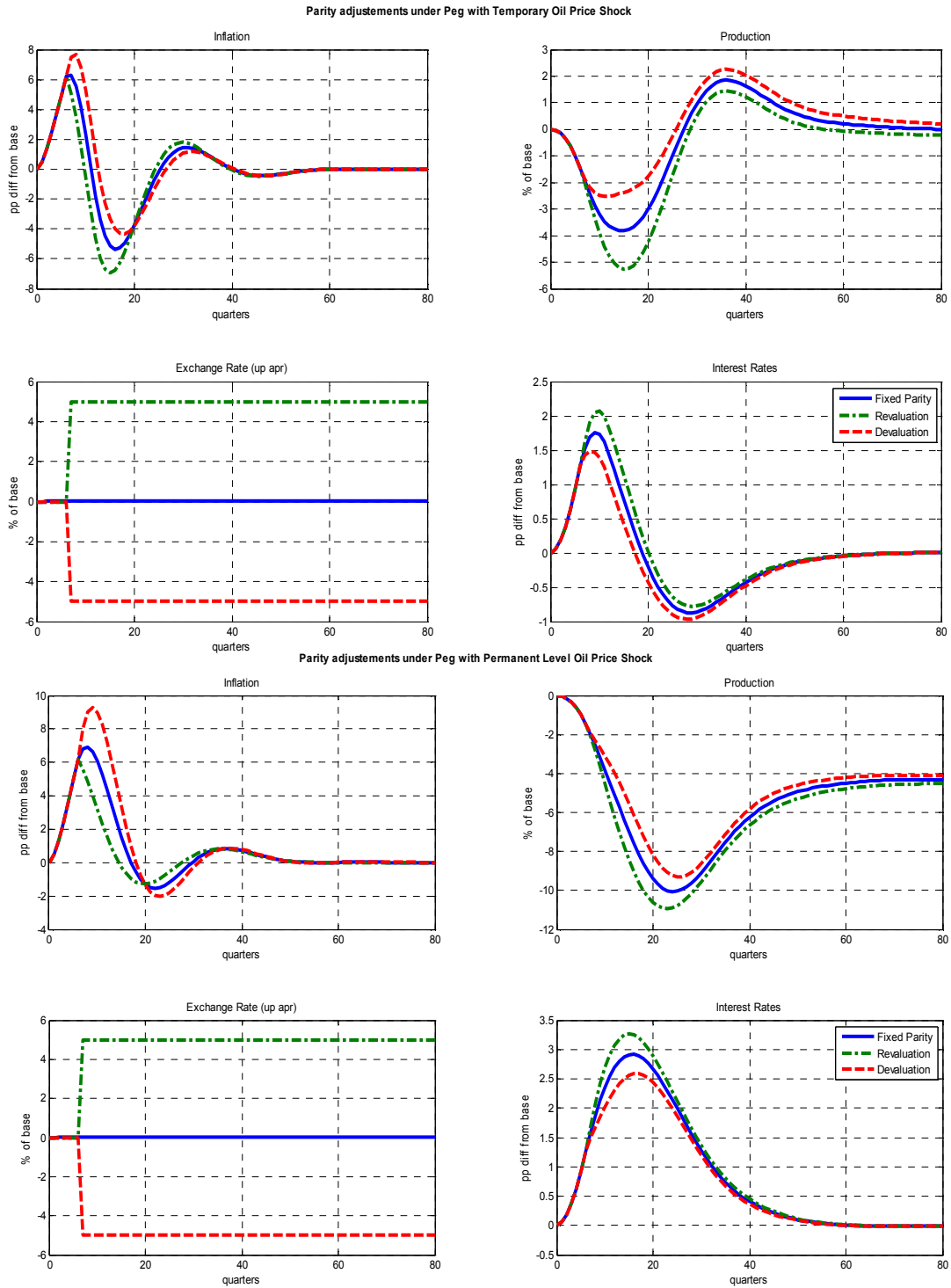
Appendix Figure 5. Role of Policy Credibility Under IT: Low vs. Full Credibility



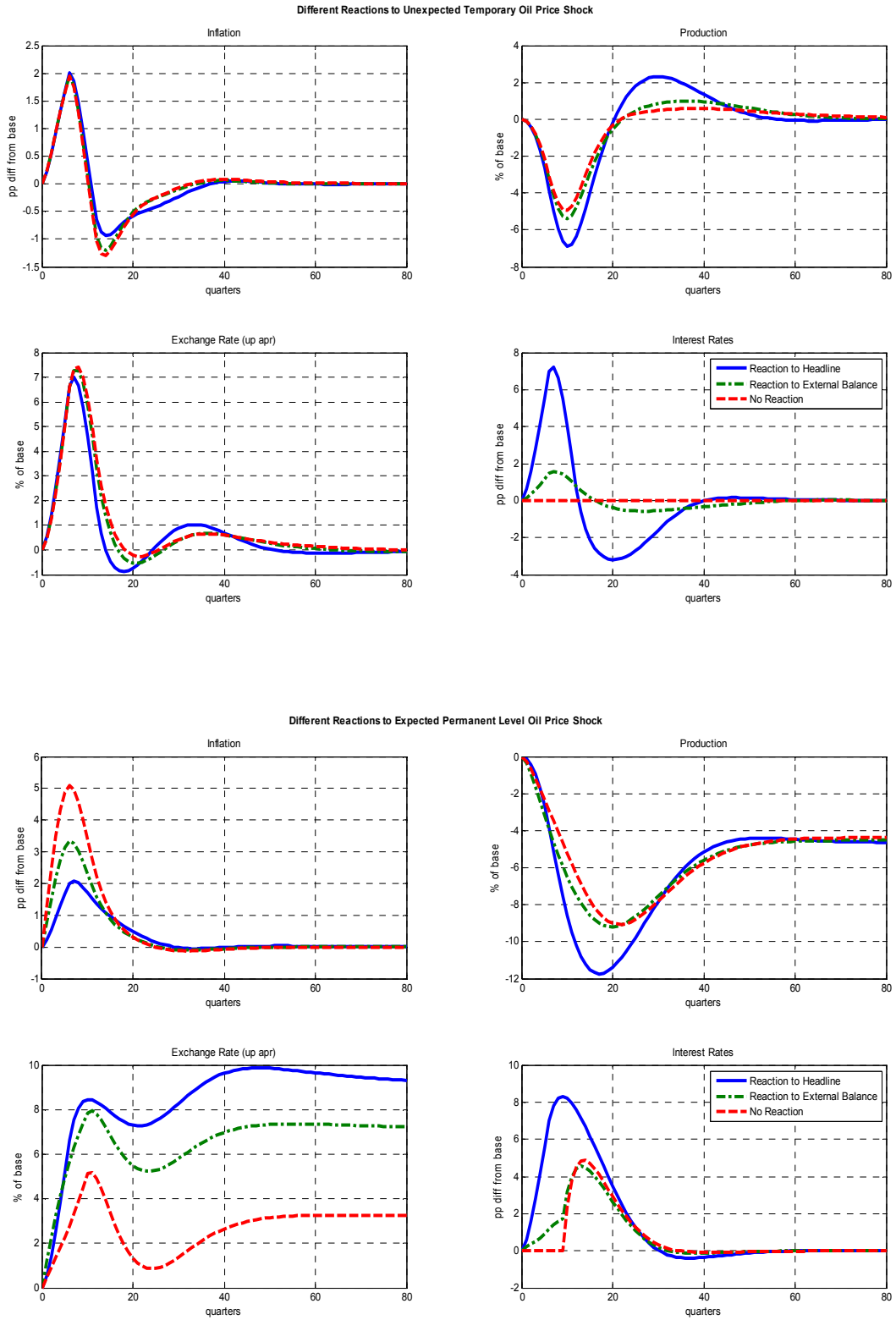
Appendix Figure 6. Options under IT: Temporary Target Change vs. No Target Change



Appendix Figure 7. Options in a peg: step appreciation, step depreciation, vs. no parity change



Appendix Figure 8. Risk Associated with Excessive Monetary Tightening Ex post



APPENDIX IX. MOVING TO GREATER EXCHANGE RATE FLEXIBILITY

70. **Many countries have adopted more flexible exchange rate regimes over the past decade.**⁵⁷ Among the factors underlying these move to greater flexibility has been the belief that more flexible exchange rates provide a greater degree of monetary policy autonomy and flexibility in responding to external shocks, including large and volatile capital flows.

71. **However, there is often a reluctance to let go of pegged exchange rates reflecting:** (i) concerns about losing policy credibility; (ii) adverse effects of a potential appreciation of the domestic currency on external balances; (iii) higher inflation from exchange rate pass-through (given the limited technical and institutional capacity to implement alternative monetary policy frameworks and under-developed financial markets characterized by larger exchange rate fluctuations); (iv) potential losses from currency mismatches, in particular when markets and instruments to hedge against risks are limited; and (v) the difficulties in assessing the right time to exit and in determining the alternative regime to adopt. Such concerns affect the pace and manner in which countries adopt greater flexibility.

72. **A smooth exit from a pegged regime requires accompanying measures to mitigate the risks,** especially when the elements supporting greater flexibility are not fully in place before the move to greater flexibility. An earlier IMF study described the institutional, operational, and technical aspects of moving to flexibility that are important for a successful transition.⁵⁸ The framework (endorsed by the IMF Executive Board in late 2004) concluded that for a successful transition to a floating regime, four “ingredients” were generally needed: (i) developing a deep and liquid FX market, (ii) setting up adequate systems to review and manage exchange rate risks, (iii) formulating coherent intervention policies consistent with the new regime, and (iv) establishing an appropriate alternative nominal anchor under the new monetary policy framework.

73. **A review of country experiences provided the detailed concrete steps countries took in transitioning to greater flexibility, elaborating on the operational attributes that proved helpful in promoting successful transitions.**⁵⁹ The findings broadly support the fixed-to-float framework, and point to some additional factors that can contribute to successful and durable exits. These include effective coordination of the exit strategy with the various ingredients of the fixed-to-float framework, setting up complementary markets and capacity to conduct effective monetary operations at an early stage to support these ingredients, and an effective communication strategy in the process of transition (Box).

⁵⁷ See Eichengreen and others (1998), Fischer (2001), and literature cited therein. See also IMF (2007) “Report on Exchange Arrangements, Restrictions, and Controls,” for more recent developments in exchange rate arrangements across the Fund membership.

⁵⁸ See IMF (2004), *From Fixed to Float: Operational Aspects of Moving Toward Exchange Rate Flexibility*.

⁵⁹ See I. Ötker-Robe and D. Vávra (2007), *Moving to Greater Exchange Rate Flexibility: Operational Aspects Based on Lessons From Detailed Country Experiences*, IMF Occasional Paper 256. The countries reviewed include countries that exited pegs under market pressure (Brazil, the Czech Republic, and Uruguay), and three countries with gradual and orderly transitions (Chile, Israel, and Poland).

Lessons from Detailed Country Experiences

- **Gradual transitions to exchange rate flexibility through increasingly more flexible forms of intermediate regimes offer time to prepare for an orderly exit, reducing the scope for policy reversals.** During the gradual exits of the three countries, avoiding moral hazard (or implicit exchange rate guarantees) was essential in the transition process, with two-way risks helping to reduce one-way bets and the scope for destabilizing market strategies.
- **It is important to strike the right balance between caution and taking advantage of the mutually reinforcing relationship between flexibility and capacity building.** A premature introduction of exchange rate flexibility can be damaging; advance preparation is essential in ensuring a smooth and successful regime change. However, too much emphasis on meeting all preconditions may unduly prolong the move to a float and even increase the risk of being forced out by the markets at the wrong time. Timely and reliable information is crucial in assessing preparedness.
- **The experiences with disorderly exits underscore the high premium assigned by markets to a consistent mix of macroeconomic and financial policies under increased capital mobility.** Capital mobility exposes inconsistencies in the macroeconomic policy mix (for example, a combination of expansive fiscal and restrictive monetary policies under a pegged exchange rate) and financial sector vulnerabilities, making the transition process more vulnerable to external pressures. Supportive fiscal policies were indeed helpful in reducing the burden on monetary policy during gradual exits, as well as in restoring monetary stability and credibility following crisis exits. A strong financial system with low FX exposure helped limit the risk of crisis exits as well as a spillover of a currency crisis to the financial sector.
- **In this connection, the experiences also emphasize that coordinating the exit strategy with capital account liberalization may reduce the pressure on macro-economic policies and help avoid disorderly exits.** In many cases, establishing some flexibility prior to capital account liberalization was beneficial, and transitions to flexibility could be supported by removing existing asymmetries in the capital account (for example, by liberalizing capital outflows to reduce the appreciation pressure on the currencies from heavy inflows).
- **The experiences demonstrate that putting in place the recommended building blocks of greater exchange rate flexibility at an early stage greatly facilitates the transition to a floating regime.** It helps address fears of floating and bolsters the chances of a successful exit, gradual or rapid. This process takes time and requires substantial capacity-building efforts. All four ingredients played key roles in preparing the economies and smoothing the regime transitions.
- **In addition, a transparent and effective communication strategy on monetary and exchange rate policies was essential, in preparing the economies for greater flexibility as well as contributing to the credibility of the floating regimes, in the context of both orderly and disorderly exits.** Moreover, building an effective capacity for monetary policy operations and deepening the complementary markets, such as interbank money and securities markets, supported the establishment and effective implementation of the four ingredients of floating.
- **Although there was no unique path to flexibility in terms of sequencing with the supporting elements, some basic elements were put in place at fairly early stages of the overall process and continued until the float:** laying the groundwork for an alternative monetary framework, establishing FX markets, and building FX risk management systems. Intervention policies did not involve much advance preparation, and a general strategy was adopted and announced at the time of the exit. Even when the exact path and sequencing could not be determined in advance, agreement on the principles of the transition and the characteristics of the eventual regime was helpful in establishing guidelines and a framework for the process.
- **Establishing the individual supporting elements can be mutually reinforcing.** Allowing some exchange rate flexibility both allowed and spurred capacity buildup in the case of gradual transitions, permitting in turn more exchange rate flexibility; over time a virtuous cycle took shape. In particular, allowing for two-

way variation in the exchange rate at an early stage (e.g., by a gradual widening of exchange rate bands and limiting central bank intervention) helped stimulate FX activity and provided incentives for better risk management. In fact, in most cases market development began only after some exchange rate flexibility was introduced even though not all the ingredients of floating were fully in place. Increasing the exchange rate flexibility through more flexible forms of pegs was hence helpful in establishing the remaining ingredients (risk management capacity and alternative monetary framework).

- **The authorities have a crucial role in the overall process.** Apart from providing a stable regulatory environment and infrastructure, the authorities took an active approach in developing markets. At the initial stages, the central banks played a market-maker role in illiquid markets, issued their bills for monetary management, introduced instruments for hedging, and participated in FX derivatives markets; they ceased their market-maker role as the markets reached an appropriate level of maturity, limiting their role to being a market participant. They also played key roles in building capacity to manage FX risks: indirectly by gradually increasing flexibility, and directly through appropriate regulation and monitoring. Cautious liberalization of derivative activities played an important role in facilitating risk management and hedging market development, supported with appropriate sequencing and safeguarding measures to mitigate the potential misuse of derivatives instruments.
- **The experiences also highlight that the relationship between flexibility and its building blocks may not be continuous.** Providing small degrees of flexibility when several of the ingredients of floating are lacking may be beneficial, because the former helps build the ingredients, whereas introducing too much flexibility without many of the building blocks may be risky, making the transition more challenging.
- **In the countries exiting pegs under market pressure, the lack of some, or most, of the ingredients prior to the exit complicated the transition to a float and the subsequent stabilization efforts** (particularly in the presence of highly dollarized public and private sector balance sheets). Intensive capacity-building efforts were required to establish a credible nominal anchor, markets, and instruments in an unstable crisis environment.
- **The experiences also suggest, however, that disorderly exits can be durable,** even in the absence of most preconditions at the time of the exit, if the lack of these elements is quickly recognized and addressed through intensive capacity-building efforts. Extensive efforts to put in place the preconditions of IT and to strengthen markets and risk management systems were essential in supporting the operation of the floating regimes, thereby contributing to the durability of the exits in the crisis countries. These efforts also helped limit the severity of the crises and achieve a relatively quick return of policy credibility.
- **Transition to flexibility usually involved testing by the markets of the authorities' commitment (in both disorderly and orderly transitions).** Credibility was generally established firmly once the commitment had been tested by the markets. The experiences hence underscore the importance of having consensus and coordination among the key parties in order to make tough decisions, and of a commitment to maintaining consistent policies.