Inflation Targeters Do Not Care (Enough) about Financial Stability: A Myth?

Investigation on a Sample of Emerging Market Economies

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(This version : April 2013)

Abstract:

The 2008/2009 financial crisis raised issues related to the monetary policy doctrine of the last two decades. Inflation targeting has been criticized as its main objective of inflation stabilisation might have diverted central banks from other concerns such as financial stability. As a first attempt in the literature on emerging countries, this study aims at investigating (i) whether inflation targeting is associated to higher financial instability, and (ii) whether inflation targeting central banks are less responsive to financial imbalances relative to non-targeters. To this end, we build a composite index in order to get a more complete and comprehensive view of the financial conditions in emerging countries. The paper concludes that, in spite of a stronger central banks' response to financial imbalances, inflation targeters are facing more financial instability than others. These findings suggest that, even if inflation targeting might be associated to higher financial fragility, this can hardly be attributed to the central banks 'carelessness' about developments in the financial sector. For emerging market economies, especially those implementing inflation targeting, this highlights the need for a broader and more integrated framework such as macro-prudential policies to tackle the issue of financial stability.

JEL classification: E4, E52, E58
Keywords: inflation targeting, financial stability, central banks' reaction function

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Acknowledgments:

We are grateful to J-P. Pollin and P. Villieu for their extremely useful comments. We also thank R. Bazillier, R. Bellando, S. Benoit, G. Levieuge, Y. Lucotte and A. Popescu for helpful advices.

I – Introduction

"The recent crisis points up the weakness of the existing regulatory and supervisory regimes in many countries [...]" (Woodford, 2012).

"[...] the crisis has taught to us that central banks, when they set interest rates, should also be concerned about the fragility of the financial system." (Giavazzi and Giovannini, 2010).

1. The above two quotes are representative of the debates arising from the 2008/2009 financial crisis. The financial regulatory system has been questioned, as well as the monetary policy doctrine of the last two decades. The financial regulatory system failed to contain the build up of the financial bubble and has been ineffective in controlling financial innovations. Since the advent of the inflation targeting monetary policy strategy, central banks in most advanced economies, but also in an increasing number of emerging markets (EMs), have been assigned a primary objective of price stability. The short term interest rate setting is guided by the aim of maintaining inflation rate around its target. This monetary policy framework has been called into question in the aftermath of the recent financial crisis.

2. Proponents of the inflation targeting framework seemed to argue that, by focusing on inflation, monetary authorities are, to some extent, also dealing with financial stability as financial imbalances should show up into inflation. The crisis pointed out the irrelevancy of such a conception. Indeed the relatively low and stable inflation of the early 2000s did not prevent the global economy from the build up of the housing price bubble which crashed in 2008. An explanation to this incoherence could be found in the so called "paradox of credibility" (Borio et al., 2003) which reflects the fact that financial imbalances might take more time to show up in increasing inflation rate because of the central banks' success in anchoring long-run inflation expectations. Debate on the need for rethinking monetary policy is now widespread among academics as well as practitioners.

3. Inflation targeting has been criticized and considered as one potential source of the recent crisis mainly because central banks have been less concerned with developments in financial markets and failed to prevent the crisis. This raises two issues which represnt the main purposes of this paper. The first is whether or not inflation targeting is actually associated to higher financial instability. If the answer to this first question is 'yes', then the second issue is whether inflation targeting central banks are less concerned with financial imbalances in their interest rate setting. These two questions have not yet been a subject of great attention in the literature.

4. As regards the issue of the 'health' of the financial system in inflation targeting countries (ITers) versus non-targeters (non-ITers), Frappa and Mésonnier (2010) is, to our knowledge, the only existing study which investigates the effect of inflation targeting on financial instability. Based on a sample of 17 advanced economies, including 9 inflation targeters, their empirical tests suggest that inflation targeting is associated to higher real house price and price-to-rent ratio.

5. To investigate whether a central bank is concerned with financial imbalances, a common approach is to estimate an augmented central bank reaction function (Taylor-type rules) including a measure of financial stability. This type of analysis has been conducted for advanced economy. Borio and Lowe (2004) argue that monetary policy would be more effectiveness in achieving stable and low inflation if central banks are also sensitive to financial imbalances. They estimate augmented central banks reaction functions (with financial variables) for Australia, Germany, Japan and the United States and conclude that there is no evidence of tightening monetary policy when financial imbalances build up. More recently, Castro (2011) investigates the extent to which the Bank of England, the FED and the European Central Bank are concerned with financial stability. Estimating linear, non-linear and asymmetric augmented Taylor rules, his findings suggest that only the European Central Bank seems to tighten monetary policy when there are increasing financial imbalances. To the best of our knowledge, no such empirical investigations have yet been conducted among emerging countries, especially, aiming to compare ITers to non-ITers.

6. There is little consensus on the way to account for financial stability within the monetary policy framework. First, central banks for which the main goal is to stabilize inflation might face a trade-off between this primary objective of monetary policy and the objective of financial stability (De Grauwe and Gros, 2009). Second, even when the central bank should account for financial imbalances, another issue is whether this should be clearly specified in its objective function (Disyatat, 2010), or merely considered as a new parameter in its reaction function and not as an objective (Bean, 2003). These questions are beyond the scope of our investigation.

7. This paper contributes to the existing literature in three main points. First, we build a composite index of financial instability which provides a more complete and comprehensive view of the financial conditions for EMs (rather than rely on a single indicator such as credit growth). Second, we shed light on the assumption that inflation targeting is associated with higher financial fragility. And third, as a first attempt in the literature, we investigate whether inflation targeting central banks in EMs are less responsive to financial imbalances as compared to their peers.

8. The empirical tests are conducted on a sample of 13 EMs[1] including 7 ITers, with quarterly data spanning from 2000Q1 to 2010Q4[2]. The findings suggest a positive effect of inflation targeting on financial instability despite a greater response of inflation targeting central banks to financial imbalances. These mixed results are interesting as they suggest that, even if inflation targeting is associated with higher financial instability, this could hardly be attributed to a lesser responsiveness of central banks to financial imbalances. The reasons of such differences in the financial conditions have to be sought elsewhere. Importantly, our findings highlight the need for a broader framework and flanking measures (such as integrated macro-prudential policies) for emerging countries inflation targeters. Indeed, financial sectors in these countries are relatively more active and more engaged in international financial transactions.

9. The remainder of the paper is organized as follows. Section II discusses issues related to the measure of financial conditions. Section III investigates whether inflation targeting increases financial fragility. Section IV deals with the central banks reactions to financial imbalances. And section V concludes.

II – On the assessment of the financial conditions

10. Given the purpose of this paper, one of the main concerns is the definition of financial instability. According to Borio and Drehmann (2009), financial instability is "*a set of conditions that is sufficient to result in emergence of financial distress/crises in response to normal-size shocks*". They further notice that shocks can originate from real economy as well as financial system itself. A large set of indicators is used in the literature to capture financial (in)stability; from individual financial institutions characteristics (related to their balance sheet) to macroeconomic data.

A – Issues in measuring financial (in)stability

11. Gadanecz and Jarayam (2009) provide a review of variables commonly used to assess financial stability. Six main categories are indentified: (1) Real economy includes GDP growth, fiscal position of government, and inflation. (2) Corporate sector includes total debt to equity, earnings to interest and principal expenses, net foreign exchange exposure to equity, and corporate defaults. (3) Household sector includes household assets, debt, income, consumption,

[1] 4 countries from Asia: Hong Kong, Malaysia, Singapore and Thailand; 5 European economies: Croatia, the Czech Republic, Hungary, Poland and the Russian Federation; and 4 from Latin America: Argentina, Brazil, Chile, and Mexico. We refer to Roger (2009) for the list of inflation targeters and their effective adoption date (appendix table 7).

[2] Due to missing observations in our database, we use simple linear interpolation to fill the gaps. Note that less than 5% of the data were missing.

debt service, and principal payments. (4) External sector includes exchange rate, foreign exchange reserves, current account, capital flows, and maturity/currency mismatches. (5) Financial sectors includes monetary aggregates, interest rate, growth in bank credit, bank leverage ratios, nonperforming loans, risk premium, capital adequacy, liquidity ratio, standalone bank credit ratings, and banks concentration. (6) Financial markets includes change in equity indices, corporate bonds spread, market liquidity, and house price. While some empirical researches focus on just one of these variables to investigate financial imbalances (Frappa and Mésonnier (2010) focus on housing price), others rely on a number of indicators to build a composite index (Brave and Butters (2011) rely on a set of 100 indicators for their composite financial condition index).

12. Building a synthetic index raises however the technical issue of aggregation. Again, various approaches emerge from the literature. Broadly speaking, two types of strategies can be identified. The first relies on econometric and/or economic simulations, based on macroeconomic models. Using alternatively a reduced model and VAR impulse responses, Goodhart and Hofmann (2001) build a financial condition index for the G7. Another economic based approach is to assign weights to each market depending on its relative importance for the total credit in the economy. The second category is basically related to statistical analyses. These include simple factor analysis (Illing and Liu, 2006), dynamic factor analysis which allows dynamic changes in the weights of individual indicators entering the composite index (Klomp and de Haan, 2008), principal component analysis (Brave and Butters, 2011), variance equal weight which assigns the same weight to each individual variable in the composite index, or sample cumulative distribution functions.

13. Little consensus emerges on the best strategy to combine various variables into one synthetic indicator, since each approach has its own pros and cons. Economic models based approaches rely entirely on a specific description of the economy and some (strong) hypothesis. As a result, the validity of the constructed index depends on the ‘belief’ that one could have on this given description of the economy. Assigning weight to each indicator depending on their relative importance for a financial sector seems to be an attractive approach. However, it limits the possibility to include other valuable variables since it mainly focuses on a specific sector.

14. The statistical analyses based approaches certainly rely on less strong assumptions as they are mainly based on correlations, variance and covariance analyses. However, there is a scope for criticism since they do not rely on economic foundations. Variance equal weight assigns the same weight to each individual indicator. This could lead to build a financial condition index

which does not reflect the real state of the financial environment since some sectors or variables are more informative than others as they play a more prominent role in the financial developments. For instance, in less financially integrated developing countries, currency mismatch will probably be less relevant for the financial environment (as compared to credit growth for example). Besides, depending on the issue considered, some statistical analysis may not be suitable. Implementing dynamic factor analysis for our study would be misleading because it allows changes in weights each period. In other words, using dynamic factor analysis in our case suggest that the central bank redefines period by period (here, from one quarter to another) the importance that should be assigned to each individual indicator entering the financial condition index. We believe this would be a fairly strong assumption. All these arguments considered, principal component analysis (PCA) is the chosen methodology to build our composite index.

15. PCA is one of the common statistical approaches used for data reduction. It aims at explaining the variance of observed data through a few linear combinations of the original dataset. From a large set of variables, one might need to condense the information contained therein into one (or a smaller number of) indicator(s) which will account for most of the variance in the dataset. This relies on the assumption that in their fundamentals, the variables reflect some redundant information that can be extracted. And this common information will likely be easily manageable and interpretable than using the original dataset. In other words, PCA allows the extraction of the needed information (common to a number of variables) and abstracts from the remaining noise.

B – A composite index for emerging countries

16. When assessing financial stability in developed and EMs, it is rational not to pay attention to the same financial and/or macroeconomic indicators, mainly because of different degree of financial development in these two groups. EMs are characterized by a lesser financial development and less sophisticated financial instruments (as compare to high income countries). The stock markets are certainly less active and the banking system embodies a higher share of the whole financial activities. Another characteristic of EMs is the higher exposure to external shocks such as exchange rates fluctuations and the flows of international capital. The exchange rate risk is mainly due to the fact that EMs' indebtedness is mostly foreign currency denominated. Most of governments face an inability to borrow abroad in domestic currency (the so called "original sin"). This is also relevant for financial institutions and particularly for the banking system. The growing amount of international capital flows entering emerging countries could negatively affect their financial system, particularly if they are highly volatile. Moreover, the sudden stop

of capital inflows and/or the sudden increase in outflows can be detrimental for the financial system.

17. To build our "macro-financial condition index" (MFCI), we rely on a set of 10 variables related to the banking sector, the stock market and the macroeconomic environment.

18. As regards the banking system

- *Credit growth*: This is the growth of banking system's claims on private sector. Credit growth is commonly used in the literature as a proxy for financial imbalances, especially in developing countries. Rapid growth in bank loans is often accompanied by declining loan standards and growing risk.
- *Banks liabilities to assets ratio*: The liabilities exclude banks' capital and reserves. This is a broad measure of banking sector indebtedness as a ratio of total assets.
- *Systemic liquidity*: Systemic liquidity is defined as the ratio of banks' total loans to total deposits. A ratio higher than one suggests that banks are lending more than the amount of deposits received. In some extent, the ratio captures the banking systems' dependence on financial markets, as a source of funding for additional credit provided to private sector.
- *Capital flows*: Capital flow represents the ratio of banks' foreign assets to foreign liabilities. Foreign liabilities (the capital inflows) might be source of financial instability if they are highly volatile. But arguably, the concern for EMs is more about foreign assets, since they highlight the banking system's exposure to external financial shocks. The 2008/2009 financial crisis shows how an external financial shock could be detrimental for the domestic financial system, particularly when banks are not engaged in sound external investments. Limiting the banks foreign assets (relative to foreign liabilities) may preserve the EMs' financial system from negative international financial shocks.
- *Currency mismatch*: Currency mismatch is the ratio of banks' foreign currency denominated assets to foreign currency denominated liabilities. Liabilities and assets are both domestic and external. As for capital flows, we believe that banks' foreign currency denominated assets are mostly a source of concern for emerging countries. Increase in foreign currency denominated assets can reflect lower confidence of the banking system in the domestic currency, and could end up jeopardizing the financial sector.

- *Interest rate spread*: The spread is the square of the difference between the bank lending interest rate and the money market rate. Higher and increasing spreads can reflect increasing tensions (higher demand or lower supply) on the credit market and result in intensification of the financial system fragility.

19. In regard to stock market

    - *Change in share price index*: Rapid growth in the share price index is a sign of the formation or amplification of a financial bubble.

20. Some relevant macroeconomic indicators also enter the composite index.

    - *M2 to GDP ratio*[3]: M2 aggregate is used as a proxy for liquidity. Higher liquidity could be harmful for the financial system since it is usually accompanied by lower interest rates and increasing risk taking. This phenomenon has been observed in the period prior to the 2008/2009 financial crisis.
    - *Net foreign assets to GDP ratio*: This is the ratio of banking system net foreign assets as a share of GDP. The higher the ratio, the more the whole economy is vulnerable to an external financial shock.
    - *Total credit to GDP ratio*: This variable accounts for the importance of the banking system in financing the economic activity.

21. To combine the above 10 indicators into a single index, we apply the PCA as discussed previously. As usual practice, we build the correlation matrix between these indicators (see appendix table 2). The findings suggest that the correlation coefficients are almost all statistically significant at a minimum level of 5%, highlighting the close connections between the individual financial stability indicators and the relevance of PCA. To select the number of components/factors we rely on three criteria: i) the Kaiser' criterion which recommends to drop factors with eigenvalue lower than 1; ii) we keep factors with individual contribution to the overall explained variance of more than 10%; and iii) we keep the number of factors allowing to capture at least 70% of the initial dataset's total variance[4]. We perform the components rotation in order to maximize the individual indicators' loadings on the factors, as this enhances the factors' interpretability. Applying the selection criteria, the number of factors is 2 or 3 depending on the country considered. Then, for country *i* at period *t*, our macro-financial condition index is built as follows:

[3] M3 aggregate, which is certainly a better measure of liquidity, is less available, especially for emerging countries.

[4] Note that for this third criterion, OECD (2008) recommends a threshold of 60%. We rather choose a more restrictive percentage of explained total variance in order to get more information from the original dataset.

$$MFCI_{it} = \sum_{n=1}^{10} \omega_{in} x_{int} \quad (1)$$

22. Where the ωs are the n weighted loadings[5] associated to the individual indicators, and the xs the n individual indicators (the 10 variables listed above) at time t, standardized with 0 mean and 1 standard deviation. The time varying MFCI obtained is rescaled to vary from 0 to 1, to enhance interpretations in our empirical work. An increase in the composite index suggests a deterioration of the financial conditions. As a first step of analysing the relevance of our composite index, we graph the MFCI by country (appendix figure 1). One striking observation is certainly the MFCI evolution since the early 2000s. For countries such as Brazil, Hong Kong, the Russian Federation and Singapore, the composite index seems to highlight an increase in the deterioration of financial conditions, which is followed in 2008/2009 by the crisis (the sudden slump of the index).

23. Besides, some of the earlier periods of financial instability are emphasized. One example is the period of extreme instability in Argentina in the early 2000s. Argentina faced between 2001 and 2003 a combination of crises encompassing banking crisis, currency crisis, debt crisis, stock market crash and inflation crisis. Mexico is another good example of the prediction performances of our MFCI. The Mexican economy faced in late 1990s and early 2000s currency, sovereign debt, banking crises and a stock market crash. We can also refer to Thailand with the currency crisis, stock market crash and banking crisis faced by this country in the early 2000s (see data on crises from Reinhart and Rogoff, 2011).

24. This preliminary overview of the retrospective performances of the synthetic index seems to be quite satisfactory as it proves its ability to reflect effectively the periods of financial imbalances. In the next section, we investigate whether inflation targeting can be associated to higher financial instability.

III – Inflation targeting and financial stability

25. In this section, we investigate comparatively the state of financial stability in emerging ITers and non-ITers. Frappa and Mésonnier (2010) empirically investigate this issue among high income countries and conclude that inflation targeting, on average, is associated to greater financial imbalances. To the best of our knowledge, our study is the first which attempts to conduct this analysis among emerging countries.

[5] The ωs are generated as the sum of the loadings in each factor, weighted by the proportion of total variance explained by the corresponding factor (appendix table 1).

26. A comparative statistical analysis of the financial sector between ITers and non-ITers emphasises some key differences (see appendix figure 2). First, during the last decade, the share price index, our proxy for developments on stock markets seems to have grown significantly faster for inflation targeters. Second, the spread between bank lending rate and money market rate is higher for tagerting countries, suggesting stronger pressure on their banking system. The ratio of banks liabilities to banks assets is also more important for ITers. Considering systemic liquidity, non-ITers seem to perform better. There is no significant difference between the two groups as regards credit growth and M2 to GDP ratio. Regarding the international connections of the financial sectors, the two indicators (capital flows and currency mismatch) exhibit a higher level for inflation targeting countries. Following the previous discussion, this suggests that these countries are more exposed and vulnerable to external shocks. Overall, this preliminary statistical analysis seems to highlight a more fragile financial sector for countries implementing the inflation targeting strategy. Not surprisingly, the composite index of the macro-financial condition corroborates this observation. To further investigate this issue, we perform an econometric analysis.

27. The estimated equation with panel data can be specified as follows:

$$MFCI_{it} = \alpha + \beta IT_{it} + \Theta X_{it} + \varepsilon_{it} \qquad (2)$$

Where $MFCI_{it}$ is our index of macro-financial instability, IT_{it} a dummy variable taking the value of 1 for country i at time t if this country is implementing the inflation targeting monetary strategy and 0 otherwise, X_{it} a vector of other variables which affect the financial conditions, and ε_{it} an error term. We apply the instrumental variables GMM estimation technique where potential endogenous variables are instrumented by their lagged values.

28. The control variables (vector X) include:

- Macroeconomic indicators: *GDP growth*, *inflation rate* and change in *nominal exchange rate*. In emerging countries, financial imbalances and economic growth might be procyclical, as countries which grow faster may also face more financial risk since the financial system is certainly involved in more diversified (and risky) activities. The exchange rate appreciation can be expected to lower the financial instability, since for instance, domestic currency appreciation would lower the real value of banks external debt and favour debt repayment. Higher inflation is harmful for the financial system's efficiency as it increases uncertainties. Besides, since the rate of inflation is probably

significantly different between ITers and non-ITers, controlling for inflation allows capturing a more reliable effect of the IT dummy.

- Institutional indicators: *economic stability* and *law and order*. The state of the economy as a whole certainly determines the efficiency and the straightness of the financial sector. A more stable economy is expected to be associated with a more stable financial sector. Political settings, but not only economic variables, may also be determinant for countries' financial stability. As argued by Klomp and de Haan (2009), the lack of sound legal system and good governance might be detrimental for financial stability because of corruption, inefficient enforcement of law and/or government ineffectiveness. The *law and order* variable aims at capturing this effect[6].
- Central bank policy rate: the *short-term interest rate*. We investigate the extent to which tightening the monetary policy can mitigate the build-up of financial imbalances.
- Finally, we build 3 dummy variables to account for crisis contagions from countries' neighbourhood: *banking crisis contagion*, *currency crisis contagion* and *stock market crash contagion*. These variables are constructed as follows: first, we split the sample into geographical regions (following the World Bank classification) and second each of the above variables takes the value of 1 for country *i* at time *t* if at least one of the other countries in the same region is facing a banking crisis, a currency crisis or stock market crash respectively. This is a very simple approach to account for spillover across countries in the same region. As it has been the case in Latin America in the early 2000s, a crisis from neighbouring countries increases the financial instability for the others.

29. The estimates results of equation (2) are given in table 1. Note that this empirical investigation covers the period from the first quarter of 2000 to the third quarter of 2008 (prior the financial crisis). Except GDP growth and banking crisis contagion (dropped) which seems to have no effect, all the other control variables show the expected and significant effect on the financial instability index. The increase in the short term interest rate is found to reduce financial instability. Inflation rate exhibits a positive and significant coefficient. Change in nominal exchange rate, law and order, and economic stability are associated to negative and significant effects on financial instability, as expected. As regards the proxies for crises contagion, the results suggest that a currency crisis and stock market crash in a given country increase financial instability in its neighbourhood. The IT dummy exhibits a positive, significant and robust effect

[6] The two institutional variables are from International Country Risk Guide. These are annual data we include in the estimations (in quarterly). Since there might be some inertia in these institutional variables, this should not be a source of particular concern.

on financial instability, suggesting that inflation targeters face more financial imbalances than non-targeters. This is in line with the findings of Frappa and Mésonnier (2010) on a sample of high income countries.

30. So far, we showed that on average inflation targeting countries face more financial instability as compared to the others, corroborating the criticism addressed to this monetary policy strategy. However, it is hard at this stage of the analysis to claim that these differences between targeters and non-targeters are due to less reactive monetary policies to financial imbalances, among countries implementing inflation targeting. To shed light on this issue, in the next step we investigate central banks reaction functions.

Table 1 : Financial instability, ITers versus Non-ITers

	Dependent variable : MFCI (financial instability)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IT	0.0481***	0.0579***	0.0551***	0.0697***	0.0529***	0.0298**	0.0300**	0.0267**
	(3.149)	(4.119)	(3.509)	(4.309)	(3.714)	(2.018)	(2.131)	(2.063)
GDP growth	0.00116	0.000697	-0.00302	-0.000220	0.000821	-0.00364	-0.00399	0.000815
	(0.494)	(0.233)	(-0.928)	(-0.0674)	(0.263)	(-1.211)	(-0.995)	(0.253)
Short term interest rate		-0.00273*	-0.0104***	-0.00915***	-0.00345**	-0.00631***	-0.0110***	-0.0108***
		(-1.757)	(-5.955)	(-5.704)	(-2.297)	(-3.732)	(-5.569)	(-6.309)
Inflation rate			0.0101***	0.0102***		0.00472***	0.00922***	0.00637***
			(5.750)	(6.118)		(3.332)	(5.730)	(4.214)
Change in exchange rate				-0.00231***			-0.00183**	-0.00587***
				(-3.551)			(-2.530)	(-4.792)
Currency crisis contagion					0.0669**			-0.0353
					(2.243)			(-1.307)
Stock market crash contagion						0.0606***		0.0556***
						(3.540)		(3.390)
Law and order							-0.0150*	-0.00668
							(-1.734)	(-0.897)
Economic stability							-0.00314*	-0.00435***
							(-1.786)	(-2.885)
Constant	0.502***	0.520***	0.538***	0.509***	0.518***	0.544***	0.741***	0.730***
	(26.53)	(19.10)	(17.50)	(16.73)	(18.37)	(20.19)	(12.75)	(13.33)
Observations	403	351	325	338	377	351	338	325
Number of country	13	13	13	13	13	13	13	13
F test : P-value	0.00712	2.52e-06	2.47e-09	2.24e-09	1.03e-05	2.46e-05	8.30e-11	7.11e-11
Hansen J test: P-value	0.657	0.985	0.101	0.287	0.959	0.164	0.174	0.104

GMM instrumental variables estimates of equation (2) with quarterly data. The list of instruments includes the lagged values of the explanatory variables. The number of lag for instrumentation does not exceed 9 periods. The F test is a test of the null hypothesis that all the coefficients, except the constant, are jointly significant. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid. ***, **, * indicate the statistical significance at 1, 5 and 10% restively.

IV – Central banks reaction function and financial imbalances

A - Central banks reaction function

31. This section discusses the specification and issues related to the central bank reaction function, relying on Taylor (1993) type rules. Following Taylor (1999), the general description of the framework commonly used for evaluating monetary policy rule in a closed economy can be summarized as:

$$\begin{cases} y_t = -\beta(i_t - \pi_t - r) + u_t \\ \pi_t = \pi_{t-1} + \alpha y_{t-1} + e_t \\ i_t = g_0 + g_\pi \pi_t + g_y y_t \end{cases} \quad (3)$$

Where y is the percentage deviation of real GDP from its potential level, i is the short term nominal interest rate, i.e. the monetary policy instrument, π is the inflation rate, r the long-run equilibrium real interest rate, β and α are the slope parameters, and u and e are stochastic disturbance terms. The last equation of the above system represents the central bank's reaction function. Central bank sets the interest rate in response to current inflation and output gap, given the parameters g_π and g_y.

32. It is now a standard practice to account for some inertia in the central bank policy rate setting, reflecting the desire to smooth the changes in interest rate. As pointed out by Woodford (2001), for monetary policy, it is generally optimal to respond *inertially* to fluctuations in the target variables and/or their determinants. One of the economic rationales behind this inertia is related to the fact that the effect of monetary policy is highly dependent on market participants' expectations about future policy. In this respect, smoothing the changes in policy rate will improve its expected effect on the long-term rate since the private sector will anticipate a continuously increase of the short term rate. When there are some uncertainties about the model parameters (as it might be the case in emerging and developing countries), the interest rate smoothing can help to reduce policy mistakes. Another concern about the interest rate setting is its effect on the financial sector. A sudden large increase in interest rate could be subject to financial risk if it exposes market participants to capital losses, particularly because they have limited capacity to hedge interest rate risk (Mohanty and Klau, 2004).

33. In small open economies as emerging countries, exchange rate fluctuations are a particular concern for monetary policy. This is because the cost of large exchange rate fluctuations may be very high for highly dollarized economies, where there is a mismatch of assets by currency or duration. Emerging countries are, by more than high income economies, vulnerable to external shocks affecting exchange rates. Besides the above mentioned effect through dollarization, exchange rate fluctuations could also be detrimental as a pass-through for inflation, since many emerging markets are net importers and thus exposed to imported inflation. Exchange rate fluctuations also affect the financial system; first through the financial institutions' foreign currency denominated liabilities/assets, but also through speculative attacks on the domestic currency and increasing volatility of external capital flows. All these arguments put together

underline the so called "fear of floating" characterizing emerging economies and justify the concern for exchange rate of monetary authorities.

34. Taking into account the need for smoothing interest rate and the concern for exchange rate, the central bank reaction in equation (3) can be rewritten as:

$$i_t = \delta_0 + \delta_1 i_{t-1} + \delta_2 (\pi_t - \pi_t^*) + \delta_3 y_t + \delta_4 x_t + \varepsilon_t \qquad (4)$$

Where i_t is the short term nominal interest rate, π_t and π^* the observed and target inflation rate[7] respectively, y_t the output gap, x_t the nominal exchange rate gap[8], and ε_t an error term. The term i_{t-1} is introduced to account for interest rate smoothing as it is now common in the empirical literature (see Clarida et al. (1998) among others). Theoretically, the parameters δ_0, δ_1, δ_2, δ_3 are expected to be positive, and δ_4 negative. Besides, the so called "Taylor principle" will hold if the long-term effect of inflation gap is greater than 1, i.e. $\delta_2/(1-\delta_1) > 1$. The Taylor principle requires that the central bank raises its interest rate by more than the increase in inflation, so that the real interest rate increases until inflation returns to its target level. As pointed by Fendel et al. (2011), even if it is sufficient, the Taylor principle is not a necessary condition for the effectiveness of interest rate setting. As soon as other factors such as output gap or exchange rate are included in the central bank's reaction function, the necessary condition should also include their associated coefficients. For more discussion on the relevance of the Taylor principle in emerging countries, see Teles and Zaidan (2010).

35. Another feature of the specification in equation (4) is the central bank's reaction to current deviations of inflation and output. 'Forward looking' reaction functions, in which central bank set the short term interest rate in response to expected inflation and output, is another type of empirical specification used in the literature (Clarida et al. (1998) among others). However, we believe that a 'current' specification for emerging countries is not misleading for a number of reasons. First, the macroeconomic models used by central banks in emerging economies are certainly less developed and reliable as compared with high income countries; therefore it is questionable if the monetary policy framework is actually 'forward-looking'. Second, investigating the conduct of monetary policy in emerging countries, Moura and de Carvalho (2010) test 16 alternative specifications of the central banks' reaction function. Their findings suggest that among the 7 sample countries[9], only 2 seem to implement a 'forward looking'

[7] For inflation targeting countries, we collect the inflation targets on the respective central bank websites. For non-targeters, π^* is the inflation trend generated with HP filter.
[8] For output and exchange rate, the gap is the difference between the observed series and their long term trend generated with HP filter.
[9] Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela.

strategy. Third, a forward looking specification requires data on expectations used by central banks. It is common in the empirical literature to rely on private sector expectations provided by the Consensus Forecast database. But there is no evidence that these are data actually used by central banks in their monetary policy-making. Finally, it should be noteworthy that the aim of our empirical tests is not to describe the conduct of monetary policy per se; we rather focus on investigating whether the central banks' interest rate setting responds to financial imbalances. Nevertheless, 'current' specifications as ours are also common in the literature describing central banks' reaction function in emerging countries (Mohanty and Klau, (2004), Moura and de Carvalho, (2010), Aizenman et al., (2011) among others).

36. To account for the potential reaction of monetary policy to financial stability, the specification in equation (4) is augmented with a financial instability indicator as follows:

$$i_t = \delta_0 + \delta_1 i_{t-1} + \delta_2(\pi_t - \pi_t^*) + \delta_3 y_t + \delta_4 x_t + \delta_5 fc_t + \varepsilon_t \qquad (5)$$

Where *fc* stands for a financial condition indicator. δ_5 is expected to be positive, suggesting an increase in the short-term interest rate in response to higher financial imbalances. We will discuss this issue in more details in our empirical estimations.

B – Central banks responses to financial imbalances

37. This sub-section presents and discusses our findings on the central banks reaction functions estimates. Following the literature, we use GMM instrumental variables technique to run the regressions.

- ***Standard Taylor rule estimates***

38. As a first step of the central banks' reaction functions analysis, we estimate a standard Taylor rule for emerging countries as specified in equation (4). The results presented in appendix table 3 are in line with previous findings in the literature. Central banks raise the short-term interest rate in response to increasing inflation and output gap. The concern for inflation seems to be more relevant for inflation targeting countries as they all exhibit a positive and significant coefficient associated with inflation gap. As regard the exchange rate deviations from its trend, the expected effect is found for the Czech Republic, Hungary and Thailand among targeters; Croatia and Singapore among non targeters. Central banks lower the short-term interest rate

when exchange rate is above its long-term trend. The monetary policy reaction functions in Argentina and the Russian Federation seem to go in the opposite way[10].

- ***Augmented Taylor rule estimates with individual financial indicators***

39. Before testing the central banks' reaction to our macro-financial condition index, it seems relevant to investigate whether and to what extent they respond or not to some selected individual indicators. The following financial variables are considered:

    - *Credit growth*: A meaningful financial condition indicator, especially for emerging countries. Central banks are expected to raise the short-term interest to dampen rapid credit growth since it might be accompanied by higher risk in the banking system.
    - *Systemic liquidity*: Recall that systemic liquidity is the ratio of bank lending to bank deposits. This is another measure of risk to which central banks are expected to respond by increasing the policy rates.
    - *Share price index*: Rapid growth in the share price index could reflect the build up of a financial bubble to which central banks are expected to react by tightening the monetary policy.
    - *Bank currency mismatch*: The ratio of banks foreign currency denominated assets to foreign currency denominated liabilities. The central bank reaction to an increase in currency mismatch seems to be less clear cut as compared to the above mentioned indicators. Indeed, higher short-term interest rates will deter the incentive to acquire foreign assets and reduce external risk taking. Simultaneously, these higher interest rates will certainly favour capital inflows. Arguably, in the case of small open economies with large exposition to exchange rate shocks, central bank should focus on limiting external risk. Capital inflows may not be detrimental if they are not too volatile and can be managed through other strategies such as macro-prudential policies. In this respect, central banks are expected to raise the interest rate in response to an increase in foreign currency denominated assets relative to foreign liabilities, in order to mitigate banks external exposition to shocks.

40. Running the specification in equation (5), *fc* is successively replaced by the deviations of the above four variables from their long-term trend, generated by the HP filter. Results are given in appendix table 4. A first glance on the findings reveals that central banks are not sensitive to the same indicators of financial imbalances. Indeed, while the Brazilian, Chilean, Mexican and

[10] It is hard to provide an economic explanation to these results, but we believe that, at least for the case of Argentina, it may be driven by the currency crisis period of the early 2000s.

Polish central banks seem to react to credit growth, the central banks of Honk Kong, Malaysia and the Russian Federation are sensitive to systemic liquidity. The concern of currency mismatch seems to be relevant for Chile, Croatia, Czech Republic, Hungary, and Thailand. The short term interest rate is raised in response to deviations of share price index from its trend in the Czech Republic, Mexico, Poland, Thailand and Malaysia.

41. These results are instructive in the sense that they highlight the complexity of defining financial stability. Moreover, they shed light on the irrelevancy of analysing financial stability through a single indicator such as credit growth, since central banks might respond to many other financial variables. Therefore, when discussing the concern for financial stability, a large set of various indicators which may signal financial imbalances or affect the financial system should be considered.

- ***Augmented Taylor rule with the MFCI***

42. With a more complete definition of financial stability, we investigate the central banks reaction to financial imbalances. Reconsidering equation (5), *fc* is now replaced by the change in MFCI. Besides, we run three types of estimates corresponding to three assumptions on the timing of central banks' reaction to financial instability:

- A *current* model, where we investigate whether central banks are currently responsive to financial instability. The short term interest rate and the change in MFCI are both set at time *t*.
- A *backward* looking model, where we hypothesized that central banks respond to financial imbalances with a period lag (a year). Here, the change in MFCI enters the equation at time (*t-4*).
- And a *forward* looking model, where it is hypothesized that central banks are concerned with expected imbalances in the financial sector. The change in MFCI is then set in the next year period (*t+4*). This is a quite strong hypothesis since we are assuming perfect expectations for the central bank. However, this is a simplified model and we presume that the potential expectations errors may be included in the error term.

43. Table 2 gives the estimates results. Among inflation targeters, 4 out of the 7 countries included in this study exhibit a positive central bank reaction to financial instability (a rise in short-term interest rate when there are increasing financial imbalances). In Chile, the short term interest rate responds 'currently' to financial imbalances, while in the Czech Republic it seems to be a lag in the central bank's reaction (the backward looking model holds). In Mexico, the backward

and the forward models both hold. The latter seems however to be more relevant as the δ_5 parameter exhibits a stronger and more significant effect. The Mexican central bank seems to be more concerned with the expected developments in the financial sector and sets the short-term interest rate preventively. Finally, the three specifications hold for Poland, certainly suggesting a greater concern for financial stability in this country.

44. Among non-inflation targeting countries, the short term interest rate responds to financial imbalances only for Malaysia in the forward specification. Another striking result of our estimations is the negative relation between the MFCI and the short term interest rate in some cases (this arises particularly when using the current specification). It suggests that central banks are conducting an accommodating monetary policy. But these results can also point a misspecification of the estimated equations (the current model might be irrelevant in describing the relation between the monetary policy interest rate and financial imbalances. Besides, since inflation and output gap enter the equation in the same period, there is certainly a strong correlation between the three variables).

45. The robustness of these findings is investigated by estimating a non-linear central banks' reaction function[11]. Indeed, one might object that the central banks' response to financial instability variables merely aims to a better control of inflation rate. We investigate this issue for countries which have been found to react to the MFCI (Chile, the Czech Republic, Mexico, Poland and Malaysia – See appendix table 5). The results reveal that the central banks' response to financial instability is still relevant for Chile, the Czech Republic, and Poland[12]. In other words, even when inflation rate is equal or below the target, the short term interest rate is raised in response to financial imbalances.

46. All in all, our findings suggest that monetary authorities in 5 out of the 13 emerging market economies in this study are concerned with financial instability in their short-term interest rate setting. Moreover, inflation targeting countries, which in the literature (and particularly since the 2008/2009 financial crisis) are suspected to discard the concern for financial imbalances, seem to be responding to financial disequilibrium. Furthermore, a quick glance on the results in table 2 may suggest that EMs inflation targeters are even more responsive to financial instability than non-targeters. This is at variance with the suspicions that within the inflation targeting regime, monetary policy does not pay attention to developments in the financial sector.

[11] The following equation is estimated: $i_t = \delta_0 + \delta_1 i_{t-1} + \delta_2(\pi_t - \pi_t^*) + \delta_3 y_t + \delta_4 x_t + \delta_5 D * fc_t + \varepsilon_t$; where D is a dummy variable which takes the value of 1 if the inflation rate is equal of below the target and 0 otherwise.

[12] For Mexico, inflation rate is above the targeted inflation over the whole period of analysis, which makes the estimation impracticable.

Nevertheless, in order to get a clear cut comparative analysis between targeters and non-targeters on central banks reaction to financial instability, we run panel data estimates including countries from the two groups.

Table 2 : Central banks reaction to macro-financial instability, ITers and non-ITers

Inflation targeters

Country		δ_1	δ_2	δ_3	δ_4	δ_5	δ_0	Obs.	R^2	Hansen J test: P-value
Brazil	current	0.838***	0.262***	0.0865*	-0.00588	-0.876	1.796***	39	0.895	0.666
		(20.12)	(3.254)	(1.746)	(-0.358)	(-0.471)	(3.200)			
	backward	0.824***	0.279***	0.0704	-0.00527	2.537	1.943***	38	0.899	0.276
		(19.25)	(4.221)	(1.622)	(-0.389)	(1.050)	(3.233)			
	forward	0.837***	0.266***	0.0824*	-0.00667	1.533	1.871**	38	0.866	0.289
		(12.70)	(2.926)	(1.960)	(-0.534)	(1.046)	(1.979)			
Chile	current	0.590***	0.272***	0.0794***	0.0103	5.970**	1.549***	40	0.779	0.313
		(8.535)	(5.393)	(4.675)	(0.488)	(2.195)	(6.149)			
	backward	0.619***	0.246***	0.0779***	0.0221	-1.169	1.463***	38	0.873	0.170
		(10.65)	(5.050)	(4.188)	(1.060)	(-0.396)	(7.362)			
	forward	0.511***	0.331***	0.0753**	0.00238	-6.831	1.941***	38	0.699	0.396
		(8.137)	(6.090)	(2.092)	(0.0795)	(-0.848)	(6.904)			
Czech Republic	current	0.838***	0.0625***	0.0505***	-0.0371***	-1.473**	0.450***	40	0.940	0.274
		(25.39)	(3.392)	(4.637)	(-3.310)	(-2.187)	(4.202)			
	backward	0.833***	0.0797***	0.0322***	-0.0265*	1.039*	0.470***	38	0.921	0.299
		(14.10)	(7.352)	(2.742)	(-1.851)	(1.771)	(3.037)			
	forward	0.869***	0.0834***	0.0359***	-0.0412***	-0.373	0.423***	38	0.934	0.262
		(22.41)	(5.254)	(3.023)	(-5.077)	(-0.550)	(3.363)			
Hungary	current	0.822***	0.142**	0.0623***	-0.0869**	-2.304	1.203**	38	0.590	0.588
		(13.43)	(2.162)	(2.800)	(-2.541)	(-0.822)	(2.023)			
	backward	0.826***	0.118**	0.0651***	-0.0822**	0.577	1.216**	38	0.591	0.457
		(13.02)	(2.001)	(3.167)	(-2.350)	(0.325)	(2.072)			
	forward	0.711***	0.0632	0.0543**	-0.106***	-4.994	2.411***	35	0.590	0.420
		(10.19)	(0.852)	(2.056)	(-2.579)	(-1.258)	(3.642)			
Mexico	current	0.534***	0.628***	0.0777**	0.0579	-5.794**	2.756***	40	0.618	0.199
		(5.929)	(4.144)	(1.988)	(1.241)	(-2.056)	(3.902)			
	backward	0.605***	0.0924	-0.00868	-0.0435	3.443*	2.786***	38	0.419	0.414
		(7.118)	(0.395)	(-0.213)	(-0.940)	(1.783)	(4.450)			
	forward	0.641***	0.437*	0.106**	0.0748	9.009***	2.269***	38	0.814	0.564
		(7.681)	(1.842)	(2.010)	(1.198)	(3.023)	(3.950)			
Poland	current	0.934***	0.254***	0.00782	-0.00329	3.938*	0.299	41	0.971	0.514
		(27.59)	(3.967)	(0.590)	(-0.222)	(1.876)	(1.516)			
	backward	0.815***	0.0303	-0.00364	0.0307***	3.214*	0.823***	38	0.960	0.302
		(34.29)	(0.544)	(-0.326)	(2.690)	(1.920)	(6.448)			
	forward	0.957***	0.264***	0.0144	-0.00221	5.589*	0.210	37	0.973	0.270
		(44.26)	(6.755)	(1.051)	(-0.180)	(1.759)	(1.397)			
Thailand	current	0.918***	0.107***	0.00587	-0.0257*	-3.988***	0.0964	40	0.928	0.234
		(22.76)	(6.739)	(0.478)	(-1.953)	(-5.262)	(1.024)			
	backward	0.905***	0.0984***	0.0181*	-0.0488***	-4.044***	0.135*	38	0.929	0.259
		(26.30)	(5.795)	(1.688)	(-3.183)	(-4.648)	(1.730)			
	forward	0.980***	0.101***	-0.00240	-0.0558**	0.156	-0.0548	38	0.908	0.384
		(14.02)	(3.156)	(-0.181)	(-2.138)	(0.118)	(-0.335)			

Table 2 (continued)

Non-inflation targeters

Country		δ_1	δ_2	δ_3	δ_4	δ_5	δ_0	Obs.	R^2	Hansen J test: P-value
Argentina	current	0.842***	-0.0327	0.0865	0.0841***	-11.52	1.635**	39	0.624	0.967
		(12.23)	(-0.308)	(1.477)	(3.975)	(-0.927)	(2.276)			
	backward	0.917***	-0.107	0.120*	0.0987***	3.589	0.813	38	0.625	0.900
		(12.29)	(-0.766)	(1.653)	(4.633)	(0.359)	(1.071)			
	forward	0.813***	0.00541	0.0620	0.0684***	3.185	1.483**	38	0.599	0.720
		(11.05)	(0.0384)	(1.163)	(2.985)	(0.435)	(2.179)			
Croatia	current	0.620***	-0.0110	0.129***	-0.485*	2.761	1.140**	40	0.345	0.270
		(4.281)	(-0.0621)	(3.313)	(-1.878)	(1.130)	(2.414)			
	backward	0.605***	0.0130	0.109***	-0.452	-0.848	1.235**	38	0.368	0.219
		(4.066)	(0.0593)	(2.632)	(-1.604)	(-0.265)	(2.453)			
	forward	0.294**	0.260*	0.0885*	-0.744**	-0.222	2.643***	38	0.252	0.552
		(2.329)	(1.794)	(1.850)	(-2.480)	(-0.0852)	(5.531)			
Hong Kong	current	0.630***	0.170**	-0.0160	0.0553	-2.589**	0.591***	40	0.540	0.421
		(8.537)	(2.176)	(-0.894)	(1.120)	(-2.530)	(3.496)			
	backward	0.555***	0.349***	-0.00578	0.122**	-3.851***	0.749***	38	0.562	0.155
		(6.210)	(3.745)	(-0.253)	(2.036)	(-5.466)	(3.714)			
	forward	0.662***	0.139**	-0.0164	0.0710	0.766	0.451***	36	0.580	0.386
		(11.46)	(2.075)	(-1.003)	(1.342)	(0.845)	(2.774)			
Malaysia	current	0.810***	0.00365	0.00714	0.0119**	-2.699***	0.552***	40	0.829	0.347
		(12.85)	(0.204)	(1.516)	(2.174)	(-2.839)	(3.059)			
	backward	0.856***	0.0290*	0.00526	0.00485	0.408	0.437**	38	0.765	0.627
		(12.73)	(1.668)	(0.940)	(0.720)	(0.544)	(2.173)			
	forward	0.828***	-0.0165	0.0181***	0.00490*	0.573*	0.511***	34	0.765	0.508
		(17.72)	(-1.590)	(6.202)	(1.673)	(1.746)	(3.715)			
Russian Federation	current	0.671***	0.255***	0.0413	0.0691	0.661	1.304***	39	0.491	0.590
		(9.198)	(2.700)	(1.561)	(1.526)	(0.299)	(2.960)			
	backward	0.631***	0.290**	0.0290	0.0782	-3.082	1.591***	38	0.474	0.282
		(7.805)	(2.439)	(0.913)	(1.234)	(-1.389)	(3.194)			
	forward	0.521***	0.375***	-0.0175	0.162**	-4.897	2.010***	38	0.457	0.392
		(6.440)	(3.286)	(-0.484)	(2.455)	(-1.291)	(3.659)			
Singapore	current	0.981***	0.00752	0.00229	-0.0809***	0.709	0.00531	40	0.895	0.571
		(34.91)	(0.391)	(1.477)	(-3.309)	(0.266)	(0.119)			
	backward	0.980***	0.0121	0.00288***	-0.0882***	-5.087***	0.0355	38	0.896	0.336
		(42.86)	(0.876)	(2.579)	(-4.812)	(-4.924)	(1.071)			
	forward	0.995***	-0.00441	0.00513**	-0.102***	1.545	0.0112	38	0.879	0.409
		(24.42)	(-0.199)	(2.044)	(-3.361)	(0.271)	(0.155)			

GMM instrumental variables estimates of equation (5) with quarterly data. The list of instruments includes the lagged values of the explanatory variables and the lagged value of the change in log of the commodity price index. The number of lag for instrumentation does not exceed 4 periods. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid. ***, **, * indicate the statistical significance at 1, 5 and 10% restively.

47. Appendix table 6 provides the estimates results of the panel analysis. We estimate the central bank's reaction function for inflation targeters and non-targeters, as groups. To ensure the robustness of our results, three specifications are considered: (i) simple OLS estimates; (ii) GMM instrumental variables estimates to account for endogeneity; and (iii) GMM estimates on

the period prior to the 2008/2009 financial crisis, to exclude the unusual monetary policy measures of this period. Besides, we run both backward and forward specifications[13]. Overall, the panel data estimates show that on average, central banks in inflation targeting countries raise the short interest rate in response to past financial imbalances (that is, only the backward model holds). There is no response within non-inflation targeters. This is in line with the previous findings.

V - Conclusion

48. This study deals with two issues: first, we conduct a comparative analysis on the state of the financial system among inflation targeting countries and non-targeters. Second, we investigate whether, as suggested (particularly since the recent financial crisis), inflation targeting monetary policy strategy is less responsive to financial imbalances relative to other monetary policy framework. To this end, we build a composite index in order to get a more complete and comprehensive definition of the financial instability. We estimate the effect of adopting inflation targeting on financial instability. We further estimate central banks reaction functions, augmented with a financial indicator, by country and by groups of targeters versus non-targeters.

49. The empirical tests have been conducted on a sample of 13 emerging countries including 7 inflation targeters, using quarterly data over the period 2000Q1 - 2010Q4. The findings evidence that the financial sector in inflation targeting countries is, on average, more unstable comparatively to that of non-targeters. Inflation targeting central banks seem to be responsive to financial imbalances, and even to a larger extent than non-inflation targeters.

50. These results raise some relevant issues. First, our findings are against the view that inflation targeting countries are too focused on their inflation objective and discard the potential imbalances in the financial sector. Second, our mixed findings (that despite their concern with financial stability, inflation targeting countries face higher imbalances) can be instructive. It suggests that using the same instrument (the short term interest rate) to achieve the inflation objective and intervene in the financial system might be misleading and inefficient. It also highlight the need for and the relevance of a broader framework and complementary policies in emerging countries inflation targeters, such as a well integrated macro-prudential policy which will aim to tackle domestic and external financial risks.

[13] As discussed previously, the current model might be misleading.

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Appendix

Appendix table 1: Weighted loadings of the PCA

COUNTRY	Share price index	Capital flows	Systemic liquidity	Interest rate spread	Credit growth	Currency mismatch
Argentina	0,1422	0,293	0,2715	-0,155	0,0321	-0,168
Brazil	0,1798	0,1806	0,1398	-0,1668	0,0563	0,0622
Chile	0,0008	0,1139	-0,0295	0,2065	0,0665	0,1229
Croatia	0,1423	0,1698	-0,144	0,175	0,1974	0,0601
Czech Republic	0,1377	0,0086	0,1679	0,1233	0,1276	0,1122
Hong Kong	0,2739	0,2088	-0,2298	0,1641	0,2539	0,0838
Hungary	0,1513	0,0953	0,1489	0,0673	0,0755	-0,0337
Malaysia	0,1113	-0,0083	-0,263	-0,0963	0,2101	0,0536
Mexico	0,1333	0,1343	0,1325	0,0735	-0,0029	0,0265
Poland	0,1238	0,0335	0,1741	0,111	0,1451	0,0226
Russian Federation	0,1477	0,1611	0,1439	-0,0118	0,0079	0,1418
Singapore	0,0316	0,147	-0,2056	0,1963	0,0428	-0,0638
Thailand	-0,0063	0,1436	0,0403	0,244	0,1083	0,2402

COUNTRY	Capital to assets ratio	Credit to GDP	Net foreign assets	M2 to GDP	Nber of factor	Variance explained (%)
Argentina	0,1941	0,2404	0,0938	0,0558	2	75
Brazil	0,0354	0,1708	0,1861	0,156	2	74
Chile	0,1427	0,1241	0,1459	0,1062	3	79
Croatia	0,0414	0,0158	0,1873	0,1548	3	72
Czech Republic	0,0895	0,1709	-0,1012	0,1635	3	90
Hong Kong	-0,2713	0,0052	0,2603	0,251	3	77
Hungary	0,1056	0,136	0,1324	0,1212	3	80
Malaysia	0,2829	0,2562	0,1546	0,2989	3	79
Mexico	0,0662	0,1633	0,1632	0,1101	3	79
Poland	0,2073	0,1686	-0,1491	0,1632	2	74
Russian Federation	-0,1777	0,1914	0,1999	0,1958	2	73
Singapore	0,1802	0,1286	0,2446	0,2636	2	74
Thailand	-0,1397	0,0466	0,1803	0,1428	3	80

Appendix table 2: Correlation matrix of financial instability indicators

	Share price index	Capital flows	Systemic liquidity	Interest rate spread	Credit growth	Currency mismatch	Liabilities/assets	Credit to GDP	Net foreign assets	M2 to GDP
Share price index	1.0000									
Capital flows	0.0736	1.0000								
Systemic liquidity	-0.0440	-0.4536*	1.0000							
Interest rate spread	0.1033*	-0.1989*	-0.1606*	1.0000						
Credit growth	0.0960*	-0.0819	-0.4451*	0.3223*	1.0000					
Currency mismatch	0.0098	0.0026	-0.1271*	-0.1317*	0.7070*	1.0000				
Liabilities/assets	0.4024*	-0.1763*	0.1374*	-0.1973*	-0.4139*	-0.2448*	1.0000			
Credit to GDP	0.0674	0.1599*	-0.1408*	-0.1518*	-0.0672	0.1194*	0.4251*	1.0000		
Net foreign assets	0.0740	0.0881*	0.3223*	-0.1228*	-0.2822*	0.1103*	0.2888*	0.7785*	1.0000	
M2 to GDP	0.0672	0.2309*	-0.1059*	-0.1242*	-0.0775	0.2177*	0.3439*	0.9456*	0.8173*	1.0000

Note: * indicates the statistical significance at a minimum level of 5%

Appendix table 3: Standard Taylor rule estimates

	δ_1	δ_2	δ_3	δ_4	δ_0	Obs.	R^2	F-test	Hansen J test: P-value
					Inflation targeters				
Brazil	0.856***	0.272***	0.107***	-0.00201	1.588***	41	0.887	0	0.612
	(21.81)	(4.015)	(2.825)	(-0.141)	(2.802)				
chile	0.528***	0.304***	0.0747***	0.0153	1.730***	40	0.781	0	0.349
	(8.439)	(6.247)	(3.979)	(0.715)	(7.085)				
Czech Rep.	0.891***	0.0765***	0.0373***	-0.0433***	0.323***	41	0.936	0	0.204
	(23.48)	(4.808)	(3.724)	(-4.113)	(2.807)				
Hungary	0.823***	0.117*	0.0655***	-0.0823**	1.246**	38	0.590	0	0.480
	(14.12)	(1.893)	(3.291)	(-2.398)	(2.252)				
Mexico	0.745***	0.403*	0.0633	0.0378	1.332*	41	0.789	1.43e-08	0.727
	(8.810)	(1.684)	(1.212)	(0.657)	(1.847)				
Poland	0.913***	0.240***	0.0199	0.000409	0.395**	41	0.969	0	0.455
	(26.58)	(3.930)	(1.173)	(0.0266)	(2.074)				
Thailand	0.961***	0.107***	-0.00934	-0.0386*	-0.0139	41	0.912	0	0.143
	(17.59)	(3.695)	(-0.664)	(-1.930)	(-0.109)				
					Non-inflation targeters				
Argentina	0.810***	0.0649	0.0744***	0.0619***	1.641***	28	0.876	0	0.716
	(35.65)	(1.526)	(5.208)	(3.303)	(7.708)				
Hong Kong	0.609***	0.180**	-0.0197	0.0471	0.642***	40	0.545	8.06e-11	0.300
	(7.735)	(2.113)	(-0.831)	(0.909)	(2.973)				
Croatia	0.587***	-0.0246	0.116***	-0.425*	1.287***	40	0.355	0.000133	0.484
	(4.127)	(-0.138)	(3.488)	(-1.717)	(2.813)				
Malaysia	0.865***	0.0137	0.00645	-0.000657	0.396*	40	0.765	0	0.516
	(12.67)	(0.855)	(1.272)	(-0.105)	(1.959)				
Russian Fed.	0.616***	0.226*	0.0294	0.122**	1.665***	41	0.505	9.54e-09	0.122
	(6.974)	(1.833)	(0.902)	(2.020)	(2.883)				
Singapore	0.968***	0.000810	0.00179	-0.0717**	0.0126	40	0.895	0	0.337
	(29.40)	(0.0355)	(0.982)	(-2.466)	(0.266)				

GMM instrumental variables estimates of equation (4) with quarterly data. The list of instruments includes the lagged values of the explanatory variables and the lagged value of the change in log of the commodity price index. The number of lag for instrumentation does not exceed 4 periods. The F test is a test of the null hypothesis that all the coefficients, except the constant, are jointly significant. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid. ***, **, * indicate the statistical significance at 1, 5 and 10% restively.

Appendix table 4: Central banks reaction to financial instability indicators, ITers and non-ITers

Inflation targeters

Country		δ_1	δ_2	δ_3	δ_4	δ_5	δ_0	Obs.	R^2	Hansen J test: P-value
Brazil	Credit growth	0.847***	0.288***	0.118***	-0.0109	0.0824*	1.609***	41	0.890	0.614
		(23.04)	(4.515)	(3.290)	(-0.878)	(1.866)	(3.052)			
	Syst. liquidity	0.854***	0.232***	0.105***	-0.00521	2.113	1.633***	41	0.892	0.631
		(20.66)	(3.215)	(2.836)	(-0.396)	(0.693)	(2.900)			
	Share p. index	0.816***	0.299***	0.116***	0.0154	-0.00873	2.158***	41	0.888	0.441
		(22.69)	(4.732)	(3.107)	(0.746)	(-1.383)	(4.203)			
	Curr. mismatch	0.854***	0.269***	0.121***	-0.00486	1.628	1.552**	41	0.887	0.596
		(18.69)	(4.167)	(3.344)	(-0.362)	(0.690)	(2.501)			
chile	Credit growth	0.514***	0.327***	0.0782***	0.00716	0.0677***	1.767***	40	0.788	0.265
		(10.29)	(8.138)	(4.910)	(0.379)	(4.039)	(9.405)			
	Syst. liquidity	0.516***	0.303***	0.0750***	0.0139	-0.672	1.773***	40	0.782	0.514
		(9.593)	(6.811)	(3.932)	(0.745)	(-0.268)	(7.881)			
	Share p. index	0.544***	0.292***	0.0520***	0.0127	0.00689***	1.655***	40	0.781	0.193
		(10.02)	(6.587)	(2.645)	(0.602)	(3.187)	(7.766)			
	Curr mismatch	0.479***	0.301***	0.0653***	0.0166	4.134***	1.900***	40	0.799	0.532
		(10.86)	(8.263)	(3.069)	(0.824)	(4.308)	(10.50)			
Czech Rep.	Credit growth	0.901***	0.0710***	0.0322***	-0.0371***	0.0133	0.286***	41	0.938	0.388
		(25.78)	(4.546)	(3.074)	(-3.316)	(1.053)	(2.704)			
	Syst. liquidity	0.877***	0.0599***	0.0395***	-0.0414***	1.269	0.352***	41	0.940	0.208
		(24.92)	(2.939)	(4.199)	(-3.811)	(1.212)	(3.565)			
	Share p. index	0.912***	0.0523***	0.0291***	-0.0339***	0.00786***	0.229**	41	0.956	0.161
		(29.40)	(3.276)	(3.639)	(-3.707)	(4.776)	(2.478)			
	Curr mismatch	0.826***	0.0383**	0.00181	-0.0166*	1.479***	0.460***	41	0.948	0.437
		(26.85)	(2.400)	(0.173)	(-1.909)	(5.249)	(5.156)			
Hungary	Credit growth	0.800***	0.110**	0.0634***	-0.0719**	-0.0203	1.447***	38	0.593	0.538
		(13.70)	(2.209)	(2.974)	(-2.133)	(-1.146)	(2.656)			
	Syst. liquidity	0.762***	0.0589	0.0699***	-0.0884**	-1.767	1.897***	38	0.596	0.465
		(12.09)	(1.024)	(3.518)	(-2.242)	(-1.048)	(3.204)			
	Share p. index	0.546***	0.283***	0.0874***	-0.0767***	-0.0366***	3.290***	38	0.666	0.107
		(6.852)	(5.129)	(5.369)	(-2.662)	(-5.764)	(4.881)			
	Curr mismatch	0.747***	0.0428	0.0388**	-0.0714**	1.154**	2.029***	38	0.578	0.164
		(14.07)	(0.742)	(2.164)	(-2.463)	(2.404)	(4.067)			
Mexico	Credit growth	0.751***	0.529**	0.0384	0.0378	0.0896**	1.068	41	0.796	0.576
		(9.955)	(2.285)	(0.817)	(0.644)	(1.987)	(1.641)			
	Syst. liquidity	0.753***	0.375	0.0798	0.0619	-4.632	1.277**	41	0.796	0.628
		(9.224)	(1.628)	(1.372)	(0.937)	(-1.183)	(1.969)			
	Share p. index	0.831***	0.237	0.0185	-0.0758	0.0172**	0.907	41	0.802	0.108
		(10.26)	(1.090)	(0.311)	(-0.998)	(2.358)	(1.340)			
	Curr mismatch	0.867***	0.318	-0.0260	-0.0285	-1.449*	0.508	41	0.802	0.267
		(11.95)	(1.494)	(-0.398)	(-0.438)	(-1.940)	(0.834)			
Poland	Credit growth	0.916***	0.249***	0.0133	-0.0138	0.0996***	0.349**	41	0.968	0.353
		(33.76)	(4.309)	(0.958)	(-0.825)	(3.264)	(2.140)			
	Syst. liquidity	0.960***	0.0895	0.00919	0.00812	0.934***	0.183	41	0.974	0.444
		(38.11)	(1.601)	(0.648)	(0.672)	(4.230)	(1.262)			
	Share p. index	0.958***	0.238***	0.00330	-0.0122	0.0121***	0.109	41	0.975	0.268
		(30.06)	(4.644)	(0.222)	(-0.969)	(3.642)	(0.575)			
	Curr mismatch	0.904***	0.203***	0.0225	0.00731	-1.029	0.409**	41	0.968	0.496
		(26.91)	(2.847)	(1.350)	(0.458)	(-0.634)	(2.262)			
Thailand	Credit growth	0.865***	0.124***	0.0210**	-0.0318**	-0.0612**	0.232**		0.919	0.134
		(19.33)	(7.368)	(2.212)	(-2.414)	(-2.405)	(2.190)			
	Syst. liquidity	0.912***	0.101***	0.00867	-0.0311**	3.036	0.106	39	0.917	0.174
		(23.45)	(5.977)	(0.722)	(-2.098)	(1.630)	(1.271)			
	Share p. index	0.940***	0.0784***	0.00868	-0.0386**	0.00576**	0.0745	39	0.920	0.203
		(21.89)	(3.745)	(0.631)	(-2.418)	(2.221)	(0.876)			

	Curr mismatch	0.986***	0.0565***	0.0274***	-0.0460***	1.904***	0.00482	39	0.922	0.508
		(29.68)	(3.310)	(3.060)	(-3.917)	(5.717)	(0.0772)			

Non-inflation targeters

Country		δ_1	δ_2	δ_3	δ_4	δ_5	δ_0	Obs.	R^2	Hansen J test: P-value
Argentina	Credit growth	0.842***	-0.0464	0.0997**	0.0602***	0.160	1.379**	39	0.614	0.987
		(14.84)	(-0.437)	(2.573)	(3.333)	(1.567)	(2.471)			
	Syst. liquidity	0.822***	0.0480	0.0742	0.0755	-0.141	1.557**	41	0.597	0.857
		(12.36)	(0.273)	(1.131)	(1.585)	(-0.0999)	(2.210)			
	Share p. index	0.865***	0.147	0.0188	0.100***	-0.0218	1.273	41	0.586	0.771
		(9.314)	(0.842)	(0.226)	(3.195)	(-0.978)	(1.257)			
	Curr mismatch	0.793***	0.136	0.103	0.0854***	1.374	1.726	41	0.602	0.838
		(10.58)	(0.931)	(1.568)	(4.081)	(0.318)	(1.636)			
Hong Kong	Credit growth	0.640***	0.195**	-0.0282	0.0547	-0.0467	0.466***	40	0.535	0.402
		(8.844)	(2.397)	(-1.384)	(1.106)	(-1.074)	(2.608)			
	Syst. liquidity	0.554***	0.104	-0.0172	0.00162	0.167**	0.756***	40	0.548	0.449
		(6.772)	(1.529)	(-0.829)	(0.0349)	(2.208)	(3.590)			
	Share p. index	0.621***	0.174**	-0.0194	0.0421	-0.000717	0.540**	40	0.543	0.449
		(7.436)	(2.373)	(-0.765)	(0.631)	(-0.0799)	(2.575)			
	Curr mismatch	0.759***	0.0686	0.0111	-0.0423	-21.21	0.480**	41	0.587	0.828
		(9.386)	(0.863)	(0.324)	(-0.745)	(-1.219)	(2.001)			
Croatia	Credit growth	0.513***	0.142	0.117***	-0.408*	-0.00223	1.694***	40	0.376	0.423
		(3.743)	(1.071)	(3.646)	(-1.913)	(-1.072)	(3.759)			
	Syst. liquidity	0.673***	0.172	0.116***	-0.620***	0.0586	1.187***	39	0.392	0.568
		(5.329)	(1.441)	(4.191)	(-2.967)	(0.0235)	(2.682)			
	Share p. index	0.559***	0.111	0.124***	-0.543**	-3.87e-05	1.494***	40	0.372	0.487
		(4.272)	(0.705)	(3.287)	(-2.043)	(-0.00599)	(3.419)			
	Curr mismatch	0.532***	0.0909	0.0999***	-0.395	9.659**	1.474***	40	0.401	0.664
		(4.113)	(0.619)	(3.051)	(-1.532)	(2.193)	(3.481)			
Malaysia	Credit growth	0.860***	0.0167	0.00639	-0.000582	0.000353	0.412**	40	0.766	0.712
		(12.24)	(1.135)	(1.383)	(-0.116)	(0.0252)	(1.998)			
	Syst. liquidity	0.870***	-0.00469	0.0123**	0.00563	0.950*	0.372**	39	0.788	0.628
		(13.99)	(-0.265)	(2.203)	(0.994)	(1.684)	(2.076)			
	Share p. index	0.770***	0.0517***	0.00119	0.00825	0.00559***	0.667***	40	0.813	0.206
		(11.50)	(2.796)	(0.272)	(1.425)	(2.868)	(3.478)			
	Curr mismatch	0.875***	0.00489***	0.00919**	-0.00132	0.113	0.362**	40	0.771	0.562
		(14.91)	(0.351)	(1.984)	(-0.199)	(0.650)	(2.101)			
Russian Fed.	Credit growth	0.638***	0.320***	0.0227	0.0992*	0.0740	1.674***	40	0.517	0.471
		(11.59)	(4.642)	(1.041)	(1.710)	(0.766)	(5.091)			
	Syst. liquidity	0.604***	0.127	0.0215	0.125**	7.186*	2.006***	40	0.546	0.619
		(7.833)	(1.007)	(0.846)	(2.390)	(1.899)	(4.180)			
	Share p. index	0.655***	0.0115	0.0707**	0.209***	-0.0248***	1.707***	41	0.573	0.423
		(7.894)	(0.121)	(2.569)	(3.540)	(-3.720)	(3.541)			
	Curr mismatch	0.515***	0.223***	0.0482**	0.377***	-6.715***	2.312***	41	0.597	0.180
		(6.586)	(2.970)	(1.965)	(5.554)	(-5.526)	(5.307)			
Singapore	Credit growth	0.978***	0.00141	0.00159	-0.0768***	-0.00153	-0.00735	40	0.896	0.456
		(30.94)	(0.0618)	(0.972)	(-2.737)	(-0.154)	(-0.152)			
	Syst. liquidity	1.002***	-0.00639	0.00324	-0.0884***	0.189*	-0.0121	40	0.892	0.367
		(27.71)	(-0.240)	(1.609)	(-2.752)	(1.674)	(-0.254)			
	Share p. index	0.984***	0.00354	0.00199	-0.0805***	0.000517	0.0112	40	0.894	0.605
		(42.18)	(0.224)	(1.075)	(-4.268)	(0.285)	(0.292)			
	Curr mismatch	0.982***	0.00859	0.00192	-0.0753***	8.828	0.00341	41	0.894	0.470
		(35.84)	(0.492)	(1.020)	(-2.996)	(0.393)	(0.0787)			

GMM instrumental variables estimates of equation (5) with quarterly data. The list of instruments includes the lagged values of the explanatory variables and the lagged value of the change in log of the commodity price index. The number of lag for instrumentation does not exceed 4 periods. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid. ***, **, * indicate the statistical significance at 1, 5 and 10% restively.

Appendix table 5 : Central banks reaction to macro-financial instability (non-linear analysis)

Country		δ_1	δ_2	δ_3	δ_4	δ_5	δ_0	Obs.	R^2	Hansen J test: P-value
Chile	Current	0.558***	0.314***	0.0784***	0.0185	0.508*	1.425***	40	0.779	0.209
		(9.485)	(6.275)	(4.692)	(0.909)	(1.738)	(5.455)			
Czech Republic	Backward	0.929***	0.0249*	0.0270***	-0.0174**	0.597***	-0.103	39	0.941	0.414
		(23.08)	(1.866)	(2.860)	(-2.223)	(4.828)	(-0.747)			
Mexico	Backward	0.625***	-0.00660	-0.0130	-0.0481	NA	2.777***	39	0.623	0.343
		(10.80)	(-0.0311)	(-0.324)	(-1.003)		(7.739)			
Poland	Backward	0.847***	0.117***	0.00376	0.0327***	0.437**	0.499***	39	0.970	0.332
		(38.89)	(2.584)	(0.383)	(3.070)	(2.094)	(3.361)			
Poland	Forward	0.922***	0.270***	0.0174	-0.00552	-0.174	0.390**	38	0.974	0.342
		(36.54)	(6.651)	(1.025)	(-0.395)	(-0.536)	(2.360)			
Malaysia	Forward	0.903***	-0.00500	0.00932*	0.00527	-0.0143	0.267*	35	0.781	0.873
		(17.46)	(-0.609)	(1.776)	(1.311)	(-0.230)	(1.838)			

GMM instrumental variables estimates of equation (5) with quarterly data. The list of instruments includes the lagged values of the explanatory variables and the lagged value of the change in log of the commodity price index. The number of lag for instrumentation does not exceed 6 periods. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid. ***, **, * indicate the statistical significance at 1, 5 and 10% restively.

Appendix table 6: Central banks reaction to macro-financial instability, group estimates, ITers versus non-ITers

Group		δ_1	δ_2	δ_3	δ_4	δ_5	δ_0	Obs.	R^2	Hansen J test: P-value
					Backward specification					
ITers	OLS	0.806***	0.153**	0.0400**	-0.0103	1.726*	1.026***	266	0.843	
		(23.14)	(3.252)	(2.454)	(-0.693)	(2.412)	(4.398)			
	GMM	0.938***	0.126***	0.0415***	-0.0146	2.848***	0.238***	250	0.956	0.463
		(86.80)	(5.383)	(3.681)	(-1.601)	(3.482)	(3.442)			
	GMM prior 2008 crisis	0.944***	0.132***	0.0378***	-0.0275**	2.914***	0.231**	189	0.963	0.155
		(62.70)	(4.089)	(2.648)	(-2.280)	(2.698)	(2.565)			
Non-ITers	OLS	0.889***	-0.181	0.0564	0.0693***	-3.521**	0.591*	228	0.604	
		(13.43)	(-1.458)	(1.200)	(15.56)	(-3.545)	(2.387)			
	GMM	0.777***	0.0434	0.0284*	0.0419	-1.924	0.719***	216	0.659	0.767
		(20.38)	(0.593)	(1.740)	(1.160)	(-1.229)	(4.774)			
	GMM prior 2008 crisis	0.763***	0.0244	0.0265	0.0259	-2.749	0.730***	162	0.658	0.808
		(16.82)	(0.286)	(1.421)	(0.632)	(-1.103)	(3.948)			
					Forward specification					
ITers	OLS	0.848***	0.152***	0.0526**	-0.0102	-0.0705	0.826*	270	0.861	
		(14.93)	(4.070)	(3.137)	(-0.820)	(-0.0518)	(1.992)			
	GMM	0.936***	0.115***	0.0422***	-0.0160*	0.579	0.235***	235	0.954	0.134
		(76.86)	(5.061)	(3.425)	(-1.665)	(0.403)	(3.001)			
	GMM prior 2008 crisis	0.924***	0.118***	0.0242**	-0.0261***	-1.784	0.369***	193	0.963	0.205
		(90.49)	(5.884)	(2.147)	(-2.876)	(-1.586)	(5.477)			
Non-ITers	OLS	0.859***	-0.151	0.0334	0.0542***	0.518	0.639*	234	0.589	
		(13.29)	(-1.184)	(1.425)	(6.789)	(0.430)	(2.136)			
	GMM	0.862***	-0.0176	0.0221	0.0788***	1.241	0.466**	222	0.681	0.692
		(20.07)	(-0.344)	(1.507)	(3.393)	(0.780)	(2.442)			
	GMM prior 2008 crisis	0.845***	-0.0343	0.0269**	0.0642***	0.893	0.523***	192	0.681	0.669
		(19.63)	(-0.578)	(2.062)	(2.955)	(0.574)	(2.744)			

GMM instrumental variables estimates of equation (5) with quarterly data. The list of instruments includes the lagged values of the explanatory variables and the lagged value of the change in log of the commodity price index. The number of lag for instrumentation does not exceed 6 periods. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid. ***, **, * indicate the statistical significance at 1, 5 and 10% restively.

Appendix table 7: Sample

Non-inflation targeters	**Inflation targeters**
Argentina	Brazil (1999M6)
Croatia	Chile (1999M1)
Hong Kong	Czech Republic (1997M12)
Malaysia	Hungary (2001M6)
Russian Federation	Mexico (2001M1)
Singapore	Poland (1998M10)
	Thailand (2000M5)

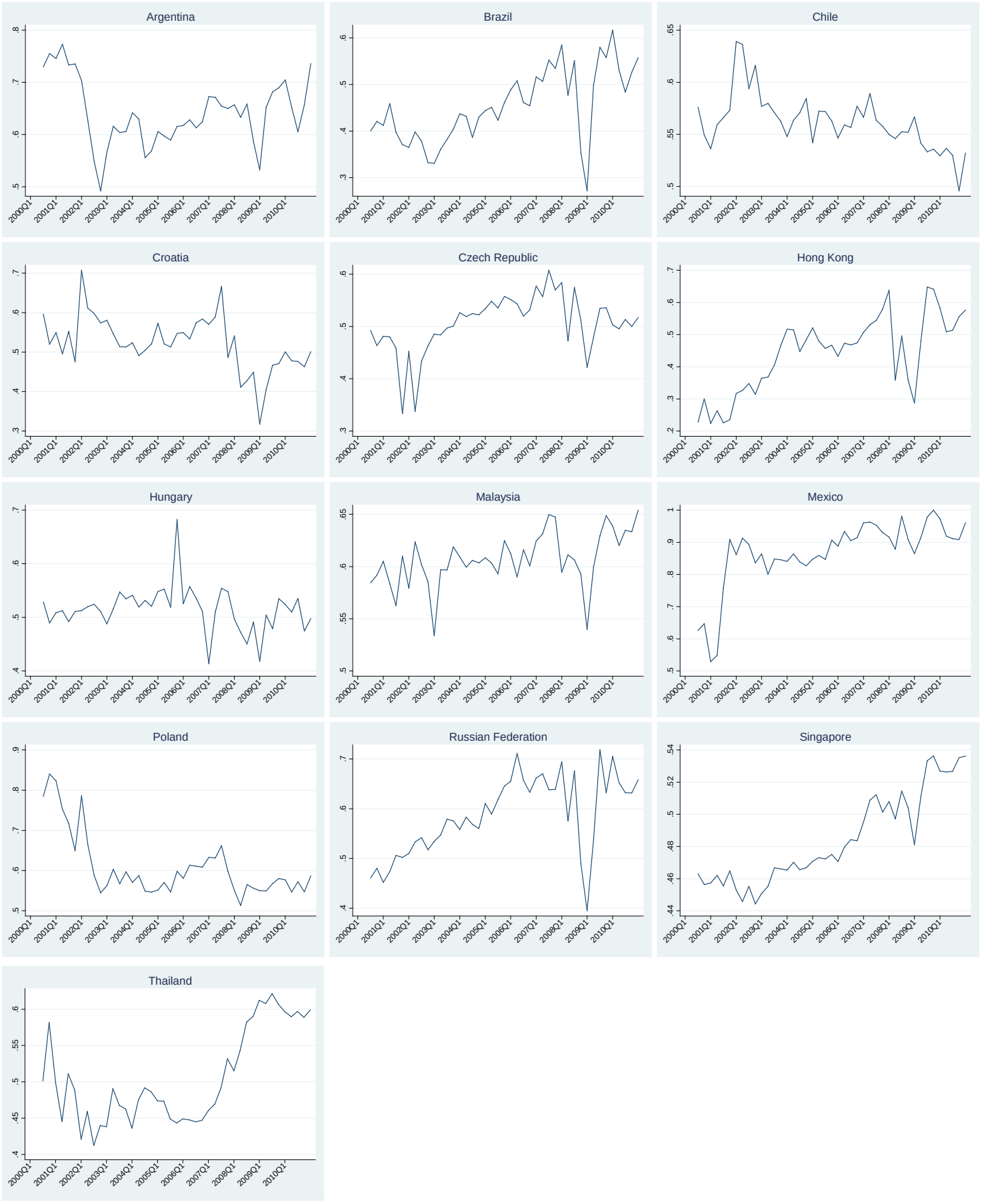
Inflation targeting effective adoption date in parentheses (Roger, 2009)

Appendix table 8: Variables included and their sources

Variable	Definition	Source
MFCI (financial instability index)	PCA on a set of financial instability indicators	Author calculation
Credit growth	Growth rate of banking system claims on private sector	IFS and central banks statistics
Bank liabilities and assets	Total liabilities of the banking system (excluding reserves and equity) and assets of the banking system	IFS and central banks statistics
Total deposit	Stock of banking system deposit money	IFS and central banks statistics
Bank foreign assets and liabilities	Banking system total foreign assets and liabilities	BIS and central banks statistics
Bank foreign currency denominated assets and liabilities	Banking system total assets and liabilities denominated in foreign currency	BIS and central banks statistics
Lending interest rate	Bank rate that usually meets the short and medium-term financing needs of the private sector	IFS
Short term interest rate	Money market rate	IFS
Share price index	Synthetic price index of the common shares of companies traded on national or foreign stock exchange	IFS
M2	M2 aggregate	IFS
GDP	Gross domestic product	IFS
Net foreign assets	Banking system net position with nonresidents	IFS
Inflation rate	CPI based inflation	IFS
Exchange rate	Nominal exchange rate	IFS
Currency crisis	Dummy variable = 1 if the country considered face a currency crisis at a given period	Reinhart and Rogoff (2011)
Stock market crash	Dummy variable = 1 if the country considered face a stock market crash at a given period	Reinhart and Rogoff (2011)
Law and order	Law and order index	ICRG (2009)
Economic stability	Index of economic stability	ICRG (2009)

IFS: International Financial Statistics, BIS: Bank for International Settlements, ICRG: International Country Risk Guide

Appendix figure 1: The macro-financial condition index



Appendix figure 2: Credit growth, share price index, interest rate spread, currency mismatch, capital flows, MFCI – ITers versus Non-ITers