# Credit at Times of Stress: Latin American Lessons from the Global Financial Crisis

**Carlos Montoro and Liliana Rojas-Suarez**

## Abstract

The financial systems in emerging market economies during the 2008–09 global financial crisis performed much better than in previous crisis episodes, albeit with significant differences across regions. For example, real credit growth in Asia and Latin America was less affected than in Central and Eastern Europe. This paper identifies the factors at both the country and the bank levels that contributed to the behavior of real credit growth in Latin America during the global financial crisis. The resilience of real credit during the crisis was highly related to policies, measures and reforms implemented in the pre-crisis period. In particular, we find that the best explanatory variables were those that gauged the economy's capacity to withstand an external financial shock. Key were balance sheet measures such as the economy's overall currency mismatches and external debt ratios (measuring either total debt or short-term debt). The quality of pre-crisis credit growth mattered as much as its rate of expansion. Credit expansions that preserved healthy balance sheet measures (the "quality" dimension) proved to be more sustainable. Variables signalling the capacity to set countercyclical monetary and fiscal policies during the crisis were also important determinants. Moreover, financial soundness characteristics of Latin American banks, such as capitalization, liquidity and bank efficiency, also played a role in explaining the dynamics of real credit during the crisis. We also found that foreign banks and banks which had expanded credit growth more before the crisis were also those that cut credit most. The methodology used in this paper includes the construction of indicators of resilience of real credit growth to adverse external shocks in a large number of emerging markets, not just in Latin America. As additional data become available, these indicators could be part of a set of analytical tools to assess how emerging market economies are preparing themselves to cope with the adverse effects of global financial turbulence on real credit growth.

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**Latin American Lessons from the Global Financial Crisis**

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# 1. Introduction

Since mid-2011, uncertainties in the global economy have increased significantly. A combination of unresolved sovereign debt problems in Europe and concerns about the lackluster behavior of the US economy have resulted in investors' increased perception of risk and a *flight to quality* towards assets considered the safest, especially US Treasuries. In the current environment, the possibility of a deep adverse shock affecting world trade and global liquidity cannot be discarded. Indeed, for a large number of emerging market economies, including many in Latin America, the largest threat to their economic and financial stability comes from potential disruptive events in developed countries.

The potential of a sharp and sustained decline in real credit growth stands out as a major concern for Latin American policymakers if a new international financial crisis were to materialize. The implications of a deep credit contraction for economic activity, financial stability and social progress are well known to Latin America in the light of its experience with financial crises in the 1980s and 1990s. Major external financial shocks, such as the oil crisis in the early 1980s and the Russian and East Asian crises in the 1990s, had severe and long-lasting financial impacts on the region.

However, and departing from the past, Latin America's good performance during the global crisis of 2008-09 set an important precedent about the region's ability to cope with adverse external shocks. As is well known, the crisis presented a major challenge to the financial stability and period of sustained growth that had characterized the region in 2004-07. Following the collapse of Lehman Brothers in September 2008, skepticism about the fortunes of Latin America ruled. This was not surprising given past events. But in contrast to previous episodes, while the external financial shock of 2008 had an important adverse impact on economic and financial variables in the region, these effects were short-lived. By early 2010, many Latin American countries were back on their path of solid economic growth, financial systems remained solvent, and real credit growth recovered rapidly.

The main objective of this paper is to identify the factors at both the country and the bank levels that contributed to the behavior of real credit growth in Latin America during the global crisis. In doing so, we also aim at contribute to the construction of indicators that can be useful in assessing the degree of resilience of real credit growth to adverse external shocks in a large number of emerging markets, not just in Latin America.

A central argument in this paper is that key factors explaining the behavior of real credit growth in emerging markets in general, and in Latin America in particular, *during* the crisis relate to policies, measures and reforms implemented *before* the crisis. Moreover, this paper argues that even the capacity to *safely* implement countercyclical policies to minimize credit contractions (such as the provision of central bank liquidity) *during* the crisis depended on the countries' initial economic and financial strength. That is, consistent with Rojas-Suarez (2010), this paper argues that initial conditions mattered substantially in defining the financial path followed by Latin America and other emerging markets during and after the external

shock.[1] The pre-crisis period is defined here as the year 2007. This was a relatively *tranquil* year in Latin America and other emerging market economies, in the sense that no major financial crises took place.

To gain some understanding about the factors behind the behavior of real credit growth *at the country (aggregate) level*, we construct a number of indicators that can provide information about the *resilience* of real credit to a severe external financial shock. In identifying variables to form these indicators, a guiding principle was their relevance for emerging markets. Thus, the indicators include, among others, a number of variables that, while particularly important for the behavior of real credit in emerging markets, are not always pertinent for financial variables' behavior in developed countries. The indicators considered covered three areas: macroeconomic performance, regulatory/institutional strength and financial system soundness.

In calculating these indicators, we include not only Latin American countries but also a number of emerging market economies from Asia and Eastern Europe. Comparisons between regions of the developing world are extremely relevant since the impact of the financial crisis was quite different between regions. While real credit growth in Asia proved to be quite resilient to the international crisis, real credit growth in a number of Eastern European countries was severely affected. Latin American lay in the middle, with large disparities in the behavior of real credit growth between *countries* in the region. The discussion in this paper allows for the identification of differences and similarities across emerging regions that led to particular outcomes.

To deal with the behavior of real credit growth during the crisis at the *bank level*, we use bank-specific data to complement aggregate variables. The analysis here is restricted to Latin American countries due to the lack of comparable bank-level information from other regions. However, in contrast to the country-level analysis, the availability of a sufficiently large data set for banks operating in Latin America allowed us to use econometric techniques to assess the relative importance of factors contributing to banks' provision of credit during the crisis. The information derived from the analysis at the *country* level is used here to help identify the variables that enter the regression. A novel finding of the paper is that the strength of some key macroeconomic variables *at the onset of the crisis* (in particular, a ratio of overall currency mismatches and alternative measurements of external indebtedness), together with variables that measure the capacity to set countercyclical policies during the crisis, explained banks' provision of real credit growth during the crisis. We also found a positive impact of sound bank indicators on real credit. That is, banks with the highest ratios

[1] Rojas-Suarez (2010), however, deals only with macroeconomic factors, while this paper tackles a number of other salient financial and structural characteristics of the countries as well as specific features of individual banks.

of capitalization and liquidity *before* the crisis experienced the lowest decline in real credit growth during the crisis. An additional result is that foreign banks and those with larger initial credit growth rates were, after controlling for other factors, the most affected during the crisis in terms of credit behavior.

The rest of the paper is organized as follows. Section 2 briefly reviews the existing literature on determinants of real credit during the global crisis in order to better place the contribution of this paper in that context. Section 3 provides basic data on the behavior of real credit growth in selected emerging market economies in the periods before, during and after the crisis. Section 4 constructs indicators of *resilience* of real credit growth to external financial shocks and applies them to selected countries in Latin America, Emerging Asia and Emerging Europe. The indicators are formed by the three categories of variables specified above, measured at their values during the pre-crisis period. In this section we explore whether countries with lower values of the indicators during the pre-crisis period were also the countries where the provision of real credit was affected the most during the global crisis. This section also enables us to identify which specific variables of the indicators were most correlated to the behavior of real credit growth. Section 5 tackles the issues at the micro level by exploring bank-level information for a set of five Latin American countries. Informed by the results from the analysis in Section 4, econometric techniques are used to assess the relative importance of the alternative factors explaining the behavior of banks' real credit growth during the global crisis. Section 6 concludes the paper.

## 2. Real credit growth in emerging markets during the global financial crisis: a brief literature review

There is a growing literature on the effects of the global financial crisis in emerging market economies. Some of the existing research analyses the effects of pre-crisis conditions on the behavior of credit. To date, however, all of these studies have focused on analyzing country-level information. In the same vein, Hawkins and Klau (2000) report on a set of indicators the BIS has been using since the late 1990s to assess vulnerability in the EMEs based on aggregate information. To the best of our knowledge, ours is the first study that analyses the drivers of real credit growth during the crisis for some emerging market economies using bank-level information.

Aisen and Franken (2010) analyze the performance of bank credit during the 2008 financial crisis using country-level information for a sample of over 80 countries. They find that larger bank credit booms prior to the crisis and lower GDP growth of trading partners were among the most important determinants of the post-crisis credit slowdown. They also find that countercyclical monetary and liquidity policy played a critical role in alleviating bank credit contraction. Moreover, Guo and Stepanyan (2011) find that domestic and foreign funding were among the most important determinants of the evolution of credit growth in emerging market economies during the last decade, covering both pre-crisis and post-crisis periods.

Kamil and Rai (2010) analyze BIS data on international banks' lending to Latin American countries and found that an important factor in Latin America's credit resilience was its low dependence on external funding and high reliance on domestic deposits. Using similar data, Takáts (2010) analyses the key drivers of cross-border bank lending in emerging market economies between 1995 and 2009 and finds that factors affecting the supply of global credit were the main determinant of its slowdown during the crisis.

In studies of other regions, Bakker and Gulde (2010) find that external factors were the main determinants of credit booms and busts in new EU members, but that policy failures also played a critical role. Also, Barajas et al (2010) find that bank-level fundamentals, such as bank capitalization and loan quality, explain the differences in credit growth across Middle Eastern and North African countries during the pre-crisis period.

Some other studies have focused on the behavior of real GDP growth during the crisis in advanced and emerging market economies. For example, Cecchetti et al (2011) find that pre-crisis policy decisions and institutional strength reduced the effects of the financial crisis on output growth. Similarly, Lane and Milesi-Ferretti (2010) find that the pre-crisis level of development, changes in the ratio of private credit to GDP, current account position and degree of trade openness were helpful in understanding the intensity of the crisis' effect on economic activity. In contrast, Rose and Spiegel (2011) find few clear reliable pre-crisis indicators of the incidence of the crisis. Among them, countries with looser credit market regulations seemed to suffer more from the crisis in terms of output loss, whilst countries with lower income and current account surpluses seemed better insulated from the global slowdown.

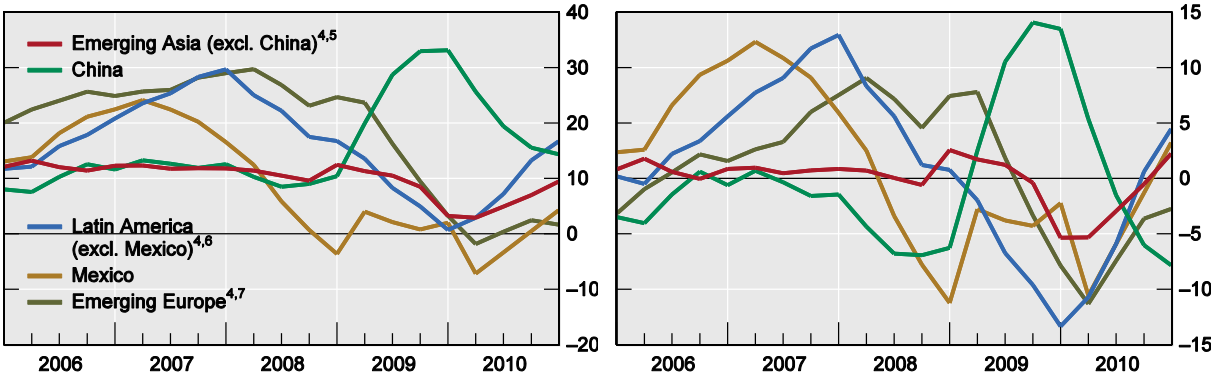
## 3. The behavior of real credit growth in emerging markets during the global financial crisis

The analysis in this paper is based on a sample of 22 countries from three emerging market regions[2]. Countries were selected on the basis of availability of comparable information (not only on credit data, but also on the variables discussed in the next section). Countries from Latin America are: Argentina, Brazil, Chile, Colombia, Mexico and Peru. Emerging Asia is: China, Chinese Taipei, India, Indonesia, Korea, Malaysia, the Philippines and Thailand. Finally, Emerging Europe is: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Romania.

[2] Economies like Hong Kong SAR and Singapore were not included in the sample because, as off-shore centres, some macroeconomic indicators of real credit growth resilience have different relevance in comparison with other emerging market economies.

**Graph 1: Real credit: growth and cycle by regions[1]**

Growth rates[2] Cycle[3]




[1] Domestic bank credit to the private sector; deflated by CPI. [2] Annual changes; in per cent. [3] Gap from Hodrick-Prescott estimated trend (lambda = 1600). [4] Weighted average based on 2009 GDP and PPP exchange rates of the economies listed. [5] Chinese Taipei, India, Indonesia, Korea, Malaysia, Philippines and Thailand. [6] Argentina, Brazil, Chile, Colombia and Peru. [7] Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Romania.

Sources: IMF; national data; BIS calculations.

Graph 1 shows the evolution of real credit growth and the real credit cycle during the crisis by region for the emerging market economies in our sample. There are some characteristics that are important to highlight: (i) The behavior of real credit in China and Mexico differs from those in the other countries in their respective regions. In particular, real credit expanded in China during the crisis while it decreased in the rest of Asia. In the case of Mexico, the recovery of real credit took longer than in the rest of the region. (ii) By the end of 2009, real credit growth and the real credit cycle experienced their lowest levels for most countries, with the exception of countries in Emerging Europe and Mexico. (iii) In most countries, with the exception of China, real credit displayed values below trend after the bankruptcy of Lehman Brothers.

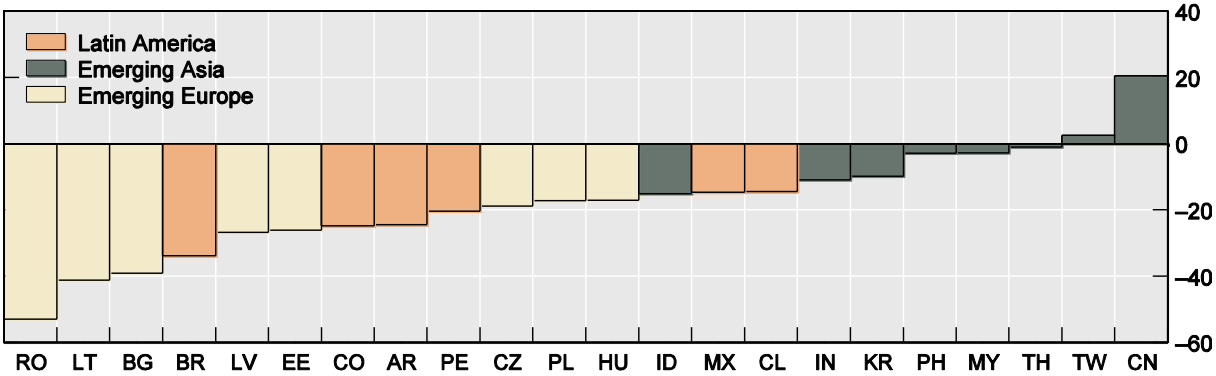
Taking into account the characteristics of the evolution of real credit, the variable under analysis in the rest of this paper is defined as the change in the year on year real credit growth rate between the fourth quarter of 2007 and the fourth quarter of 2009.[3] We consider

[3] At the country level, we also considered the difference between the year on year real credit growth for the fourth quarter of 2009 and the third quarter of 2008 (since the year on year real credit growth peaked in Q3 2008 in most countries at the *aggregate level*). However, there were insufficient reliable data at the bank level to use this period of analysis. Thus, consistency between the aggregate and bank-level analyses was a key criterion for the selection of the period.

this fixed period because for most countries in our sample, credit conditions resumed to normality by 2010, as shown in Graph 1.[4] The main advantage of this measurement is that it does not rely on the use of a filter to de-trend the time series. However, it is worth mentioning that this measure does not take into account the credit cycle position of each country. That is, it may be that a reduction in real credit growth could be a good thing, for example in a credit boom. Other caveats are that the measurement does not take into account the duration of the fall in credit, nor control for the effects of other shocks (beyond the crisis) that could affect credit. for example, because of countercyclical policies implemented earlier.

**Graph 2: Change in real credit growth during the crisis[1]**

In per cent




AR = Argentina; BG = Bulgaria; BR = Brazil; CL = Chile; CN = China; CO = Colombia; CZ = Czech Republic; EE = Estonia; HU = Hungary; ID = Indonesia; IN = India; KR = Korea; LT = Lithuania; LV = Latvia; MX = Mexico; MY = Malaysia; PE = Peru; PH = Philippines; PL = Poland; RO = Romania; TH = Thailand; TW = Chinese Taipei.

[1] Difference in year over year percentage change for Q4 2009 and Q4 2007.

Sources: IMF; Datastream; national data.

Graph 2 (and Table A1 in Appendix II) presents the change in real credit growth during the crisis, calculated as explained above, in order of magnitude.[5] The regional differences stand

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[4] However, this is not the case for countries in Emerging Europe. An alternative indicator would be the difference between the maximum and minimum levels of real credit growth around the post-Lehman Brothers bankruptcy period. The indicator, however, does not take into account different durations of the effects of the crisis (thus, it does not penalise for longer durations of the crisis' effects).

[5] Table A1 in Appendix II also standardizes the real credit growth variable (second column in the table) by subtracting the cross-country mean and dividing by the standard deviation. The standardised values will be highly useful in the next section when we compare the behavior of real credit growth to a number of other calculated variables. The last column of Table A1 presents the ranking of countries according to the behavior of real credit growth. The countries where real credit growth declined the most during the crisis occupy the lowest positions in the ranking.

out. Emerging Asia displays the lowest reductions in real credit growth during the crisis among the selected countries. Indeed, if we rank countries such that those where real credit growth declined the least occupy the highest positions in the ranking, the top nine positions in the ranking can be found in Emerging Asia. China and Chinese Taipei take the first two positions, with an increase in real credit growth due to a strong countercyclical fiscal expansion in the former country and a close relationship between the two countries. In contrast, the lowest positions in the ranking are occupied by countries in Emerging Europe. Latin American countries rank in the middle.

Why was real credit growth in some countries more resilient than in others? We turn to that question in the next sections.

## 4. Indicators of real credit growth resilience to external financial shocks in emerging markets: analysis at the aggregate level

In this section we construct three indicators at the country level signaling the relative capacity of financial systems to withstand the adverse effects of an external shock on real credit growth. In this sense these are *financial resilience indicators*. We claim that the financial systems of emerging market economies with the highest values of the resilience indicators *during the pre-crisis period* were best prepared to cope with the global financial crisis and were, therefore, relatively less affected in terms of the contraction of real credit growth during the crisis.[6, 7]

The indicators cover three areas: (i) macroeconomic performance; (ii) financial regulatory/supervisory quality; and (iii) banking system soundness. Although many of the variables included in the indicators have been previously utilized in the literature to assess financial systems' strengths and vulnerabilities, our contribution regarding the construction of the indicators is twofold. First, *the criterion used in the selection of variables was, first and foremost, their relevance for emerging markets*. Second, and guided by the criterion above, we introduce a novel variable within the macroeconomic indicator: a measurement of the capacity of monetary policy to react promptly to adverse external shocks *without compromising* domestic financial stability (see discussion below).

Each of the indicators is constructed for the sample of 22 emerging market economies listed in the previous section. Since the indicators are examined at their values during the pre-crisis period, variables are calculated for 2007.

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[6] As discussed above, China and Chinese Taipei were exceptions in that their rates of growth of real credit during the crisis were higher than the rates observed during the pre-crisis period.

The methodology for constructing each indicator is straightforward. First, to make the different variables within an indicator comparable, each variable is standardized, subtracting the cross-country mean and dividing by the standard deviation. Second, variables whose increase in value signals a reduction in financial strength (an increase in vulnerability) are multiplied by -1. Finally, the indicator is simply the average value of the standardized variables.[8] [9]. This methodology, of course, implies that we analyze *relative* financial resilience among countries in the sample.

We now turn to the construction of each specific indicator.

## 4.1. Macroeconomic performance

As described in Section 2, there is a long list of macroeconomic variables that have been previously identified as providing useful signals of financial systems' strengths and vulnerabilities. To a significant extent, macro *resilience* translates into financial systems and, therefore, real credit growth *resilience*.

Thus, along the lines of this paper, the variables included here to compose the macroeconomic indicator have been chosen to potentially maximize the explanatory power of the evolution of real credit growth *in emerging markets* in the presence of an external financial shock.[10]

From a macroeconomic point of view, *resilience* can be described as having two dimensions: (i) the economy's capacity to *withstand* the impact of an external financial shock (and, therefore, minimize the impact on the provision of real credit); and (ii) the authorities' capacity to rapidly put in place policies to counteract the effects of the shock on the financial system (such as the provision of liquidity).

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[7] As has been well documented, an adverse shock that weakens the banking system will result in capital losses and credit growth contractions.

[8] As shown by Stock and Watson (2010), a common explanatory factor (a scalar dynamic factor model) can be estimated by the cross-sectional average of the variables when there is limited dependence across series. Accordingly, the cross-sectional average of standardised variables provides the estimation of a common explanatory factor when the variables involved have different variability; that is, when the error terms of the scalar dynamic factor model have heteroskedasticity, as shown below.

[9] Alternatively, we could have formed the indicator by adding the standardised variables (as in Gros and Mayer, 2010).

[10] Note that even if an external shock does not have a significantly large *direct* effect on banks' funding conditions, there can be large *second round* effects on both the supply of and demand for credit by households and firms if the shock adversely affects real economic activity. This was the case in many emerging market economies during the crisis.

As is well known, different regions in the world follow different economic growth models. Thus, it is expected that the effects of an external financial shock on local financial systems will differ between regions (and countries). Fully capturing differences between growth models involves analyzing not only economic differences, but also large variations in social and political factors. This is a huge task, well beyond the scope of this paper. Instead, we focus on a single question that can capture key economic and financial differences between growth models: How are investment and growth financed?

There are three major sources of financing investment and growth in emerging markets: foreign financial flows, export revenues and domestic savings.[11] While all regions use these three sources, differences in their growth models imply that the degree of reliance on each of them differs sharply. For example, facing low domestic savings ratios and relatively low trade openness, Latin American countries rely relatively more on foreign financial flows as a financing mechanism for growth than Asian countries that display high domestic savings ratios and a high ratio of trade flows to GDP. Table 1 summarizes the reliance of the emerging market regions considered here on alternative sources of funding by presenting average indicators for financial openness, trade openness and savings ratios.

As shown in Table 1, by 2007 – the pre-crisis year – Latin America was (and it still is) a highly financially open region in the developing sample, in the sense that it imposed few restrictions to the cross-border movements of capital. Indeed, excluding Argentina, the value of the index reached 1.6 (in an index whose value fluctuates between -2.5 (financially closed) and 2.5 (fully open financially). At the same time, Latin America is the least open region in terms of trade and displays an extremely low savings rate.

Table 1: Financial openness, trade openness and savings ratios in emerging markets (Regional percentage averages)

| | Financial openness index 20071 | Trade openness indicator (X+M)/GDP (average 2004-07) | National savings rates as percentage of GDP (average 2004-07) |
|---|---|---|---|
| Latin America | 1.16 | 48 | 25 |
| Emerging Asia | 0.30 | 168 | 35 |
| Central/Eastern Europe | 2.20 | 120 | 20 |

[1] Chinn and Ito (2008) index. The higher the value of the index, the lower the restrictions to cross-border movements of capital. The value of the index fluctuates between -2.5 and 2.5.
Sources: Chinn and Ito (2008); Rojas-Suarez (2010); World Bank, World Development Indicators.

[11] See Birdsall and Rojas-Suarez (2004).

Emerging Asia stands opposite to Latin America in terms of these indicators. The Asian region is the least financially open among the regions considered, while it is the most open region regarding trade transactions and shows the highest national savings ratios. The countries in the Central/Eastern Europe area are closer to Latin America than to Emerging Asia in their degree of financial openness and their very low savings ratio. In terms of trade openness, however, the region is closer to Emerging Asia.

In what follows we explain how these (varying) features of emerging markets translate into a set of macroeconomic variables that provides signals of resilience with respect to external financial shocks.

#### 4.1.1. The first dimension of resilience: the economy's capacity to withstand an external financial shock

As has been well documented in the literature,[12] highly open financial economies tend to be very vulnerable to a sudden dry-up of external funding. However, as the global financial crisis demonstrated, economies that are highly open to trade are also quite vulnerable to the extent that trade finance is a key source of funding for this type of international transactions. In this regard, albeit with different degrees of intensity, *all financial systems in the emerging market regions under consideration are quite vulnerable to external financial shocks*.

Thus, at the macro level, following a sharp and adverse external financial shock, the destabilizing local economic and financial effects will depend on a country's current external financing needs (a flow measure) and on the country's external solvency and liquidity position (stock measures). The variables chosen in this paper as indicators of a country's external position are: (a) the current account balance as a ratio of GDP; (b) the ratio of total external debt to GDP; (c) the ratio of short-term external debt to gross international reserves; and (d) a measurement of currency mismatch proxied by the foreign currency share of total debt divided by the ratio of exports to GDP.

**(a) The current account balance as a ratio of GDP** is a customary indicator of a country's existing (at the time of the shock) external financing needs and represents the flow indicator. The other three indicators are intended to represent the country's external solvency and liquidity stance.

**(b) The ratio of total external debt to GDP** is used as an indicator of a country's overall capacity to meet its external obligations (a solvency indicator). Under this concept, the aggregate of public and private debt is included.

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[12] See, for example, Calvo and Reinhart (2000), Edwards (2004), and Hawkins and Klau (2000).

**(c) The ratio of short-term external debt to gross international reserves** intends to capture the degree of a liquidity constraint. In the presence of a sharp adverse external shock, countries need to show that they have resources available to make good on payments due during the period following the shock. *Proof of liquidity* is particularly important for emerging market economies since they cannot issue *hard currencies* (i.e. currencies that are internationally traded in liquid markets). Lacking access to international financial markets at the time of the shock, large accumulations of foreign exchange reserves and limited amounts of short-term external debt serve these countries well in maintaining their international *creditworthiness* and, therefore, minimizing the impact of the shock. Recognition of this source of vulnerability by authorities in many emerging market economies, especially in Asia and Latin America, has been reflected in the recently observed huge accumulation of foreign exchange reserves. Notice that this source of vulnerability does not depend on the exchange rate regime. Facing a sudden stop of capital inflows, even a sharp depreciation of the exchange rate cannot generate sufficient resources (through export revenues) fast enough to meet external amortizations and interest payments due. This explains why Latin American countries, since the mid-1990s, have increased the flexibility of their exchange rate regimes and do not follow *purely* flexible exchange rate systems.[13]

**(d) The foreign currency share in total debt as a ratio of exports to GDP**[14] is a measurement of **currency mismatch** initially proposed by Goldstein and Turner (2004). The central idea is that financing consumption or investment in non-tradable goods with foreign currency-denominated debt exposes debtors to solvency problems in the presence of a severe shock leading to a depreciation of the currency. This vulnerability takes a number of forms. For example, cross-border borrowing in foreign currency (by the public or private sector) to finance a local project using local inputs generates a currency mismatch. Local banks lending in foreign currency to firms or individuals whose earnings are in local currency is another source of a currency mismatch. In either of these two examples, a sharp depreciation of the local currency might severely impede the financial position of the debtor. In the first example, the returns generated by the project (in local currency) might not suffice to cover the external debt in foreign currency. In the second example, banks' non-performing loans might increase substantially (therefore deteriorating banks' solvency positions) as the local-currency earnings of borrowers might not be adequate to meet their foreign currency-denominated debt payments.

Note that, *similarly to the liquidity indicator previously discussed, the currency mismatch problem is an emerging market problem since these countries cannot issue hard currency*. With regard to the first

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[13] See Rojas-Suarez (2010, 2003) for a full discussion of the restrictions on monetary/exchange rate policies in Latin America imposed by the volatility of capital inflows.

[14] The time series for this and other measures of currency mismatches for 27 countries are available on request from Bilyana.Bogdanova@bis.org

example above, developed countries have the option of issuing *large* amounts of external debt denominated in their own currencies.[15] The second example is also not relevant for developed countries since earnings of banks' borrowers are also denominated in hard currencies.

#### 4.1.2. The second dimension of resilience: policymakers' capacity to rapidly put in place policies to counteract the effects of the external shock

For all practical purposes, and from a macroeconomic perspective, this basically means the authorities' capacity to implement countercyclical fiscal and monetary policies. Thus, the two variables include here concern the: (e) fiscal and (d) monetary positions. While the fiscal variable is straightforward, we propose here a new indicator of monetary policy stance.

**(e) The ratio of general government fiscal balance to GDP** is the variable chosen here to represent a country's fiscal position. We chose a broader concept of the fiscal stance because of significant differences in definitions and aggregations of fiscal accounts between countries. The argument put forward by this paper is that countries with strong fiscal positions *before* an external shock are better prepared to implement countercyclical fiscal policies *without further deteriorating the macroeconomic landscape* affecting the local financial systems. In other words, while any government can technically increase expenditures and/or reduce taxes in the short run, only those with a sound fiscal stance can comfortably undertake these policies and maintain fiscal solvency. As an example, we can think of the active countercyclical role played by Banco del Estado, a public bank in Chile, during the crisis. While the lending activities of this bank contributed to deterioration in the consolidated fiscal stance and a large fiscal deficit in 2009, the Chilean authorities reversed the fiscal expansion after the crisis, and by 2011 Chile's overall fiscal balance had returned to a surplus position.

**(f) The financial-pressures-adjusted monetary policy stance** is the monetary variable used in this paper and, due to its novelty, requires a more extended explanation than the other macro variables considered.

Monetary policy frameworks in emerging markets have put a lot of emphasis in the control of inflation. However, inflation under control and output close to its potential do not rule out the build-up of pressures that can destabilize financial markets, especially because these pressures are accumulated at longer horizons than those taken into account by traditional monetary policy frameworks.

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[15] It is important to clarify that the issue of currency mismatches in emerging markets remains valid even if these countries can issue *some* external debt denominated in their own currencies (as is the case of Mexico and Chile, for example). The problem is that the markets for this type of debt are still highly illiquid and, therefore, highly volatile.

For this reason, we assess the monetary policy stance taking into account two factors: the "pure" monetary policy conditions and the degree of financial instability pressures. For the former we consider an interest gap, calculated as the deviation of the policy rate from a benchmark rate. For the latter we develop a simple *signal* of unsustainable credit growth; that is, we try to identify the potential presence of a credit boom. These two factors are combined to obtain a *financial-pressures-adjusted monetary policy stance*. The indicator attaches a greater risk of financial instability to an expansionary monetary policy when it is taking place in the context of a credit boom.

To calculate the interest gap, we estimate a benchmark rate based on a Taylor rule with interest rate smoothing.[16] Therefore, a negative interest gap corresponds to an expansionary monetary policy stance. To assess the presence of a credit boom, we estimate a threshold on the real credit growth rate above which the growth of real credit is deemed to be unsustainable.

The financial-pressures-adjusted monetary stance indicator is calculated as the standardized version of the following:

$$\left(\Delta RC_t - \Delta RC^{boom}\right) \times \left(R_t - R_t^{TR}\right)$$

Where $\Delta RC_t$ is the growth rate of real credit, $\Delta RC^{boom}$ is the threshold on credit growth for credit boom and $R_t - R_t^{TR}$ is the interest rate gap.

The indicator is negative when either a signal of a credit boom is combined with an expansionary monetary policy or there is no credit boom and monetary policy is contractionary. Positive values of the indicator imply that either monetary policy is expansionary but there is no signal of a credit boom or there is a credit boom but monetary policy is adjusting (contractionary policy stance). Its limitations notwithstanding, this indicator provides a first approximation for assessing how well positioned (resilient) a

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[16] The Taylor rule estimated has the following form: $R_t^{TR} = \rho R_{t-1}^{TR} + (1-\rho)\left[(R^n + \overline{\Pi}) + \gamma_\pi\left(\Pi_{t+4} - \overline{\Pi}\right) + \gamma_y\left(Y_t - \overline{Y}_t\right)\right]$, where $R_t^{TR}$ is the nominal benchmark rate at quarter *t*, $R^n$ is the long term real interest rate, $\overline{\Pi}$ is the inflation target level, $\Pi_{t+4}$ is the inflation rate one year ahead and $Y_t - \overline{Y}$ is the output gap calculated as the deviation of output with respect to its potential level. Lacking sufficient data for country differentiation, we use the same coefficients for all the countries: $\varrho$=0.75, $\gamma_\pi$=1.5 and $\gamma_y$=0.5. The coefficients for inflation and output gap are the same used by Taylor (1993) as benchmark. The long-term real interest rate is estimated as the average real ex-post interest rate for each country over the longest available period (which varies across countries). When no inflation target is available we use the average inflation level (over the same period used for estimating the long-term interest rate). We calculate the potential output using the HP (Hodrick-Prescott) filter.

country is in terms of its monetary policy to deal with an adverse external financial shock. For example, easy monetary policy in the context of a credit boom could fuel the boom further, weakening the financial system. This would expose financial fragilities, inducing a contraction in real credit growth, if an adverse external shock were to materialize.

The threshold on the real credit growth rate for a credit boom is calculated as the median real credit growth rates for episodes of credit booms in Latin America and Emerging Asia, where credit booms are identified following the Mendoza and Terrones (2008) methodology. The resulting threshold equals 22%. Using a common threshold has the advantage that the measure does not rely on the use of a filter to de-trend the time series. However, it has the disadvantage that it does not take into account each country's cyclical variability of credit.[17] We say that there is a *signal* of a credit boom if the rate of growth of real credit is above 22%.

Graph 3 shows separately the two variables that form the financial-pressures-adjusted monetary stance variable for 2007, the year previous to the crisis. The vertical axis shows the pure monetary stance, i.e. the interest rate gap. The calculations show that in the pre-crisis period the policy stance in all countries in the sample was expansionary; that is, the policy rate implied by a Taylor rule was higher than the actual policy rates. In contrast, countries differed significantly regarding the behavior of real credit growth (horizontal axis). While there were no signals of credit booms in the Asian countries in the sample, there was evidence of credit booms in several countries in Latin America and Emerging Europe. In particular, the growth rates of real credit in Argentina, Brazil, Colombia, Bulgaria, Estonia, Latvia, Lithuania, Poland and Romania were above the 22% threshold.

Countries that are further southeast in Graph 3 had larger negative values of the financial-pressures-adjusted monetary stance variable, while countries in the southwest quadrant of the graph had a positive value of this indicator. As shown, the countries with larger negative values of the financial-pressures-adjusted monetary stance variable were those in Eastern/Central Europe. For example, in Bulgaria, Latvia, Lithuania and Romania (the countries in the furthest southeast positions in the graph), very accommodative monetary policies in the context of credit booms resulted in severe fragilities in these country's financial systems. These four countries also experienced sharp reductions in real credit growth during the crisis.[18] The situation in Latin America was mixed. While monetary policy was not as expansionary as in most countries in Emerging Europe, our methodology indicates the presence of credit booms in Argentina, Brazil and Colombia, which increased the vulnerability of these countries' financial systems to an external shock. On an overall basis, Chile, followed by Peru, was the country within Latin America best positioned according to this indicator. Emerging Asia was the least vulnerable region according to the

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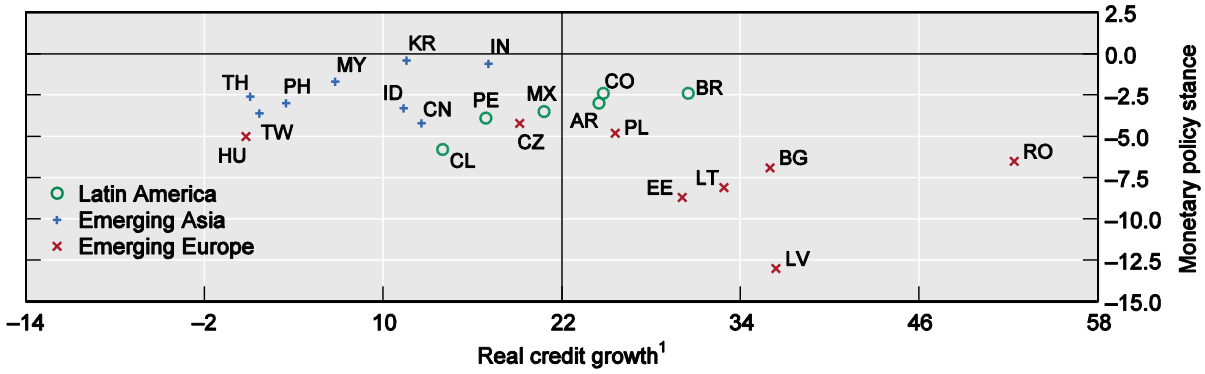
17 Further research is needed to compare alternative measures of the credit boom indicator.

18 Hungary is a notable exception among countries in Emerging Europe.

variable, with Chinese Taipei, Philippines and Thailand standing out for their strength. Table A2 in Appendix II presents the actual values of the financial-pressures-adjusted monetary policy variable and its components.

**Graph 3: Financial-pressures-adjusted monetary policy stance**

In per cent




AR = Argentina; BG = Bulgaria; BR = Brazil; CL = Chile; CN = China; CO = Colombia; CZ = Czech Republic; EE = Estonia; HU = Hungary; ID = Indonesia; IN = India; KR = Korea; LT = Lithuania; LV = Latvia; MX = Mexico; MY = Malaysia; PE = Peru; PH = Philippines; PL = Poland; RO = Romania; TH = Thailand; TW = Chinese Taipei.

[1] For 2007; based on quarterly data.

Sources: IMF; Datastream; national data.

### 4.1.3. The values of the macroeconomic indicator and its components

Table 2 presents the values of the six variables discussed above ((a) to (f)) and the aggregate macroeconomic indicator, constructed following the methodology described above. Note that the values of the variables – total external debt to GDP, short-term external debt to gross international reserves and the mismatch ratio – have been multiplied by (-1) since the larger the values, the lower the contribution of these variables to sound macroeconomic performance.

How were emerging market economies positioned with regard to the macroeconomic indicator and its components? The last column of the table shows the countries' relative position according to the value of the indicator. For example, China ranks 1st among the countries in the sample and Latvia last (in the 22th position).

Not surprisingly, a number of countries in Emerging Europe were very badly positioned to face an unexpected external shock. A variety of factors, especially unrealistic expectations of a speedy entrance into the euro area (and the associated expected reduction in exchange rate risk and expected increase in net worth) led to excessive risk taking by both the public and private sectors. This translated into excessively high indebtedness ratios, huge and

unwarranted reliance on short-term external debt, and unsustainable fiscal and current account deficits.

At the regional level, the pre-crisis situation in Emerging Asia and Latin America contrasted with that of Eastern Europe. For example, debt ratios (including both total and short-term external debt) were much smaller in the former regions than in the latter. Moreover, while all European countries in the sample displayed current account deficits (and many in the double digits), the large majority of Asian and Latin American countries experienced current account surpluses. With plenty foreign exchange reserves (as a ratio of short-term external liabilities) and well contained external financing needs, most of the Asian and Latin American countries were well positioned to show financial *resilience* to the external shock of 2008. Specifically, given the solid external positions in these two regions, the shock did not raise significant concerns about these countries' capacity to meet their external obligations. As such, authorities were able to undertake countercyclical policies.

Among Latin American countries, Chile, followed by Peru, was the best positioned in terms of its fiscal and monetary stance. Indeed, authorities in these two countries were able not only to undertake countercyclical fiscal and monetary expansions during the shock but also to quickly reverse the expansion once the worst of the crisis was over. As of mid-2011, these two countries were once again strong enough to deal with a new unexpected shock.

The countries' ranking position in the macroeconomic indicator is consistent with the discussion above. Most of the strongest positions are held by Asian countries, with Chile (ranking 2nd) joining the group of the most resilient countries. In contrast, the six lowest positions in the ranking are occupied by Emerging European countries, with Argentina (ranking 16th) closer to the weakest performers.[19]

It is interesting to note the role that limited trade openness plays in determining the relative position of Latin American countries in the macroeconomic indicator. By construction, the lower the ratio of exports to GDP, the higher the mismatch ratio. This partly explains the relatively high mismatch ratios in a number of Latin American countries. In other words, the resilience of Latin American countries to external financial shocks could benefit from efforts to increase the region's degree of trade openness.

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[19] Argentina displayed the weakest ratios of debt and currency mismatch among Latin American countries in 2007.

Table 2: Macroeconomic performance: variables and indicators

| | Variables[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Total external debt / GDP (-1) | Short-term external debt / gross international reserves (-1) | Currency mismatch ratio[2] (-1) | Current account balance / GDP | General government fiscal balance / GDP | Financial-pressures-adjusted monetary variable | Macroeconomic indicator[3] | Country ranking |
| Latin America | | | | | | | | |
| Argentina | -47.5 | -75.2 | -148.0 | 2.3 | -2.1 | -7.5 | -0.4 | 16 |
| Brazil | -16.0 | -27.5 | -58.6 | 0.1 | -2.6 | -20.5 | 0.2 | 13 |
| Chile | -35.4 | -65.7 | -46.8 | 4.5 | 8.4 | 46.3 | 0.8 | 2 |
| Colombia | -21.5 | -26.4 | -113.2 | -2.8 | -1.0 | -6.6 | 0.0 | 14 |
| Mexico | -18.7 | -29.5 | -50.2 | -0.8 | -1.3 | 4.2 | 0.3 | 9 |
| Peru | -30.8 | -28.9 | -108.2 | 1.3 | 3.2 | 20.1 | 0.3 | 7 |
| Emerging Asia | | | | | | | | |
| China | -11.1 | -17.6 | -6.5 | 10.6 | 0.9 | 39.6 | 0.9 | 1 |
| Chinese Taipei | -24.0 | -31.3 | -10.6 | 8.9 | -1.4 | 73.1 | 0.7 | 3 |
| India | -19.0 | -20.9 | -44.5 | -0.7 | -4.0 | 2.8 | 0.2 | 12 |
| Indonesia | -31.8 | -38.1 | -57.3 | 2.4 | -1.2 | 35.3 | 0.3 | 8 |
| Korea | -37.9 | -63.5 | -23.5 | 0.6 | 4.2 | 3.9 | 0.5 | 6 |
| Malaysia | -30.5 | -17.3 | -12.8 | 15.9 | -2.6 | 26.5 | 0.6 | 5 |
| Philippines | -46.0 | -39.4 | -67.8 | 4.9 | -1.5 | 55.6 | 0.3 | 10 |
| Thailand | -30.1 | -46.3 | -9.5 | 6.3 | 0.2 | 54.8 | 0.7 | 4 |
| Emerging Europe | | | | | | | | |
| Bulgaria | -94.3 | -105.0 | -64.3 | -26.9 | 3.5 | -95.7 | -0.7 | 18 |
| Czech Republic | -43.6 | -72.7 | -22.9 | -3.3 | -0.7 | 11.9 | 0.2 | 11 |
| Estonia | -108.4 | -248.3 | -58.3 | -17.2 | 2.9 | -70.6 | -0.8 | 20 |
| Hungary | -103.1 | -134.5 | -40.6 | -6.5 | -5.0 | 106.6 | -0.4 | 17 |
| Latvia | -127.6 | -342.7 | -102.2 | -22.3 | 0.6 | -187.3 | -1.8 | 22 |
| Lithuania | -71.9 | -121.5 | -87.4 | -14.6 | -1.0 | -88.2 | -0.7 | 19 |
| Poland | -48.4 | -112.1 | -47.3 | -4.8 | -1.9 | -17.5 | -0.2 | 15 |
| Romania | -51.0 | -80.7 | -143.6 | -13.4 | -3.1 | -198.1 | -1.1 | 21 |
| Correlation with credit growth[4] | 0.45 | 0.38 | 0.71 | 0.76 | 0.05 | 0.73 | 0.75 | |

[1] 2007 data; in per cent. [2] Foreign currency share of total debt divided by the ratio of exports to GDP. [3] Average of the standardized version of the variables shown. [4] Difference in year on year percentage change for Q4 2009 and Q4 2007.
Sources: IMF; Datastream; Moody's; national data; BIS.

## 4.2. Regulatory/institutional strength

In the years previous to the crisis, a number of emerging market economies had made significant progress in improving their financial regulatory and supervisory frameworks. The severe financial crises of the 1990s and early 2000s that affected Asian and Latin American countries, in particular, were a major factor conducive to strengthening rules and regulations governing the functioning of the financial system. The conjecture, of course, is that countries with stronger regulatory and supervisory frameworks are better prepared to withstand adverse shocks to the local financial systems and, therefore, to the provision of credit.

Cross-country comparable data on the quality of regulation/supervision, however, are lacking. Although the country coverage of the IMF's comprehensive analysis of a country's financial sector through the FSAPs (Financial System Analysis Program) has been increasing, many of the country reports are not published.[20] Moreover, among the published reports, presentation of the assessments makes cross-country comparisons extremely difficult in many cases. Thus, while the trend in information provision in this area is positive, it was not adequate at the time of this writing.

To date, the most comprehensive cross-country survey on financial regulation/supervision issues is the one originally designed by Barth et al (2006) and regularly updated by the World Bank, most recently in 2007, the pre-crisis year.[21] The survey respondents are country authorities. Because of existing imperfections with the data set (most importantly with interpretation problems in answering some of the survey questions), in this paper we have selected a few representative variables from the survey's questions that are straightforward to answer (to minimize the interpretation problem). These variables cover two key areas of the regulatory framework. The first area relates to the regulatory permissiveness regarding banks' involvement in fee-based bank activities (such as securities, insurance and real state); that is, activities beyond the traditional deposit taking/lending operations. The second area relates to the quality of accounting procedures and transparency of banks' financial statements.

The construction of these variables from the Barth et al survey is described in Appendix I. Each variable has been re-scaled in such a way that their values fluctuate between 0 and 1. The first two columns of Table 3 show the resulting re-scaled values for the countries in our

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[20] FSAPs are undertaken on a voluntary basis. Under current arrangements, publication of the assessment results remains at the discretion of each country's authorities.

[21] The entire data set and the original (and updated publication) can be found at: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20345037~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

sample. In that table, column 3 averages the scorings to obtain a broad indicator of regulatory quality.[22]

Table 3: Regulatory/institutional strength: variables and indicators

| | Variables[1] | | | | Indicator[3] | Country ranking |
|---|---|---|---|---|---|---|
| | Overall activities and bank ownership restrictions | Accounting and transparency | Aggregate scoring[2] | Government effectiveness | | |
| Latin America | | | | | | |
| Argentina | 0.6 | 0.6 | 0.6 | 0.5 | -1.1 | 20 |
| Brazil | 0.4 | 0.8 | 0.6 | 0.5 | -1.0 | 19 |
| Chile | 0.8 | 0.6 | 0.7 | 0.8 | 1.3 | 3 |
| Colombia | 0.8 | 0.8 | 0.8 | 0.5 | 0.1 | 9 |
| Mexico | 0.1 | 0.8 | 0.4 | 0.5 | -1.6 | 21 |
| Peru | 0.9 | 0.6 | 0.8 | 0.4 | -0.8 | 18 |
| Emerging Asia | | | | | | |
| China | 0.9 | 0.4 | 0.7 | 0.5 | -0.5 | 14 |
| Chinese Taipei | 0.8 | 1.0 | 0.9 | 0.7 | 1.8 | 1 |
| India | 0.6 | 0.8 | 0.7 | 0.5 | -0.4 | 13 |
| Indonesia | 1.0 | 0.8 | 0.9 | 0.4 | 0.0 | 12 |
| Korea | 0.4 | 0.8 | 0.6 | 0.7 | 0.4 | 8 |
| Malaysia | 0.6 | 1.0 | 0.8 | 0.7 | 1.7 | 2 |
| Philippines | 0.3 | 1.0 | 0.6 | 0.5 | -0.7 | 17 |
| Thailand | 0.8 | 1.0 | 0.9 | 0.6 | 0.8 | 6 |
| Emerging Europe | | | | | | |
| Bulgaria | 0.5 | 0.8 | 0.7 | 0.5 | -0.6 | 15 |
| Czech Republic | 0.7 | 0.8 | 0.7 | 0.7 | 0.8 | 7 |
| Estonia | 0.3 | 0.8 | 0.6 | 0.7 | 0.0 | 10 |
| Hungary | 0.6 | 1.0 | 0.8 | 0.7 | 1.1 | 4 |
| Latvia | 0.3 | 1.0 | 0.7 | 0.6 | 0.0 | 11 |
| Lithuania | 0.6 | 1.0 | 0.8 | 0.7 | 1.0 | 5 |
| Poland | 0.3 | 0.8 | 0.6 | 0.6 | -0.7 | 16 |
| Romania | 0.6 | 0.4 | 0.5 | 0.5 | -1.6 | 22 |

[1] All variables adjusted to be in 0-1 range. [2] Average of "overall activities" and "accounting and transparency". [3] Standardized version of the "aggregate scoring" adjusted by "Government effectiveness".
Sources: Barth et al (2006); http://info.worldbank.org/governance/wgi/index.asp.

[22] Given existing data, the variables presented for this indicator correspond to the pre-crisis year 2007.

As with the macroeconomic indicators, it is important to incorporate here features that are particularly relevant for emerging markets. In this case, consideration of the quality of institutions, which varies significantly among emerging market economies, is highly pertinent. As is widely recognized, notwithstanding the quality of the regulatory framework, a country's institutional strength is determinant in ensuring the enforcement of rules and regulations. For example, countries with weak institutions may experience severe political interference during times of difficulties in the banking system that will prevent an appropriate implementation of banking laws.

To correct for the above problem, the aggregate scoring in column 3 is multiplied by a well-known measurement of institutional quality: the *Government Effectiveness* component of the World Bank *Governance Indicators*. This measurement is designed to "captur[e] perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (Kaufmann et al, 2010). Column 4 in the table presents the values of the Government Effectiveness variable for 2007, re-scaled so that these values fluctuate between 0 and 1. Column 5 multiplies columns 3 and 4 and applies the standardization procedures followed in this paper to produce the regulatory/institutional strength indicator. The relative position of each country with respect to this indicator is presented in the last column.

In contrast to the macroeconomic indicators discussed above, a number of the countries in Emerging Europe obtain relatively high rankings among emerging markets (Romania is one of the exceptions). This result signals that the deep financial problems experienced by many countries in this region during the crisis cannot be attributed (at least not to a large extent) to deficiencies in compliance with regulatory standards or severe institutional weaknesses. The results for Asia are quite mixed, and it is not possible to make an assessment for the region as a whole. While the best two positions in the ranking are held by Chinese Taipei and Malaysia, the Philippines is close to the bottom of the ranking. The Latin American situation is somewhat less diverse since most of the countries in the region occupy very low positions in the ranking. Chile is the notable exception, since it ranks close to the Emerging European countries.

Among the three groups of indicators constructed in this paper, the regulatory/institutional indicator is the most subjective one. This indicator is based on survey data and is subject to interpretation in answering survey questions. Not surprisingly, as will be discussed below, this indicator is the least correlated with the behavior of real credit growth during the crisis.

### 4.3. Financial soundness

A characteristic of most financial systems in emerging market economies is that they are bank-dominated. Capital market development is generally low relative to developed

countries, although there are some exceptions, including Brazil. In this context, assessing the financial soundness of banks provides, in general, a good evaluation of the strength of the overall financial system and, therefore, the resilience of real credit growth in the presence of an adverse external shock.

To construct the indicator of financial soundness we include four variables. The first is a capitalization ratio. Ideally, we would have liked to use the ratio of bank capital to risk-weighted assets. However, given the large country variation in accounting methodologies, including procedures for risk assessment, we decided to use the simplest and most straightforward ratio: the capital to assets ratio.

The second and third variables relate to the banking system liquidity position and are guided by the Basel III recommendations on stable funding.[23] These variables are the ratio of bank deposits to bank credit and the ratio of short-term international bank claims to domestic credit to the private sector. The idea is that real credit growth will be less affected by adverse external financial shocks the higher the proportion of credit financed with domestic deposits and the lower the proportion of credit financed by short-term international claims (which tend to be a more volatile source of funding).

The last variable included in the indicator of financial soundness is a commonly used ratio of banking system efficiency: the ratio of non-interest expenses to gross income.

Following our procedure to construct the indicators, the ratio of short-term international claims to domestic credit and the ratio of non-interest expenses to gross income were multiplied by -1 since larger values of these two values reduce the overall resilience of the financial system and, therefore, adversely affect real credit growth.

The financial soundness indicator and the variables used to construct it are presented in Table 4. Regional conclusions are similar to those for the macroeconomic indicator: The lowest positions in the ranking are held by Emerging Europe and (most of) the highest by Asian countries. However, most Latin American countries are better positioned in this indicator than in the macroeconomic indicator, with Brazil ranking 2nd among all countries in the sample.

To a significant extent, the relative weaknesses of Emerging European countries was due to banks' high dependence on external sources of funding and relatively low funding through local deposits. For example, in Latvia's banking system, deposits funded only 42% of credit, while the ratio of deposits to credit was around 200% in the Philippines. Moreover, while the ratio of short-term international bank claims to domestic credit to the private sector

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[23] Cecchetti et al (2011) follow a similar criterion in the selection of bank liquidity variables relevant to the behavior of real economic growth.

averaged 35% in Emerging Europe, this ratio averaged only 19% in Latin America and 12% in Emerging Asia.

Table 4: Financial soundness: variables and indicators

| | Variables[1] | | | | Indicator[2] | Country ranking |
|---|---|---|---|---|---|---|
| | Bank capital to total assets | Non-interest expenses / gross income (-1) | Bank deposits / bank credit | Short-term international bank claims / domestic credit to the private sector (-1) | | |
| Latin America | | | | | | |
| Argentina | 13.7 | -67.6 | 161.6 | -32.8 | 0.3 | 8 |
| Brazil | 11.3 | -58.6 | 138.7 | -8.7 | 0.5 | 2 |
| Chile | 7.1 | -48.6 | 73.1 | -13.7 | -0.1 | 15 |
| Colombia | 12.9 | -51.8 | 53.2 | -14.1 | 0.3 | 7 |
| Mexico | 9.6 | -52.6 | 123.1 | -13.7 | 0.3 | 6 |
| Peru | 8.8 | -51.8 | 122.1 | -32.8 | 0.0 | 11 |
| Emerging Asia | | | | | | |
| China | 5.7 | -37.4 | 125.6 | -3.0 | 0.6 | 1 |
| Chinese Taipei | 6.1 | -54.3 | 80.0 | -5.6 | -0.3 | 17 |
| India | 6.4 | -58.1 | 134.3 | -12.2 | -0.1 | 14 |
| Indonesia | 10.2 | -53.5 | 147.1 | -25.7 | 0.4 | 5 |
| Korea | 9.0 | -47.8 | 59.4 | -11.3 | 0.1 | 10 |
| Malaysia | 7.4 | -40.6 | 110.3 | -10.5 | 0.5 | 4 |
| Philippines | 11.7 | -63.9 | 196.5 | -26.2 | 0.5 | 3 |
| Thailand | 9.8 | -60.3 | 106.1 | -4.4 | 0.1 | 9 |
| Emerging Europe | | | | | | |
| Bulgaria | 7.7 | -51.7 | 93.2 | -35.1 | -0.3 | 19 |
| Czech Republic | 5.7 | -50.8 | 134.1 | -20.4 | -0.1 | 13 |
| Estonia | 8.6 | -40.7 | 48.6 | -26.7 | 0.0 | 12 |
| Hungary | 8.2 | -59.3 | 75.0 | -29.1 | -0.5 | 20 |
| Latvia | 7.9 | -48.7 | 41.8 | -39.2 | -0.6 | 21 |
| Lithuania | 7.9 | -51.1 | 61.1 | -20.9 | -0.3 | 18 |
| Poland | 8.0 | -59.6 | 104.2 | -14.9 | -0.2 | 16 |
| Romania | 10.7 | -60.6 | 87.5 | -93.9 | -1.1 | 22 |

[1] 2007 data; in per cent. [2] Standardized version of the average of the variables shown.
Sources: IMF; Bankscope; national data.

## 4.4. An overall resilience indicator

For the sake of completeness, we construct an overall *resilience indicator*, which simply consists in averaging the values of the three indicators discussed above. The indicator and its components are presented in Table 5.

Table 5: An overall resilience indicator and its components

| | Macro-economic performance | Financial soundness | Regulatory/ institutional strength | Resilience indicator[1] | Country ranking |
|---|---|---|---|---|---|
| Latin America | | | | | |
| Argentina | -0.4 | 0.3 | -1.1 | -0.40 | 19 |
| Brazil | 0.2 | 0.5 | -1.0 | -0.11 | 14 |
| Chile | 0.8 | -0.1 | 1.3 | 0.67 | 3 |
| Colombia | 0.0 | 0.3 | 0.1 | 0.12 | 9 |
| Mexico | 0.3 | 0.3 | -1.6 | -0.31 | 17 |
| Peru | 0.3 | 0.0 | -0.8 | -0.17 | 15 |
| Emerging Asia | | | | | |
| China | 0.9 | 0.6 | -0.5 | 0.34 | 6 |
| Chinese Taipei | 0.7 | -0.3 | 1.8 | 0.74 | 2 |
| India | 0.2 | -0.1 | -0.4 | -0.10 | 13 |
| Indonesia | 0.3 | 0.4 | 0.0 | 0.21 | 8 |
| Korea | 0.5 | 0.1 | 0.4 | 0.35 | 5 |
| Malaysia | 0.6 | 0.5 | 1.7 | 0.92 | 1 |
| Philippines | 0.3 | 0.5 | -0.7 | 0.01 | 11 |
| Thailand | 0.7 | 0.1 | 0.8 | 0.55 | 4 |
| Emerging Europe | | | | | |
| Bulgaria | -0.7 | -0.3 | -0.6 | -0.54 | 20 |
| Czech Republic | 0.2 | -0.1 | 0.8 | 0.33 | 7 |
| Estonia | -0.8 | 0.0 | 0.0 | -0.28 | 16 |
| Hungary | -0.4 | -0.5 | 1.1 | 0.05 | 10 |
| Latvia | -1.8 | -0.6 | 0.0 | -0.77 | 21 |
| Lithuania | -0.7 | -0.3 | 1.0 | 0.00 | 12 |
| Poland | -0.2 | -0.2 | -0.7 | -0.35 | 18 |
| Romania | -1.1 | -1.1 | -1.6 | -1.25 | 22 |
| Correlation with credit growth[2] | 0.75 | 0.55 | 0.35 | 0.71 | |

See previous tables for definitions of the variables.
[1] Simple average of the indicators shown. [2] Difference in year on year percentage change for Q4 2009 and Q4 2007.
Sources: IMF; UN; Bankscope; Datastream; Moody's; national data; BIS.

The last column of Table 5 shows the ranking of the countries. Not surprisingly, according to this overall indicator, before the crisis, Emerging Asia was the region best prepared (most resilient) to minimize the adverse effects of an external shock on real credit growth. Indeed, from this region, Malaysia, Chinese Taipei and Thailand are within the first four positions in the ranking. Likewise, Emerging Europe was the least resilient region. The last two positions in the ranking (Romania and Latvia) are in this region. With the exception of Argentina,

which ranks very low, and Chile, which ranks third, the rest of the Latin American countries are positioned in the middle of the ranking.

### 4.5. Putting the indicators to work: how did they correlate with real credit growth during the global financial crisis?

We can now move on to tackling the questions posed in this paper: Did the pre-crisis indicators constructed in this section matter for the behavior of real credit growth during the crisis, and were some indicators more relevant than others? Ideally, we would like to address these questions using econometric techniques (as we will do in the next section using bank-level data). However, at the aggregate level, with 22 countries in our sample, there are no sufficient data points for any meaningful application of cross-section econometric analysis. Thus, at the aggregate level, we simply rely on calculating partial correlations. While no causality can be derived from these correlations, we find them extremely useful for two reasons. The first is that, as a first approximation, the exercise allows recognition of the factors that were associated with the behavior of real credit growth during the crisis. Thus, it can guide policymakers in emerging markets regarding the key factors that need to be in place to minimize the impact of an adverse external shock on real credit growth. The second reason is that this exercise helps to identify the most relevant indicators (variables) to be included in the econometric estimation of the equation explaining the behavior of real credit growth at the bank level.

The last row in Table 5 presents the correlations between the alternative indicators presented in this section and the growth of real credit during the crisis (as defined in Section 3 with data in Graph 2). With a value of 0.7, the correlation between the overall resilience indicator and real credit growth is, indeed, high. Among the more specific indicators, the macroeconomic indicator stands out as having the highest correlation with real credit growth, followed by the indicator of financial soundness.

The correlation coefficient associated with the indicator of regulatory/institutional strength is the lowest among the indicators (0.35). There are several explanations for this outcome. First, in contrast to the macro performance and financial soundness indicators, the regulatory/institutional indicator is better suited to explain long-term trends than short-term credit behavior associated with an external shock. Second, the inclusion of variables within this indicator was limited to the availability of comparable data between countries in the sample; this might have left out some key regulatory variables associated with the behavior of real credit. Finally, as discussed above, the *quality* of the regulatory/institutional indicator is lower than the others because of the high content of subjective information.

Among macroeconomic variables, the highest correlation coefficients (see last row of Table 2) were found for current account/GDP (0.76), the currency mismatch ratio (0.71) and financial-pressures-adjusted monetary policy stance (0.73). Thus, real credit growth resilience during the crisis was associated with the countries' external financing needs, their

indebtedness in foreign currency relative to the size of their tradable sectors (exports/GDP), and the capacity of monetary policy to provide liquidity without generating macroeconomic instability. The correlation coefficients for all the other macroeconomic variables were also positive, but at significantly lower levels.

The results so far are, therefore, indicative that initial conditions in the period *before the crisis* regarding macroeconomic performance and financial strength mattered for the behavior of real credit growth during the crisis. Moreover, the results support the premise in this paper that there are a number of variables particularly relevant for emerging market economies when facing adverse external financial shocks. As discussed above, some of these variables relate to the inability of emerging market economies to issue *hard* currency. As such, the importance of avoiding large currency mismatches is particularly important. This factor could be determinant to the stability of financial systems if an adverse shock were to materialize.

To strengthen the results obtained so far, the next section turns to a more rigorous econometric analysis using bank-level data for the Latin American region.

# 5. An econometric investigation on the behavior of real credit growth in Latin America during the crisis: analysis at the bank level

This section complements the analysis conducted at the aggregate level by using bank-level data for the case of Latin America. The advantage of using data at the micro level is that now we have a sufficiently large data set to apply econometric techniques. The limitation, however, is that lacking comparable bank data across all countries discussed in the previous section, we restrict our analysis to the Latin American countries included in the sample: Argentina, Brazil, Chile, Colombia, Mexico and Peru.

## 5.1. Econometric strategy

Continuing with the main theme in this paper, in this section we test whether initial conditions regarding country-specific variables (such as macroeconomic conditions) and bank-specific characteristics in the *pre-crisis year* (2007) help to explain the behavior of banks' real credit growth *during* the crisis. Thus, the specification of the benchmark equation estimated is as follows:

$$Y_{i,j,t} = \alpha_j + \beta_x X_{j,t-1} + \beta_{z1} Z^1_{i,j,t-1} + \beta_{z2} Z^2_{i,j,t-1} + \varepsilon_t ,$$

The endogenous variable $Y_{i,j,t}$ is defined as the change in the annual real growth rate of banking institution $i$ in country $j$ between 2009 and 2007.[24] The equation includes country dummies $(\alpha_j)$ and the following variables measured in 2007: country-specific variables such as macroeconomic variables $(X_{j,t-1})$, bank-specific financial soundness variables $(Z^1_{i,t-1})$, and bank-specific controls. Initially we estimate this specification by ordinary least squares, and then we test and correct for heteroskedasticity and endogeneity of the regressors.

This econometric specification is in line with other studies that analyze the behavior of bank credit in emerging market economies, such as Arena et al (2007) and Dages et al (2000). However, there are some differences with respect to previous studies: (i) we focus on the determinants of the change of real credit growth during a particular crisis period, while other studies focus on the growth of real credit across different periods; (ii) ours is a cross-section analysis, while previous studies have performed panel regression analysis; and (iii) we focus on pre-determined macroeconomic fundamentals as sources of differences in behavior of credit growth.

Since we are dealing with cross-section analysis, it is not possible to simultaneously include several of the country-specific variables in the regression. Doing so would result in problems of multicolinearity. Thus, we guide our selection of aggregate variables according to the results obtained in the previous section. According to that analysis, the performance of a small number of macroeconomic variables *before the crisis* was highly correlated with the behavior of real credit growth *during the crisis*. We therefore include one of each of those variables at a time in alternative regressions. That is, we have one specification of the benchmark equation for each macroeconomic variable to be tested. A limitation of this approach is that we cannot test for the effect of each macroeconomic variable after controlling for the others.[25]

A second group of variables shown in the previous section to be highly correlated with the change in real credit growth was formed by the components of the financial soundness indicator. We include these variables in the regression taking advantage of the availability of data at the bank level. The financial soundness variables included were capitalization, liquidity and efficiency ratios. Among other bank-specific controls, we include the real credit

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[24] We choose to compare the annual 2009 real growth rate of credit with that of 2007 because quarterly data availability was limited and information for 2008 already takes into account some of the effects of the crisis. In addition, this is the same time period used in Section 4.

[25] We also include in the regression some country dummies to capture any additional country-specific effect at the aggregate level. We would like to include dummies for all the countries, but this is not feasible because it would lead to perfect multicolinearity. Therefore, we chose to include the largest set of country dummies that does not generate multicolinearity with the macroeconomic variables. We end up including country variables for Brazil, Mexico and Peru.

growth rate in the pre-crisis period (2007), to take into account the credit cycle of each bank, and other bank-specific characteristics such as foreign ownership (where foreign banks are defined as those banks with foreign ownership larger than 50%).

According to the Breusch-Pagan test (Table 6), we found evidence of heteroskedasticity in the ordinary least squares (OLS) regression for some regressors and for the benchmark equation in general. We correct the heteroskedasticity by two methods: through heteroskedasticity-robust standard errors and cluster-robust standard errors considering country as the cluster.[26] The former method uses an estimate of the standard errors that are robust to heteroskedasticity and the latter uses clusters or groups of errors that are correlated within their cluster or group.

Table 6: Breusch-Pagan test for heteroskedasticity[1]

| | d.f. | Equation number | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Variable 'X' | | General government fiscal balance / GDP | Total external debt / GDP (-1) | Short-term external debt / gross international reserves (-1) | Current account balance / GDP | Mismatch ratio (-1) | Financial-pressures-adjusted monetary variable |
| Variable | | Breusch-Pagan (p-value) | | | | | |
| Lagged real credit growth | 1 | 7.66 | 7.78 | 7.70 | 7.58 | 7.72 | 7.65 |
| | | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Foreign | 1 | 9.36 | 9.18 | 9.34 | 9.59 | 9.22 | 9.40 |
| | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Brazil dummy | 1 | 31.10 | 31.63 | 31.40 | 30.94 | 31.29 | 31.04 |
| | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Mexico dummy | 1 | 4.39 | 4.42 | 4.47 | 4.51 | 4.36 | 4.40 |
| | | (0.04) | (0.04) | (0.03) | (0.03) | (0.04) | (0.04) |
| Peru dummy | 1 | 4.42 | 4.44 | 4.45 | 4.46 | 4.42 | 4.43 |
| | | (0.04) | (0.04) | (0.03) | (0.03) | (0.04) | (0.04) |
| X | 1 | 13.49 | 13.65 | 13.28 | 12.93 | 13.75 | 13.41 |
| | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Capitalization | 1 | 0.11 | 0.11 | 0.11 | 0.10 | 0.11 | 0.11 |
| | | (0.74) | (0.74) | (0.74) | (0.75) | (0.74) | (0.74) |
| Liquidity | 1 | 46.53 | 47.36 | 46.40 | 45.20 | 47.17 | 46.32 |
| | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Efficiency | 1 | 12.13 | 10.94 | 5.60 | 1.11 | 4.88 | 19.45 |
| | | (0.00) | (0.00) | (0.02) | (0.29) | (0.03) | (0.00) |
| Simultaneous | 9 | 92.02 | 92.82 | 91.77 | 90.63 | 92.77 | 91.78 |
| | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |

[1] Applied over benchmark equation; 2007 values. H0: constant variance.

[26] For a definition of both, see Cameron and Trivedi (2009), pp 82-83.

Another potential econometric problem is the endogeneity of the regressors, which would derive into inconsistent estimates of the coefficients. We use the Wu-Hausman test to test for endogeneity of the bank-specific regressors (Table 7). The p-values of this test (last column of Table 7) show that it was possible to reject the endogeneity of the financial soundness variables in the regression but not for the initial credit growth rate. We address the endogeneity of this regressor with instrumental variables (IV) estimation. The instruments chosen were the one period lagged (2006) real credit growth rate and financial soundness variables. Moreover, as a measure of fit for the IV estimation we use the generalized R2 criterion as suggested by Pesaran and Smith (1994)

## 5.2. Data

The econometric exercise is restricted to private banks, defined as those with more than 50% of non-government ownership, in the six Latin American countries in the sample. We use bank-specific information from 2006 to 2009 from Bankscope.[27] From a total sample of 269 banks, we were able to work with a sample of 124 banks after eliminating observations with missing variables. Brazil is the country with the largest number of banks in our sample (60), followed by Argentina (18), Mexico (17), Chile (15), Colombia (10) and Peru (9). There were 47 foreign banks in the sample.

The specific definition of the financial soundness variables used was chosen considering the largest set available and its significance in the regression. For capitalization, the ratio of equity to total assets was selected (Bankscope code 4009); for liquidity, we used the total deposits and borrowing to net loans ratio (Bankscope code 4034); for efficiency, the cost to income ratio was used (Bankscope code 4029). Also, for our robustness exercise we included a profitability ratio measured by the return on average assets (ROAA, Bankscope code 4024) and the ratio of loan loss provisioning to impaired performing loans (Bankscope code 4003). The definition of the financial soundness variables used in this section is very similar to the ones used in the previous section for the aggregate analysis, with the exception of liquidity and capitalization.[28] For these variables we previously used the bank deposits to bank credit ratio and the bank capital to total assets ratio, which are slightly different definitions of liquidity and capitalization, respectively.

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[27] Data from 2006 are needed to calculate the annual rate of growth of real credit in 2007 and as instruments for the IV estimation.

[28] The liquidity ratio used in the econometric analysis also includes other forms of financing than deposits. Among Bankscope variables, this definition of liquidity was the closest to the variable used for the aggregate analysis in Section 4. In the case of capitalization, we use the equity to capital ratio instead of the capital to assets ratio because of the limited availability of the latter variable in the Bankscope database, in particular for banks from Argentina and Colombia.

Table 7: Wu-Hausman test of endogeneity[1]

| Instrumented variable | Instruments | Variable 'X' | Error correction | d.f. | Wu-Hausman | p-value |
|---|---|---|---|---|---|---|
| Real credit growth, 2007 | Real credit growth, 2006 | General government fiscal balance / GDP | No correction | 1,118 | 13.40 | 0.00 |
| | | | Robust | | 6.42 | 0.01 |
| | | Total external debt / GDP (-1) | No correction | | 13.21 | 0.00 |
| | | | Robust | | 6.38 | 0.01 |
| | | Short-term external debt / gross international reserves (-1) | No correction | | 13.12 | 0.00 |
| | | | Robust | | 6.52 | 0.01 |
| | | Current account balance / GDP | No correction | | 13.13 | 0.00 |
| | | | Robust | | 6.67 | 0.01 |
| | | Mismatch ratio (-1) | No correction | | 13.45 | 0.00 |
| | | | Robust | | 6.32 | 0.01 |
| | | Financial-pressures-adjusted monetary variable | No correction | | 13.38 | 0.00 |
| | | | Robust | | 6.45 | 0.01 |
| Camel,[2] 2007 | Camel,[2] 2006 | General government fiscal balance / GDP | No correction | 3,115 | 1.27 | 0.29 |
| | | | Robust | | 1.32 | 0.27 |
| | | Total external debt / GDP (-1) | No correction | | 1.25 | 0.29 |
| | | | Robust | | 1.35 | 0.26 |
| | | Short-term external debt / gross international reserves (-1) | No correction | | 1.28 | 0.29 |
| | | | Robust | | 1.36 | 0.26 |
| | | Current account balance / GDP | No correction | | 1.31 | 0.28 |
| | | | Robust | | 1.36 | 0.26 |
| | | Mismatch ratio (-1) | No correction | | 1.25 | 0.29 |
| | | | Robust | | 1.31 | 0.27 |
| | | Financial-pressures-adjusted monetary variable | No correction | | 1.27 | 0.29 |
| | | | Robust | | 1.32 | 0.27 |

[1] Applied over benchmark model. H0: variables are exogenous. [2] "Camel" comprises the following: capitalization, liquidity and efficiency.

## 5.3. Results

Table 8 shows the estimation of the benchmark regression. As explained above, each column shows a regression including one of each macroeconomic variable at a time. Moreover, as in Table 2, some of the macroeconomic variables have been multiplied by -1, in such a way that a larger value implies better macroeconomic performance.[29] Therefore, the expected sign for the coefficients of each macroeconomic variable is positive. Given the econometric problems of heteroskedasticity and endogeneity of regressors reported above, we estimate the benchmark regression with instrumental variables correcting for heteroskedasticity by cluster-robust standard errors.[30]

A key result from this benchmark regression is that the macroeconomic variables that were most important in explaining the evolution of real credit growth during the crisis were the currency mismatch ratio, the ratio of total external debt to GDP and the ratio of short-term external debt to gross international reserves. All of these variables are related to the economy's capacity to withstand an external financial shock. Somewhat less statistically significant were the government fiscal balance to GDP and the financial-pressures-adjusted monetary variable,[31] which are related to the capacity to implement policies affecting the performance of real credit in Latin American banks during the crisis. On the other hand, the current account to GDP ratio did not show a significant effect on the evolution of credit in these countries.

Most of these results are in line with those found in the previous section. The macroeconomic solvency indicator measured by the ratio of total external debt to GDP and the mismatch ratio were highly important in both analyses to explain the evolution of credit during the crisis. However, there are also some differences. In the country-level analysis the current account to GDP ratio seemed to play a more important role, but this variable is not statistically significant in the bank-level study. This result suggests that this indicator of external financing needs at the time of the shock was more important in explaining the differences across regions than differences within Latin American countries. Similarly, the ratio of short-term external debt to gross international reserves showed a low correlation

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[29] Those variables that were multiplied by -1 were total external debt to GDP, short-term debt to gross international reserves and the mismatch ratio.

[30] Also, Tables A3 to A8 in Appendix III show regressions of the benchmark equation estimated using alternative methods, such as OLS estimation, without correction of heteroskedasticy (BEN), robust standard error correction (HET) and cluster-robust standard error correction (CLU), and IV estimation using the same three strategies to deal with heteroskedasticity. The signs of the coefficients do not change when we correct for the endogeneity of the regressors; however, significance is affected when we correct for heteroskedasticity. IV-CLU is the regression that shows the largest significance of regressors (last column).

[31] The significance of these variables is considerable less than the previous ones, the p-values are respectively 0.07 and 0.16.

with the change of credit growth at the aggregate level, but this measure of external liquidity was highly statistically significant at the micro level for Latin America.

Table 8: Regression results: benchmark equation[1]

| Equation number | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Variable 'X' | General governme nt fiscal balance / GDP | Total external debt / GDP (-1) | Short-term external debt / gross internatio nal reserves (-1) | Current account balance / GDP | Mismatch ratio (-1) | Financial-pressures-adjusted monetary variable |
| Variable | Coefficient (p-value) | | | | | |
| Lagged real credit growth | -2.65 | -2.63 | -2.62 | -2.62 | -2.65 | -2.64 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Foreign | -49.96 | -49.14 | -48.41 | -48.11 | -50.36 | -49.79 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Brazil dummy | 60.55 | 38.97 | 44.11 | 54.04 | 50.38 | 61.30 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Mexico dummy | 52.37 | 34.49 | 38.09 | 46.09 | 42.38 | 50.57 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Peru dummy | 32.69 | 28.83 | 22.45 | 32.63 | 34.70 | 32.58 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| X | 0.92 | 0.80 | 0.35 | -1.02 | 0.13 | 0.15 |
| | (0.07) | (0.00) | (0.01) | (0.45) | (0.00) | (0.16) |
| Capitalization | 2.63 | 2.68 | 2.66 | 2.62 | 2.64 | 2.62 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Liquidity | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Efficiency | 0.10 | 0.10 | 0.09 | 0.09 | 0.10 | 0.10 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Constant | 7.86 | 37.60 | 29.38 | 10.91 | 23.31 | 7.81 |
| | (0.56) | (0.00) | (0.00) | (0.38) | (0.04) | (0.57) |
| N | 129 | 129 | 129 | 129 | 129 | 129 |
| R2[2] | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |

[1] Dependent variable: change in real credit growth during the crisis; estimation method: instrumental variables (two stage least squares); instrumented variable: 2007 real credit growth; instrument: 2006 real credit growth; regressors: 2007 values; standard error correction: cluster (cluster variable is country). [2] Generalized R2.

Moreover, as in the country-level analysis, the financial soundness characteristics of Latin American banks played a role on the evolution of credit during the crisis. In particular, the large coefficient of capitalization (larger than 2 in all regressions) indicates that the better

capitalized banks were before the crisis, the more able they were to withstand the adverse effects of the crisis. Also, more liquid banks, measured by a greater dependence on local deposits as a funding source (and consequently lower dependence on external sources of funding), and more efficient banks (that is, those that incurred in lower costs from running the business), were able to cope better with the effects of the crisis on credit.

Furthermore, the negative sign of the lagged real credit growth regressor shows that banks that were facing larger growth rates of credit prior to the crisis were also those who suffered more in terms of credit contraction. Also, the negative sign of the foreign-owned bank variable indicates that this type of banks also performed worse than domestic banks during the crisis in terms of credit provision, after controlling for other factors. This last result is consistent with Galindo et al (2010), who find that in the years prior to the crisis foreign-owned banks in Latin America responded more than domestically owned banks to external financial shocks in terms of the supply of credit.

Robustness analysis to the benchmark equation is presented in Table 9. To this end, we included other controls such as the size of the bank and other financial soundness characteristics, such as provisioning and profitability. The relative size of each bank is measured by the share of capital in its respective national system. The indicator of provisioning was measured by the loan loss reserves to impaired loans ratio (Bankscope code 4003), and the indicator of profitability was measured by the return on average assets (Bankscope code 4024).

The first column of Table 9 shows the regression after replacing the macroeconomic variables with a full set of country dummies. We found a positive and statistically significant coefficient for Brazil, Mexico and Peru, which indicates that these countries had an important country-specific effect in the performance of credit. However, the coefficients for Argentina and Chile were not statistically significant at the 10% level, which indicates that, after controlling for other factors, there was not a significant country-specific effect for these countries. Also, in columns 2 to 7 we repeat the benchmark regressions, including the additional controls mentioned above. As shown, none of the new controls was statistically significant at the 10% level, and none of the main results presented in the benchmark regression changed qualitatively. That is, the size of the banks and their levels of provisioning and profitability previous to the crisis did not appear to have a role in explaining the performance of credit during the crisis.

Table 9: Regression results: robustness analysis[1]

| Equation number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Variable 'X' | | General government fiscal balance / GDP | Total external debt / GDP (-1) | Short-term external debt / gross international reserves (-1) | Current account balance / GDP | Mismatch ratio (-1) | Financial-pressures-adjusted monetary variable |
| Variable | | Coefficient (p-value) | | | | | |
| Lagged real credit growth | -2.67 | -2.68 | -2.67 | -2.68 | -2.69 | -2.67 | -2.68 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Size | -83.74 | -66.95 | -79.84 | -73.25 | -61.56 | -72.75 | -65.20 |
| | (0.32) | (0.43) | (0.35) | (0.39) | (0.47) | (0.38) | (0.44) |
| Foreign | -48.90 | -49.35 | -47.86 | -47.31 | -47.35 | -49.64 | -49.20 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Argentina dummy | -1.73 | | | | | | |
| | (0.92) | | | | | | |
| Brazil dummy | 63.42 | 59.29 | 31.94 | 39.97 | 53.01 | 42.93 | 60.87 |
| | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) |
| Chile dummy | 20.13 | | | | | | |
| | (0.20) | | | | | | |
| Colombia dummy | 22.98 | | | | | | |
| | (0.09) | | | | | | |
| Mexico dummy | 61.72 | 54.65 | 31.52 | 36.62 | 46.66 | 39.26 | 51.97 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Peru dummy | 49.30 | 34.64 | 30.60 | 22.81 | 34.76 | 37.90 | 34.41 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| X | | 1.42 | 0.99 | 0.43 | -1.21 | 0.20 | 0.24 |
| | | (0.09) | (0.00) | (0.01) | (0.60) | (0.00) | (0.19) |
| Capitalization | 2.57 | 2.54 | 2.59 | 2.60 | 2.58 | 2.54 | 2.54 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Liquidity | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Efficiency | 0.12 | 0.12 | 0.12 | 0.11 | 0.10 | 0.12 | 0.12 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Profitability | 1.19 | 1.17 | 1.13 | 1.08 | 1.04 | 1.20 | 1.15 |
| | (0.22) | (0.25) | (0.26) | (0.30) | (0.34) | (0.23) | (0.26) |
| Provisioning | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | -0.01 | 0.00 |
| | (0.91) | (0.90) | (0.93) | (0.82) | (0.82) | (0.84) | (0.93) |
| Constant | | 9.92 | 47.16 | 35.32 | 12.01 | 33.97 | 9.56 |
| | | (0.54) | (0.00) | (0.02) | (0.48) | (0.01) | (0.56) |
| N | 129 | 129 | 129 | 129 | 129 | 129 | 129 |
| R2[2] | 0.36 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 |

[1] Dependent variable: change in real credit growth during the crisis; estimation method: instrumental variables (two stage least squares); instrumented variable: 2007 real credit growth; instrument: 2006 real credit growth; regressors: 2007 values; standard error correction: cluster (cluster variable is country). [2] Generalized R2.

## 6. Conclusions

Real credit growth in emerging market economies is vulnerable to adverse effects of external financial shocks. The global crisis of 2008-09 was a case in point. However, policymakers from emerging markets do not have to be (and many have not been) bystanders to the vagaries of international capital markets. It is the quality of pre-crisis credit growth (which preserved healthy balance sheets) that matters as much as its rate of expansion. Analysis at the country and bank levels shows that initial conditions, determined by the actions of local public and private sector participants, in the period *before the crisis* mattered for the behavior of real credit growth *during* the crisis.

The results at the country level strongly suggest that pre-crisis balance sheet indicators of macroeconomic performance and the strength of the financial system were closely associated with the resilience of real credit growth during the crisis. In particular, real credit growth resilience during the crisis was higher in the countries that faced the beginning of the crisis with lower external financing needs (relative to GDP), had lower currency mismatches both in private and public balance sheets, and were well placed to implement countercyclical monetary policies and to provide liquidity without generating macroeconomic instability. These results underscore the important limitations faced by emerging market economies due to their inability to issue *hard* currency. While, in general, it is not a good idea to have a large amount of liabilities denominated in currencies that a country cannot issue, this is particularly critical in the presence of an external shock that dries up hard-currency liquidity.

Analysis of data at the bank level for a set of Latin American countries reinforces a number of the results obtained at the aggregate level. In particular, the economy's overall currency mismatch was a significant variable in the econometric exercise conducted at the micro level. External debt ratios (measuring either total debt or short-term debt) were also significant variables in the real credit growth equations of Latin American banks. The capacity to implement countercyclical policies during the crisis was also important in explaining the behavior of bank credit, albeit at a lower level of significance. The policy implication is that macroprudential policies which limit both currency mismatches and external debt to ensure sustainable forms of credit expansion are absolutely central. Moreover, financial soundness characteristics of Latin American banks also played a role in explaining the dynamics of real credit during the crisis. In particular, higher ratios of capitalization, liquidity and bank efficiency were factors that helped banks to better cope with the effects of the crisis on credit. We also found that foreign banks and banks which had expanded credit growth more before the crisis were also those that cut credit most.

As additional data become available, the analysis in this paper can be useful for assessing how emerging market economies, in general, and Latin American countries, in particular, are preparing themselves to cope with the adverse effects on real credit growth of an increase in global financial turbulence.

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## Appendix I: Constructing the regulatory strength variables

The two variables included in the analysis – (i) overall activities and bank ownership restrictions and (ii) accounting and transparency – were constructed by assigning specific scores to the answers from a survey conducted by the World Bank using the Berth et al (2007) questionnaire. The value of each variable for every country is the average of the assigned scores.

All the answers to the World Bank survey can be found at:
http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20345037~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

This appendix presents the survey questions used and the scores assigned to construct the two regulatory strength variables

### A. Accounting and transparency

| Question no in the survey | Question in the survey | Possible answers | Assigned scores |
|---|---|---|---|
| 3.10 | Are accounting practices for banks in accordance with International Accounting Standards (IAS)? | YES<br>NO | 1 if the answer is YES<br>0 if the answer is NO |
| 3.11 | Are accounting practices for banks in accordance with US Generally Accepted Accounting Principles (GAAP)? | YES<br>NO | 1 if the answer is YES<br>0 if the answer is NO |
| 10.1 | Does accrued, though unpaid interest/principal enter the income statement while the loan is still performing? | YES<br>NO<br>Not Available | 1 is the answer is YES<br>0 if the Answer is No or Not Available |
| 10.1.1 | Does accrues, though unpaid interest/principal enter the income statement while the loan is still non-performing? | YES<br>NO<br>Not Available | 1 if the answer is NO<br>0 if the answer is YES or Not available |
| 10.3 | Are financial institutions required to produce consolidated accounts covering all banks and any nonbank financial subsidiary? | YES<br>NO<br>Not Available | 1 is the answer is YES<br>0 if the Answer is No or Not Available |
| 10.5 | Must banks disclose their risk management procedures to the public? | YES<br>NO<br>Not Available | 1 is the answer is YES<br>0 if the Answer is No or Not Available |

**B. Overall activities and bank ownership restrictions**

| Question no in the survey | Question in the survey | Possible answers | Assigned scores |
|---|---|---|---|
| 4.1 | What are the conditions under which banks can engage in security activities | 1. Unrestricted: A full range of activities can be conducted indirectly in banks<br>2. Permitted: A full range of these activities are offered, but all or some of these activities must be conducted in subsidiaries or in another part of a common holding.<br>3. Restricted: Less than a full range of activities can be conducted in the bank or subsidiary.<br>4. Prohibited: The activity cannot be conducted in either the bank or subsidiaries | Unrestricted = 1<br>Permitted = 2<br>Restricted = 3<br>Prohibited = 4 |
| 4.2 | What are the conditions under which banks can engage in insurance activities? | 1. Unrestricted: A full range of activities can be conducted indirectly in banks<br>2. Permitted: A full range of these activities are offered, but all or some of these activities must be conducted in subsidiaries or in another part of a common holding.<br>3. Restricted: Less than a full range of activities can be conducted in the bank or subsidiary.<br>4. Prohibited: The activity cannot be conducted in either the bank or subsidiaries | Unrestricted = 1<br>Permitted = 2<br>Restricted = 3<br>Prohibited = 4 |
| 4.3 | What are the conditions under which banks can engage in real estate activities? | 1. Unrestricted: A full range of activities can be conducted indirectly in banks<br>2. Permitted: A full range of these activities are offered, but all or some of these activities must be conducted in subsidiaries or in another part of a common holding.<br>3. Restricted: Less than a full range of activities can be conducted in the bank or subsidiary.<br>4. Prohibited: The activity cannot be conducted in either the bank or subsidiaries | Unrestricted = 1<br>Permitted = 2<br>Restricted = 3<br>Prohibited = 4 |
| 4.4 | Can banks own voting shares in non-financial firms? | 1. Unrestricted: A bank might own 100%of the equity in any non-financial firm.<br>2. Permitted: A bank might own 100% of the equity in a non-financial firm, but ownership is limited based on the bank's equity capital.<br>3. Restricted: A bank can only acquire less than 100% of the equity in a non-financial firm.<br>4. Restricted: A bank might not acquire any equity investment in a non-financial firm whatsoever. | Unrestricted = 1<br>Permitted = 2<br>Restricted = 3<br>Prohibited = 4 |

## Appendix II: Values of the real credit growth and financial-pressures-adjusted monetary variables

Table A1: Real credit growth during the crisis

| | Real credit growth[1] | Standardized credit growth[2] | Country ranking |
|---|---|---|---|
| Latin America | | | |
| Argentina | -24.5 | -0.4 | 15 |
| Brazil | -33.9 | -1.0 | 19 |
| Chile | -14.5 | 0.2 | 8 |
| Colombia | -24.8 | -0.4 | 16 |
| Mexico | -14.6 | 0.2 | 9 |
| Peru | -20.4 | -0.2 | 14 |
| Emerging Asia | | | |
| China | 20.5 | 2.4 | 1 |
| Chinese Taipei | 2.5 | 1.3 | 2 |
| India | -10.9 | 0.4 | 7 |
| Indonesia | -15.1 | 0.2 | 10 |
| Korea | -9.8 | 0.5 | 6 |
| Malaysia | -2.8 | 0.9 | 4 |
| Philippines | -2.9 | 0.9 | 5 |
| Thailand | -1.0 | 1.0 | 3 |
| Emerging Europe | | | |
| Bulgaria | -39.1 | -1.3 | 20 |
| Czech Republic | -18.9 | -0.1 | 13 |
| Estonia | -26.1 | -0.5 | 17 |
| Hungary | -17.1 | 0.0 | 11 |
| Latvia | -26.7 | -0.5 | 18 |
| Lithuania | -41.2 | -1.4 | 21 |
| Poland | -17.2 | 0.0 | 12 |
| Romania | -53.0 | -2.2 | 22 |

[1] Difference in year over year percentage change for Q4 2009 and Q4 2007. [2] Standardized version of the average of the variables shown.
Sources: IMF; Datastream; national data.

Table A2: Financial-pressures-adjusted monetary policy variable

| | Monetary policy stance (1) | Credit boom[1] (2) | Adjusted monetary policy stance (3) = (1) X (2) | Financial-pressures-adjusted monetary variable[2] (4) | Country ranking (5) |
|---|---|---|---|---|---|
| Latin America | | | | | |
| Argentina | -3.0 | 2.5 | -7.5 | 0.0 | 15 |
| Brazil | -2.4 | 8.5 | -20.5 | -0.1 | 17 |
| Chile | -5.8 | -8.0 | 46.3 | 0.7 | 5 |
| Colombia | -2.4 | 2.8 | -6.6 | 0.0 | 14 |
| Mexico | -3.5 | -1.2 | 4.2 | 0.2 | 11 |
| Peru | -3.9 | -5.1 | 20.1 | 0.4 | 9 |
| Emerging Asia | | | | | |
| China | -4.2 | -9.4 | 39.6 | 0.6 | 6 |
| Chinese Taipei | -3.6 | -20.3 | 73.1 | 1.1 | 2 |
| India | -0.6 | -4.9 | 2.8 | 0.2 | 13 |
| Indonesia | -3.3 | -10.6 | 35.3 | 0.6 | 7 |
| Korea | -0.4 | -10.4 | 3.9 | 0.2 | 12 |
| Malaysia | -1.7 | -15.2 | 26.5 | 0.5 | 8 |
| Philippines | -3.0 | -18.5 | 55.6 | 0.8 | 3 |
| Thailand | -2.6 | -20.9 | 54.8 | 0.8 | 4 |
| Emerging Europe | | | | | |
| Bulgaria | -6.9 | 14.0 | -95.7 | -1.1 | 20 |
| Czech Republic | -4.2 | -2.8 | 11.9 | 0.3 | 10 |
| Estonia | -8.7 | 8.1 | -70.6 | -0.8 | 18 |
| Hungary | -5.0 | -21.2 | 106.6 | 1.5 | 1 |
| Latvia | -13.0 | 14.4 | -187.3 | -2.3 | 21 |
| Lithuania | -8.1 | 10.9 | -88.2 | -1.0 | 19 |
| Poland | -4.8 | 3.6 | -17.5 | -0.1 | 16 |
| Romania | -6.5 | 30.4 | -198.1 | -2.5 | 22 |

[1] 2007 real credit average growth rate minus 22%; based on quarterly data. [2] Standardized version of column (3) shown.
Sources: IMF; Datastream; national data.

## Appendix III: Alternative methods for estimating the benchmark regression

Table A3: Regression results: benchmark equation using general government fiscal balance / GDP[1]

| Equation number | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Estimation method | OLS | | | IV 2SLS[2] | | |
| Error correction | No correction | Robust | Cluster[3] | No correction | Robust | Cluster[3] |
| Variable | Coefficient (p-value) | | | | | |
| Lagged real credit growth | -1.01 | -1.01 | -1.01 | -2.65 | -2.65 | -2.65 |
| | (0.00) | (0.00) | (0.00) | (0.03) | (0.02) | (0.00) |
| Foreign | -19.94 | -19.94 | -19.94 | -49.96 | -49.96 | -49.96 |
| | (0.00) | (0.00) | (0.06) | (0.09) | (0.08) | (0.00) |
| Brazil dummy | 25.59 | 25.59 | 25.59 | 60.55 | 60.55 | 60.55 |
| | (0.00) | (0.00) | (0.00) | (0.11) | (0.05) | (0.00) |
| Mexico dummy | 11.31 | 11.31 | 11.31 | 52.37 | 52.37 | 52.37 |
| | (0.29) | (0.10) | (0.05) | (0.22) | (0.30) | (0.00) |
| Peru dummy | 15.64 | 15.64 | 15.64 | 32.69 | 32.69 | 32.69 |
| | (0.25) | (0.00) | (0.02) | (0.38) | (0.07) | (0.00) |
| General government fiscal balance / GDP | 0.74 | 0.74 | 0.74 | 0.92 | 0.92 | 0.92 |
| | (0.51) | (0.30) | (0.14) | (0.75) | (0.57) | (0.07) |
| Capitalization | 0.57 | 0.57 | 0.57 | 2.63 | 2.63 | 2.63 |
| | (0.07) | (0.08) | (0.16) | (0.18) | (0.08) | (0.00) |
| Liquidity | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) |
| Efficiency | 0.26 | 0.26 | 0.26 | 0.10 | 0.10 | 0.10 |
| | (0.00) | (0.12) | (0.00) | (0.71) | (0.39) | (0.00) |
| Constant | -23.14 | -23.14 | -23.14 | 7.86 | 7.86 | 7.86 |
| | (0.01) | (0.06) | (0.01) | (0.80) | (0.66) | (0.56) |
| N | 139 | 139 | 139 | 129 | 129 | 129 |
| R2[4] | 0.74 | 0.74 | 0.74 | 0.20 | 0.20 | 0.20 |

[1] Dependent variable: change in real credit growth during the crisis; regressors: 2007 values. [2] Instrumented variable: 2007 real credit growth; instrument: 2006 real credit growth. [3] Cluster variable is country. [4] For IV estimations, generalized R2.

Table A4: Regression results: benchmark equation using total external debt / GDP[1]

| Equation number | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Estimation method | OLS | | | IV 2SLS[2] | | |
| Error correction | No correction | Robust | Cluster[3] | No correction | Robust | Cluster[3] |
| Variable | Coefficient (p-value) | | | | | |
| Lagged real credit growth | -1.01 | -1.01 | -1.01 | -2.63 | -2.63 | -2.63 |
| | (0.00) | (0.00) | (0.00) | (0.03) | (0.02) | (0.00) |
| Foreign | -19.52 | -19.52 | -19.52 | -49.14 | -49.14 | -49.14 |
| | (0.00) | (0.00) | (0.06) | (0.09) | (0.07) | (0.00) |
| Brazil dummy | 10.90 | 10.90 | 10.90 | 38.97 | 38.97 | 38.97 |
| | (0.43) | (0.16) | (0.02) | (0.34) | (0.12) | (0.00) |
| Mexico dummy | -0.75 | -0.75 | -0.75 | 34.49 | 34.49 | 34.49 |
| | (0.96) | (0.92) | (0.79) | (0.43) | (0.45) | (0.00) |
| Peru dummy | 13.24 | 13.24 | 13.24 | 28.83 | 28.83 | 28.83 |
| | (0.34) | (0.00) | (0.03) | (0.43) | (0.09) | (0.00) |
| Total external debt / GDP (-1) | 0.52 | 0.52 | 0.52 | 0.80 | 0.80 | 0.80 |
| | (0.32) | (0.10) | (0.01) | (0.57) | (0.29) | (0.00) |
| Capitalization | 0.61 | 0.61 | 0.61 | 2.68 | 2.68 | 2.68 |
| | (0.05) | (0.06) | (0.14) | (0.17) | (0.08) | (0.00) |
| Liquidity | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) |
| Efficiency | 0.26 | 0.26 | 0.26 | 0.10 | 0.10 | 0.10 |
| | (0.00) | (0.12) | (0.00) | (0.70) | (0.36) | (0.00) |
| Constant | -2.98 | -2.98 | -2.98 | 37.60 | 37.60 | 37.60 |
| | (0.89) | (0.81) | (0.61) | (0.54) | (0.25) | (0.00) |
| N | 139 | 139 | 139 | 129 | 129 | 129 |
| R2[4] | 0.74 | 0.74 | 0.74 | 0.20 | 0.20 | 0.20 |

[1] Dependent variable: change in real credit growth during the crisis; regressors: 2007 values. [2] Instrumented variable: 2007 real credit growth; instrument: 2006 real credit growth. [3] Cluster variable is country. [4] For IV estimations, generalized R2.

Table A5: Regression results: benchmark equation using short-term external debt / gross international reserves[1]

| Equation number | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Estimation method | OLS | | | IV 2SLS[2] | | |
| Error correction | No correction | Robust | Cluster[3] | No correction | Robust | Cluster[3] |
| Variable | Coefficient (p-value) | | | | | |
| Lagged real credit growth | -1.01 | -1.01 | -1.01 | -2.62 | -2.62 | -2.62 |
| | (0.00) | (0.00) | (0.00) | (0.03) | (0.02) | (0.00) |
| Foreign | -19.15 | -19.15 | -19.15 | -48.41 | -48.41 | -48.41 |
| | (0.00) | (0.00) | (0.07) | (0.09) | (0.07) | (0.00) |
| Brazil dummy | 14.66 | 14.66 | 14.66 | 44.11 | 44.11 | 44.11 |
| | (0.22) | (0.03) | (0.00) | (0.25) | (0.08) | (0.00) |
| Mexico dummy | 2.02 | 2.02 | 2.02 | 38.09 | 38.09 | 38.09 |
| | (0.88) | (0.76) | (0.38) | (0.37) | (0.41) | (0.00) |
| Peru dummy | 9.40 | 9.40 | 9.40 | 22.45 | 22.45 | 22.45 |
| | (0.56) | (0.06) | (0.08) | (0.59) | (0.20) | (0.00) |
| Short-term external debt / gross international reserves (-1) | 0.23 | 0.23 | 0.23 | 0.35 | 0.35 | 0.35 |
| | (0.43) | (0.11) | (0.06) | (0.63) | (0.32) | (0.01) |
| Capitalization | 0.60 | 0.60 | 0.60 | 2.66 | 2.66 | 2.66 |
| | (0.05) | (0.06) | (0.14) | (0.17) | (0.07) | (0.00) |
| Liquidity | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) |
| Efficiency | 0.26 | 0.26 | 0.26 | 0.09 | 0.09 | 0.09 |
| | (0.00) | (0.12) | (0.00) | (0.71) | (0.37) | (0.00) |
| Constant | -8.77 | -8.77 | -8.77 | 29.38 | 29.38 | 29.38 |
| | (0.64) | (0.44) | (0.06) | (0.59) | (0.27) | (0.00) |
| N | 139 | 139 | 139 | 129 | 129 | 129 |
| R2[4] | 0.74 | 0.74 | 0.74 | 0.20 | 0.20 | 0.20 |

[1] Dependent variable: change in real credit growth during the crisis; regressors: 2007 values. [2] Instrumented variable: 2007 real credit growth; instrument: 2006 real credit growth. [3] Cluster variable is country. [4] For IV estimations, generalised R2.

Table A6: Regression results: benchmark equation using current account balance / GDP[1]

| Equation number | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Estimation method | OLS | | | IV 2SLS[2] | | |
| Error correction | No correction | Robust | Cluster[3] | No correction | Robust | Cluster[3] |
| Variable | Coefficient (p-value) | | | | | |
| Lagged real credit growth | -1.01 | -1.01 | -1.01 | -2.62 | -2.62 | -2.62 |
| | (0.00) | (0.00) | (0.00) | (0.03) | (0.02) | (0.00) |
| Foreign | -18.99 | -18.99 | -18.99 | -48.11 | -48.11 | -48.11 |
| | (0.00) | (0.00) | (0.07) | (0.09) | (0.07) | (0.00) |
| Brazil dummy | 21.43 | 21.43 | 21.43 | 54.04 | 54.04 | 54.04 |
| | (0.01) | (0.00) | (0.00) | (0.11) | (0.05) | (0.00) |
| Mexico dummy | 7.70 | 7.70 | 7.70 | 46.09 | 46.09 | 46.09 |
| | (0.50) | (0.22) | (0.11) | (0.26) | (0.34) | (0.00) |
| Peru dummy | 16.17 | 16.17 | 16.17 | 32.63 | 32.63 | 32.63 |
| | (0.23) | (0.00) | (0.04) | (0.37) | (0.07) | (0.00) |
| Current account balance / GDP | -0.52 | -0.52 | -0.52 | -1.02 | -1.02 | -1.02 |
| | (0.79) | (0.53) | (0.66) | (0.84) | (0.65) | (0.45) |
| Capitalization | 0.58 | 0.58 | 0.58 | 2.62 | 2.62 | 2.62 |
| | (0.06) | (0.07) | (0.16) | (0.18) | (0.07) | (0.00) |
| Liquidity | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) |
| Efficiency | 0.25 | 0.25 | 0.25 | 0.09 | 0.09 | 0.09 |
| | (0.00) | (0.13) | (0.00) | (0.73) | (0.40) | (0.00) |
| Constant | -21.06 | -21.06 | -21.06 | 10.91 | 10.91 | 10.91 |
| | (0.03) | (0.07) | (0.01) | (0.73) | (0.53) | (0.38) |
| N | 139 | 139 | 139 | 129 | 129 | 129 |
| R2[4] | 0.74 | 0.74 | 0.74 | 0.20 | 0.20 | 0.20 |

[1] Dependent variable: change in real credit growth during the crisis; regressors: 2007 values. [2] Instrumented variable: 2007 real credit growth; instrument: 2006 real credit growth. [3] Cluster variable is country. [4] For IV estimations, generalised R2.

Table A7: Regression results: benchmark equation using the mismatch ratio[1]

| Equation number | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Estimation method | OLS | | | IV 2SLS[2] | | |
| Error correction | No correction | Robust | Cluster[3] | No correction | Robust | Cluster[3] |
| Variable | Coefficient (p-value) | | | | | |
| Lagged real credit growth | -1.01 | -1.01 | -1.01 | -2.65 | -2.65 | -2.65 |
| | (0.00) | (0.00) | (0.00) | (0.03) | (0.02) | (0.00) |
| Foreign | -20.13 | -20.13 | -20.13 | -50.36 | -50.36 | -50.36 |
| | (0.00) | (0.00) | (0.05) | (0.09) | (0.08) | (0.00) |
| Brazil dummy | 17.58 | 17.58 | 17.58 | 50.38 | 50.38 | 50.38 |
| | (0.06) | (0.01) | (0.00) | (0.16) | (0.05) | (0.00) |
| Mexico dummy | 3.46 | 3.46 | 3.46 | 42.38 | 42.38 | 42.38 |
| | (0.78) | (0.64) | (0.12) | (0.32) | (0.36) | (0.00) |
| Peru dummy | 17.09 | 17.09 | 17.09 | 34.70 | 34.70 | 34.70 |
| | (0.20) | (0.00) | (0.02) | (0.35) | (0.07) | (0.00) |
| Mismatch ratio (-1) | 0.10 | 0.10 | 0.10 | 0.13 | 0.13 | 0.13 |
| | (0.41) | (0.23) | (0.04) | (0.67) | (0.47) | (0.00) |
| Capitalization | 0.57 | 0.57 | 0.57 | 2.64 | 2.64 | 2.64 |
| | (0.07) | (0.08) | (0.16) | (0.18) | (0.08) | (0.00) |
| Liquidity | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) |
| Efficiency | 0.26 | 0.26 | 0.26 | 0.10 | 0.10 | 0.10 |
| | (0.00) | (0.12) | (0.00) | (0.70) | (0.38) | (0.00) |
| Constant | -11.32 | -11.32 | -11.32 | 23.31 | 23.31 | 23.31 |
| | (0.47) | (0.32) | (0.00) | (0.61) | (0.43) | (0.04) |
| N | 139 | 139 | 139 | 129 | 129 | 129 |
| R2[4] | 0.74 | 0.74 | 0.74 | 0.20 | 0.20 | 0.20 |

[1] Dependent variable: change in real credit growth during the crisis; regressors: 2007 values. [2] Instrumented variable: 2007 real credit growth; instrument: 2006 real credit growth. [3] Cluster variable is country. [4] For IV estimations, generalised R2.

Table A8: Regression results: benchmark equation using the financial-pressures-adjusted monetary variable[1]

| Equation number | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Estimation method | OLS | | | IV 2SLS[2] | | |
| Error correction | No correction | Robust | Cluster[3] | No correction | Robust | Cluster[3] |
| Variable | Coefficient (p-value) | | | | | |
| Lagged real credit growth | -1.01 | -1.01 | -1.01 | -2.64 | -2.64 | -2.64 |
| | (0.00) | (0.00) | (0.00) | (0.03) | (0.02) | (0.00) |
| Foreign | -19.86 | -19.86 | -19.86 | -49.79 | -49.79 | -49.79 |
| | (0.00) | (0.00) | (0.06) | (0.09) | (0.08) | (0.00) |
| Brazil dummy | 26.39 | 26.39 | 26.39 | 61.30 | 61.30 | 61.30 |
| | (0.01) | (0.00) | (0.00) | (0.12) | (0.06) | (0.00) |
| Mexico dummy | 9.95 | 9.95 | 9.95 | 50.57 | 50.57 | 50.57 |
| | (0.33) | (0.12) | (0.05) | (0.22) | (0.31) | (0.00) |
| Peru dummy | 15.57 | 15.57 | 15.57 | 32.58 | 32.58 | 32.58 |
| | (0.25) | (0.00) | (0.02) | (0.38) | (0.07) | (0.00) |
| Financial-pressures-adjusted monetary variable | 0.13 | 0.13 | 0.13 | 0.15 | 0.15 | 0.15 |
| | (0.56) | (0.34) | (0.21) | (0.78) | (0.61) | (0.16) |
| Capitalization | 0.57 | 0.57 | 0.57 | 2.62 | 2.62 | 2.62 |
| | (0.07) | (0.08) | (0.16) | (0.18) | (0.08) | (0.00) |
| Liquidity | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) |
| Efficiency | 0.26 | 0.26 | 0.26 | 0.10 | 0.10 | 0.10 |
| | (0.00) | (0.12) | (0.00) | (0.71) | (0.39) | (0.00) |
| Constant | -23.25 | -23.25 | -23.25 | 7.81 | 7.81 | 7.81 |
| | (0.01) | (0.06) | (0.01) | (0.80) | (0.66) | (0.57) |
| N | 139 | 139 | 139 | 129 | 129 | 129 |
| R2[4] | 0.74 | 0.74 | 0.74 | 0.20 | 0.20 | 0.20 |

[1] Dependent variable: change in real credit growth during the crisis; regressors: 2007 values. [2] Instrumented variable: 2007 real credit growth; instrument: 2006 real credit growth. [3] Cluster variable is country. [4] For IV estimations, generalised R2.