IT in Financially Stable Economies: Has it been Flexible Enough? *

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Abstract

The events surrounding the financial crisis and great recession of 2008-2009 have required significant policy measures by central banks. Has the Inflation Targeting framework been flexible enough to accommodate these responses? Or has IT restricted their room of maneuver? In this paper we tackle this question by assessing the policy responses to the crisis of a selection of nine central banks that follow Inflation Targeting (IT) frameworks and that remained financially stable, in the sense of not facing systemic problems in their banking or financial systems. We find that monetary policy responses from the second half of 2008 onward have deviated substantially in all cases from the prescriptions of standard and simple reaction functions, a finding that can be more easily reconciled with a drop in the persistence of monetary policy in all cases. We document non-monetary-policy measures adopted and estimate their impact in local money markets, both in local currency and USD, as well as the exchange rate. We find that there is a significant heterogeneity in the response in specific economies to these non-monetary policy responses.

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1. Introduction [pending]

2. Assessing the monetary policy responses.

Taylor (1990) suggested that simple linear reaction functions should be enough to describe monetary policy actions. Later, Judd and Rudebusch (1998) proposed that this description of the way central banks operates could be best improved by accounting for persistence. This improvement would stem from several sources. Sack and Wieland (1999) propose that interest rate smoothing can follow from three reasons; namely, forward looking expectations, and uncertainty about data or the monetary policy transmission mechanism alike. In the paradigmatic rendering of optimal monetary policy, Woodford (2003) and others, have stated the case that predictable monetary policy actions are consistent with optimality, which in practice can be understood as the rationale for including lags in empirical versions of Taylor rules.

We follow this framework to assess whether monetary policy responses in our selected IT economies have followed the standard prescriptions of these Taylor rules or whether there have been significant deviations.

2.1 Has monetary policy deviated from previous patterns?

We consider that monetary policy can be represented estimate the following Taylor Rule

$$r_t = g + r r_{t-1} + (1- r)[g_p(p_{t-1} - p^*) + g_x(x_{t-1} - x^*)] \qquad (1)$$

where r_t is the monetary policy rate at time t, p_t is the twelve month inflation rate and x_t is the twelve month growth rate of the industrial production index. We use industrial production as the frequency selected is monthly. Moroever, the estimation relies on the annual growth rate of industrial production instead of an output gap due to the lack of long term series which could be used to correctly estimate the level of these output gaps. This

specification also considers Walsh's (2003) view that optimal monetary policy can be thought of as reacting to changes in the output gap instead of its levels, an approach that would be consistent with a specification such as (1).

p_t^* stands for the inflation target, and x_t^* stands for a proxy of natural output growth rate. For this last variable, and unlike the widely used HP filter (or any other filter for that matter), we choose not to use past, current and future values of growth to infer trend growth; x_t^* but we use the last 24 month simple mean of annual industrial production growth. (Moura and de Carvalho, 2009).

With this framework, we proceed to estimate equation (1) for each of our selected economies up to the moment when the aggressive monetary policy easing began, typically in the fourth quarter of 2008. Then, we proceed to dynamically forecast the path for policy rates given the actual evolution of inflation and industrial production growth, and we compare the resulting path for policy with actual policy, assessing both the size of the eventual difference as well as its statistical significance. A large, and statistically significant deviation of the actual monetary policy path since the outbreak of the global financial crisis and the estimated path using these estimated Taylor rules would suggest a break in the reaction of monetary policy to shocks.

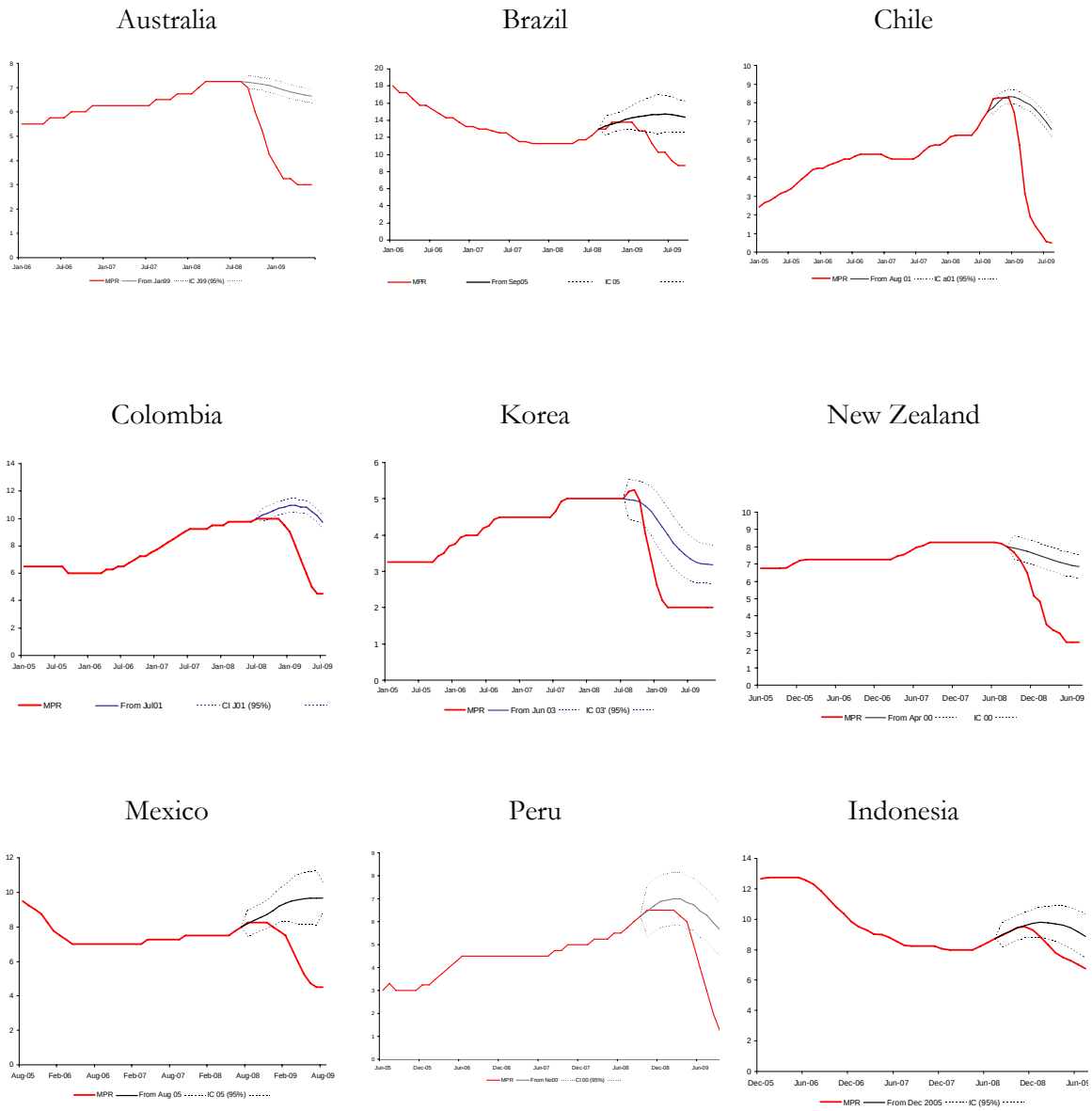
Figure 2a shows the results for our nine economies. The red line is the actual realization of MPR settings by the Central Bank and the black lines show the conditional point forecast (solid line) and its confidence interval (dashed lines) of different dynamic simulations, starting from July 2008 to December 2008. It is readily apparent that, broadly, the monetary policy response has been significantly different from the one predicted from simple Taylor rules such as (1). Figure 2b summarizes the resulting gaps between the effective path followed by the monetary policy rates and the one simulated according to the evolution of expected inflation and the output gap. First, these gaps are quite large, ranging from 200 to 700bp. Second, these simulations are performed starting in August 2008, and the timing of the gaps seem to indicate that Australia, New Zealand and Korea started to deviate earlier than the Latin American economies (and Indonesia) from the suggested monetary policy response by the simple policy rule.

However, the gaps in Latin American economies by the second quarter of this year had widened significantly more than in the other cases. Thirdly, the shape of the policy deviation is indicative of a gradual start and also a gradual end of the aggressive easing of policy in Latin American economies, while in Australia, New Zealand and Korea the earlier deviation appeared to be much more sudden.

What is behind these differences (and whether they are statistically significant from each other) is open to question. However, a more prevalent concern about exchange rate fluctuations in Latin American monetary policy making could account for a more gradual initial reaction, that as conditions developed showed that was not introducing undue turbulence in foreign exchange rate markets, could be followed by a more aggressive stance. In contrast, in Australia, New Zealand and Korea, with probably less concern about exchange rate fluctuations, the easing of policy could be swifter.

Differences in the transmission mechanism of monetary policy could also be behind the magnitude of the maximum deviation from the simulated paths of policy. Most noteworthy, the significance of floating interest rate mortgages in Australia makes for a more potent transmission mechanism, while in Latin America, with less developed mortgage markets, monetary policy could need to be more aggressive to achieve the same degree of macroeconomic impact.

Figure 2a – Effective and simulated monetary policy responses in selected economies

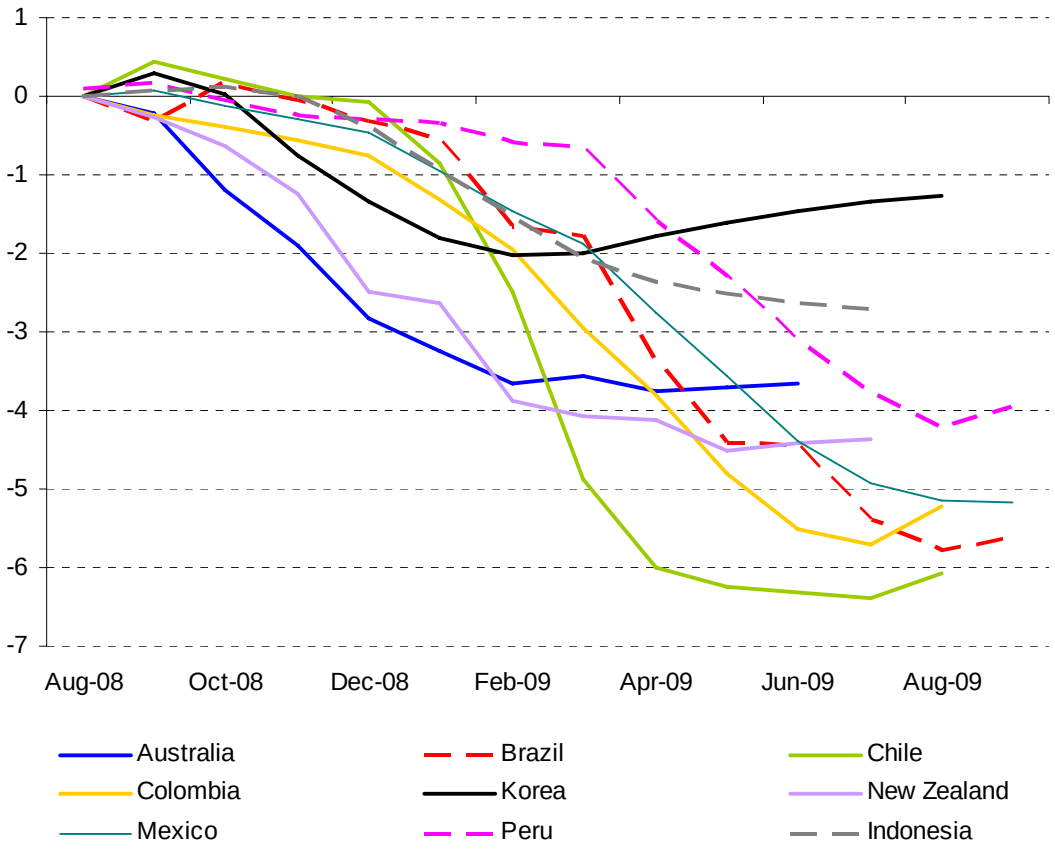


2.2 Activism or dovishness?

A number of possible interpretations can be given to the fact that monetary policy has been more aggressive than a standard prescription by a policy rule estimated in normal times. In particular, under the light of the perceived notion that optimal policy should be predictable, a

first take on these results is that monetary policy in these IT countries has deviated significantly from standard monetary policy recommendations and that therefore the monetary policy framework itself has deviated from a "pure" IT framework.

Figure 2b - Gap between simulated and effective monetary policy rates.



We do not believe this to be the case, on several counts. First, a specification such as (1) is a simple rendering of reality, abstracting many aspects of optimal monetary policy. Particularly, although it has been widely shown that simple monetary policy rules lead to economic outcomes, in terms of inflation and output volatility, that do not differ substantially from optimal policy rules[1], it is not necessarily the case that this holds true for large shocks. In the face of large shocks, the linearity assumptions that permit the equivalence between simple policy rules and more complex optimal rules breaks down. Therefore, it can be the case that

[1] See Clarida, Gali and Gertler (2001) as well as Schmitt-Grohé and Uribe (2006).

under the special circumstances experienced from the last quarter of 2008 onwards, the optimal policy response should perforce deviate from a simple policy rule such as (1). This would be consistent also with the traditional view on optimal policy. This is in line with Svensson's[2] view that financial factors have a large role in terms of affecting the transmission mechanism and thus, faced with a financial shock, monetary policy needs to react in a more forceful way.

On the other hand, although in normal times, and given the standard distribution of shocks that affect the economy, the assumption that current monetary policy actions do not affect current macroeconomic outcomes can also break down. Indeed, standard reaction functions such as (1) allow the identification of policy thanks to the assumption that the arguments on the right-hand side of the equation are not themselves determined by current monetary policy decisions. In normal times, thanks to price stickiness and the lags of policy, this is true. However, during turbulent times it can be the case that this situation also breaks down. Under financial stress, planning horizons shorten and confidence about the future becomes a paramount determinant of current spending and pricing decisions. Thus, the economic counterfactual of a smooth and gradually adjusting monetary policy could be a much more protracted and severe economic downturn. In a structural sense, the gap between the simulated and actual paths of monetary policy can actually represent the magnitude of the confidence shock to output and prices that is currently driving the cycle. Thus, policy has to quickly adjust so as to prevent this large deflationary shock from manifesting itself in economic activity and prices.

A proper interpretation and quantification of the latter channel would require a structural, model-based approach that could help simulate the performance of an economy that is subject to a large shock under the assumption of optimal policy vs simple rules-based policy. This is outside the scope of the current work, but is touched upon in other contributions to this Conference, and is consistent with recent views with respect to optimal monetary policy design in the face of financial turbulences or financial stress, for instance presented in Curdia and Woodford (2009), and also Taylor (2008a) and (2008b).

[2] See Svennson (2009)

Instead of a full-fledged structural analysis, we posit two extreme assumptions about what drives the shift in the monetary policy response in these economies. The first one is that monetary policy has become more *activist*, in the sense of lowering the weight of past decisions on current decisions. Hence, this activism can be interpreted as a reduction in the persistence of the policy rule. The second one is that monetary policy became more *dovish*, so that it tended to increase the weight of the output gap on the monetary policy process.

Returning to our baseline policy rule, the stylized fact found in the previous section is that observed monetary policy ro_t can be seen as the prescription from the rule plus a shock e_t;

$$ro_t = r_t + e_t = g + r\, r_{t-1} + (1- r)[g_p(p_{t-1} - p^*) + g_x(x_{t-1} - x^*)] + e_t$$

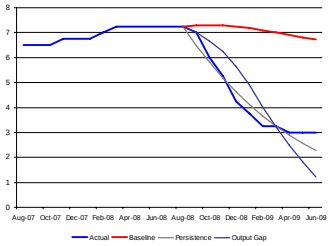
An Activist interpretation identifies the shock e_t as a shift (reduction) in the persistence parameter r, while the dovish interpretation implies a shift (increase) in the weight of the output gap g_x.

To obtain a sense on whether our simulations support one or the other, we follow the simple expedient of minimizing the squared deviations of actual policy with a simulated path for with either a changing persistence or a changing weight of the output gap. This allows us to obtain, for each country, a new set of estimates of persistence or sensitivity to the output gap consistent with a path for policy that attempts to closely fit actual events. The result of these exercises is presented in Figure 2c.

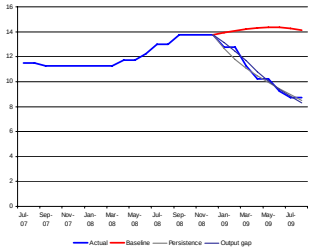
In most cases, it is possible to fit similarly well the actual path for policy either allowing for lower persistence or for a higher weight on the output gap. However, the calibration results imply significantly larger adjustments to the later than to the former to account for actual behavior of policy. In most cases, the weight on the output gap has to increase by an order of magnitude, and only in the cases of Peru and Korea the calibrated weight is between two and four times the estimated parameter previous to the crisis. In contrast, only a modest adjustment, between 6% and 30%, in the estimated persistence is required to fit the monetary path remarkably well.

Figure 2c – Activist (persistence) and Dovish (output gap) paths for policy

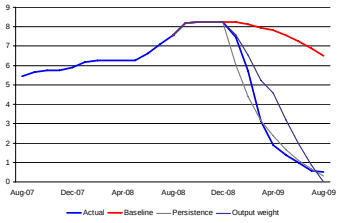
Australia



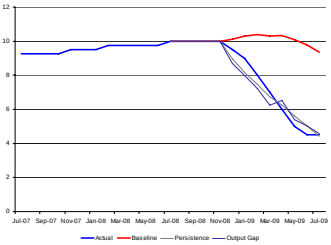
Brazil



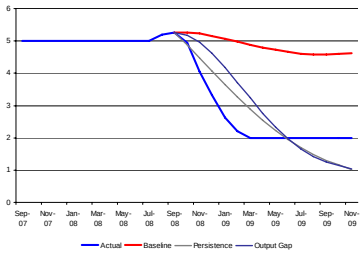
Chile



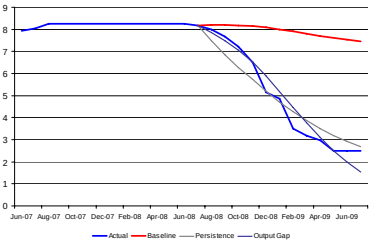
Colombia



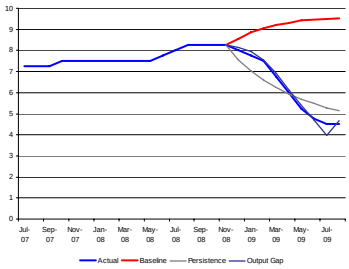
Korea



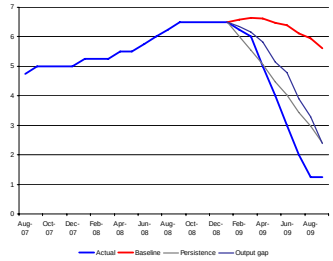
New Zealand



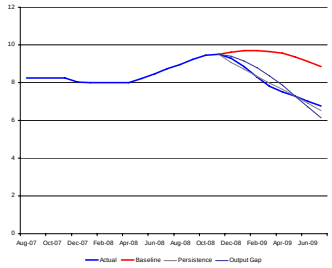
Mexico



Peru



Indonesia



3. Assessing the non-monetary policy responses

As discussed previously, the selected Central Banks engaged in a number of non-monetary policy actions. Before addressing the more general issue on whether these measures were consistent with a framework based on Inflation Targeting, we tackle the more concrete aspect of whether these measures had (or didn't have) a measurable and statistically significant correlation with key financial variables.

To narrow the scope of this issue, we focus on the more direct concerns of Central Banks, that is, money market liquidity and the exchange rate. As mentioned in the introduction, the selection of financially-stable IT economies allows us to avoid the thorny issue of the optimality of taking credit risk by the Central Bank during financial crises, the required coordination with the Treasury, and the impact of credit-easing or quantitative-easing policies on a broad set of asset prices such as house prices, long term interest rates and equities.

4.1 Empirical approach

Thanks to the compilation contained in this paper regarding the number of non-monetary policy measures undertaken by Central Bank we aim at identifying the correlation of these measures with three variables. Local short-term (one-month) currency money market interest rates, USD short-term (one-month) local interest rates, and the bilateral exchange rate vis-à-vis the USD. The outbreak of financial turmoil in principle affected all three markets, the tightening of USD liquidity worldwide should have been reflected in onshore USD markets, the transmission of financial shocks, high global volatility and uncertainty regarding the ability and capacity of authorities to respond in a timely and effective manner also should have led in different degrees to higher local currency money market spreads. Finally, the sudden stop of capital inflows, or more generally the prevalence of home-bias effects stressed the external financing of a number of economies, which coupled with the USD role as a reserve currency depreciated bilateral exchange rates with respect to the dollar worldwide.

A similar line of research has been followed by Ichi et al 2009, who look to explain why certain measures where taken, and their effectiveness.

Policy responses to this situation were very varied, but they can be classified in three groups corresponding to the three variables discussed previously. Some measures were aimed at easing USD liquidity, such as forex swaps between central banks and between central banks and local financial or non-financial corporations; some were aimed at easing local money market tensions, such as deposit guarantees, extensions of the tenors of standard REPO operations and/or the broadening of eligible collateral. A third group of measures could be though as aimed at directly affecting the exchange rates, such as forex reserve sales or purchases.

Most measures likely had a direct impact on some of these markets while indirectly affecting others. This can be clarified with a number of examples. For example, take the extension of term lending in local currency. This should of course directly impact local money market interest rates, but not necessarily local dollar money market interest rates. If the magnitude of the impact on local money market interest rates is large enough, then also the exchange rate should react to this measure through the uncovered interest rate parity condition. On the other hand, an intervention in the foreign exchange market should impact the bilateral exchange rate with the dollar, while having an ambiguous impact in the local currency money markets depending on the degree and form of the sterilization of the spot sale. Moreover, the forex intervention should have opposite effects on the local USD money market rates depending on whether the intervention is performed in the spot or the forward markets.

Thus, given the diversity of non-monetary policy measures undertaken by our selected IT central banks in principle one should allow for an effect of a specific measure on a number of dimensions. The specifications selected for the empirical exercise follow this approach. In each case we allow for the selected policy variables (which are represented by dummies) to have an impact on all three variables. A number of controls is required, and these are a set of standard global financial variables. Some are specific to the variable selected, others are common across variables. For instance, the commodity price index is used as a control for the nominal exchange rate specification, but not in the local interest rate. Other controls are

common to all three specifications: a constant dummy captures on all three cases the shift that occurred after Lehman Brothers collapsed, while we include the VIX as well as the libor-ois spread.

Each non-monetary policy measure specific to an economy is identified by a dummy variable. Per the previous discussion, we do not exclude the possibility that these non-monetary policy measures had an effect on all variables. Moreover, given that these measures likely had both an announcement effect and a concrete subsequent effect, we allow for both an effect on impact as well as an effect over the implementation period. We are well aware of the endogeneity issues involved with this specification: the timing of implementation is indeed endogenous to the tensions in the different financial markets and thus our endogenous variables. However, we proceed nevertheless based on three aspects. First, we believe that the estimated correlations should be informative enough for policy discussion. Second, the estimated coefficients will be biased against finding a significant results. Third, the endogenenity problem is somewhat mitigated by the fact that global developments were at the root of the local financial turbulences and not specific local events.

Nominal exchange rate

Equation (2) is the empirical specification for the exchange rate. It relates the log of the bilateral nominal exchange rate *e* with the US dollar with: i) measures to capture "stress" in international financial markes - the log of the VIX index, the libor-ois spread, and a dummy for the period after the bankruptcy of Lehman Brothers.; ii) the log of the effective nominal multilateral USD exchange rate, and iii) the log of the commodity price index provided by the CRB.

$$e_t = a + a_{vix} \ln VIX + a_{USD} \ln USD + a_{CRB} \ln CRB + a_{lbro} D^{lbro} + a_{lois} \left(r^* - ois^* \right) + \sum_i \left(a_d^i D^i + a_{da}^i \Delta D^i \right) \qquad (2)$$

As mentioned, we include both the level dummies for each specific non-monetary policy that takes the value of 1 for the duration of the measure, and the change in this dummy variable

to capture the announcement effect. We only consider the initial change in each dummy variable, and not the preannounced lapsing of the measures in those cases were this was part of the initial announcement.

Local currency money market

Equation (3) models local currency money markets. It relates the short term (30 day) local currency deposit (or Libo) rate i to the current overnight interbank rate r (most often the policy rate), the expected interbank rate twenty working days ahead (where available measured by an interest rate swap), the local USD money market rate i^*, and the same variables used in (2) to measure international financial "stress". As in (2) we include the full set of dummy for exceptional measures and their announcements.

$$i_t = b + b_r r_t + b_{re} r_{t+20} + b_{i^*} i_t^* + b_{vix} \ln VIX + b_{lbro} D^{lbro} + b_{lois} \left(r^* - ois^* \right) + \sum_i \left(b_d^i D^i + b_{da}^i \Delta D^i \right) \quad (3)$$

Local USD money market

Several countries in our sample saw large deviations between dollar rates in domestic markets and USD rates in key financial markets after October 2008. In economies integrated into global financial markets, one would not expect this to happen, as domestic USD interest rates should exactly match risk adjusted USD rates in international financial markets. Note, however, that in several countries in our sample financial integration is still imperfect– due both to regulatory restrictions and lack of development of some key financial markets. In addition, during the recent financial crisis, many of the agents that could arbitrage differences between international and local USD rates in normal times where either unwilling or unable to do so. The extraordinary degree of turmoil led to increased concerns for counterparty risk and made funding concerns paramount, likely hindering these trades.

With this in mind, Equation (4) models local USD rates by relating the short term (30 day) local USD rate i^* to the current local money market rate i, the 30 day USD Libor r^*, the "stress variables" and the policy dummies.

$$i_t^* = d + d_i i_t + d_r r_t^* + d_{vix} \ln VIX + d_{lbro} D^{lbro} + d_{lois} \left(r^* - ois^* \right) + \sum_i \left(d_d^i D^i + d_{da}^i \Delta D^i \right) \quad (4)$$

Equations (2)-(4) are not based on any optimizing behavior framework, but have the great advantage of providing a flexible enough framework for assessing the wide variety of measures undertaken by our selection of Central Banks. Moreover, simple extensions of these equations allow to, for instance, test whether the policy measures also affected the sensitiveness of interest rates and the exchange rate to global factors, such as the VIX, the multilateral dollar exchange rate and commodity prices.

In what follows we present the results of estimating equations (2)-(4) for a number of economies that follow IT frameworks: Australia, Brazil, Chile, Colombia, Korea, Indonesia, Mexico and New Zealand [Peru: pending]. In each case, we provide a brief description of the rationale for the policy measures undertaken in 2008 and 2009, a list of these measures, and our selected dummies. Then, we proceed to estimate and comment the results of these estimations.

Before proceeding to the details of the estimations, it is worthwhile to discuss the specifics of the data set selected. All data is daily, and the estimation was performed over the period stemming from January 2007 to August 2009. The nominal exchange rate and the macrofinancial controls selected, such as VIX, the one month USD Libor, the Libor-OIS spread, the multilateral nominal value of the USD, commodity prices are easily obtained from the usual sources. However, for local money market interest rates and local onshore USD interest rates there are no ready and standard datasets. The money market infrastructures and practices differ widely between economies, and therefore the selection of the variables to be used has to be done with care. Regarding local currency money market interest rates, we proceeded to select "a Libor-type" interest rate, that is, a term (1 month)

interbank interest rate. In some cases, such as Australia and New Zealand, the 1 month Libor in local currency is easily obtainable. In other economies, this is not the case. For instance, for the case of Chile we used the prime 1 month deposit rate, which in practice is very similar to a money market rate, although more than banks participate in its pricing. Apendix 1 details the selected local money market rates for each of the economies chosen, along with their Bloomberg ticker.

For onshore USD local interest rates the data challenge was even bigger. Simply there is not a short term USD local interest rate that can be obtained from most economies. We proceeded therefore to construct a proxy of local dollar liquidity interest rates by using forward prices. The covered interest rate parity condition, assuming arbitrage and no transaction costs, can be expressed as follows:

$$F = S \times \frac{(1+i)}{(1+i^*)}$$

Where F si the forward Exchange rate at a given tenor, S is the spot nominal exchange rate, i and i* are the local currency and USD interest rates at the same tenor. Thus, knowing the spot and forward exchange rates and the local currency interest rates it is possible to infer the implicit USD interest rate. We call this the onshore USD interest rate:

$$i^* = (1+i) \times \frac{S}{F}$$

In practice, bid-ask spreads and different tenor standards for the measurement o finterest rates. On the one hand, bid-ask spreads can be as high as 10% in some economies, while the standar tenors can be calendar days (360 or 365 days) or working days (252 for instante). Hence, the implicit onshore USD rate we calculate follows the following expression:

$$i_b^{on} = \left(\frac{S_a}{F_a} * (1 + i_b * T) - 1 \right) * \frac{1}{T}$$

Where Sa y Fa are the spot and forward exchange rates, ib is the local currency deposit interest rates and T is a time factor adjusted for the tenor standard. With this procedure we constructed onshore USD interest rates at 1, 3 y 12 months, from january 2007 to the end of october 2009. All data is from Bloomberg. Details are presented in appendix 2.

It is noteworthy to highlight the situation in a number of Asian economies, which alter the financial crisis in the late nineties took a number of measures that led to the segmentation of onshore and offshore forex markets. In those cases, we considered the onshore forwards for our calculations.

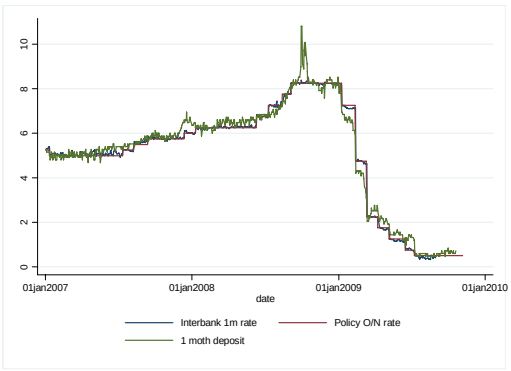
4.2 Empirical results

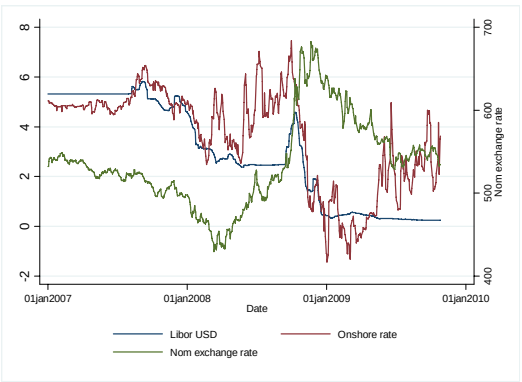
Chile

The sequencing of measures is presented in Table 4.2a. Before the collapse of Lehman brothers, the Central Bank had put in place a reserve accumulation program. This program was cut short on September 29th, as the acute dollar liquidity shortages became apparent globally. What followed was a number of liquidity provision measures in both dollar and local currency. Foreign currency *swaps* were implemented, in the form of sales of foreign exchange in the spot market with a simultaneous REPO of foreign exchange. In terms of domestic currency, term REPO's in local currency (at a floating interest rate) were implemented, and the set of collaterals broadened to include time deposits. All these measures have been in place since October 2008. Moreover, with the purpose of enhancing the monetary policy stimulus in the context of a binding zero-lower bound, in July 2009 term (six month) lending at the fixed policy rate was implemented.

We identify one policy dummy with the accumulation of reserves in 2008 previous to the outbreak of the crisis, two dummies represent first the implementation of foreign currency swaps in late September and second by the middle of October as the broadening of these forex swaps plus the inclusion of time deposits as collaterals for money market operations. A fourth dummy the term lending at a fixed rate put in place in July 2009. Table 4.2b presents the results of the estimations. We also include dummies for the announcement of each of these programs.

Table 4.2a – Non-Monetary Policy Measures in Chile





Start Date	Ending Date	Extraordinary Action
14-Apr-08	12-Dec-08	Increse USD reserves by US$8000M
		US$50M every day / competitive auctions + sterilization
29-Sep-08		Interruption of the reserve accumulation process (only 70% of goal was achieved)
30-Sep-08		Currency swap auctions
10-Oct-08		Extension of liquidity providing operations
		Extension (from 1) to 6 months - currency swaps
		REPO facilities
		REPO facilities (7 days) in clp with bank deposits as collateral
10-Oct-08	8-Apr-09	Banks' reserve requirement denomination constraint is relaxed (for USD liabilities)
3-dic-08		Extension of liquidity providing operations: currency swaps up to 180d
10-dic-08	31-dic-09	Extension of liquidity providing operations
		Currency swaps up to 180d
		Repo operations to 28d (using CB bonds) and 7d (using bank deposits)
15-dic-08	31-dic-09	Repo operations to 28d (using bank deposits as collateral)
1-ene-09	31-dic-09	28d liquidity facility broadening collateral assets (Gov Bonds and Bank Deposits)
10-Jul-09		From 15-jul-09 FLAP (90 and 180d) [Term Liquidity Facility]
30-Dec-08	26-Jan-10	Liquidity Credit Line in National Currency for Banking Enterprises with Collateral
		New credit line for banks -

The specifications show expected results regarding the controls on each case. The effective nominal USD exchange rate and the commodities index have a large and significant effect on the bilateral peso/USD exchange rate, the VIX does not impact nominal exchange rate and dollar liquidity conditions once the Libor-OIS spread is included, while the USD Libor also affects local dollar liquidity conditions.

Regarding the policy measures, the 2008 reserve accumulation program had a significant impact on the nominal exchange rate, while increasing the local USD rates and increasing local money market rates in the baseline specifications. The more aggressive forex swap program had an important effect, in the correct direction, on local money market conditions reducing peso and dollar rates. Local USD interest rates fell by close to 250bp while local currency deposit rates fell by close to

100bp. Finally, the term lending facility implemented in july 2009 had a significant impact on interest rates. Peso rates fell by 30bp, while onshore rates rose.

Table 4.2b – Empirical results for Chile

Chile
Range: Jan 2007 - Oct 2009
Frequency: Daily Data

	Dependent Variable				
Deposit Rate		**Onshore rate**		**Nominal Exch Rate**	
Policy Rate	0.663	Log (VIX)	0.222	Log USD Mult	-1.059
	[37.13]***		[1.00]		[13.06]***
Interest Rate Swaps	0.245	Libor USD	0.629	Log (VIX)	0.004
	[12.46]***		[11.22]***		[0.58]
Log (VIX)	-0.122	Deposit rate	-0.083	Log (CRB)	-0.357
	[2.10]**		[2.50]**		[8.88]***
Libor USD	-0.057				
	[3.55]***				
Onshore rate	0.016				
	[1.45]				
Reserve Accumulation +	-0.248		1.034		0.056
	[5.17]***		[5.82]***		[12.74]***
Currency Swap Options	0.721		0.015		0.011
	[5.28]***		[0.03]		[0.68]
Curr Swap Op Ext & REPO	-1.187		-2.594		-0.005
	[11.49]***		[6.86]***		[0.36]
Term Liquidity Facility	-0.285		1.491		0.028
	[3.41]***		[5.90]***		[3.08]***
Ann. Reserve Accumulation +	0.334		-1.134		-0.063
	[1.46]		[1.25]		[2.00]**
Ann. Currency Swap Options	-0.237		-0.128		-0.046
	[0.71]		[0.10]		[1.00]
Ann. Curr Swap Op Ext & REPO	1.372		1.126		0
	[5.78]***		[1.20]		[0.01]
Ann. Term Liquidity Facility	-0.144		0.726		-0.036
	[0.60]		[0.78]		[1.10]
Lehman Bro	0.17		0.725		-0.014
	[1.95]*		[2.14]**		[1.32]
Libor OIS	0.313		0.52		0.046
	[7.21]***		[3.10]***		[11.37]***
Constant	1.049		1.465		13.201
	[5.19]***		[1.88]*		[62.90]***
Observations	613		649		680
R-squared	0.99		0.8		0.9

Absolute value of t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Brazil

The outbreak of the financial crisis in October led to a sizeable increase in capital outflows and to stress in the access of Brazilian corporates to foreign credit lines. This prompted the authorities to undertake significant measures to bolster domestic liquidity and facilitate access to foreign liquidity.

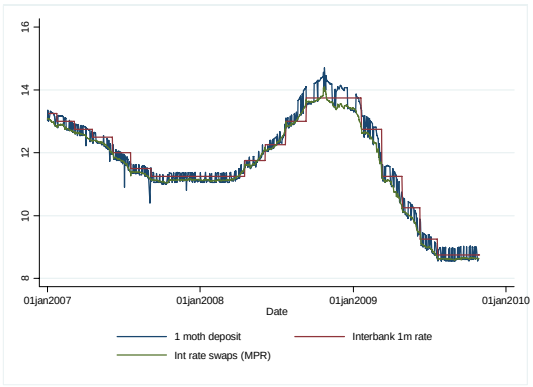
Already by the end of September the Central Bank had phased out its reverse FX swaps operations (which amounted to the purchase of a forward USD position and therefore increased the USD position in the balances sheet of the Central Bank) and had stopped its purchase of USD in the spot market. By early October, the Central Bank started to unwind its forward USD position as a first reaction to the financial crisis. Moreover, to further bolster the foreign liquidity cushions, in October 21st the Central Bank was given the authorization to undertake currency swap agreements with foreign central banks, paving the way to the USD30 billion swap arrangement with the Federal Reserve in late October. This was extended for six months in late June 2010, and has not been tapped. In terms of forex intervention, most of the measures have been implemented through these forex swaps, and only partially through spot sales.

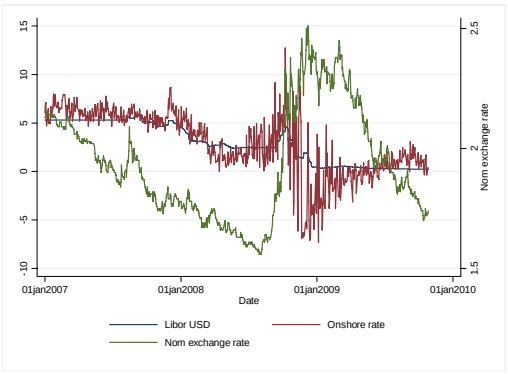
In terms of local financing, the Central Bank took measures both to facilitate access of exporting firms to credit lines and to ease other local currency liquidity strains. The former was undertaken through the implementation of credit lines to exporters. In domestic liquidity, the reduction of the large reserve requirements on deposits the banking system provided a significant boost to local liquidity, amounting to 100 billion Reais in the last quarter of 2008, representing 2/3 of base money[3]. Also, to contain financial stress in the most exposed segments of the banking system, incentives were put in place so that larger institutions could reduce their reserve requirements if they acquired the credit portfolios of smaller institutions. Table 4.2c displays the sequencing of these different policy measures.

To assess the impact of these measures we identify six policy dummies: Reverse forex swap operations, traditional forex swap operations, spot intervention in the forex market, the announcement of the USD/BRL swap between the Central Bank and the Federal Reserve, the implementation of credit lines to exporters, and the reduction in the compulsory reserve requirement. These policy dummies take the value of 1 while the measures are in place. Dummies are also included on announcement.

Table 4.2c - Non-Monetary Policy Measures in Brazil

[3] OECD (2010)





Start Date	Ending Date	Extraordinary Action
21-Dec-07	29-Sep-08	BCB carried out reverse FX swap auctions
6-Oct-09	28-Apr-09	BCB offers traditional FX swap on a daily basis
8-Oct-08		US$ purchase in the spot market
21-Oct-08		Autorization to the CB to carry out currency swaps with CB of other countries
30-Oct-08	30-Oct-09	Agreement for up to US$ 30 billion with the NYFed
5-May-09		BCB carried out reverse FX swap auction amounting
30/06/2009	01/02/2010	Extension of possibility of carrying out FX swaps with the Fed up to US$ 30 bi

Table 4.2d shows the results of the estimation. With regards to the effects on the exchange rate, the reverse swap operations (e.g. increasing the long USD position previous the crisis and after May 2010) seems to have had an impact in terms of keeping a weaker nominal exchange rate, but the traditional swaps do not appear to have stemmed the depreciation in a statistically significant way. The swap agreement with the Fed does appear as significantly, both from a statistical and economic point of view, affecting the nominal exchange rate (a close to 6% appreciation). The measures designed to bolster domestic liquidity and access to credit both point towards depreciating the currency.

Table 4.2d – Empirical results for Brazil

Brazil Range: Jan 2007 - Oct 2009 Frequency: Daily Data Dependent Variable Deposit Rate		Onshore rate		Nominal Exch Rate	
Interbank 1m rate	-0.058	logvix	-0.044	logusdmult	-1.104
	[1.19]		[0.10]		[15.13]***
Int rate swaps (MPR)	**1.12**	Libor USD	1.208	logvix	0.012
	[23.06]* **		[16.88]***		[2.15]**
Log (VIX)	0.013	1 moth depos	-0.106	logcrb	-0.586
	[0.25]		[1.08]		[16.42]***
Libor USD	0.031				
	[2.88]***				
Onshore rate	-0.005				
	[1.12]				
Lehman Bro	**-0.197**		**1.817**		**0.016**
	[2.69]* **		**[3.03]*** **		**[1.77]***
Libor OIS	0.02		**-0.661**		0.001
	[0.53]		**[2.12]** **		[0.16]
Reverse Swaps	-0.056		-0.543		**0.022**
	[0.99]		[1.13]		**[3.23]*** **
Traditional Swaps	0.037		-0.303		-0.006
	[0.54]		[0.56]		[0.80]
Spot Intervention	-0.061		-1.065		0.006
	[1.11]		[2.40]**		[0.96]
Possibility of FX Swaps/FED	**0.026**		**-3.08**		**-0.059**
	[0.30]		**[4.30]*** **		**[5.64]*** **
Credit Line - Exp	-0.076		-0.443		0.033
	[0.95]		[0.72]		[3.76]***
Comp Res Req	**0.408**		0.641		0.029
	[3.64]* **		[0.68]		[1.98]**
Ann. Reverse Swaps	-0.266		0.174		-0.001
	[1.27]		[0.10]		[0.04]
Ann. Traditional Swaps	0.085		0.447		0.044
	[0.56]		[0.34]		[2.34]**
Ann. Spot Intervention	**-0.571**		**8.365**		**0.103**
	[2.68]* **		**[4.64]*** **		**[3.93]*** **
Ann. Possibility of FX Swaps/FE	0.052		**-4.447**		-0.025
	[0.25]		**[2.48]** **		[0.95]
Ann. Credit Line - Exp	0		0		0
	[.]		[.]		[.]
Ann. Comp Res Req	0.08		-0.396		-0.004
	[0.37]		[0.21]		[0.14]
Constant	-0.66		2.316		9.125
	[2.67]***		[1.17]		[46.44]***
Observations	653		680		680
R-squared	0.98		0.74		0.96
Absolute value of t statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1%					

Regarding domestic liquidity, the measures do not appear to have had a relevant impact, while foreign liquidity seemed to have been eased by the policy measures. USD dollar interest rates reacted most significantly to the swap agreement with the FED (a reduction of more than 300bp), while spot sales also had an impact. This is consistent with the findings of Stone and others (2009), who find that both the announcement and the implementation of foreign exchange easing reduced the local cost of dollar borrowing. Forex swap operations credit lines to exporters did not significantly impact this variable.

Colombia

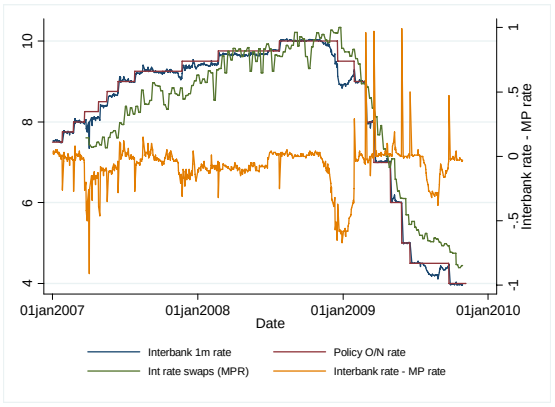
The impact of the financial crisis in October on the Colombian foreign exchange and short term markets was relative small compared to other countries in our sample. The inter-bank overnight interest rates remained close to the policy rate. Indeed the spread between the short term deposit interest rates and the actual policy rate, or the expected policy rate (as measured by the OIS market) did not increase in late 2008. Similarly, the implied dollar rates in forward contracts only rose in late 2008 to close to 100bp above LIBOR. It is therefore not surprising that the Colombian Central Bank did not put in place liquidity provision programs in USD – responding to rising spreads on Colombian USD denominated bonds simply by eliminating capital controls. In terms of domestic liquidity provision, in October the Banco de la República reduced reserve requirements on local currency deposits, announced 14 and 30 day repo operations and an outright purchase of government bonds. Starting June, the Banco de la República implemented a reserve accumulation program, purchasing 20mill USD per day in competitive auctions. After conditions in international financial markets changes in October, the program was suspended. Finally, in April, Colombian authorities secured a contigent credit line facility from the IMF.

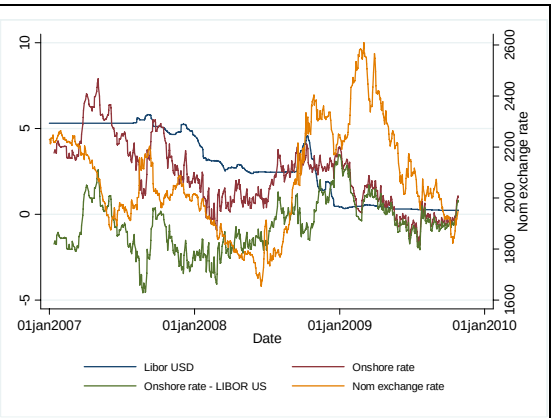
To assess the impact of these measures we identify three policy dummies: the reserve accumulation program, the changes in reserve requirements and repo operations, and the contingent credit lime announcement. The non significant coefficients on foreign volatility measures (log Vix) or liquidity premia in US interbank rates in the estimation for Colombian interbank rates is consistent with the low impact of international financial conditions on the domestic money markets. In terms of

policies, the domestic liquidity measures are correlated with lower interbank rates, as expected. The positive estimated coefficient on the reserve accumulation program dummy is a surprising result.
In terms of onshore dollar rates, as expected these move in line with Libor in our sample, rising significantly after the deepening of the financial crisis (Lehman Dummy). Note however, that unlike onshore rates in Chile and other countries in our sample we actually find a negative correlation between these rates and the Vix and libor-ois spread. In terms of policies: domestic dollar rates where higher in the period of reserve accumulation.

Results are closer to our priors for the exchange rate. In this period the dollar peso exchange rate has moved due to changes in the dollar value against other countries, depreciated after the deepening of the financial crisis in October and depreciated in those periods in which the ViX was rising. We find no significant correlation between the reserve program and the peso dollar exchange rate.

Table 4.2e - Non-Monetary Policy Measures in Colombia





Start Date	Ending Date	Extraordinary Action	Announced Horizon
20-Jun-08		Modification of International Reserve Accumulation US$20M / day - competitive auction	Undefined
9-Oct-08		Elimination of URR & Cancel International Reserve Accumulation	Once
24-Oct-08		Reduction of cash position requirements (pesos)	Undefined
		Repo Operations of 14 to 30 days (pesos)	
		Purchase of treasury bonds: p$ 500MM	Once
20-Apr-09		Contingent Credit Line petition to the IMF Us$10400M	Undefined
28-Aug-09		Special Drawing Right (IMF) availability for US$890M	Undefined

Table 4.2f – Empirical results for Colombia

	Interbank 1m rate		Onshore rate		Log (NER)
Int rate swaps (MPR)	0.085	Interbank 1m rate	0.984	Log USD Mult	-1.147
	[3.53]***		[16.83]***		[13.83]***
Policy O/N rate	0.877	Log(VIX)	-2.811	Log(VIX)	0.033
	[39.18]***		[11.33]***		[4.96]***
logvix	0.051	Libor USD	1.142	Log (CRB)	-0.405
	[1.13]		[25.40]***		[10.12]***
Libor USD	0.078				
	[6.75]***				
Onshore rate	-0.039				
	[6.27]***				
Reserve Accumulation2	**0.186**		1.46		-0.003
	[7.13]* **		[8.33]***		[0.65]
Repo, Res Req, TES purchase	**-0.086**		2.821		-0.097
	[1.86]*		[9.42]***		[9.91]***
Ann. Reserve Ac	-0.146		-1.102		**-0.067**
	[1.03]		[1.08]		**[2.05]** **
Ann Repo+ResReq	0.042		-0.197		0.024
	[0.29]		[0.19]		[0.71]
Ann Cont Cred Lines	0.114		0.034		0.034
	[0.81]		[0.03]		[1.06]
Lehman Bro	-0.077		2.486		0.032
	[1.59]		[7.63]***		[3.39]***
Libor OIS	0.009		-1.107		0.014
	[0.38]		[7.16]***		[3.60]***
Constant	-0.067		-2.204		15.206
	[0.59]		[3.03]***		[77.98]***
Observations	576		626		680
R-squared	0.99		0.72		0.9

Absolute value of t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Mexico

The outbreak of the financial crisis in October had a significant impact on the peso/dollar markets in Mexico. Falling global demand for emerging market assets interacted in Mexico with rising demand for dollar denominated assets from the corporate sector, rushing to cover unhedged dollar positions that had built up over the period of exchange rate stability (see Kamil and Walker 2009). The result was a significant reduction in turnover in peso/dollar markets and a significant depreciation of the peso. The increased demand for USD assets by firms also explains why in the last quarter of 2008 the implicit onshore dollar rate in Mexico fell. Increased demand to buy dollars in future markets pushed up forward rates via-a-vis spot rates, depressing the implicit dollar rate. This led the Bank of Mexico to start selling international reserves – both via a series of extraordinary auctions in October and through a daily auction program started in early October

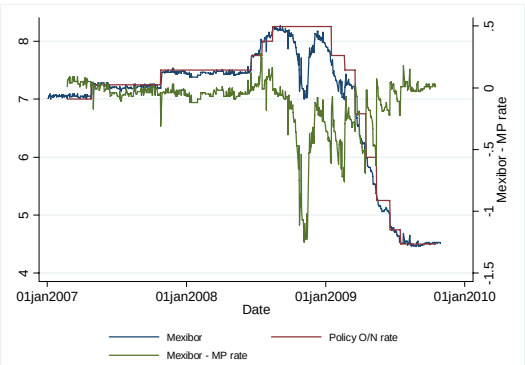
and continued through June. This program initially set the minimum price for these auctions at 2% above the previous day exchange rate, as a form of reducing volatility. This minimum price was eliminated in March.

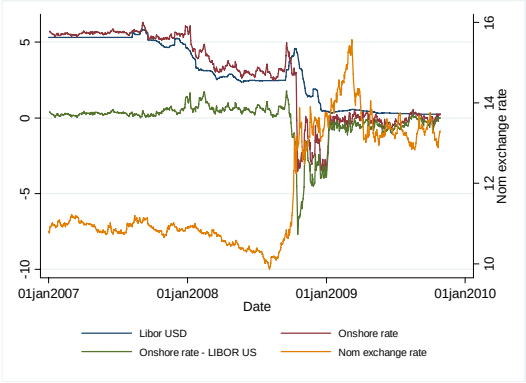
Lack of a swap market on the overnight interbank rates makes it difficult to precisely determine whether Mexico experienced rising tensions in peso money markets in this period. This being said available data suggest that this was not the case. Indeed, 28 day interbank rates actually fell in October driven by investors reducing their positions in long term Government paper, and switching to short term debt instruments. In this context, the extraordinary liquidity facilities put in place by Banco de Mexico in October (and extended in December) can be seen as a "preventive measure" (Banco de Mexico 2008) put in place to help local institutions manage liquidity.

Banco de Mexico also introduced an interest rate swap facility in mid November. This facility was aimed at reducing the exposure of banks to the high volatility in the prices of Mexican government bonds. In addition to this swap, and in an attempt to reduce long term interest rate son public debt the Mexican authorities reduced their issuance of long term bonds during the last quarter of 2008.

Table xx reports estimates of the correlation of these policy measures with domestic rates, onshore rates and the nominal exchange rate. For the interbank rate (the mexibor) the policy rate has the expected sign and magnitude. Interestingly, the coefficient on the VIX is negative and significant, unlike other countries that saw short term rates go up relative to the policy rate after Lehman. The estimated coefficients indicate a negative correlation between the domestic liquidity measures and the interbank rate, and a negative correlation between the interbank rate and the interest rates swaps. The fact that so many programs where announced on October 8th, makes it difficult to interpret the positive coefficient on the announcement dummy.

Table 4.2g - Non-Monetary Policy Measures in Mexico





8-Oct-08	23-Oct-08	Extraordinary dollar auctions of US 11000 M
9-Oct-08	1-Oct-09	Daily Auctions. Intially for US$ 400M and with minimum price. After March no minimum price and reduced amounts
27-Oct-08	31-dic-08	Mod (-) to the auction program of public bonds for 2008Q4, replacing with short term debt CETES and latter buy back of bonds. Replaced with short term debt.
27-Oct-08	4-Nov-08	Mod (-) to the auction prog of "Bonos de Proteccion al Ahorro" by IPAB of ~US$ 140M for 2008Q4 and latter announcement of buying auction of "Bonos de Proteccion al ahorro" ~ US$10714M
14-Nov-08	28-Nov-09	Interest Rate Swap lines - domestic - (up to p$50000M ~ 3500US$ M) Fixed (creditor: CB) vs variable interest rate (creditor: fin inst) debt
8-Oct-08		Broadening of admissible collateral for liquidity provision for OM operations
1-Dec-08		Broadening of admissible collateral for liquidity provision for OM operations
18-dic-08		Broadening of admissible collateral for liquidity provision for OM operations
29-Oct-08	1-Feb-10	Swap lines with foreign CB (extended in May and June)
21-abr-09		Auction of swap line funds: US$ 4000M (using collateral in 9.2 of 08/2009 release)
1-abr-09	1-abr-10	IMF (contingent) flexible credit line of US$47000M

The onshore rate covaries with the libor, as expected. However, the correlation with the vix and and libor ois spreads is negative – due to the unwinding of corporate derivative positions in the last quarter of 2008. Both the announcement and implementation of the FED swapline reduced the onshore dollar rate – as expected.

The Mexican peso depreciated after the bankruptcy of Lehman, and further depreciated in those periods of highest volatility (vix). We fail to find the expected impact of dollar sales (both programmed and extraordinary) probably due to the endogeneity of the timing of these measures.

Table 4.2h– Empirical results for Mexico

	Mexibor		Onshore rate		Log (NER)
Policy O/N rate	0.877	Log (VIX)	0.588	Log (USD Mult)	-0.421
	[45.47]***		[3.98]***		[6.93]***
logvix	-0.075	Mexibor	-0.64	Log (VIX)	0.067
	[2.07]**		[7.36]***		[13.27]***
Libor USD	-0.029	Libor USD	0.648	Log (CRB)	-0.142
	[3.63]***		[23.22]***		[4.64]***
Onshore rate	-0.009				
	[1.10]				
Extraordinary Sales of USD	0.166		-0.081		0.023
	[2.74]***		[0.29]		[2.47]**
Broadening of admisible collateral for OM op and programmed dollar sales	**-0.494**		-4.262		0.115
	[8.79]* **		[19.50]***		[14.34]***
FED Swapline Implemented	-0.086		**-1.005**		-0.001
	[1.79]*		**[4.85]*** **		[0.29]
Ann 8 oct package	0.303		4.281		-0.031
	[2.00]**		[6.17]***		[1.34]
Ann swapline (29 oct)	0.037		**-1.048**		-0.01
	[0.50]		**[3.07]*** **		[0.91]
Lehman Bro	0.063		1.078		0.029
	[1.44]		[5.41]***		[3.98]***
Libor OIS (spread)	-0.031		-0.976		-0.038
	[1.19]		[8.55]***		[10.51]***
Constant	1.298		5.405		4.988
	[7.51]***		[6.91]***		[32.65]***
Observations	628		662		680
R-squared	0.98		0.94		0.96
Absolute value of t statistics in brackets					
* significant at 10%; ** significant at 5%; *** significant at 1%					

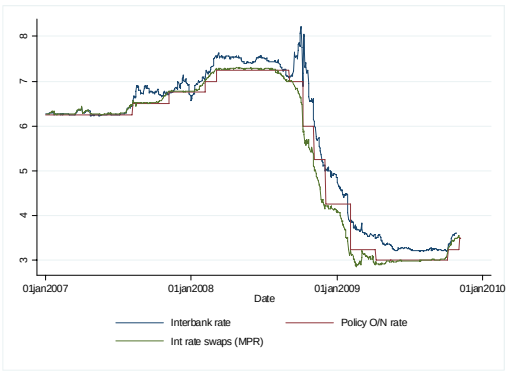
Australia

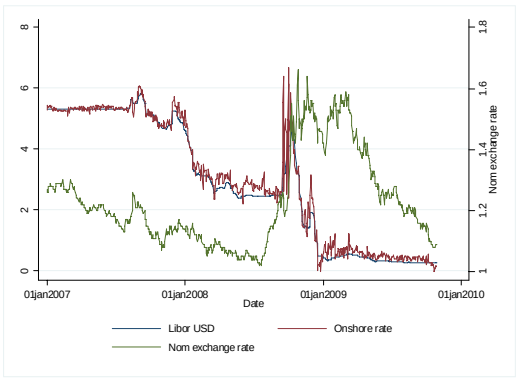
The outbreak of the financial crisis also affected money markets in Australia. Markets for bank funding became particularly stressed and the RBA took a number of measures to alleviate the situation and to satisfy the increased demand for cash balances. The tenor of REPO operations was extended, and the frequency of six- and 12-month repos was increased to daily in early October. Moreover, to confront the increase in counterparty risk, the range of acceptable collaterals was broadened to include RMBS and ABCP of related parties, in contrast with the constraints that were normally put in place regarding the eligibility of collateral for REPO operations.[4] Also the restrictions on the ability to substitute collateral within an existing REPO were removed. The average term of REPO operations increases significantly in October thanks to these measures. Regarding the provision of USD liquidity, the main measure undertaken was the bilateral swap arrangement with the Federal Reserve.

[4] Debelle (2008).

What were the effects of these measures according to our empirical specification? We identify two dummy variables, corresponding to the bilateral swap agreement with the Fed on one hand, and the broadening of eligible collateral and term extension for REPO operations plus the state guarantees for deposits and other liabilities. Due to the short time between the latter measures it is not possible to separately identify the impacts on our selected financial variables. Table 4.2j presents the results.

Table 4.2i - Non-Monetary Policy Measures in Australia





Start Date	Ending Date	Extraordinary Action
24-Sep-08		Bilateral Swap with Federal Reserve at $10 bn (24/09/08), increased to $30 bn (29/09/08)
8-Oct-08		Frequency of six- and 12-month repos was increased to daily Acceptance of RMBS and ABCP of related parties as elligible collateral Restrictions on substituting collateral within an existing repo removed Repo Operations of 14 to 30 days (pesos) Term Deposit Facility with one- and two-week maturities introduced to absorb liquidity
12-Oct-08		State guarantee introduced for an unlimited amount for deposits until October 2011 and for debt securities with maturities up to five years.

The bilateral swap with the FED and the extensions of REPO operations plus the implementations of deposits and other guarantees had significant impacts on the currency (appreciating it) and reducing the onshore rate in a significant way (between 60 and 100 basis points) persistently over the period. Interestingly, for local liquidity conditions things are slightly different. The effects were

most marked on the announcement, but did not seem to persist, controlling of course for the rest of the variables. The effects also seem to have been more muted, around 15 to 20 basis points.

Table 4.2j – Empirical results for Australia

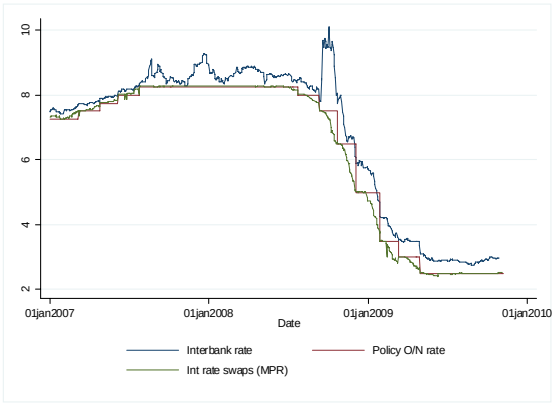
Australia Range: Jan 2007 - Oct 2009 Frequency: Daily Data Dependent Variable Libor rate		Onshore rate		Nominal Exch Rate	
Policy O/N rate	0.137	Log (VIX)	0.092	logusdmult	-1.51
	[4.96]***		[1.60]		[30.63]***
Int rate swaps (MPR)	0.884	Libor USD	0.934	logvix	0.044
	[27.67]***		[88.66]***		[11.13]***
logvix	0.007	Interbank rate	-0.096	logcrb	-0.267
	[0.34]		[2.63]***		[11.41]***
Libor USD	0.04				
	[2.79]***				
Onshore rate	-0.025				
	[1.69]*				
RBA-TD and FED swap line	0.066		-0.656		-0.044
	[1.12]		[4.30]***		[4.44]***
REPO and Collateral	0.014		-0.989		0.004
	[0.28]		[8.02]***		[0.56]
Ann. RBA-TD and FED swap line	-0.179		0.503		0.018
	[1.65]*		[1.72]*		[0.90]
Ann. REPO and Collateral	-0.143		1.44		0.043
	[1.34]		[5.11]***		[2.18]**
Lehman Bro	0.286		1.045		0.016
	[6.51]***		[9.59]***		[2.11]**
Libor OIS	0.365		0.151		0.038
	[17.04]***		[2.32]**		[16.64]***
Constant	-0.284		0.697		8.546
	[2.25]**		[2.27]**		[74.08]***
Observations	644		679		680
R-squared	0.99		0.98		0.97
Absolute value of t statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1%					

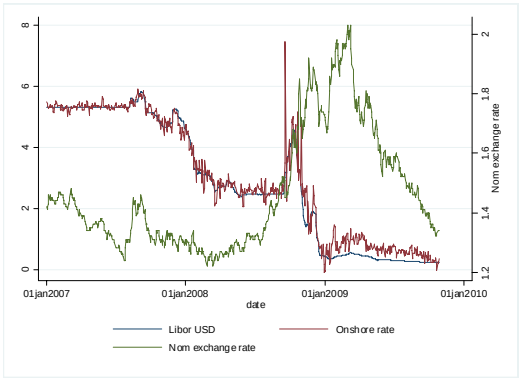
New Zealand

In contrast to other economies, the financial and banking system in New Zealand was undergoing a downward credit cycle previous to the outbreak of the turbulences in October 2008. Hence already by June, as a precaution, some measures had been adopted so as to broaden collateral and support domestic liquidity, and when the crisis hit, some finance companies were already under

pressure[5]. These measures were further complemented in early October as funding became harder to obtain and thus RMBS were also allowed as eligible collateral. By November, further liquidity facilities were implemented through term lending and by December more securities were accepted for domestic liquidity operations, including highly rated corporate bonds.

Table 4.2k - Non-Monetary Policy Measures in New Zealand





Start Date	Ending Date	Extraordinary Action
3-Jun-08		Broadening of Collateral: Extension of the range of securities eligible for acceptance in the RBNZ domestic liquidity operations: NZ-registered NZ dollar AAA rated securities, including Residential Mortgage-backed securities, and AA rated NZ government sector debt – including Government agencies, SOEs and Local Authorities. The discount margin applied in the Bank's Overnight Reverse Repo Facility will be 50 basis points for all eligible securities. Extension of Overnight Reverse Repo Facilit: 1 to 30 days
9-Oct-08		Broaden securities program to RMBS (Residential Mortgage Backed Securities)
29-Oct-08	30-Apr-09	FRBNZ and FED announce USD swap Facility up to US$ 15 billion
12-Nov-08	26-Oct-09	Term Auction Facility Offer up to NZD 2 billion to 3, 6 and 12 month mat.
12-Nov-08	26-Oct-09	RB bill tenders to withdraw liquidity injected via TAF
17-Dec-08		Extension of the range of securities acceptable in the RBNZ's domestic liquidity operations to include: Sec guaranteed by the government Highly rated NZ corporate securities NZD Asset Backed securities
30-Jun-09		Prudential Liquidity Policy
22-Oct-09		Prudential Liquidity Policy deadline implementation is relaxed

[5] See Bollard and Ng (2009) and Nield (2008)

Table 4.2l presents the effects of these policy interventions. All three sets of measures (and their announcements) coincided with significantly lower domestic interest rates. Effects of the measures on the onshore rates was mixed. The announcements of all measures coincided with currency appreciations, whereas the measures themselves coincided with a depreciated currency.

Table 4.2l – Empirical results for New Zealand

New Zealand
Range: Jan 2007 - Oct 2009
Frequency: Daily Data
Dependent Variable

Libor rate		Onshore rate		Nominal Exch Rate	
Policy O/N rate	0.26	Log (VIX)	0.17	Log USD Mult	-1.312
	[6.82]***		[2.64]***		[18.02]***
Int rate swaps (MPR)	0.802	Libor USD	0.978	Log (VIX)	0.02
	[18.93]***		[70.38]***		[3.32]***
Log (VIX)	-0.207	Interbank rate	-0.079	Log (CRB)	-0.077
	[5.13]***		[3.74]***		[2.04]**
Libor USD	0.136				
	[5.55]***				
Onshore rate	-0.13				
	[5.49]***				
Lehman Bro	0.884		0.246		-0.041
	[14.02]***		[2.76]***		[5.13]***
Libor OIS	0.499		-0.142		0.033
	[16.70]***		[2.76]***		[7.90]***
Broadening of eligible collateral	-0.059		0.075		0.077
	[2.03]**		[1.59]		[19.85]***
Swap lines with the FED	-0.196		0.17		0.035
	[6.95]***		[3.82]***		[6.37]***
TAF and Extention of Acceptable Coll	-0.113		-0.582		0.072
	[1.71]*		[5.84]***		[9.16]***
Ann. Broadening of eligible collateral	-0.064		-0.012		-0.046
	[0.36]		[0.04]		[1.74]*
Ann. Swap lines with the FED	-0.616		-0.391		-0.073
	[3.42]***		[1.33]		[2.72]***
Ann. TAF and Extention of Acceptable Coll	-0.346		0.985		-0.042
	[1.93]*		[3.40]***		[1.59]
Constant	0.171		0.33		6.703
	[1.14]		[1.40]		[37.54]***
Observations	677		679		680
R-squared	0.99		0.98		0.96

Absolute value of t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Korea[6]

The Central Bank of Bank of Korea responded initially to rising international financial volatility by supplying liquidity to banks and securities companies by way of long-term REPO operations from October 2008. To further ease tensions in funding markets, in November and December 2008the Bank included bank debentures and certain government agency bonds among the securities eligible for use as collaterals in open market operations, which were originally only Treasury bonds, government-guaranteed bonds and Monetary Stabilization Bonds. In November, the Central Bank supported the creation of a Bond market stabilization fund, while in December, the extent of counterparties for REPO operations was broadened, to include securities companies in addition to banks.

To facilitate lending, the aggregate credit ceiling was raised in November in order to boost banks' incentives for lending to SMEs. The aggregate credit ceiling was further increased on March 23, 2009. Moreover, in December 2008, to help banks expand their credit supply capacity by raising their BIS capital adequacy ratios, the Central Bank paid them a one-off remuneration on their required reserve deposits.

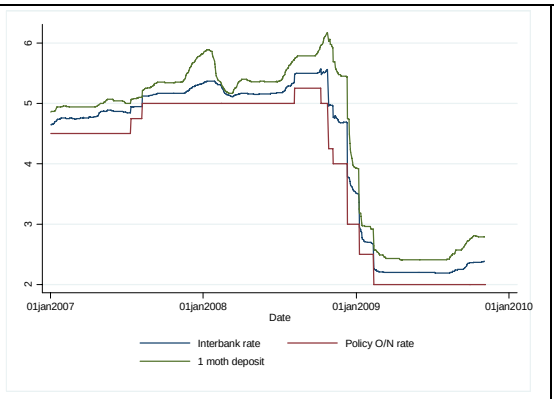
As in other economies, in the wake of Lehman Brothers collapse, foreign exchange market tensions grew. This is evident from the shift in the level and volatility of the onshore dollar rate in Korea in the 4th quarter of 2008, which peaked at over 600bp over LIBOR. The Central Bank undertook a number of measures to alleviate further financial market unrest and to prevent the turmoil from evolving into a full blown currency crisis. On October 30, 2008, the Central Bank entered into a 30-billion US dollar swap arrangement with the Federal Reserve. On December 12, in addition, the Bank not only entered into a swap arrangement with the People's Bank of China, but also expanded the ceiling of an existing currency arrangement with the Bank of Japan.

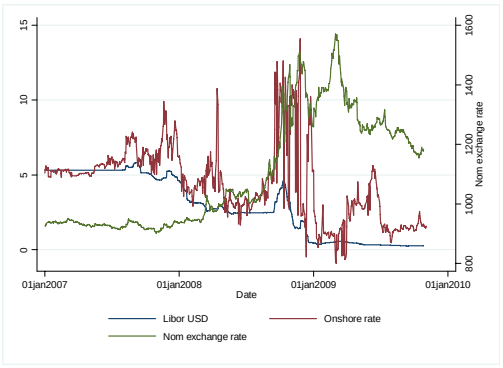
Furthermore, the Bank of Korea acted directly to ease corporate access to foreign credit through a number of measures. It directly provided US dollars in foreign currency liquidity to financial

[6] Based on Bank of Korea (2009)

institutions experiencing difficulties in overseas fund-raising by way of a competitive swap facility between Oct. 21 and Dec. 16 last year, on Nov. 17, 2008 introduced measures to heighten the attraction to foreign exchange banks of providing trade finance to SMEs. Meanwhile, for firms which had taken out of foreign currency loans or purchased financial derivative products and were facing a widening debt service burden and losses on derivative products, the Bank of Korea allowed domestic banks to extend the maturities of their foreign currency loans made for use as working capital and also permitted export firms to take out foreign currency loans for settlement of currency option contracts such as KIKOs. Table 4.2m presents these measures

Table 4.2m - Non-Monetary Policy Measures in Korea





Start Date	Ending Date	Extraordinary Action
1-Oct-08		Specific Support to Businesses
1-Dec-08		Specific Support to Businesses
30-Apr-08		Specific Support to Businesses
17-Oct-08		FX Swap Auctions
27-Oct-08		Extension of accepted collateral
		Bonds issued by banks
29-Oct-08	30-Oct-09	Swap Facility with the FED
12-Dec-08	**1-Apr-09**	Expansion of BoJ swap line
11-Dec-08		12 more eligible firms for repo operations
3-Dec-08		Interest began to be paid on bank deposits in the CB
9-Dec-08		Extension of accepted collateral
		Public Corporation Bonds
9-Jan-09		91 day repos introduced

For our purposes, we identify as policy dummies the direct provision of liquidity to businesses, the USD-Kwon swap operations by the Central Bank, collateral extensions and the remuneration of reserves and the swap arrangement with the Federal Reserve. Table 4.2n presents the results of the estimation. Two main results are worth pointing out. First, the variable that most reacted to these policy measures was the onshore USD interest rate. The liquidity support to businesses, KRW-USD swaps and the swap arrangement with the FED reduced this interest rate substantially, in 270bp, 330 and 260bp. Similarly to other cases, the nominal exchange rate did not seem to react in a significant way to any of these policy measures, in the sense of experiencing an appreciation.

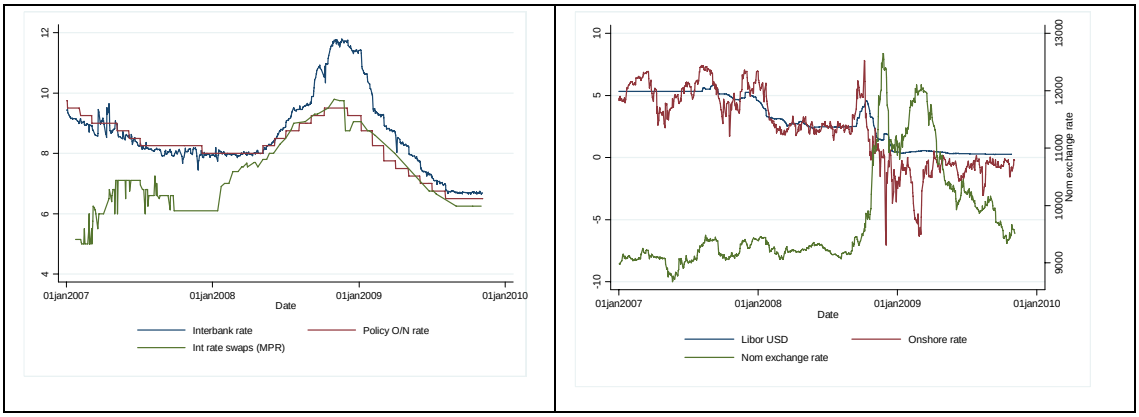
Table 4.2n – Empirical results for Korea

Korea Range: Jan 2007 - Oct 2009 Frequency: Daily Data Dependent Variable Deposit Rate		Onshore rate		Nominal Exch Rate	
Interbank rate	1.581	logvix	1.243	logusdmult	-1.403
	[38.49]***		[3.64]***		[16.80]***
Policy O/N rate	-0.498	Libor USD	0.069	logvix	-0.01
	[10.16]***		[0.42]		[1.37]
Log (VIX)	-0.045	1 moth deposit	1.947	logcrb	0.395
	[2.28]**		[13.38]***		[8.74]***
Libor USD	0.038				
	[4.13]***				
Onshore rate	0.003				
	[1.24]				
Lehman Bro	-0.179		3.726		0.082
	[6.00]***		[7.18]***		[8.27]***
Libor OIS	0.115		0.025		0.047
	[7.84]***		[0.09]		[10.04]***
Support to Businesses	0.086		-2.772		0.104
	[3.39]***		[6.01]***		[21.95]***
KRW-USD FX swaps	0.148		-3.319		0.072
	[3.38]***		[4.40]***		[4.55]***
Coll relaxation and CB dep ir	0.403		4.114		0.06
	[7.76]***		[4.84]***		[3.71]***
Swap Fac FED and BoJ	-0.044		-2.636		0.052
	[3.00]***		[9.97]***		[8.25]***
Ann Support to Businesses					-0.063
					[2.06]**
Ann KRW-USD FX swaps	-0.1		3.702		-0.036
	[1.18]		[2.24]**		[1.07]
Ann Coll relaxation and CB dep ir	0.064		-8.603		-0.018
	[0.79]		[5.45]***		[0.58]
Ann Swap Fac FED and BoJ	0.084		1.308		-0.07
	[1.09]		[0.85]		[2.23]**
Constant	-0.452		-7.955		10.896
	[5.63]***		[6.34]***		[45.74]***
Observations	559		649		680
R-squared	0.99		0.65		0.97
Absolute value of t statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1%					

Indonesia

A significant concern in the wake of the global financial crisis in Indonesia was the magnitude of external debt maturing over 2009 as well as the settlement of structured products between a number of banks.[7] Hence, as elsewhere the implementation of measures aimed at easing short term funding pressures were a key ingredient in facing the outbreak of the crisis. Most of the measures implemented by the Central Bank related to the provision of liquidity in foreign currency. By mid-October, the tenor of USD-local currency swaps was extended to one month, reserve requirements on USD deposits were cut, limits on foreign borrowing by local banks were abolished. Additionally, in February 2009, as the global financial turmoil continued, Indonesia secured a number of facilities for the provision of additional foreign liquidity in the form of standby loans from the World Bank, bilateral swap agreements with Japan and China, and an expanded pool of reserves through the Chiang Mai initiative. In terms of local money markets, also by the middle of October, the maximum guarantee for deposit of selected institutions was expanded and longer tenor REPO operations were introduced. In December, the corridor for the overnight rate was narrowed. The following Table presents the list of measures implemented.

Table 4.2o – Non-Monetary Policy Measures in Indonesia



[7] See Mulya (2009).

Start Date	Ending Date	Extraordinary Action
9-Oct-08		Introduction of two week repo operation
4-Dec-08		Corridor for overnight interest rates narrowed from 200bp to 100bp
14-Oct-08		FX Market measures
		FX swaps maturity extension from seven days to one month
		Reserve requirements on FC deposits lowered from 3 to 1%
		Limit on foreign currency borrowing (by banks) is abolished
2-Feb-09		Credit lines with foreign institutions
		Arrangement of $ 5.5 bn standby loans from WB, ADB, Australia and Japan
		Expansion bilateral C-Swap arrangement with Japan ($2 to $6 billion)
		(23/03/2009) bilateral swap line with China

For our purposes, we identify three policy dummies. First, the introduction of local money market and USD facilities in the middle of October, second the narrowing of the corridor for the interbank rate, and thirdly the number of credit lines with foreign institutions. Results are presented on Table 4.2b. These suggest that several of these measures were indeed effective in easing money market tensions, both in local currency and USD. Although the initial implementation of measures in October did not significantly reduce the spread between interbank rates and the policy rates, it did reduce implied onshore USD interest rates by close to 300bp. The access to a more broad set of foreign resources by the first quarter of 2009 did have a significant impact on both local money market interest rates and implied onshore USD rates. Interestingly, none of these measures seemed to have had a significant impact on the exchange rate, not unlike other economies in the area.

Table 4.2p – Empirical results for Indonesia

Indonesia Range: Jan 2007 - Oct 2009 Frequency: Daily Data Dependent Variable **Interbank rate**		**Onshore rate**		**Nominal Exch Rate**	
Policy O/N rate	1.344	Log (VIX)	0.141	Log (USD M)	0.102
	[69.64]***		[0.58]		[1.20]
Log (VIX)	0.417	Libor USD	1.01	Log (VIX)	0.112
	[9.53]***		[21.93]***		[19.19]***
Libor USD	-0.115	Interbank rate	-0.553	Log (CRB)	-0.372
	[10.41]***		[7.38]***		[9.00]***
Onshore rate	-0.014				
	[2.01]**				
Lehman Bro	0.849		3.69		-0.04
	[12.65]***		[9.62]***		[4.60]***
Libor OIS	0.01		-0.302		-0.01
	[0.33]		[1.74]*		[2.26]**
Repo/Swap/ResReq/Limit	0.131		-3.726		0.047
	[1.93]*		[10.19]***		[4.94]***
Corridor of OIR narrowed	0.013		-0.203		-0.005
	[0.24]		[0.64]		[0.58]
Credit lines with Foreign Banks	-0.645		-1.776		0.03
	[12.59]***		[5.62]***		[4.92]***
Ann Repo/Swap/ResReq/Limit	-0.969		0.475		-0.094
	[4.86]***		[0.41]		[3.20]***
Ann Corridor of OIR narrowed	0.412		-0.985		0.031
	[2.09]**		[0.86]		[1.06]
Ann Credit lines with Foreign Banks	-0.028		1.614		0.023
	[0.15]		[1.42]		[0.80]
Constant	-3.641		4.402		10.574
	[15.30]***		[4.04]***		[56.80]***
Observations	631		641		670
R-squared	0.97		0.86		0.91
Absolute value of t statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1%					

4.3 Empirical results – summary

The previous section highlights the diversity of experiences in domestic local currency and dollar markets. In most cases domestic local currency markets experienced some degree of "stress" in the second half of 2008, with the average spread between 28 day interbank rates and the expected policy rate rising significantly vis-à-vis previous levels and becoming considerably more volatile (table 4.3a). Notable exceptions to this are Colombia and Mexico. In Mexico, "flight" from long term public debt pushed down short term rates. In Colombia, although there was no evident pressure in money markets, the Central Bank expanded its mechanisms for domestic liquidity provision which in turn pushed down short term interbank rates.

In those countries which experienced rising rates, Central Banks expanded the scope of their liquidity facilities, seeking to align short term bank funding rates with policy rates so as to ensure the effectiveness of the monetary policy transmission mechanism. Despite the fact that the interbank-swap spread came down in most countries in 2009, the simple regressions presented in the previous section suggest that the effectiveness of the measures was mixed (table 4.3a). This is at odds with the small but growing empirical literature on the effectiveness of unconventional measures for advanced economies. This literature tends to find that domestic liquidity provision programs tend to reduce libor-ois spreads (see Aït-Sahalia and others (2009), Artuç and Demiralp, forthcoming; McAndrews, Sarkar, and Wang, 2008; Deutsche Bank, 2009; and Christensen, 2009)

Note however, that with counted exceptions Central Banks responded to rising rates by looking to reduce exceptionally high spreads between 28 day rates and overnight policy rates, but did not abandon the pre-crisis schemes of primarily targeting short term rates. Indeed, in most cases the liquidity tools traditionally used to target overnight rates where simply enhanced to extend the maturity and eligible collateral of the central bank operations.

Table 4.3a

"Swap" spread in local currency (in basis points)

	jan07-may07	jun07-aug08	sep08-dec08	avg 09	max 08	Last Av.
Australia	2	18	58	30	205	38
Brazil	-8	-4	27	-9	110	-15
Chile	4	17	22	0	255	22
Colombia	-10	-5	-12	-6	5	-3
Indonesia	-19	0	180	67	250	19
Korea	18	22	61	27	108	40
Mexico	3	-3	-39	-19	28	1
New Zealand	25	36	93	42	260	47
Peru	-65	-49	-8	81	26	201

Spread Volatility (St Dev)

	jan07-may07	jun07-aug08	sep08-dec08	avg 09
Australia	19	22	40	33
Brazil	16	23	60	46
Chile	15	7	21	21
Colombia	25	44	26	73
Indonesia	2	11	26	8
Korea	4	6	37	21
Mexico	6	20	75	17
New Zealand	8	24	19	84
Peru	0	0	0	0

Source: authors calculations based on data from Bloomberg and Central Bank (see appendix 1). For Mexico and Indonesia we report spreads between the 28 day interbank rate and the overnight policy rate because data on interest rates swaps is not available.

Several central banks in our sample also participated in some form of public debt policy. In the case of Chile, for example, the CBCh shifted the maturity of debt issuance to minimize the impact on the yield curve of higher public sector issuance. Implicit in these policies is a belief that – in particular in a period of financial distress -- the supply of debt could have significant (if probably transitory) effects on rates. This being said, available information indicates that, again in most cases, the objective of these measures was to avoid transitory deviations of rates from "fundamentals" that would impact the transmission mechanism rather than to complement traditional monetary policy by pushing down long term rates.

The impact of the crisis on onshore dollar rates is more heterogeneous. Whether rates rose of fell relative to LIBOR depends on both the impact of financial stress on external financing costs, and on events in domestic forward markets. In several cases (Brazil and Mexico), agents rushed to unwind short dollar positions, pushing down domestic dollar rates. In others, the risk adjusted rate rose in line with rising global uncertainty or illiquidity and pushed up onshore rates (table 4.3b). In most cases, however, volatility increased relative to levels observed in the 1st semester of 2007.

Here policies either aimed to directly complement the private supply of dollar credit via swaps or other mechanisms, or to offset the impact of lack of dollar liquidity on the exchange rate. Many of the measures that provided dollar loans appear to have been relatively successful in reducing domestic dollar rates. The effects of direct (one off or programmed) sales of USD, as discussed in the previous section, are mixed.

Table 4.3b

Spread over Libor in USD (in basis points)

Country	jan07-may07	jun07-aug08	sep08-dec08	avg 09	max 08
Australia	0	14	26	15	318
Brazil	101	28	-116	-26	845
Chile	-46	81	112	102	458
Colombia	-33	-161	62	11	347
Indonesia	-22	10	-105	-153	373
Korea	-13	125	513	157	1270
Mexico	24	51	-249	-49	177
New Zealand	2	2	24	32	426
Peru	93	381	-171	-24	1154

Spread Volatility (St Dev)

	jan07-may07	jun07-aug08	sep08-dec08	avg 09
Australia	79	111	444	174
Brazil	11	118	141	149
Chile	140	117	128	112
Colombia	119	91	214	134
Indonesia	21	111	338	129
Korea	8	32	237	45
Mexico	10	19	68	22
New Zealand	66	321	234	71
Peru	0	0	0	0

Source: authors calculations based on data from Bloomberg and Central Bank (see appendix 2).

Finally, Table 4.3c presents in a more synthetic form the resulting estimates for the different global financial controls. In general, the period subsequent to the Lehman Brothers collapse saw a

significant increase in onshore USD interest rates. This effect occurred over and above the sensitivity to other risk and volatility measures, such as Libor OIS spreads and the VIX, and the actual movement of USD Libor itself. Local interest rates also reacted to global financial turmoil, although the degree of heterogeneity between economies seems to be larger in this case. The local exchange rate followed the gyrations of the dollar worldwide and commodity prices.

Table 4.3c – Synthesis of global controls

	Local Currency Interest Rate				Onshore USD Interest Rate				
	Libor USD	**Libor OIS**	**Log VIX**	**Lehman**		**Libor USD**	**Libor OIS**	**Log VIX**	**Lehman**
Australia	0.04	0.365	0.007	0.286	Australia	0.934	0.151	0.092	1.045
	[2.79]***	[17.04]***	[0.34]	[6.51]***		[88.66]***	[2.32]**	[1.60]	[9.59]***
Brazil	0.031	0.02	0.013	-0.197	Brazil	1.208	-0.661	-0.044	1.817
	[2.88]***	[0.53]	[0.25]	[2.69]***		[16.88]***	[2.12]**	[0.10]	[3.03]***
Chile	-0.057	0.313	-0.122	0.17	Chile	0.629	0.52	0.222	0.725
	[3.55]***	[7.21]***	[2.10]**	[1.95]*		[11.22]***	[3.10]***	[1.00]	[2.14]**
Colombia	0.062	-0.029	0.061	-0.012	Colombia	1.069	-0.677	-2.177	2.876
	[5.60]***	[1.18]	[1.49]	[0.25]		[21.06]***	[3.90]***	[8.70]***	[8.85]***
Indonesia	-0.002	-0.004	0.156	0.941	Indonesia	1.01	-0.302	0.141	3.69
	[0.07]	[0.06]	[1.76]*	[5.79]***		[21.93]***	[1.74]*	[0.58]	[9.62]***
Korea	0.038	0.115	-0.045	-0.179	Korea	0.069	0.025	1.243	3.726
	[4.13]***	[7.84]***	[2.28]**	[6.00]***		[0.42]	[0.09]	[3.64]***	[7.18]***
Mexico	-0.036	0.093	-0.11	-0.052	Mexico	0.887	-0.274	0.421	-0.092
	[5.60]***	[6.10]***	[6.04]***	[2.00]**		[43.24]***	[2.89]***	[3.81]***	[0.59]
New Zealand	0.136	0.499	-0.207	0.884	New Zealand	0.978	-0.142	0.17	0.246
	[5.55]***	[16.70]***	[5.13]***	[14.02]***		[70.38]***	[2.76]***	[2.64]***	[2.76]***
Peru	-0.082	0.086	0.305	0.16	Peru	-0.753	0.628	1.59	-4.118
	[7.69]***	[2.19]**	[5.75]***	[1.61]		[10.56]***	[2.45]**	[4.23]***	[6.00]***

	Nominal Exchange Rate (Log)				
	Log (USD m)	**Log (VIX)**	**Log (CRB)**	**Libor OIS**	**Lehman**
Australia	-1.51	0.044	-0.267	0.038	0.016
	[30.63]***	[11.13]***	[11.41]***	[16.64]***	[2.11]**
Brazil	-1.104	0.012	-0.586	0.001	0.016
	[15.13]***	[2.15]**	[16.42]***	[0.16]	[1.77]*
Chile	-1.059	0.004	-0.357	0.046	-0.014
	[13.06]***	[0.58]	[8.88]***	[11.37]***	[1.32]
Colombia	-1.053	0.025	-0.418	0.013	-0.011
	[11.03]***	[3.55]***	[8.68]***	[2.52]**	[0.95]
Indonesia	0.102	0.112	-0.372	-0.01	-0.04
	[1.20]	[19.19]***	[9.00]***	[2.26]**	[4.60]***
Korea	-1.403	-0.01	0.395	0.047	0.082
	[16.80]***	[1.37]	[8.74]***	[10.04]***	[8.27]***
Mexico	-0.446	0.062	-0.182	-0.011	-0.009
	[7.48]***	[15.31]***	[6.26]***	[3.18]***	[1.56]
New Zealand	-1.312	0.02	-0.077	0.033	-0.041
	[18.02]***	[3.32]***	[2.04]**	[7.90]***	[5.13]***
Peru	-0.988	0.011	-0.065	-0.011	-0.002
	[22.67]***	[2.90]***	[2.91]***	[4.48]***	[0.35]

Conclusions [pending]

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Appendix 1
Domestic Interest Rate Data

Country/ Data Description		
Chile		
Deposit rate		30 - 90 day banking system average deposit rate. Source: Central Bank of Chile
Interbank rate		Overnight interbank loan rate.
MP rate		Overnight monetary policy rate set by the Central Bank of Chile
Australia		
Interbank rate	AU0001M Index	LIBOR AUD 1M Index. British Bankers Association Fixing for Australia Dollar.The fixing is conducted each day at 11am (London time).The rate is an average derived from the quotations provided by the banks determined by the BritishBankers' Association.
MP rate	RBATCTR	Australia RBA Cash Rate Index.
Swap rate	ADSOA Curncy	AUD SWAP OIS 1 MO Curncy.
Brazil		
Swap rate	BCSWAPD Curncy	BRL SWAP PRE-DI 1MO Curncy. PRE is the fixed rate and DI is the floating rate. DI is the Brazilian Interbank Depossit Average rate.
Interbank rate	BCCDIO Curncy	Brazilian interbank lending rate with no government bonds as collateral.
Deposit rate	BCCDBAE Index	Brazilian retail certificate of deposit quoted as an effective annualized rate. This is a fixed 30 day rate.
MP rate	BZSTSETA Index	Brazilian SELIC Target rate is the benchmark rate set by the Brazilian Central Bank. The SELIC target was created on March 4, 1999, replacing the TBC and TBAN rates.
New Zealand		
Interbank rate	NZ0001M Index	London-Interbank Offered Rate - British Bankers Association Fixing for NZ Dollar. The fixing is conducted each day at 11am (London time). The rate is an average derived from the quotations provided by the banks determined by the British Bankers' Association.
MP rate	NZOCRS Index	New Zealand Official Cash Rate Index
Swap rate	NDSOA CURNCY	NZD SWAP OIS 1Mo Curncy
Colombia		
Interbank rate		Interbank rate 90d. Source: Banco de la República
Swap rate	CLSWA Curncy	COP Swap 1M Curncy
Deposit rate	CLDRA Curncy	COP Deposit 1MO Curncy
MP rate	CORRRMIN Index	Colombia Minimum Repo Rate to be Offered at Daily Auction
Mexico		
MP rate	MXONBR Index	Bank of Mexico Official Overnight Rate
Interbank rate	MPTBA Curncy	Mexico MXN T-Bill 1MO Curncy / MxLibor only between 2001 -2003 are almost identical
Korea		
Deposit rate	KWCDC Curncy	KRW CD 3MO Curncy.
Interbank rate	KRBO1M Index	SK KFB KORIBOR KRW 1M Index
MP rate	KOCRD Index	South Korea Target Overnight Call Rate Daily. This index stores the daily call rate announced by the Bank o Korea
Peru		
Deposit rate	PSDRA Curncy	Peruvian Deposit 1 MO Curncy
Interbank rate	PRBOPRBI Index	Preu Reference Interest Rate. LIMABOR interest rate in local currency.
MP rate	PRRRONUS Index	Peru Central Bank Reference Rate
Indonesia		
Interbank rate	JIIN1M Index	Jakarta Interbank 1M Index
MP rate	IDBIRATE Index	Bank of Indonesia Reference Rate
Swap rate	IHSWOOA CURNCY	IDR Swap Onshore (OIS) 1MO
Deposit rate	idre1mo index	IDR Deposit Rate Average 1Mo Index / 131 Banks in the Sample

Appendix 2
Construction of onshore rates

Country	Data	Bloomberg Ticket	Description
Australia	**Nominal Exchange Rate**	AUD Curncy	Spot Exchange Rate - Price of 1 AUD in USD. The Australian dollar is the official currency of the Commonwealth of Australia. The conventional market quotation is the number of US dollars per Australian dollar. It is an independent free-floating currency.
	Forward Contract	AUD1M Curncy**	1 Month Forward Points.
		AUD3M Curncy**	3 Month Forward Points.
		AUD12M Curncy**	12 Month Forward Points.
	Interest Rate	ADBB1M Index	Bank Bill 1 Month. Day Count: ACT/365.
		ADBB3M Index	Bank Bill 3 Month. Day Count: ACT/365.
		ADSWAP1Q Index	Interest Rate Swap Quaterly 1 Year. Quote: Quarterly 1 to 3 year use Quarterly Settlement vs. 3 month Bank Bill. Day Count: ACT/365.
Brazil	**Nominal Exchange Rate**	BRL Curncy	Spot Exchange Rate - Price of 1 USD in BRL. The Brazilian real is the official currency of the Federative Republic of Brazil. The conventional market quotation is the number of reals per US dollar. It is an independent free-floating currency.
	Forward Contract	BCN1M Curncy***	1 Month NDF Points.
		BCN3M Curncy***	3 Month NDF Points.
		BCN12M Curncy***	12 Month NDF Points.
	Interest Rate	OD1 Comdty	Generic 1st 'OD' Future. One-Day Interbank Deposit Futures Contract. Underlying asset: the interest rate of Interbank Deposits, defined as the capitalized daily avg of 1 day rates based on the period from the transaction date to the last trade day. Price quotations expressed as a percentage rate per annum compounded daily based on a 252-day year. Day Count: DU/252.
		OD2 Comdty	Generic 2st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD3 Comdty	Generic 3st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD4 Comdty	Generic 4st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD7 Comdty	Generic 7st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD8 Comdty	Generic 8st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD9 Comdty	Generic 9st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD10 Comdty	Generic 10st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD11 Comdty	Generic 11st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD12 Comdty	Generic 12st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD13 Comdty	Generic 13st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD14 Comdty	Generic 14st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
		OD15 Comdty	Generic 15st 'OD' Future. One-Day Interbank Deposit Futures Contract. Day Count: DU/252.
Canada	**Nominal Exchange Rate**	CAD Curncy	Spot Exchange Rate - Price of 1 USD in CAD. The Canadian dollar is the official currency of Canada. The conventional market quotation is the number of Canadian dollars. It is an independent free-floating currency.
	Forward Contract	CAD1M Curncy**	1 Month Forward Points.
		CAD3M Curncy**	3 Month Forward Points.
		CAD2M Curncy**	12 Month Forward Points.
	Interest Rate	CDOR01 Index	Canada Bankers Acceptances 1 Month. Average Rates from nine Canadian Banks/contributors. The high and low rates are omitted and the remaining seven are averaged. Day Count: ACT/365.
		CDOR03 Index	Canada Bankers Acceptances 3 Month. Average Rates from nine Canadian Banks/contributors. The high and low rates are omitted and the remaining seven are averaged. Day Count: ACT/365.
		CDOR12 Index	Canada Bankers Acceptances 12 Month. Average Rates from nine Canadian Banks/contributors. The high and low rates are omitted and the remaining seven are averaged. Day Count: ACT/365.
Chile	**Nominal Exchange Rate**	CLP Curncy	Spot Exchange Rate - Price of 1 USD in CLP. The Chilean peso is the official currency of the Republic of Chile. The conventional market quotation is the number of pesos per US dollar. It is an independent free-floating currency.
	Forward Contract	CHN1M Curncy***	1 Month NDF Points.
		CHN3M Curncy***	3 Month NDF Points.
		CHN12M Curncy***	12 Month NDF Points.
	Interest Rate	CLTN30DS Curncy	Nominal Avg Interbank Rate 30 Days. Nominal Average Interbank Rate informed by Asociacion Nacional de Bancos, observed amongst the local financial institutions. Nominal rates are ACC/30 days and whithout considering inflation.
		CHSWPC Index	Interest Rate Swap Peso vs. Camara 3 Month. Quote: Semi-Annual settlement & Compounding vs. Camara. Day Count: ACT/360.
		CHSWP1 Index	Interest Rate Swap Peso vs. Camara 1 Year. Quote: Semi-Annual settlement & Compounding vs. Camara. Day Count: ACT/360.

Colombia	**Nominal Exchange Rate**	COP Curncy	Spot Exchange Rate - Price of 1 USD in COP. The Colombian peso is the official currency of the Republic of Colombia. The conventional market quotation is the number of pesos per US dollar. It is a free-floating currency.
	Forward Contract	CLN1M Curncy***	1 Month NDF Points.
		CLN3M Curncy***	3 Month NDF Points.
		CLN12M Curncy***	12 Month NDF Points.
	Interest Rate	DTF RATE Index	DTF 90 days interest rate. This index is released on a weekly basis. It is a weighted average of all financial institutions' deposit rates, calculated by the Central Bank. This is an annual effective rate.
		COMM1YR Index	Time deposits of banks yield curve 1 year. Rates are also known as TBS (Tasa Basica de la Superintendencia Bancaria). Refers to a 360 days period.
Indonesia	**Nominal Exchange Rate**	IDR Curncy	Spot Exchange Rate - Price of 1 USD in IDR. The Indonesian rupiah is the official currency of the Republic of Indonesia. The conventional market quotation is the number of rupiah per US dollar. It is an independent free-floating currency.
	Forward Contract	IHO1M Curncy*	1 Month Onshore Forward Points.
		IHO3M Curncy*	3 Month Onshore Forward Points.
		IHO12M Curncy*	12 Month Onshore Forward Points.
	Interest Rate	IHDRA Index	Deposit 3 Month. Day Count: ACT/360.
		IHDRC Index	Deposit 1 Month. Day Count: ACT/360.
		IDRE12MO Index	Indonesia Deposit Rate Avg 12 Month. Day Count: ACT/360.
Maylasia	**Nominal Exchange Rate**	MYR Curncy	Spot Exchange Rate - Price of 1 USD in MYR. The Malaysian ringgit is the official currency of Federation of Malaysia. The conventional market quotation is the number of Malaysian ringgit per US dollar. It is a managed floating currency.
	Forward Contract	MYR1M Curncy**	USDMYR 1 Month Offshore Forward Points.
		MYR3M Curncy**	3 Month Offshore Forward Points.
		MYR12M Curncy**	12 Month Offshore Forward Points.
	Interest Rate	KLIB1M Index	Malaysia Interbank Offered Rate Fixing 1 Month. Day Count: ACT/365.
		KLIB3M Index	Malaysia Interbank Offered Rate Fixing 3 Month. Day Count: ACT/365.
		MRSWQO1 Index	Interest Rate Swap Onshore 1 Year. Quote: Quarterly compounded vs 3 month Klibor. Day Count: ACT/365.
Mexico	**Nominal Exchange Rate**	MXN Curncy	Spot Exchange Rate - Price of 1 USD in MXN. The Mexican peso is the official currency of Mexico. The conventional market quotation is the number of pesos per US dollar. It is an independent free-floating currency.
	Forward Contract	MXN1M Curncy**	1 Month Forward Points.
		MXN3M Curncy**	3 Month Forward Points.
		MXN12M Curncy**	12 Month Forward Points.
	Interest Rate	MXIBTIIE Index	Benchmark Interbank Deposit Rates TIIE 28 Day. The TIIE is an interbank interest rate which is decided by the supply and demand of funds. Calculated by bids provided by Mexican banks, when supply and demand reach equilibrium, this is the rate which is set.
		MPSWC Index	Mexican peso-denominated interest-rate swaps (TIIE) 3 Month. Daycount: 28/360
		MPSW1A Index	Mexican peso-denominated interest-rate swaps (TIIE) 13 Months. Daycount: 28/360
New Zeland	**Nominal Exchange Rate**	NZD Curncy	Spot Exchange Rate - Price of 1 NZD in USD. The New Zealand dollar is the official currency of New Zealand. The conventional market quotation is the number of US dollars per New Zealand dollar. It is an independent free-floating currency.
	Forward Contract	NZD1M Curncy**	1 Month Forward Points.
		NZD3M Curncy**	3 Month Forward Points.
		NZD12M Curncy**	12 Month Forward Points.
	Interest Rate	NDBB1M Index	Bank Bill 1 Month. Day Count: ACT/365.
		NDBB3M Index	Bank Bill 3 Month. Day Count: ACT/365.
		NDBB12M Index	Bank Bill 12 Month. Day Count: ACT/365.
Norway	**Nominal Exchange Rate**	NOK Curncy	Spot Exchange Rate - Price of 1 USD in NOK. The Norwegian krone is the official currency of the Kingdom of Norway. The conventional market quotation is the number of kroner per US dollar. It is a managed floating currency.
	Forward Contract	NOK1M Curncy**	1 Month Forward Points.
		NOK3M Curncy**	3 Month Forward Points.
		NOK12M Curncy**	12 Month Forward Points.
	Interest Rate	NIBOR1M Index	Norway Interbank Offered Rate Fixing 1 Month. Day Count: ACT/360.
		NIBOR3M Index	Norway Interbank Offered Rate Fixing 3 Month. Day Count: ACT/360.
		NIBOR12M Index	Norway Interbank Offered Rate Fixing 12 Month. Day Count: ACT/360.

Peru	**Nominal Exchange Rate**	PEN Curncy	Spot Exchange Rate - Price of 1 USD in PEN. The Peruvian new sol is the official currency of The Republic of Peru. The conventional market quotation is the number of new soles per US dollar. It is an independent free-floating currency.
	Forward Contract	PSN1M Curncy***	1 Month NDF Points.
		PSN3M Curncy***	3 Month NDF Points.
		PSN12M Curncy***	12 Month NDF Points.
	Interest Rate	PRBOPRBI Index	Asbanc 1 Month Nominal Rate. Reference LIMABOR interest rates in local currency (PES), is the interbank rate to which any bank is available to buy or sell. Day Count: ACT/360.
		PRBOPRB3 Index	Asbanc 3 Month Nominal Rate. Reference LIMABOR interest rates in local currency (PES), is the interbank rate to which any bank is available to buy or sell. Day Count: ACT/360.
		PRBOPRB1 Index	Asbanc 1 Year Nominal Rate. Reference LIMABOR interest rates in local currency (PES), is the interbank rate to which any bank is available to buy or sell. Day Count: ACT/360.
Philippines	**Nominal Exchange Rate**	PHP Curncy	Spot Exchange Rate - Price of 1 USD in PHP. The Philippine peso is the official currency of The Republic of the Philippines. The conventional market quotation is the number of pesos per US dollar. It is an independent free-floating currency.
	Forward Contract	PHP1M Curncy**	1 Month Offshore Forward Points.
		PPN1M Curncy***	1 Month NDF Points.
		PHP3M Curncy**	3 Month Offshore Forward Points.
		PPO3M Curncy*	3 Month Onshore Forward Points.
		PHP12M Curncy**	12 Month Offshore Forward Points.
		PPN12M Curncy***	12 Month NDF Points.
	Interest Rate	PREF1MO Index	Philippines 1-Month Interbank Reference Rate PHIREF at 1130am.
		PREF3MO Index	Philippines 3-Month Interbank Reference Rate PHIREF at 1130am.
		PPSWO1 Index	Interest Rate Swap Onshore 1 Year. Quote: Quarterly vs. 3 month Philippines Interbank Reference Rate. Day Count: ACT/360.
South Africa	**Nominal Exchange Rate**	ZAR Curncy	Spot Exchange Rate - Price of 1 USD in ZAR. The South African rand is the official currency of The Republic of South Africa. The conventional market quotation is the number of rand per US dollar. It is an independent free-floating currency.
	Forward Contract	ZAR1M Curncy**	1 Month Forward Points.
		ZAR3M Curncy**	3 Month Forward Points.
		ZAR12M Curncy**	12 Month Forward Points.
	Interest Rate	JIBA1M Index	South Africa Johannesburg Interbank Agreed Rate 1 Month. Day Count: ACT/365.
		JIBA3M Index	South Africa Johannesburg Interbank Agreed Rate 3 Month. Day Count: ACT/365.
		JIBA12M Index	South Africa Johannesburg Interbank Agreed Rate 12 Month. Day Count: ACT/365.
South Korea	**Nominal Exchange Rate**	KRW Curncy	Spot Exchange Rate - Price of 1 USD in KRW. The South Korean won is the official currency of The Republic of Korea (South Korea). The conventional market quotation is the number of won per US dollar. It is a free-floating currency.
	Forward Contract	KWO1M Curncy*	1 Month Onshore Forward Points.
		KWO3M Curncy*	3 Month Onshore Forward Points.
		KWO12M Curncy*	12 Month Onshore Forward Points.
	Interest Rate	KRBO1M Index	KORIBOR (Korea Inter-Bank Offered Rate) 1 Month. Is the average of lending interest rates in the interbank market.
		KWCDC Index	Certificate of Deposit (CD) 3 Month. Is a debt instrument issued by a bank that will pay principal and interest when it reaches maturity. Settlement for KRW CD's is T+0.
		KWSWO1 Index	Interest Rate Swap Onshore 1 Year. Quote: Quarterly fixed rate vs. 91 Day KRW CD. Day Count: ACT/365
Thailand	**Nominal Exchange Rate**	THO Curncy	Onshore Spot Exchange Rate - Price of 1 USD in THO. The Thai baht is the official currency of Thailand. The conventional market quotation is the number of baht per US dollar. It is an independent free-floating currency. In March, 2008, Thailand government lifted the 30% reserve requirement, so onshore and offshore spot requirement, so onshore and offshore spot of Thai Baht have been merged to THB Curncy since 03/27/2008.
	Forward Contract	TBO1M Curncy*	1 Month Onshore Forward Points.
		TBO3M Curncy*	3 Month Onshore Forward Points.
		TBO12M Curncy*	12 Month Onshore Forward Points.
	Interest Rate	THFX1M Index	Bloomberg Thailand 1 Month Fixing Rate. Day Count: ACT/365.
		THFX3M Index	Bloomberg Thailand 3 Month Fixing Rate. Day Count: ACT/365.
		TBSWO1 Index	Interest Rate Swap Onshore 1 Year. Quote: Semi-annual vs. 6 Month BIBOR. Day Count: ACT/365.

* Onshore forward foreign exchange transactions occur in controlled domestic markets and involve the purchase of a specified amount of one currency and selling of another on an agreed future date. Onshore forward rates are not necessarily determined by an arbitrage free relationship between the interest rates of the two currencies and the current spot rate.
** Forward foreign exchange transactions involve the purchase of a specified amount of one currency and selling of another on an agreed date in the future. Forward exchange rates are determined by using the arbitrage free price relationship between the interest rates of the two currencies and the current spot rate.
*** Non-deliverable forwards are a type of cash settled financial derivative. In the foreign exchange market, traders and investors will enter into an outright forward or futures contract exchange market, traders and investors will enter into an outright forward or futures contract where counterparties agree to settle based upon the difference between a strike price and where counterparties agree to settle based upon the difference between a strike price and the prevailing spot rate for a specified notional amount on a defined fixing date in the future.

Source: Bloomberg.