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# How do financial crises affect commercial bank liquidity? Evidence from Latin America and the Caribbean

***Abstract***:
The 1990s were a turbulent time for Latin American and Caribbean countries. During this period, the region suffered from no less than sixteen banking crises. One of the most important determinants of the severity of banking crises is commercial bank liquidity. Banking systems, which are relatively liquid, are better able to deal with the large deposit withdrawals that tend to accompany bank runs. This study provides an assessment of the main determinants of bank liquidity as well as an evaluation of the impact of banking crises on liquidity. The results show that on average, bank liquidity is about 8% less than what is consistent with economic fundamentals during financial crises.

*Keywords*: E44; G21
*JEL Codes*: Liquidity, Financial Crisis, Banks

## 1. Introduction

During the 1990s, Latin America and the Caribbean countries suffered from numerous shocks to their domestic banking systems. Demirgüç-Kunt and Detragiache (2005) estimate that the region under went no less than sixteen domestic banking crises between 1990 and 2002. Although not all banking crises are caused by the same factors and have the same result on the economy, the G-10 Working Party on Financial Consolidation (2001) provides a general definition of a crisis as "an event that will trigger a loss in economic value or confidence in a substantial portion of the financial system that is serious enough to … have significant adverse effects on the real economy". The International Monetary Fund (1998), using observations from fifty-three industrial and developing countries and fifty-four banking crises estimated that the cumulative output loss was on average 11.6%.

Unfortunately, the onset of a crisis is difficult to predict (Lai, 2002). Most studies can provide certain features of an economy that are at risk of a financial crisis, but higher risk does not always result in a crises. Kaminsky and Reinhart (1999) provide one of the earliest studies of the determinants of banking crisis. Using data on the incidence of currency, banking and twin crises in a sample of twenty industrial and emerging countries between 1970-1995, the authors find that banking crises are usually preceded by an appreciation of the real exchange rate and increases in interest rates, equity prices and the money multiplier. However, these indicators were only able to correctly signal that a crisis will occur 20% of the time. Demirgüç-Kunt and Detragiache (1998) using an alternative methodology which combines signals from all the variables into one index were able to correctly predict the occurrence of banking crises 70% of the time. Similar to Kaminsky and Reinhart (1998), they find that crises tend to result during

periods of weak growth and loss of monetary control, reflected by high real interest rates and inflation. Although the factors that lead to banking crisis seem to be better understood relative to the start of the 1990s, implementing a system to predict banking crises in practice has proved to be somewhat difficult (see Demirgüç-Kunt and Detragiache, 2005).

Based on an analysis of banking crises in Latin America in the 1990s, Garcia-Herrero (1997) argues that banks' liquidity management may act as a buffer for deposit withdrawals during banking crises. For example, Argentina during the 1997 crisis was able to meet the massive withdrawals that buffeted the banking system prior to the announcement of a macroeconomic programme.

Despite the importance of liquidity dynamics, especially during a crisis, the topic is for the most part under-researched. A liquidity constrained banking sector might hinder economic activity as banks reduce credit. This may in turn result in firm closures, reduced consumption, lower aggregate demand and higher unemployment (see Fischer, 1933; Bernanke, 1983). Later empirical studies by Baer and McElravey (1993), Peek and Rosengren (1997) and Kashyap and Stein (1995) reported results consistent with bank credit supply and economic activity. Calomiris and Wilson (1998), however, argue that the correlation between bank credit and economic activity can also reflect expectations of poor conditions which may reduce the demand for loans. Using data on New York City banks in the 1920s and 1930s, the authors find evidence to support the Fisher-Bernanke view, i.e. banks reduced the supply of loans in an attempt to shed asset risk during this period.

While banking crisis are usually modelled in theoretical literature as being accompanied by large withdrawals from the banking system, some authors find only a weak relationship between bank deposits and banking crises. Gupta (1996) and Demirgüç-Kunt, Detragiache and

Gupta (2004) find that bank crises are not accompanied by any substantial declines in bank deposits relative to GDP. The authors suggest that their results could be due to generous bank safety net that reduce the possible loss to depositors despite bank insolvency.

Therefore, while the effect of a crisis on credit and deposits has to some extent been studied the overall impact of a crisis on bank liquidity however has not yet been empirically studied. Latin American and the Caribbean provide an interesting case study given the large number of crises that have occurred in the region. The paper is structured as follows. Section 2 presents a survey of liquidity trends in the Latin America and the Caribbean. An empirical model of the demand for liquidity is presented in Section 3 and Section 4 provides the estimated model results and an assessment of whether liquidity tends to rise or fall during crises. Section 5 summarises the main findings of the paper and presents some policy recommendations.

## 2. Stylised Facts

### *2.1 Measuring Liquidity*

Liquidity can be defined as the ability of a financial institution to meet all legitimate demands for funds (Yeager and Seitz, 1989). A financial institution can utilise a number of sources to meet its liquidity needs, these include new deposits, maturing assets, borrowed funds and/or using the discount window (borrowing from the central bank). Given that access to these facilities may not always be available and their use incurs a cost, adequate liquidity management is an important activity in most commercial banks.

One can measure liquidity either from a stock or flow perspective. The stock approach employs various balance sheet ratios to identify liquidity trends. These ratios include:

- loans as a ratio of deposits (referred to as the loan-to-deposit ratio);
- investment securities maturing in one year or less divided by total assets, and;
- cash less required reserves plus government securities divided by total assets (referred to as the liquid asset ratio).

The flow approach, in contrast, treats liquid reserves as a reservoir: the bank assesses its liquidity risk by comparing the variability in inflows and outflows to determine the amount of reserves that are needed during a period. Although both approaches are intuitively appealing, the flow approach is more data intensive and there is no standard technique to forecast inflows and outflows. As a result, the stock approaches are more popular in practice and the academic literature (see Crosse and Hempel, 1980; Yeager and Seitz, 1989; Hempel, Simonson and Coleman, 1994).

The two most popular stock ratios are the loan-to-deposit ratio and the liquid asset ratio, where the higher the loan-to-deposit ratio (or the lower the liquid asset ratio) the less able a bank to meet any additional loan demands. Both indicators have their short-comings: the loan-to-deposit ratio does not show the other assets available for conversion into cash to meet demands for withdrawals or loans, while the liquid assets ratio ignores the flow of funds from repayments, increases in liabilities and the demand for bank funds. Fortunately, the ratios tend to move together (Cross and Hempel, 1980). This paper therefore employs the monthly loan-to-deposit ratio to assess liquidity trends in Latin America and the Caribbean.

### *2.2 Bank Liquidity Trends*

Although the 1990s was a period of instability for Latin America and Caribbean banks, it was also marked by widespread reforms. This process involved the privatisation of state-owned banks, the elimination of targeted credit programmes, the removal of interest rate controls, reduction in legal reserve requirements and establishing modern banking regulation systems (Lora, 1997; Clarke, Cull and Peria, 2004).

As a result of these reforms, a number of foreign banks entered the regional banking industry. Clarke, Cull and Peria (2004) report that the change in foreign-owned banks' share of total bank assets between 1997-2001 rose by more than 10% in Brazil, Chile, Panama and Mexico and between 1 and 10% in Peru, Guyana, Guatemala and Venezuela. The authors also report that increased foreign bank participation seemed to have lowered interest rate spreads and increased access to long-term loans. García-Herrero (1997) also report that high levels of foreign banks participation seems to have helped some crisis countries to stabilise their deposit base, thereby reducing the negative macroeconomic consequences of banking crises.

Figure 1 plots the loan-to-deposit ratio for sixteen Latin America and Caribbean countries. Of the sixteen countries considered, half of these had a general rise in liquidity (a fall in the loan-to-deposit ratio) between 1970 and 2004. Most of these countries, however, suffered from banking crises (listed in Table 1) during the latter half of the review period. All of the other countries either fluctuated around the sample mean, or rose in the case of Belize, Chile and Peru.

The variation in liquidity in Brazil was the largest. This primarily reflects the relatively high rates of inflation between 1981-1994, which would of increased uncertainty. During this period Brazil's inflation rate ranged from 100 percent to 2076 percent in 1994. Table 1,

however, seems to indicate that there is a positive relationship between inflation and the loan-to-deposit ratio, which is somewhat counterintuitive. However, those countries with hyper-inflation are more likely to also have significant state-ownership in the banking system and relatively loose monetary and fiscal policies that lead to higher levels of credit. Indeed, if one excludes the high-inflation countries, those with an average annual inflation rate above 25%, there is a negative relationship between inflation and the loan-to-deposit ratio (the calculated correlation ratio was 0.45). On the other hand, those countries with relatively high rates of growth and low rates of unemployment seem to be more likely to have higher loan-to-deposit ratios. This finding is generally consistent with the econometric literature linking financial development/intermediation and growth (see Levine, 1997, for a survey of this literature).

### *2.3 Liquidity Before, During and After the Crisis*

Comparing average liquidity before (18 months in this study), during and after the crisis (18 months) can provide a preliminary evaluation of the effect of banking crises on liquidity; this approach is similar to that used by Kaminsky and Reinhart (1999). The results are given in Table 2. The table shows that the loan-to-deposit ratio rises during banking crises by about 7 percentage points, suggesting that liquidity generally contracts during a crisis, as commercial banks are inundated with numerous requests for deposit withdrawals. During particularly deep downturns, for example in Argentina and Chile, the liquidity ratio rose by more than 33 percentage points relative to the preceding 18-month period.

In some countries, however, the loan-to-deposit ratio declined, indicating an increase in commercial bank liquidity. This can by explained by three factors: (1) in some countries the government stepped in and purchased and recapitalised a number of banks that probably would of folded; (2) in countries with high foreign bank participation, these banks could call on foreign parent companies for liquidity support, and; (3) the calculation for multiple crises periods does not account for changes in financial development.

In contrast, in all the cases, except Peru whose banking crises was comparatively modest, liquidity expanded in the 18-month period after the crisis. On average, the loan-to-deposit ratio fell by 17 percentage points after a crisis. One of the likely explanations for this trend is that after a crisis most governments tend to implement financial sector reforms that then lead to greater financial intermediation.

## 3. Econometric Model

This section of the study specifies a demand function for liquidity ( $LQ$ ) of commercial banks. From the literature, the main factors that explain a bank's demand for liquidity can be linked to its customer characteristics and the macroeconomic environment (see Agénor, Aizerman and Hoffmaister, 2004). A bank needs to hold liquid assets to meet the cash requirements of its customers (captured by fluctuations in the cash-to-deposit ratio, $C/D$). In most financial systems around the world, if the institution does not have the resources to satisfy its customers' demand, then it either has to borrow on the inter-bank market or the central bank, both of which incur an interest penalty. Agénor, Aizenman and Hoffmaister show that with a sufficiently high

penalty rate, liquidity shocks, which increase consumers' demand for cash, can encourage a bank to hold more liquid assets (lower loan-to-deposit ratio). The coefficient on this variable is therefore expected to be negative.

The current macroeconomic situation, in terms of both the level of economic activity (given by the deviation of income from trend, $Y/Y^T$) and income volatility ($CV_{Y/Y^T}$), also have important impacts on the demand for commercial bank liquidity. A cyclical downturn, for example, lowers banks' expected transactions demand for money, on the part of consumers, and therefore leads to decreased liquidity. In contrast, a rise in economic volatility, since it is usually accompanied by liquidity shocks, should lead to an expansion in liquidity (lower loan-to-deposit ratio). The coefficient on this variable is anticipated to be positive, however, it is likely that the coefficient could be positive if some banks reduce their loan supply during cyclical downturns, leading to higher liquidity (see Maynard and Moore, 2005).

The opportunity cost of holding reserves also influences the demand for liquidity. The variable employed to capture opportunity cost in this paper is the money market rate of interest ($r$). An increase in the interest rate should, holding all other factors constant, reduce the demand for liquidity (increase in the loan-to-deposit ratio), since this increases the revenue foregone from holding these low or zero interest-bearing assets. The interest rate variable is therefore expected to be positive.

The estimated liquidity demand equation is therefore given by the following autoregressive specification, which allows for a gradual adjustment to the desired level of reserves:

$$lq_t = A_1 lq_{t-1} + A_2 CV_{C/D} + A_3 Y/Y^T + A_4 CV_{Y/Y^T} + A_5 r + \varepsilon \qquad (1)$$

where $\varepsilon$ is an error term which is assumed to have normal properties and $A_j(L)$ are lag polynomials, with

$$A_1 = a_{11}L + ... + a_{1p}L^p \text{ and}$$
$$A_j = 1 + a_{j1}L + ... + a_{jp}L^p$$

for $j \geq 2$ and $L$ is the lag operator. The model is estimated using ordinary least squares and the econometric package PCGIVE 10.4 within OX 10.4 (see Doornik, 2001; Hendry and Doornik, 2001). The Kwiatkowski, et al. (1992) test indicates that all the variables are stationary in levels.

## 4. Empirical Results

### *4.1 Model Evaluation*

Table 3 presents the coefficient estimates and various specification tests of the model results. The equations are able to explain, on average, more than 60% of the variation in liquidity over the estimation period. In addition, the LM test for autocorrelation accepts the null hypothesis of no autocorrelation for all regressions at the 5% level of testing. To further evaluate the robustness of the model, the income to trend income variable is generated using the Hodrick-Prescott filter rather than a linear trend. However, this change did not significantly alter the main conclusions of the paper. It is possible that during significant domestic and external shocks the behaviour of the banking industry could change. Testing for parameter constancy is therefore important, since it indicates whether the model can be an effective tool to draw broad conclusions relating to the behaviour of liquidity during these crises. As a result, the author employs the Hansen (1992) test for the constancy of the regression coefficients to evaluate the

estimated equations. In all regressions, the Hansen test accepted the null of parameter constancy over the estimation period.

### *4.2 Main Determinants of Liquidity*

Given that the previous section indicates that the models provide a fairly robust representation of excess reserve dynamics, this section analyses the estimated coefficients. The table gives the static long-run parameters (since the individual coefficients are difficult to interpret) with the standard errors calculated analytically using the algorithm proposed by Bårdsen (1989). The coefficients therefore show the long run effects of a change in the explanatory variables on the demand for excess reserves.

Most of the coefficients are generally inline with *a priori* expectations. The relatively large coefficient on the lagged excess reserve term suggests some persistence in the loan-to-deposit ratio of commercial banks. The coefficient estimates also indicate that liquidity tends to be inversely related to the business cycle in half of the countries studied, suggesting that commercial banks tend to error on the side of caution by holding relatively more excess reserves during downturns. While this might lead to lower risk, in terms of the number of defaults in the industry, it can also deepen the recession as the reduction in the provision of credit lowers investment and the ability of the economy to rebound from the cyclical downturn. The volatility of income is incorrectly signed and in nine out of the sixteen countries examined is not measured

precisely. Agénor, Aizerman and Hoffmaister (2004) reported similar results for Thailand, and attributed this to the difficulty of separating the effect of $Y/Y^T$ from $CV[Y/Y^T]$.

As expected, a rise in interest rates, which represents the opportunity cost of holding liquidity is positively and significantly related to the interest rate in some countries. However, the coefficient on this variable was negative and significant in some countries, suggesting that rising interest rates have a larger impact on supply of deposits relative to the supply of loans. This was especially the case in countries with relatively high rates of interest, such as Brazil, Chile, Ecuador, El Salvador, Jamaica, Uruguay and Venezuela. In line with *a priori* expectations, the volatility of the cash-to-deposit ratio is negatively related to liquidity. This suggests that commercial banks tend to expand liquidity when the volatility of cash demand by the public rises.

### *4.3 How do Financial Sector Crises affect Liquidity?*

The estimated coefficients of the liquidity model are used to provide out-of-sample forecasts of liquidity during a crisis. These forecasts are obtained by using previous forecasts of the liquidity indicator in period $k$ to generate forecasts for period $k+1$. For example, the forecast for January of 2000 are obtained by taking the actual values of the liquidity indicator for December of 1999 and the previous quarters and the actual values of the other regressors in the first quarter of 2000 and their lagged values. Subsequent forecasts are obtained by taking the forecasted

value of the liquidity indicator and for the previous quarters and the actual values of the other regressors.

This out-of-sample forecast allows one to evaluate whether the changes in liquidity during a crisis are above or below what are consistent with fundamentals. If the actual loan-to-deposit ratio is above the predicted value this would suggest that commercial banks are less liquid than is consistent with fundamentals, while if the actual ratio is below the predicted value commercial banks are more liquid than what is consistent with economic fundamentals.

In six out of the nine crisis episodes considered, the loan-to-deposit ratio was above what was consistent with the macroeconomic fundamentals, indicating that commercial banks were less liquid than what is consistent with economic fundamentals. This would be the case if there was a lending boom before the crisis or if banks were subject to large deposit withdrawals during the crisis. In the other three countries – Bolivia, Paraguay and Venezuela – banks were more liquid than what was consistent with economic fundamentals. In most of these countries the banking crisis was accompanied by an exchange rate crisis that probably would of led banks to be more conservative in their liquidity policies.

This exercise leads to some interesting conclusions about commercial bank liquidity during crises. The results show that, on average, commercial bank liquidity is about 8% below what is consistent with economic fundamentals during a crisis. This finding is consistent with the large number of bank closures resulting from illiquidity. The results also show that financial crises, when combined with external crises could lead commercial banks to hold more liquid reserves

than what is consistent with fundamentals, which can lead to an even deeper crisis if firms cannot access credit to support their operations.

## 5. Conclusions

This paper has three main goals: (1) discuss the behaviour of commercial bank liquidity during crises in Latin America and the Caribbean; (2) identify the key determinants of liquidity, and; (3) provide an assessment of whether commercial bank liquidity during crises is higher or lower than what is consistent with economic fundamentals.

A simple descriptive analysis of the liquidity indicator before, during and after a crisis suggests that liquidity tends to fall on average by around 7 percentage points during a crisis. In the 18-month period after the crisis, however, liquidity tends to rise on average by 17 percentage points. The estimated model liquidity finds that liquidity tends to be inversely related to the business cycle, interest rates and the volatility of the cash to deposit ratio. In addition, the large coefficient on the lagged liquidity variable suggests some persistent in liquidity adjustment.

The estimated model is then employed to generate dynamic out-of-sample projections for the loan-to-deposit ratio during crises to identify whether banks hold less or more liquidity during crises than what is consistent with economic fundamentals. The results show that on average, bank liquidity is about 8% less than what is consistent with economic fundamentals. These results imply that policymakers in the region could offset some of the negative consequences of

banking crises by ensuring that they quickly implement a consistent and comprehensive policy response to reduce the negative macroeconomic effects of banking crises.

## Appendix A. Data description and sources

This study uses monthly observations over the period January 1970 to December 2004 and are taken from the International Monetary Fund's *International Financial Statistics* CD-Rom (May 2005). The variables are defined as follows:

- loan-to-deposit ratio is the ratio of claims on the private sector divided by the sum of demand, time and savings deposits;
- output is proxied by the exports of the individual countries in millions of US dollars;
- currency is defined as currency in circulation outside of deposit money banks;
- the interest rate variable used is the money market interest rate;
- the coefficient of the variation of the currency to deposit ratio and the output to trend output ratio are equal to the standard deviation of the specified variable divided by the average of it for the current value and 3 leads and lags.

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**Table 1: Bank Liquidity, Growth, Inflation and Unemployment (Averages between 1970-2004)**

| | Banking Crises Dates and Durations | Loan-to-Deposit Ratio (%) | Annual Real Growth Rate (%) | Inflation (%) | Unemployment (%) |
|---|---|---|---|---|---|
| Argentina | 1980-1982, 1989-1990, 1995, 2001-2002 | 111.7 | 2.0 | 273.1 | 10.4 |
| Barbados | none | 81.8 | 2.1 | 7.2 | 17.9 |
| Belize | none | 91.1 | 8.6 | 2.8 | n.a. |
| Bolivia | 1986-1988, 1994-1997, 2001-2002 | 123.7 | 2.9 | 403.1 | 5.8 |
| Brazil | 1990, 1994-1999 | 145.4 | 4.1 | 486.1 | 5.7 |
| Chile | 1981-1987 | 143.3 | 4.0 | 59.7 | 6.8 |
| Ecuador | 1995-2002 | 137.2 | 4.5 | 28.7 | 8.7 |
| El Salvador | 1989 | 99.8 | 2.6 | 11.4 | 8.4 |
| Honduras | none | 106.6 | 3.5 | 10.9 | n.a. |
| Jamaica | 1996-2000 | 66.6 | 1.2 | 18.7 | 20.1 |
| Mexico | 1982, 1994-1997 | 89.5 | 3.8 | 30.6 | 2.5 |
| Paraguay | 1995-1999 | 83.0 | 4.3 | 15.2 | n.a. |
| Peru | 1983-1990 | 68.8 | 2.7 | 376.3 | 7.5 |
| Trinidad and Tobago | none | 77.6 | 2.7 | 9.2 | 16.6 |
| Uruguay | 1981-1985, 2002 | 90.2 | 2.1 | 48.8 | 11.1 |
| Venezuela, Rep. Bol. | 1993-1997 | 76.9 | 2.3 | 25.0 | 10.9 |

Source: Demirgüç-Kunt and Detragiache (2005) and IMF's International Financial Statistics CD-Rom (May 2005).

**Table 2: Liquidity Before, During and After a Crisis**

| | Banking Crises Dates and Durations | Before | During | After |
|---|---|---|---|---|
| Argentina | 1980-1982, 1989-1990, 1995, 2001-2002 | 98.7 | 131.5 | 119.6 |
| Barbados | none | | | |
| Belize | none | | | |
| Bolivia | 1986-1988, 1994-1997, 2001-2002 | 151.6 | 136.3 | 128.3 |
| Brazil | 1990, 1994-1999 | 164.6 | 143.8 | 128.0 |
| Chile | 1981-1987 | 146.0 | 205.1 | 159.9 |
| Ecuador | 1995-2002 | 110.9 | 143.5 | 97.7 |
| El Salvador | 1989 | 95.2 | 99.1 | 89.3 |
| Honduras | none | | | |
| Jamaica | 1996-2000 | 56.9 | 68.3 | 45.0 |
| Mexico | 1982, 1994-1997 | 94.7 | 96.9 | 63.1 |
| Paraguay | 1995-1999 | 93.5 | 102.5 | 88.0 |
| Peru | 1983-1990 | 67.2 | 53.0 | 55.6 |
| Trinidad and Tobago | none | | | |
| Uruguay | 1981-1985, 2002 | 105.5 | 97.6 | 79.7 |
| Venezuela, Rep. Bol. | 1993-1997 | 67.5 | 54.8 | 76.3 |
| *Average* | | 104.4 | 111.0 | 94.2 |

Source: Demirgüç-Kunt and Detragiache (2005) and author's calculations.

**Table 3: Determinants of Liquidity in Latin America and the Caribbean**

| | Intercept*$10^{-3}$ | $LQ_{t-1}$ | $Y/Y_T$ | $CV[Y/Y_T]*10^{-2}$ | $CV[C/D]*10^{-3}$ | R | R-squared | Hansen Test | F-test for Serial Correlation Test |
|---|---|---|---|---|---|---|---|---|---|
| Argentina | 0.351 | 0.824 | -0.321 | 0.902 | -0.252 | 0.483 | 0.997 | 6.639 | 1.215 |
| | (0.022)** | (0.077)** | (0.148) | (0.570) | (0.082)* | (0.077)** | | | (0.300) |
| Barbados | 0.111 | 0.942 | 0.029 | -0.179 | -0.983 | 0.494 | 0.972 | 8.421 | 1.144 |
| | (0.035) | (0.059)** | (0.201)* | (0.483) | (0.408)** | (0.751) | | | (0.335) |
| Belize | 0.158 | 0.904 | -0.563 | -0.112 | 0.139 | -1.575 | 0.945 | 5.333 | 1.128 |
| | (0.024)** | (0.029)** | (0.182)** | (0.035) | (0.246) | (0.748)* | | | (0.347) |
| Bolivia | 0.154 | 0.794 | -0.453 | 0.124 | -0.056 | 0.368 | 0.894 | 4.310 | 0.475 |
| | (0.015)** | (0.040)** | (0.099) | (0.077)* | (0.067)** | (0.118) | | | (0.852) |
| Brazil | -0.382 | 0.860 | 4.774 | -1.765 | 1.248 | -0.061 | 0.616 | 5.567 | 1.598 |
| | (1.404) | (0.079)** | (14.120) | (5.524)** | (3.710)** | (0.176)** | | | (0.144) |
| Chile | 0.169 | 0.831 | 0.013 | 2.432 | 0.107 | -3.152 | 0.950 | 4.623 | 0.973 |
| | (0.082) | (0.084)** | (0.708) | (4.829) | (0.235) | (0.955)* | | | (0.457) |
| Ecuador | 0.007 | 0.951 | 0.752 | 2.291 | 0.303 | -0.016 | 0.955 | 6.806 | 0.542 |
| | (0.058) | (0.037)** | (0.368) | (1.613) | (0.117)** | (0.624)** | | | (0.803) |
| El Salvador | 0.082 | 0.890 | 0.277 | 0.100 | -0.049 | -0.767 | 0.938 | 7.356 | 0.449 |
| | (0.017)* | (0.037)** | (0.100)* | (0.241) | (0.042) | (0.636) | | | (0.870) |
| Honduras | 0.118 | 0.910 | -0.094 | 0.074 | 0.175 | 0.129 | 0.936 | 4.075 | 1.243 |
| | (0.014)** | (0.061)** | (0.107) | (0.350) | (0.100)* | (0.398)** | | | (0.280) |
| Jamaica | 0.084 | 0.972 | -0.009 | -0.032 | 0.018 | -0.799 | 0.969 | 4.958 | 0.643 |
| | (0.055) | (0.053)** | (0.364) | (1.275) | (0.150) | (0.471)* | | | (0.720) |
| Mexico | -0.125 | 0.985 | 1.875 | 10.203 | -0.796 | 1.244 | 0.986 | 6.114 | 1.755 |
| | (0.401) | (0.024)** | (3.521) | (27.880)* | (0.945)** | (1.548)** | | | (0.096) |
| Paraguay | 0.002 | 0.916 | -0.259 | 0.105 | -0.252 | 1.888 | 0.888 | 3.244 | 1.783 |
| | (0.002) | (0.047)** | (0.209) | (0.545) | (0.318) | (2.274)** | | | (0.101) |
| Peru | 0.142 | 0.978 | -0.123 | 1.266 | -0.386 | 0.004 | 0.995 | 5.771 | 1.139 |
| | (0.071) | (0.052)** | (0.619) | (2.375)* | (0.140) | (0.013)** | | | (0.341) |
| Trinidad & | 0.080 | 0.936 | 0.049 | -0.184 | -0.146 | 0.019 | 0.889 | 2.307 | 1.609 |
| Tobago | (0.007)** | (0.039)** | (0.038) | (0.189) | (0.115) | (0.644)** | | | (0.131) |
| Uruguay | 0.149 | 0.980 | 0.399 | -0.071 | -0.680 | -2.162 | 0.961 | 3.445 | 1.560 |
| | (0.092) | (0.036)** | (0.690)** | (2.354)* | (0.996) | (1.982) | | | (0.147) |
| Venezuela | 0.118 | 0.930 | -0.019 | -0.029 | -0.374 | -0.395 | 0.981 | 3.770 | 1.720 |
| | (0.010)** | (0.030)** | (0.053)** | (0.027) | (0.105)** | (0.085)** | | | (0.103) |

Note: The dependent variable in the equations is the ratio of credit to deposits (LQ). The regressors are the lags or the dependent variable ($LQ_{t-1}$), the lags and contemporaneous values of the ratio of output to trend output, the volatility of the ratio of output to trend output, the volatility of the cash to deposits ratio and the penalty rate. The coefficients in the table are the static long run estimates of the lagged polynomials and the standard errors are shown in parenthesis below the coefficients. **, * indicates that the null hypothesis that all the lagged polynomials can not be restricted to zero at the 1 or 5 percent levels of testing.

**Table 4: Out-of-Sample Predicted Values of Liquidity During Crises**

| | Banking Crises Considered | Actual Loan-to-Deposit Ratio (a) | Predicted Value (b) | Absolute Deviation (c) = (a - b) | Percent Deviation (c/b*100) |
|---|---|---|---|---|---|
| Argentina | 1995 | 122.5 | 98.2 | 24.3 | 24.7 |
| Bolivia | 1994-1997 | 128.6 | 133.3 | -4.7 | -3.5 |
| Ecuador | 1995-2002 | 121.5 | 112.3 | 9.2 | 8.2 |
| El Salvador | 1989 | 99.1 | 94.4 | 4.8 | 5.0 |
| Jamaica | 1996-2000 | 68.3 | 55.6 | 12.7 | 22.8 |
| Mexico | 1994-1997 | 105.6 | 97.8 | 7.8 | 8.0 |
| Paraguay | 1995-1999 | 103.0 | 103.1 | -0.2 | -0.2 |
| Uruguay | 2002 | 106.5 | 100.5 | 6.1 | 6.0 |
| Venezuela | 1993-1997 | 54.8 | 55.5 | -0.7 | -1.3 |
| *Average* | | *101.1* | *94.5* | *6.6* | *7.8* |

**Figure 1: Loan-to-Deposit Ratios in Latin America and the Caribbean**