Bank Liquidity and Exchange Rate Regimes

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Abstract:
Combining panel data on bank liquidity at the individual level and data on their macroeconomic environment, for a sample of commercial banks in emerging countries between 1995 and 2000, we show that their exists a "bank liquidity smile across exchange rate regimes". In extreme regimes at both ends of the line, i.e. for pure floating exchange rate regimes at one end and currency boards and dollarized economies at the other end, bank assets are more liquid than in intermediate regimes.

Keywords: Bank liquidity, exchange rate regimes, currency boards, emerging countries.

JEL classification: F33, G21

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1- Introduction

The aim of the paper is to explore how the liquidity of commercial bank assets is affected by the exchange rate regime of the country in which they operate.

Many papers have been written on twin crises, and the relationship between exchange rate (or balance of payment) and bank fragility[1]. In particular, Chang & Velasco (2000), using an open economy extension of the famous Diamond & Dybvig (1983) model, study how the "mixture" of exchange rate regime and presence or lack of a lender of last resort affects the potential for bank (liquidity) crises and balance of payment crises, either simultaneously or in isolation. They show that fixed exchange rate regimes where the central bank does not act as a lender of last resort, in particular currency boards, are more vulnerable to liquidity crises, whereas the combination of flexible exchange rates and a central bank that serves as lender of last resort eliminates self-fulfilling runs. Therefore, according to their model, the potential for a bank run is not independent of the exchange rate regime.
The aim of this paper to confront with facts the following corollary of that idea: if the potential for a bank liquidity crisis indeed depends on the exchange rate regime, banks should behave accordingly. Some kind of self-protection response should induce banks to keep more or less liquid assets, depending, *ceteris paribus*, on the exchange rate regime.

Combining panel data on bank liquidity at the individual level and data on their macroeconomic environment, for a sample of commercial banks in emerging countries between 1995 and 2000, we identify a particular configuration: in extreme regimes at both ends of the line, i.e. for pure floating exchange rate regimes at one end and currency boards and dollarized economies at the other end, bank assets are more liquid than in intermediate regimes. This results seems to be very robust to changes in the definition of liquidity (we used different liquidity ratios), or the difference between official and *de facto* exchange rate regimes.

After a review of some measurable determinants of bank liquidity (section 2), we set out the data (section 3) and the regression results (section 4).

[1] See Feldstein (2003), among others, and in addition to Chang & Velasco (2000).

2- The model

Several phenomena affect the liquidity of bank assets, such as bank specialization, ability in risk management, banking regulation and supervision, interest rate margins and their variability, information asymmetries in the credit market, macroeconomic environment. Among these many phenomena, we want to emphasize the role of the exchange rate regime.

Since the perspective of this paper is basically empirical, and oriented towards emerging economies, we take into account variables for which available data exist and are easily obtained.

Individual bank data was provided by the Bankscope® database (see below). Since the behaviour of banks may depend on its "type", we retained *commercial banks* only[2].

We test the following relationship:

$$\begin{aligned} \textit{Liquidity ratio} = \\ & \alpha_0 + \alpha_1 \textit{ total assets} + \alpha_2 \textit{ equity to asset ratio} \\ & + \alpha_3 \textit{ presence of prudential regulation (dummy)} + \alpha_4 \textit{ lending interest rate} \\ & + \alpha_5 \textit{ public expenditures/GDP} + \alpha_6 \textit{ rate of inflation} + \alpha_7 \textit{ rate of growth} \\ & + \alpha_8 \textit{ realisation of a financial crisis (dummy)} \\ & + \sum_k \beta_k \textit{ type of exchange rate regime (dummy)} \end{aligned}$$

We interpret this relationship as follows.

The higher the *liquidity ratio* is, the more liquid the bank assets will be. It is assumed to depend on individual behaviour of banks, their market and macroeconomic environment as well as the exchange rate regime.

A first set of variables are representative of individual characteristics of commercial banks.

[2] We used the general, worldwide, classification provided by Bankscope®, which divides banks into 12 categories (assigned to each bank based on the annual report): Commercial Banks, Savings Banks, Cooperative Banks, Real Estate/Mortgage Banks, Medium & Long Term Credit Banks, Investment Banks/Securities Houses, Islamic Banks, Non Banking Credit Institutions, Specialised Governmental Credit Institutions, Bank Holdings & Holding Companies, Central Banks and Multi-lateral Governmental Banks.

1- *Total assets* are a measure of the size of the bank. It should capture differences in asset liquidity according to the size of the bank. If big banks were seeing themselves as "too big to fail", we would observe a negative coefficient (the bigger the bank, the less liquid)[3]. This effect may be reinforced if larger banks have stronger political connections and support than smaller banks, as may be the case in some emerging countries.

2- The *ratio of equity to assets* may have opposite effects on liquidity, as shown by the debate on minimum capital adequacy requirements in emerging markets. On the one hand, the effect may be negative. The higher the equity ratio, the smaller the amount of liquid assets required for sound banking practice, in order to keep liquid liabilities and liquid assets in balance. Kim and Santomero (1998) show that in general the solvency regulation will entail a recomposition of the risky part of the bank's portfolio in such a way that its risk is increased. According to Dewatripont and Tirole (1993), shareholders are much more inclined to involve the bank into risky investment projects than ordinary creditors. Therefore the bank may reduce its "unprofitable" liquid assets in order to maintain or to increase the overall return on bank's equity. On the other hand, information asymmetries in the credit market may bring about credit rationing phenomena, reflecting the fact that banks do not necessarily increase profitability by lending more. Thus, a higher ratio of equity to assets may be compatible with higher asset liquidity (see e.g. Thakor 1996).

We take these two variables as exogenous to liquidity, and we do not include other variables that are more or less codetermined with asset liquidity and asset portfolio choice, such as the net interest margin, or measures of return (ROAE, ROAA).

A second set of variables relates liquidity to banking activities at a "market" level.

3- The *presence of prudential regulation* should show through on bank liquidity. In emerging economies, prudential regulations were adopted progressively through the 1990's after the various financial crises. At first sight, they can be considered as an obligation for banks to be liquid enough, but also as an incentive mechanism for banks to enforce a more efficient liquidity management. It is also implemented within a general improvement of bank supervision. In an environment such as emerging markets, with poor lending opportunities, the introduction of prudential regulation can explain an increase in liquidity if banks tended

[3] However, this would be better captured by a relative rather than absolute measure of the bank size.

to lend too much, but also a decrease in liquidity whenever banks tended to be too cautious in their lending policy.

4- The *lending interest rate* is taken into account as a measure of lending profitability at market level, so that higher interest rates could be naively interpreted as an explanation for lower bank liquidity. However, it is well known that portfolio choices of banks depend on both interest rates and risk controllability. In a credit market with asymmetric information, i.e. poor risk controllability, adverse selection can lead to credit rationing, as shown e.g. by Stiglitz and Weiss (1981), so that high interest rates may well be associated with high bank liquidity.

A third set of variables relates liquidity to the macroeconomic environment.

5- *Public expenditures/GDP* are included to take into account supply side factors in the market for liquid assets: large public expenditures reflect substantial supply of government securities, which are usually computed as liquid assets. It also represent the potential for government inference in banking activities: in emerging countries, in which capital market development is in process, the government often relies on banks to finance its expenditures.

6- The *rate of inflation* measures another incentive for banks to hold liquid assets: when banks give more importance to customer relations and increase long term lending, they make the nominal value of their assets more sticky, and thus become more vulnerable to rises in inflation.

7- The *rate of growth*, on the contrary, is taken as indicating better perspectives for borrowers, and more profitable lending by banks, thus reducing their asset liquidity.

8- At last, we take into account the fact that the *realisation of a financial crisis* must have a negative link with bank liquidity. First, a financial crisis may be due to poor bank liquidity, which can result from a lending boom (see e.g. Tirole 2002). Second, a financial crisis purges the financial system from unhealthy (illiquid) banks, induces banks to curtail lending, spills over to the real sector and prompts a decrease in the demand for loans, so that the aftermath of the crisis should be associated with higher liquidity.

The last set of variables are dummy variables that reflect the *type of exchange rate regime*, which is the raison d'être of this paper, as explained in introduction. Many emerging economies went through noticeable changes in their exchange rate regimes during the second half of the 1990's, after confronting severe financial crises. We have to bear in mind that, for a subset of emerging countries, changes in exchange rate regime, realisation of a financial crisis and changes in prudential regulation were concomitant.

3- The data

3.1- Individual bank data:

Individual bank data (liquidity ratios, total assets, equity ratio) come from Bankscope®. We used data available on a sample of 1107 commercial banks in 36 emerging economies[4] for years 1995 to 2000. Table 1 reports data availability on the main items of the banks' balance sheet in Bankscope.

Table 1: Bank balance sheet items and data availability[5]

Loans (68.0%)	Customer & Short Term Funding (68.4%)
Other Earning Assets (68.9%)	Other Funding
Total Earning Assets (69.0%)	Other (Non Interest Bearing)
Fixed Assets (68.4%)	Loan Loss Reserves (52.8%)
Non-Earning Assets (69.0%)	Other Reserves
	Equity (69.0%)
Total Assets (69.0%)	**Total Liabilities & Equity**

In brackets: percentage of available data in the Bankscope sample.

We use five different measures of bank asset liquidity.

1. *Liquid Assets / Total Assets* (computed from Bankscope data).
"Liquid assets" are the sum of "Cash and Due from Banks", "Deposits with Banks", "Due from Central Banks", "Due from Other Banks", "Due from Other Credit Institutions", "Treasury Bills", "Other Bills", "Government Securities", "Trading Securities", "CDs".

[4] Countries in the sample were selected according to the IMF classification of emerging countries (see the IMF World Economic Outlook) and taking into account data availability in the Bankscope database. They are in Africa (Morocco, Tunisia, South Africa), in Asia (China, India, Indonesia, Malaysia, Philippines, South Korea, Thailand, Vietnam), in the Middle East (Egypt, Israel, Lebanon), in the Western Hemisphere (Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Venezuela), in the Commonwealth of Independent States (Belarus, Kazakhstan, Russia, Ukraine) and E.U. accession candidates (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Turkey).

[5] No information is given on whether assets and liabilities are in home or in foreign currency, so that no conclusion can be inferred regarding the "dollarization" of assets and or liabilities.

2. *Net Loans / Total Assets* (provided by Bankscope)
This ratio indicates what percentage of the assets of the bank are tied up in loans. The higher this ratio the less liquid the bank will be.

3. *Liquid Assets / Customer & Short Term Funding* (provided by Bankscope)
This is a deposit run off ratio and shows what percentage of customer and short term funds could be met if they were withdrawn suddenly. The higher this percentage, the more liquid the bank and the less vulnerable to a classic run.

4. *Liquid Assets / Total Deposits & Borrowing* (provided by Bankscope)
This ratio is similar to the previous one, but indicates the amount of liquid assets available to borrower as well as depositors.

5. *Interbank Ratio*, computed as the ratio of "due from banks" over "due to banks" (provided by Bankscope)
This ratio is a measure of interbank liquidity. If money lent to other banks divided by money borrowed from other banks is greater than 100%, then it indicates the bank is net placer rather than a borrower of funds in the market place, and therefore more liquid.

The first and second ratios assess some kind of "absolute" asset liquidity, since they consider liquid (or illiquid) assets relative to total assets. The third and forth ratios measure some kind of "relative" asset liquidity, since they relate liquid assets to liquid liabilities. The fifth ratio measures liquidity in the interbank market.

3.2- Market and macroeconomic data:

Most market and macroeconomic data were retrieved from various publications of the International Monetary Fund.

- *lending interest rate*: line 60p
- *public expenditures/GDB*: line 91f/ line 99b
- *rate of inflation*: computed from the Consumer Price Index given in line 64
- *rate of growth*: computed from real GDP given in line 99bvp

except for Lebanon: data provided by EIU and the national bank (Banque du Liban).

- *presence of prudential regulation (dummy)*

This dummy variable in order to catch the regulatory framework indicates whether the country adopted the bank minimum capital requirements as recommended by the 1988 Capital Accord proposed by the Basel Committee on Banking Supervision. As Chiuri, Ferri and Majnoni (2001) point out, the non G10 countries adopted the Basel 1988 Capital Accord on a voluntary basis and therefore without any predefined time schedule. Moreover, several non G10 countries have relatively weak regulatory and supervisory structures and therefore the simple introduction of new capital requirements cannot be considered equivalent to their enforcement.

For these reasons, there is an element of judgement in the definition of the exact date when the New Basel capital requirements were effectively adopted by the emerging countries of our sample as well as the proper date where capital requirements were enforced. We employ the assessment made by Chiuri, Ferri and Majnoni (2001) for 15 countries of our sample (Argentina, Brazil, Hungary, Korea, Malaysia, Mexico, Morocco, Thailand, Turkey, South Africa, Venezuela, Chile, India, Israel, and Poland). As for the other 21 countries of our sample, we extended their analysis with a view of being consistent. We identified the years of Capital requirements enforcement by surveying the IMF Reports on the Observance of Standards and Codes (ROSCs). We focused on banking supervision as one of the 11 areas[6] studied by the Fund and the World Bank.

The computation of our dummy variable for prudential regulation is summed up in table 2.

Table 2: "prudential regulation" by year

Prudential regulation	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Total**
NO	23	21	16	10	10	7	87
% by year	*63.89*	*58.33*	*44.44*	*27.78*	*27.78*	*19.44*	
YES	13	15	20	26	26	29	129
% by year	*36.11*	*41.67*	*55.56*	*72.22*	*72.22*	*80.56*	
Total	**36**	**36**	**36**	**36**	**36**	**36**	

- *realization of a crisis (dummy)*

We identified the countries and the years where a financial and/or a currency crisis took place through an extensive survey of the IMF *World Economic Outlook* for the specified time span. Furthermore, useful information was provided by the IMF Country Reports for the 36 countries of

[6] The other areas are monetary and financial policy transparency; fiscal transparency; securities; insurance; payments systems; corporate governance; accounting; auditing; and insolvency and creditor rights.

our sample. The dummy variable is also introduced with a one-year lag, to capture the expected opposite effects of both the onset and the aftermath of the crisis on bank liquidity.

3.3- Exchange rate regimes:

Table 3: exchange rate regime classification

Official classification	*De facto classification by Bubula and Otker-Robe (2002)*	*De facto classification in line with the official one.*	*Exchange rate category used in regressions*
8 = independently floating	13 = independent floating	8 = independent floating	Independently Floating
7 = managed floating with no preannounced path for exchange rate	12 = other managed float with no preannounced exchange rate path (excluding tightly managed floats.)	7 = managed floating with no preannounced path for exchange rate	Managed Floating
6= exchange rates within crawling bands	10 = backward looking crawling bands 9 = forward looking crawling bands	6 = exchange rates within crawling bands	Soft Pegs
5 = crawling pegs	8 = backward looking crawling pegs 7 = forward looking crawling pegs	5 = crawling pegs	
4 = pegged exchange rates within horizontal bands	6 = horizontal bands	4 = pegged exchange rates within horizontal bands	
3 = Other conventional fixed peg arrangements (against a single currency, against a composite and de facto peg arrangements under managed floating)	11 = tightly managed floats 5 = against a composite 4 = against a single currency	3 = Conventional fixed peg arrangements	Conventional Fix
2 = currency boards arrangements	3 = currency boards arrangements	2 = currency boards arrangements	Hard Pegs
1 = exchange arrangements with no separate legal tender	exchange arrangements with no separate legal tender: 2 = currency union; 1 = formal dollarization .	1 = exchange arrangements with no separate legal tender	

We used IMF International Financial Statistics Yearbok (2001) definitions for official exchange rate regimes, and Bubula and Otker-Robe (2002) for *de facto* regimes. The basic official IMF Exchange Rate Arrangements (i.e. the declared commitments of the Central Banks) are identified by a number from 8 (independent floating) to 1 (dollarization). Bubula and Otker-Robe (2002) split *de facto* regimes into 13 categories. However, for comparison purposes, we reorganized the latter to use the same taxonomy as for official regimes.

We then group some classes together, and keep five different types of regime (see table 3). The group "soft pegs" consists of economies with exchange rates within crawling bands, crawling pegs and pegged exchange rates within horizontal bands. The group "conventional fix" consists of economies with other conventional fixed peg arrangements (against a single currency, against composite as well as de facto peg arrangements under managed floating). The extreme solutions

consist of either hard pegs (that is currency boards arrangements and formal dollarization) or independently floating. Therefore we treat managed float with no specified central rate as an intermediate exchange rate regime rather than an extreme one.

Figure 1: De facto exchange rate arrangements

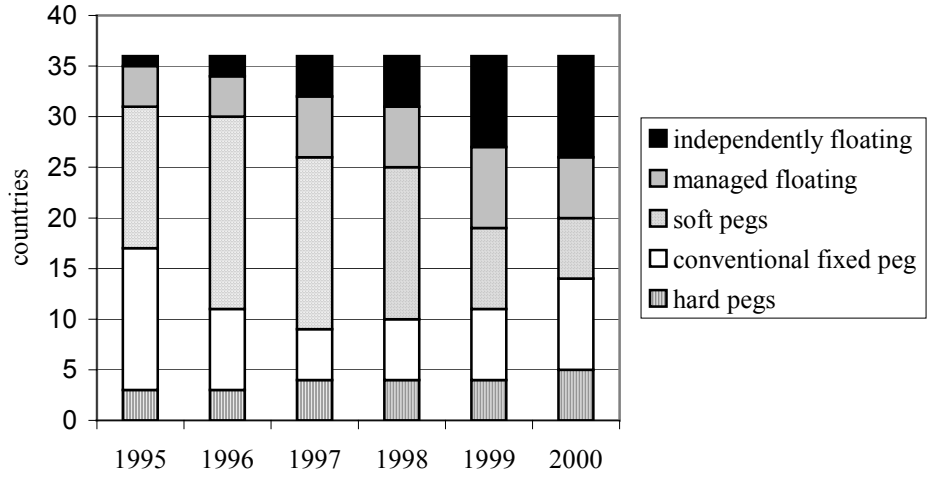


Figure 1 shows the evolution of the number of countries in the different de facto exchange rate arrangements.

Careful study of sample data on the realization of a financial crisis, the introduction of prudential regulation and changes in exchange rate regimes shows that (see table 4): (1) there is no systematic link between exchange rate regime switches and financial crises; (2) a (local) crisis is neither a systematic nor the only trigger of the introduction of prudential regulation. We will thus use the dummy variables for the realization of a financial crisis, the presence of prudential regulation and the type of exchange rate regimes as separate variables in the regressions, instead of building dummies that would catch cross effects.

Table 4: financial crisis, exchange rate regime switch and prudential regulation

Number of countries	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
realization of a financial crisis	4	2	7	8	7	1
exchange rate regime* switch		9	12	9	11	8
exchange rate regime switch same year as a crisis year*		*1*	*7*	*3*	*4*	*0*
exchange rate regime switch one year after a crisis year*		*2*	*1*	*2*	*4*	*1*
prudential regulation introduced		2	5	6	0	3
prudential regulation introduced same year as a crisis year		*0*	*2*	*2*	*0*	*0*
prudential regulation introduced one year after a crisis year		*0*	*2*	*2*	*0*	*1*

*de facto, 8 classes.

4- The results:

We estimate the following type of relationship : $R(i, t) = \sum_{k=1}^{9} x_k(i,t)\,\alpha_k + \sum_{k=1}^{4} \delta_k(i,t)\,\beta_k + u(i, t)$

where :

- R(i, t) denotes the liquidity ratio,
- $x_k(i,t)$ represent the following explanatory variables: Total Assets, Equity To Assets Ratio, Presence of prudential regulation (dummy), Lending Rate, Public Expenditure /GDP, Rate of Inflation, Rate of Growth, Realization of Financial Crisis (dummy), Lag of Financial Crisis (dummy),
- δ_k are the dummy variables for the exchange rate regime (with "managed floating" used as reference for official regimes, and "soft peg" for *de facto* regimes)[7],
- u(i, t) is the error term.
- i denotes an individual bank,
- t is the time index.

We use the SAS® TSCSREG procedure which is appropriate for regressions on unbalanced panel data, after deleting all banks in the sample reporting a null equity ratio, a null total assets, and/or less than two years for all the variables. We estimate the relationships as two-way random effect models, applying the "RanTwo" option of the SAS® TSCSREG procedure, i.e. we assume that the

[7] The references were chosen according to the size of the underlying samples. Since the sample used for each regression changes, due to missing and/or deleted data, the reference could have been different. It turns out that they are not.

error term depends on both the cross section and the time series to which the observation belongs: $u(i, t) = v(i) + e(t) + \varepsilon(i, t)$.
where $v(i)$ is the cross section component of the error term, $e(t)$ its time component, and $\varepsilon(i, t)$ is a classical error term with zero mean and a homoscedastic covariance matrix.

Although we think that using the *de facto* classification for exchange rate arrangements is more appropriate, we report regression results using both official and de facto taxonomies in table 5 and table 6. Two general, and not surprising, comments apply, before a more detailed review of the results. Firstly, there are no major differences in results if we use one exchange rate regime classification or the other. Secondly, however, results are somewhat different in the regressions of the "interbank ratio", which measures relative liquidity in the interbank market, rather than asset liquidity.

"Total assets" are generally statistically insignificant (except but the regression of the ratio of "Liquid Assets to Total deposit and borrowing", where it is significant at a 10% level). The size effect, which we identified with "total assets", thus does not look robust.
The coefficient on the "equity to asset ratio" is significant and positive in regressions for all liquidity ratios except the "interbank ratio" (where it is not significant), whether the exchange rate classification is official or de facto. These results support the view that a higher ratio of equity to assets is concomitant with higher asset liquidity.

The "lending rate" parameter estimate is significant and positive (except for the "interbank ratio", and "Liquid Assets to customer and ST funding"), which is consistent with the "credit rationing" phenomenon: higher lending rates do not encourage banks to lend more.
The ratio "Public expenditures to GDP" is significant and with the expected (positive) sign in all the regressions. We interpret this result as evidence of a liquid asset supply effect.
The "rate of inflation" and the "rate of growth" enter with the expect sign, whenever they are significant at standard levels of confidence. We note that the rate of inflation is not significant (or at best at a 10% level of confidence in one case) in the four regressions of the "relative liquidity" ratios. Since banks can protect their balance sheets from the negative effect of inflation by matching liquid assets and liabilities, the influence of inflation on observed ratios of liquid assets to liquid liabilities need not be monotonous.

Table 5: Bank liquidity and official exchange rate regimes

Dependent Variable	*Liquid Assets / Total Assets*	*Net Loans / Total Assets*	*Liquid Assets / Cust & Sh.Term*	*Liquid Assets / Dep & Borrowing*	*Interbank Ratio*
Intercept	25.63766*** (<.0001)	59.74652*** (<.0001)	13.17182*** (0.0019)	13.33102*** (0.0012)	102.6992*** (<.0001)
Total assets	-1.36E-6 (0.3047)	1.568E-6 (0.1980)	2.178E-6 (0.4336)	-2.91E-6 (0.2899)	-0.00002 (0.1658)
equity to asset ratio	0.039931** (0.0436)	-0.21036*** (<.0001)	1.510442*** (<.0001)	1.345849*** (<.0001)	0.305106 (0.4211)
presence of prudential regulation	2.052218*** (0.0043)	-1.61571** (0.0154)	-3.81709* (0.0675)	-5.28401*** (0.0065)	-11.104 (0.2374)
Lending rate	0.024513*** (0.0064)	-0.03734*** (<.0001)	0.018426 (0.5157)	0.060794** (0.0140)	0.019999 (0.8644)
public expenditures/GDP	0.612127*** (<.0001)	-0.52401*** (<.0001)	0.499218*** (0.0066)	0.593273*** (0.0007)	3.803034*** (0.0001)
rate of inflation	0.010895*** (0.0011)	-0.01079*** (0.0004)	0.015836* (0.0988)	0.006563 (0.3421)	0.071823 (0.1090)
rate of growth	-0.11428** (0.0363)	0.276829*** (<.0001)	-0.83131*** (0.0007)	-0.72716*** (0.0020)	1.482873** (0.0411)
realisation of a financial crisis	-3.17001*** (<.0001)	3.286887*** (<.0001)	-5.76108** (0.0333)	-2.38877 (0.3503)	-7.47819 (0.4322)
Lag of financial crisis	2.846108*** (<.0001)	-4.05153*** (<.0001)	2.791148 (0.2810)	4.668843* (0.0558)	29.46061*** (0.0038)
Independently floating (official)	***3.768529*** (<.0001)***	***-4.1257*** (<.0001)***	***14.42666*** (<.0001)***	***16.05551*** (<.0001)***	***48.68543*** (<.0001)***
Soft Peg (official)	***-3.68665*** (0.0010)***	***1.469475 (0.1715)***	***3.715822 (0.2597)***	***-3.84577 (0.2171)***	***-7.57154 (0.5648)***
Conventional fix (official)	***-0.25467 (0.7851)***	***0.294396 (0.7341)***	***3.694469 (0.2251)***	***8.493383*** (0.0034)***	***23.94733** (0.0451)***
Hard Peg (official)	***-0.86027 (0.5726)***	***-3.39687** (0.0152)***	***13.63542** (0.0261)***	***17.12244*** (0.0033)***	***111.1351*** (<.0001)***
Number of Cross Sections	1016	973	696	396	776
Series Length	6	6	6	6	6
Haussman Test for Random effects	<.0001	<.0001	<.0001	<.0001	<.0001

*** indicates significance at 1% level; ** indicates significance at 5% level; * indicates significance at 10% level; Significance level of Student statistics are in brackets.

The dummy for the "presence of prudential regulation" enters with positive or negative signs in the different regressions, depending on the liquidity ratio, which may seem a bit confusing at the first sight.

The impact of regulation is insignificant when liquidity is measured according to the "Interbank Ratio". The impact on "absolute liquidity" is positive, as shown in regressions of "Liquid Assets/Total Assets" and "Net Loans/Total Assets", whatever the exchange rate taxonomy. It is negative on "relative liquidity", as shown in regressions of the "Liquid Assets/ Total Deposit and Borrowing" and "Liquid Assets/ Customer and Short Term Funding" (although not different from 0

at a 10% confidence level in the latter case with the de facto classification of exchange rate regimes). Therefore, it seems that the impact of prudential regulation is to increase the "absolute liquidity" of liabilities faster than the "absolute liquidity" of assets[8]. It may be that the introduction of prudential regulation increases confidence in the banking sector, so that banks can collect more deposits, thus increasing liquid liabilities, while, at the same time but to a lesser extent, investing more in illiquid projects.

Table 6: Bank liquidity and *de facto* exchange rate regimes

Dependent Variable	*Liquid Assets / Total Assets*	*Net Loans / Total Assets*	*Liquid Assets / Cust & Sh.Term*	*Liquid Assets / Dep & Borrowing*	*Interbank Ratio*
Intercept	24.38215*** (<.0001)	59.68794*** (<.0001)	11.3588** (0.0101)	8.90899** (0.0387)	101.744*** (<.0001)
Total assets	-1.71E-6 (0.1993)	1.911E-6 (0.1186)	1.566E-6 (0.5783)	-4.8E-6* (0.0826)	-0.00002 (0.2010)
equity to asset ratio	0.03575* (0.0721)	-0.20917*** (<.0001)	1.483763*** (<.0001)	1.333603*** (<.0001)	0.478406 (0.2199)
presence of prudential regulation	1.552667** (0.0307)	-1.36912** (0.0412)	-3.42881 (0.1036)	-6.85674*** (0.0008)	-8.17888 (0.4288)
Lending rate	0.026511*** (0.0034)	-0.03517*** (<.0001)	0.027274 (0.3421)	0.085416*** (0.0006)	-0.01541 (0.8997)
public expenditures/GDP	0.679519*** (<.0001)	-0.57022*** (<.0001)	0.713421*** (<.0001)	0.876599*** (<.0001)	4.482071*** (<.0001)
rate of inflation	0.008147** (0.0159)	-0.00833*** (0.0074)	0.009483 (0.3305)	0.002642 (0.7064)	0.010681 (0.8132)
rate of growth	-0.07332 (0.1657)	0.278092*** (<.0001)	-0.58886** (0.0179)	-0.49066** (0.0386)	0.666137 (0.3516)
realisation of a financial crisis	-3.23195*** (<.0001)	4.113413*** (<.0001)	-9.46356*** (0.0007)	-9.85611*** (0.0004)	-19.8736** (0.0480)
Lag of financial crisis	3.275862*** (<.0001)	-3.90833*** (<.0001)	2.168562 (0.4106)	3.056438 (0.2240)	27.80246*** (0.0078)
Independently floating	**2.068342** (0.0272)**	**-2.49055*** (0.0042)**	**12.88086*** (<.0001)**	**15.2697*** (<.0001)**	**-12.3878 (0.3549)**
Managed	**1.011312 (0.2869)**	**-0.98663 (0.2738)**	**7.140021*** (0.0078)**	**12.47381*** (<.0001)**	**57.11853*** (<.0001)**
Conventional fix	**1.096032 (0.1967)**	**-0.2 (0.8003)**	**2.33338 (0.3656)**	**8.597666*** (0.0004)**	**-2.00915 (0.8738)**
Hard Peg	**4.273856** (0.0102)**	**-2.62795* (0.0888)**	**15.44732*** (0.0096)**	**26.65302*** (<.0001)**	**46.34848** (0.0263)**
Number of Cross Sections	1016	973	696	396	776
Series Length	6	6	6	6	6
Haussman Test for Random effects	<.0001	<.0001	.0001	<.0001	<0.0001

*** indicates significance at 1% level; ** indicates significance at 5% level; * indicates significance at 10% level; Significance level of Student statistics are in brackets.

[8] Writing the bank balance sheet as: Liquid Assets (LA) + Loans = Liquid Liabilities (LL) + Equity + Other Liabilities, and denoting Total Assets by TA, Total Liabilities and Equity by TLE (with of course: TA=TLE), a simultaneous increase in LA/TA and decrease in LA/LL imply an increase in LL/TLE.

As expected, the "realization of a crisis" has a significant negative impact on both "absolute" and "relative" liquidity (although the estimate of the parameter is not significantly different from zero in the regression of the "Liquid Assets/ Total Deposit and Borrowing" ratio using the official exchange rate classification). The impact on interbank liquidity is significantly negative only when we use the de facto taxonomy.
As to the lagged impact of the crisis, it has a positive effect on "absolute liquidity" (whatever the exchange rate classification), as expected. The effect on "relative liquidity" is not significant under the de facto exchange rate classification, and significant at a 10% level in one case under the official classification. The aftermath of the crisis is characterized by a surge in absolute liquidity, but no significant effect on relative liquidity.

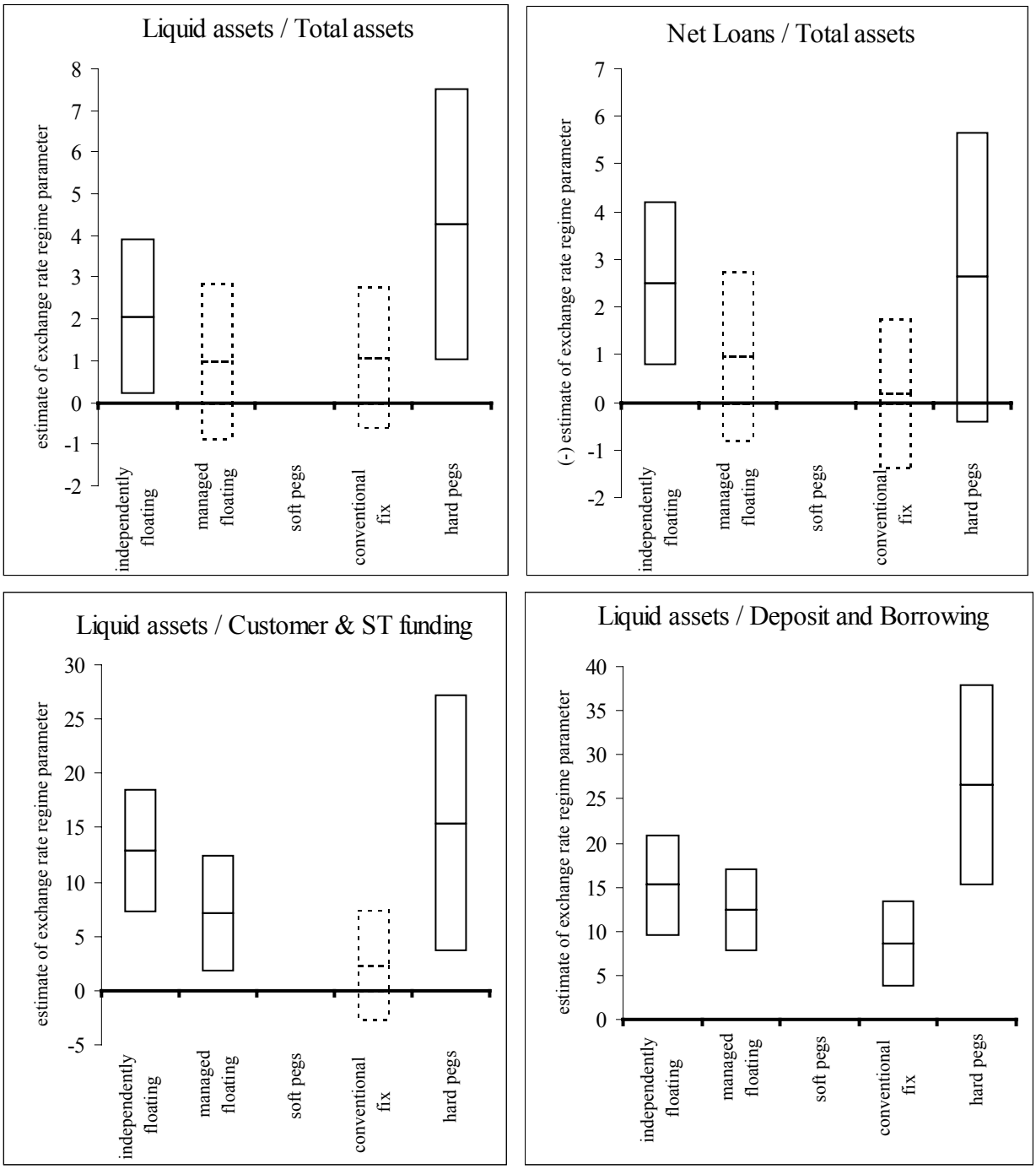
The nature of the exchange rate regime has an interesting effect on bank liquidity. In extreme regimes at both ends of the line, i.e. in the independently floating exchange rate regime at one end and hard pegs at the other end, bank assets are more liquid than in intermediate regimes, especially when liquidity is measured in absolute terms. We call this phenomenon a "bank liquidity smile across exchange rate regimes", as suggested by figure 2 for de facto regimes.

Under "hard pegs", observed high bank liquidity complies with the theoretical model put forward by Chang and Velasco (2000)[9]: lender of last resort operations are severely limited, so that bank runs and financial panics are not easily prevented, unless bank themselves keep a sufficient amount of liquid assets.

The higher liquidity under "independently floating" exchange rates is not as obviously explained in their model as under "hard pegs". Nevertheless, they point out that deposit dollarization, i.e. the fact that bank accounts may be denominated in foreign currency, impedes dramatically the potential role of the central bank as a lender of last resort: "*the central bank can print pesos, but not dollars needed to honor the dollar claims of impatient depositors… flexible exchange rates cannot help prevent bank runs*" (Chang and Velasco 2000, page 27). We could not check this potential explanation since Bankscope does not give data on deposit dollarization, and aggregated data, which could be used as an indicator, is not published for all countries.

[9] e.g. their corollary 3.4, page 12, states that "*equilibrium bank runs may occur in a currency board regime*".

Figure 2: bank liquidity across de facto exchange rate arrangements



Exchange rate arrangements are de facto, "soft pegs" is the reference class. Boxes represent confidence intervals around the estimated parameter of the exchange rate regime dummy variable, β_k (calculated as $\beta_k \pm 1.96 * \text{standard error}$). Dotted line boxes recall estimated parameters that are not significantly different from 0.

Another way to consider the "liquidity smile" is to emphasize the relative lack of bank liquidity in intermediary regimes. This phenomenon has been underlined by studies on the Asian crisis (see eg. Tirole 2002, Feldstein 2003). Intermediary regimes in the mid 1990s created an illusion of stability and lowered the cost of borrowing in international markets by blurring currency and country risk: banks could borrow underpriced liquidity if need be, and kept a relatively low amount of liquid assets.

5- Conclusion

Using panel data on bank liquidity in emerging countries between 1995 and 2000, we find that in hard pegs and in pure floats, commercial banks are more liquid than in intermediary regimes. We call it a "bank liquidity smile".

We accounted for the fact that many emerging countries were hit by financial and/or currency crises during that period, as well as the changes of prudential regulation they operated.

We take the "bank liquidity smile" as a stylised fact to be reinforced or dispelled by further empirical research. Empirical developments of our analysis should include banks in more advanced countries, in order to check whether the liquidity smile is specific to emerging markets or a more general phenomenon. It should also take into account liability dollarization and the currency mismatch of bank balance sheets as much as possible.

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