Understanding capital flows
to emerging market economies

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A number of recent empirical studies have aimed to identify the determinants of capital flows to emerging market economies (EMEs), usually grouping these into two broad categories: factors that are specific to creditor countries ('push' factors), and those that are specific to debtor countries ('pull' factors). This article summarises two related pieces of work carried out at the Bank of England. The first is a model on the determinants of bank lending flows to EMEs, and the second a model on the determinants of spreads on EME sovereign bonds. The main finding is that push factors are important in explaining banking flows and bond spreads. In the case of the latter, the model suggests that two thirds of the compression in EME bond spreads in the period between October 2002 and earlier this year was explained by push factors alone, and in particular the fall in US short-term rates in 2001. This implies a need for caution by EMEs in borrowing too heavily during times of a benign external financing environment, as a reversal in credit conditions is more often than not beyond the control of the borrower.

EXTERNAL CREDIT CONDITIONS for emerging market economies (EMEs) have typically been marked by a high degree of volatility in the past. Periods of large, low-cost capital inflows have often been followed by periods of sharp outflows and a rise in the cost of borrowing, resulting in episodes of widespread financial instability. A notable example of this was the Asian crisis of 1997. And in 2002, the Brazilian economy was destabilised by a sharp deterioration in its external financing conditions. Such episodes are costly, not only to EMEs, but potentially also to developed economies where financial links to EMEs and global capital markets are significant. Understanding the key drivers of this volatility can therefore be an important element in assessing both global and domestic financial stability risks.

A substantial body of literature has developed which aims to identify the factors that might explain the volatility of these flows. The empirical strand of this literature has increasingly focused on two broad categories: those factors that are specific to creditor countries, or 'push' factors, and those that are specific to debtor countries, or 'pull' factors. Both impact on the flow of capital to EMEs, in terms of both the price and quantity of credit provided by developed-country investors.

Given the availability of data, the literature has typically focused on the price of credit from secondary bond markets, and the quantity of credit for bank lending from regulatory returns. Accordingly, this article brings together two recent studies in these areas carried out by the Bank of England.

The first is a model that builds on recent work at the Bank for International Settlements (BIS) which aims to explain the determinants of the flow of bank lending from developed countries to EMEs. The second is a model for determining the spread on EME sovereign debt. The models are reduced-form, exploring correlations between push-pull factors and bank lending flows and bond spreads without exploring the economic processes that underlie these relationships. For bank lending, particular emphasis is given to the period from 1996 to end-2003, capturing the pre-Asian-crisis rise in cross-border lending to EMEs and the subsequent decline. For bond spreads, the focus is mainly on the rally in bond markets between late 2002 and early 2004.

Whilst the long-run trends in banking flows and bond spreads are captured by the models, their deviation from actual flows and spreads is sometimes significant. This might reflect data considerations and the limitations of the push-pull framework, including potentially important factors that are absent from the analysis. These are also discussed.

A push-pull framework for explaining bank flows to EMEs

In this section, the results of the estimation of a model that builds on Jeanneau and Micu (2002) are presented.

Data set and variable selection

Jeanneau and Micu (2002) analyse BIS-reporting banks' lending flows to ten EME debtor economies, of which five are Latin American economies (Argentina, Brazil, Chile, Venezuela and Mexico) and five are Asian economies (Malaysia, Indonesia, the Philippines, Thailand and Korea). Here, seven more countries – Turkey, Poland, Hungary, India, Taiwan, China and South Africa – were added to the data set, accounting for an additional one third of BIS-reporting banks' consolidated foreign claims on EMEs. Moreover, Hong Kong and Singapore, classified as offshore financial centres in the BIS statistics, were also added to the list. This is mainly due to their importance to UK bank exposures.

The dependent variable used in the estimation is the change in cross-border claims on the EMEs listed in the preceding paragraph by banks from the following BIS-reporting countries: USA, UK, France, Germany, Italy and Spain.[1]

The explanatory variables are drawn from the theoretical literature and are listed in Table 1. The borrower-specific pull variables are intended to capture factors that affect either the demand for credit by an EME (borrower gross domestic product (GDP), local equity indices) or the risks involved (exchange rate volatility and borrower debt/GDP ratios). Push variables are intended to capture factors that are independent of the borrower but affect the supply of lending to EMEs. Specifically, these include the opportunity cost of lending (global equity returns), the risk appetite of lenders (spread differential on BB and BBB bonds) and the financial position of lenders (creditor-country GDP).

In the case of the latter variable, the relationship with banking flows is theoretically uncertain. On the one hand, greater growth in the creditor economy is associated with greater profits for the banking system, and thus a potential wealth effect may increase flows to EMEs. On the other hand, greater growth may provide greater investment opportunities in developed economies, diverting flows away from EMEs.

Table 1:
Push-pull explanatory variables of changes in bank lending to EMEs[a]

Variable	Rationale	Expected effect on flows
Pull		
Borrower GDP cycle	Greater growth suggests an improved creditworthiness and greater demand for credit by EMEs.	+
Bilateral exchange rate volatility	An increase in exchange rate volatility exposes borrowers and/or lenders to currency risk. May also be an indicator of financial instability in borrower country.	–
External debt/GDP	The higher the external debt burden, the more likely a country is to become insolvent.	–
Local currency equity return index	Proxy for attractiveness of investment in borrower country.	+
Push		
Lender GDP cycle	Strong growth in creditor country may result in greater investment abroad. However, it may also mean domestic investment opportunities become more attractive.	?
Global equity return	This is a measure of alternative investment return. The higher the return in industrialised countries, the lower the expected lending to EMEs.	–
Yield spread on low/high rated US corporate bonds	The higher the spread, the lower the risk appetite of creditors.	–
Other		
Bilateral trade	Controls for trade finance and/or the importance of information asymmetries (the greater the trade, the more familiar a country).	+
Brady operations dummy	Controls for Brady restructuring deals which resulted in one-off reductions in the value of BIS banks' exposures.	–

Sources: World Bank, IMF, Institute of International Finance (IIF), Bloomberg and Thomson Financial Datastream.

(a) For some countries, data from separate sources were used for certain factors, depending upon availability. All data are semi-annual, which in some cases has involved linear extrapolation of annual data.

Following Jeanneau and Micu (2002), two control variables were included. Bilateral trade attempts to filter out the effect of trade finance and the generally higher level of financial interlinkages that are associated with close trading relationships. The inclusion of a Brady dummy, which captures the effect of a Brady deal on bank lending, is intended to remove distortions arising from a one-off reduction in lending as loans are transformed into Brady bonds.

1: This is just a proxy for the flow of bank lending since international bank claims also include holdings of bonds and other debt securities by international banks. The dependent variable should therefore be thought of as changes in volume of all credit provided by international banks (though it will be referred to as bank lending in the remainder of this article).

Estimation and results

The model was estimated for the countries in the sample simultaneously by seemingly unrelated regressions for the period 1986 H1 to 2003 H2 (the annex contains more details on both models presented in this article). Coefficients were restricted to be equal across countries, and thus represent the common long-run elasticity of bank lending flows to EMEs to changes in the underlying factors.

Table 2 shows the results of the estimation. All coefficients are highly significant, except for GDP in the creditor country, and with the expected sign.

Table 2:
Coefficient estimates of push-pull variables on bank lending flows to EMEs[a][b]

Variable	Coefficient (Standard error)
Borrower GDP cycle	0.12 (0.03)[c]
Bilateral exchange rate volatility	-0.12 (0.03)[c]
External debt/GDP	-0.2 (0.03)[c]
Local currency equity return index	0.16 (0.03)[c]
Lender GDP cycle	-0.04 (0.04)
Global equity return	-0.09 (0.04)[d]
Yield spread on low/high rated US corporate bonds	-0.15 (0.03)[c]
Bilateral trade	0.09 (0.03)[c]
Brady operations dummy	-1.36 (0.23)[c]
Total observations	610
Time periods	36
Cross-sections	19
Overall R-squared	0.23
Adjusted R-squared	0.21
SE of regression	0.93
Durbin-Watson statistic	1.9

Sources: Bank calculations, World Bank, IMF, IIF, Bloomberg and Thomson Financial Datastream.

(a) Seemingly unrelated regressions (SUR) estimation technique employed.

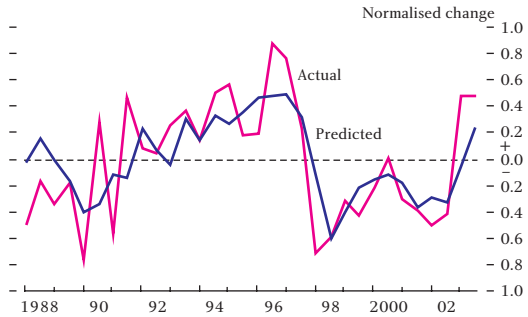
(b) All variables (except Brady dummy) normalised, and creditor/borrower GDP, borrower debt/GDP, local and global equity indices, and bilateral trade de-trended prior to normalisation. Data not available for early part of the sample period for some countries. There are therefore fewer than the maximum 36 observations for all 19 countries, resulting in an unbalanced panel of 610 observations.

(c) Significant at 1%.

(d) Significant at 5%.

Although only one quarter of bank flows to EMEs are explained by the model, from Chart 1 it is apparent that the model captures the long-run trend in the data relatively well. Specifically, the model captures the pattern of rising cross-border lending pre-1997, and the decline thereafter.

Chart 1:
Predicted versus actual bank lending flows[a] to EMEs

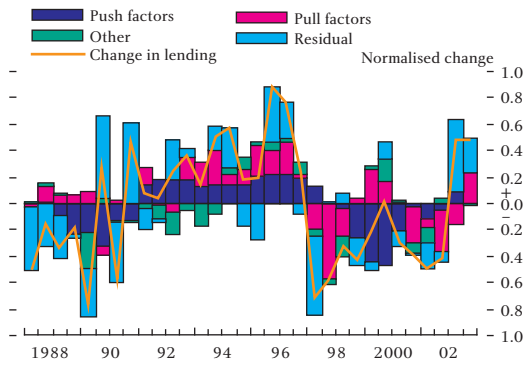


Sources: Bank of England and Bank for International Settlements.

(a) This variable was normalised by subtracting the mean and dividing by the standard deviation, as in Jeanneau and Micu (2002).

To show the relative importance of push and pull factors in explaining banking flows, Chart 2 plots the contributions of each to the flow of bank lending from 1988 to 2003. The deviations of actual flows from the long-run flows predicted by the model (blue bars) are discussed later in the article. Of the proportion of the change that is explained by the model, however, push factors appear to be, on average, equally important as pull factors.

Chart 2:
Relative contribution of push-pull factors to bank lending flows to EMEs



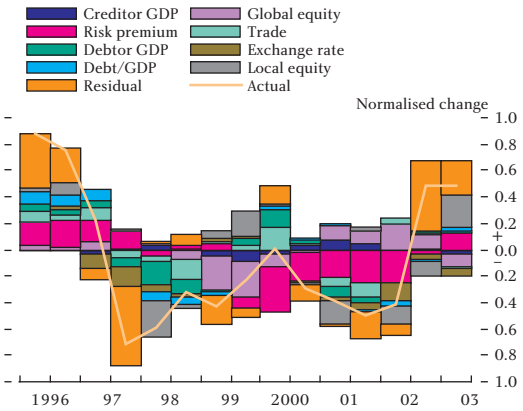
Sources: Bank of England and Bank for International Settlements.

In order to determine just which pull and push factors have the greatest influence on the flow of lending, Chart 3 plots the contribution of each explanatory variable used in the regression, focusing on the period since just before the Asian crisis.

The first point to make is how important risk premia and global equity markets appear in terms of push

factors. This points to the importance of bank risk appetite and investment opportunities in lending decisions.

Chart 3:
Relative contribution of individual factors to bank lending flows to EMEs



Sources: Bank of England and Bank for International Settlements.

It is also interesting to note that although the expected positive relationship between trade and banking flows has been found to be statistically significant, the actual contribution of trade to banking flows is not very large. This may be because changes in the volume of trade over the period were in a smaller order of magnitude than changes in other variables. Alternatively, it may be that trade links play a larger role in explaining the level of bank lending, rather than the flows.

Notwithstanding the contribution made by push factors, pull factors, particularly those indicating growth of EME economies, such as debtor GDP and local equity indices, have a significant influence on bank lending flows to EMEs. This is less the case when explaining EME sovereign bond spreads.

A push-pull framework for explaining bond spreads to EMEs

Early empirical literature on the determinants of the price of credit to EMEs focused exclusively on pull factors affecting the risk of borrower default (eg Edwards (1984), (1986)). The importance of push factors such as global risk-free interest rates was explored only relatively recently.[2] In this section, work done within the Bank of England that utilises a push-pull framework to assess the determinants of secondary market sovereign bond spreads is presented.

Data set and variable selection

The dependent variable in the analysis is the log spread on JP Morgan's index of emerging market bonds.[3] JP Morgan publish two variants of this index: a broader measure (the EMBI Global) which covers a wide cross-section of 27 countries from 1998 onwards, and a narrower measure (the EMBI), which covers only the limited number of Brady bonds and other restructured sovereign instruments, but which is available from 1991. From these two indices, an unbalanced, ragged-edge panel is constructed using the broadest cross-section available at each point in time, consisting of 1,982 monthly observations.

As in the bank flows model, the explanatory variables comprise of country-specific pull variables and external push variables. These are listed in Table 3. The pull variables are intended to capture the debtor country's financial position and creditworthiness (external debt/GDP, fiscal surplus/GDP), as well as its ability to service its foreign debt (trade openness, amortisation/reserves, current account/GDP). The push variables capture the cost of purchasing EME bonds (yields on short- and long-term US debt), investor risk appetite (spread on BB and BBB bonds), and the macroeconomic environment in which the investment community operates (US equity index).

Similar to the banking flows model, the relationship between the creditor-country's macroeconomic performance and EME spreads is theoretically unclear: better financial performance (as proxied by higher US equity indices) may create wealth effects, but may also act to divert capital towards these strongly performing markets.

The effect of long-term yields on bond spreads is also theoretically unclear. On the one hand, rising yields are associated with rising borrowing costs to EMEs and, potentially, wider spreads. On the other hand, rising long-term yields may result in a steeper yield curve if short-term yields do not, or are not expected, to rise (at least by the same rate as long-term yields). This has, in the past, been associated with greater

2: For example, Eichengreen and Mody (1998a,b), Kamin and von Kleist (1999), and Dell'Ariccia, Schnabel and Zettelmeyer (2000).

3: The use of secondary market bond spreads avoids the critique of Eichengreen and Mody (1998b) that studies using primary spreads are subject to a selectivity bias as the creditworthiness of primary issuers will vary with financing conditions.

investor leveraging, as investors 'search for yield' by borrowing short in domestic markets and investing in higher-yielding, longer-term debt such as EME bonds, thereby compressing spreads.[4]

Table 3: Push-pull explanatory variables of changes in EME bond spreads[(a)]

Variable	Rationale	Expected effect on spreads
Pull		
External debt/GDP	The higher the external debt burden, the more likely a country is to become insolvent.	+
Budget surplus/GDP	The larger the budget surplus, the more likely the sovereign can meet repayments. Also a measure of solvency insofar as lax fiscal policy endangers a sovereign's financial position.	–
Trade openness	The more open an economy is, the greater in the foreign income with which to meet debt repayments.	–
Amortisation/reserves	The higher the amortisation and interest payments on external debt relative to foreign exchange reserves, the greater the likelihood the sovereign will fail to meet them.	+
Current account/GDP	The larger the current account surplus, the more able the sovereign will be to finance its external debt.	–
Push		
Yield of 30-day US T-bill	The higher the short-term interest rate, the greater the borrowing cost for the sovereign and the higher the probability of default.	+
Yield of ten-year US government bond	A steeper US yield curve raises borrowing costs of EMEs. On the other hand, it increases incentives for leveraged investors to buy EME debt.	?
Yield spread on low/high rated US corporate bonds	The higher the spread, the lower the risk appetite of creditors.	+
US S&P 500 equity index	Strong equity performance suggests strong growth in creditor country and may result in greater investment abroad. However, it may also mean domestic investment opportunities become more attractive.	?

Sources: World Bank, IMF, IIF, governments and central banks.

(a) In most cases monthly observations generated by linear interpolation of annual/quarterly data.

Estimation and results

The relationship between the push-pull factors and secondary sovereign spreads was estimated over the period December 1991 to March 2003, using a pooled mean group estimator (PMG) as developed by Pesaran, Shin and Smith (1999). This is a dynamic error-correction model that can conceptually be broken down into two parts: a long-run component, which restricts coefficients to be equal across all countries, giving the long-run equilibrium relationship between push-pull factors and the average level of spreads on sovereign debt; and a short-run adjustment component, which captures the dynamics of the process by which short-run shocks to the underlying factors affect bond spreads, and which is allowed to vary across countries.[5] As the purpose of this article is to examine the general relationship between push-pull factors and spreads, this section will focus on the long-run component of the model. This also makes the analysis consistent with the bank flows model presented in the previous section.

Table 4 shows the main results of the PMG estimation. Most regression coefficients are statistically significant and with the expected sign. The key result is that the coefficients on external push factors are highly significant. In particular, short-term US interest rates (30-day yields) have a large significant positive effect on EME spreads. This is consistent with the theoretical relationship between global interest rates and EME spreads as outlined in Kamin and von Kleist (1999). The hypothesis is that lower global risk-free rates make risky debt look more attractive on a yield basis, lower the cost of borrowing of EMEs (and hence solvency risk), and increase investor risk tolerance. This is also consistent with earlier empirical findings, such as Arora and Cerisola (2001).

Higher long-term US interest rates (ten-year yields), however, are found to have a strong negative impact on EME spreads. This contradicts the findings of Arora and Cerisola (2001), who find a positive relationship, but is consistent with others, such as Eichengreen and Mody (1998a) and McGuire and Schrijvers (2003). The result suggests that, on average, during the sample period, the effect of the steeper yield curve on leveraged investors' incentives was greater than the impact of the long-term cost of borrowing to EMEs, as discussed earlier.

Chart 4 plots long-run equilibrium spreads predicted by the model with actual spreads for the countries in the sample between January 1992 and April 2004. The chart shows there are two main periods during the sample period where market spreads have been significantly and consistently below the model's

4: IMF Global Financial Stability Report, 2004.

5: See Ferrucci (2003) for a full exposition of the estimation techniques and issues.

long-run equilibrium level. These were in 1993–1994 and in 1996–1998, which were both followed by sharp corrections in bond prices.

Table 4:
Coefficient estimates (long-run) of push-pull factors on changes in EME spreads[a][b][c]

Variable	Coefficient (Standard error)
External debt/GDP	0.25 (0.12)[d]
Budget surplus/GDP	-0.72 (0.58)
Trade openness	-0.37 (0.11)[e]
Amortisation/reserves	0.19 (0.06)[e]
Current account/GDP	0.14 (0.35)
Yield of 30-day US T-bill	8.88 (1.39)[e]
Yield of ten-year US government bond	-8.00 (2.13)[e]
Yield spread on low/high rated US corporate bonds[f]	-0.44 (0.18)[e]
US S&P 500 equity index[f]	-0.6 (0.12)[e]
Constant[g]	0.78 (0.12)[e]
Error correction term[g]	-0.15 (0.02)[e]
Observations	1982
Cross-sections	23
Overall R-squared[h]	0.4
RBAR-squared[h]	0.21
Standard deviation of regressions[h]	0.065
No. of model parameters	262

Sources: Bank calculations, World Bank, IMF, IIF, governments and central banks.

(a) Dependent variable: log of spreads. PMG estimation technique. Sample period: Dec. 1991 to Mar. 2003.

(b) A fixed lag of one selected for all countries.

(c) The Schwarz-Bayesian criterion used to select the appropriate lag orders for each country, conditional on a maximum lag of two. Two countries (Côte d'Ivoire and Croatia) excluded from the EMBI index in estimations.

(d) Significant at 1%.

(e) Significant at 5%.

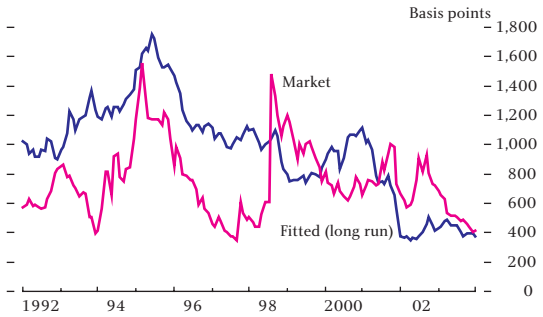
(f) Log value.

(g) Average of country-specific coefficients.

(h) Average of country-specific statistics.

The equilibrium level of spreads fell sharply between January 2001 and March 2002, in line with sharply declining US short-term interest rates. Actual spreads also fell somewhat during that period, but rose sharply during the summer of 2002, mainly in response to the Brazilian crisis. In October 2002, spreads began to narrow significantly and consistently, and by January 2004 were at levels in line with the long-run equilibrium.

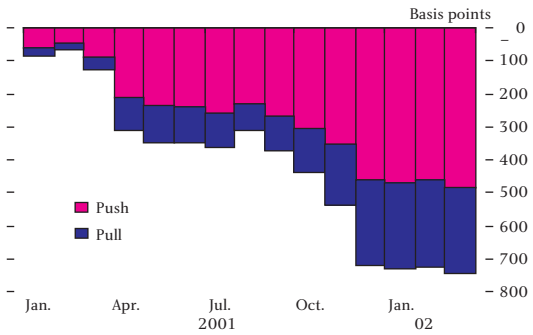
Chart 4:
Actual versus model-fitted spreads



Sources: Bank calculations and JP Morgan Chase & Co.

Chart 5 plots the cumulative contribution to changes in long-run equilibrium spreads for push and pull factors during the period from January 2001 to March 2002, when the equilibrium level was falling. It is clear that push factors are the more significant determinant during the period, explaining two-thirds of the fall in the equilibrium level of spreads.

Chart 5:
Cumulative contribution to reduction in long-run equilibrium spreads, January 2001 to March 2002



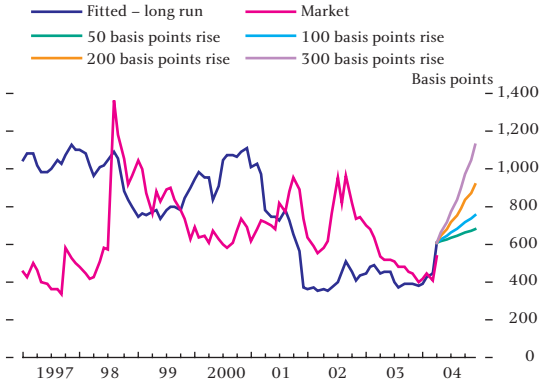
Sources: Bank calculations and JP Morgan Chase & Co.

The fact that push factors are more significant in explaining changes in equilibrium bond spreads than banking flows has an intuitive appeal. This may reflect the bank-borrower relationship, which is longer term and the importance of which reduces the weight put on lending decisions of factors such as alternative investment opportunities relative to borrower specific considerations.

Of the push factors, the model appears to be highly sensitive to short-term interest rates, which have a significantly positive impact on spreads, as noted earlier. To illustrate this point, Chart 6 plots the equilibrium level of spreads predicted by the model

assuming various movements in the short-term yield by end-2004, holding all other factors equal.

Chart 6:
Sensitivity of long-run equilibrium spreads to changes in short-term interest rates



Sources: Bank calculations and JP Morgan Chase & Co.

Limitations of the push-pull framework

The models presented here have focused on long-run relationships between push-pull factors and credit to EMEs. Some deviation between the observed and predicted values for banking flows and changes in spreads is to be expected due to noise in the short-run data. However, the push-pull models omit factors that plausibly could explain a systematic divergence between actual banking flows and spreads from those predicted.

To begin with, the models assume efficient markets and perfect information. Incomplete information and time-lags in the receipt of information may mean that banks and investors do not react to certain push-pull factors immediately. This is exacerbated by the possibility that, as explained in Calvo and Mendoza (1995), high information costs and relatively low exposures (as may be the case in EMEs) reduce incentives to monitor and process information.

Incomplete information and poor incentives to monitor may also contribute to herding behaviour. Such behaviour can act to both fuel exuberance during good times, and accentuate flight during bad times. This may explain some of the exuberance in the run-up to the Russian crisis evidenced by greater-than-predicted banking flows, and lower-than-predicted spreads, as well as the sharp fall-off in both post-1998.

The models also only take into consideration just one side of the price/quantity equation: the supply of bonds is related to external financing conditions, and as the supply will also affect the price, it is likely that the omission of supply considerations will have contributed to some deviation from equilibrium spreads. Equally, the interest charged on bank loans will affect the demand for such loans.

The models also do not take into account certain aspects of investors' long-term strategy. For example, bank strategy in the mid-1990s shifted towards expansion of local lending in EMEs via direct participation in local financial systems via foreign direct investment. This was motivated by a number of factors, including new investment opportunities in these markets, profit potential in underdeveloped financial systems, home market saturation, and geographical risk diversification (see Soussa (2004) for a discussion of these). This increase in local lending is commonly believed to have been at the cost of cross-border lending, perhaps explaining some of the fall-off post-1997.

Finally, the models do not take into account moral hazard. Dell'Ariccia, Schnabel and Zettelmeyer (2002) describe the potential impact of IMF lending on investors' lending decisions. A perception by investors that the IMF will 'bail out' a country when it gets into trouble may reduce the risk premium required by investors to hold that country's debt, reducing the spread beyond the long-run equilibrium level.[6] The same could be true for banking flows, especially where these are to state-owned banks or enterprises, implicitly guaranteed by the sovereign.

Conclusions

The volatility of capital flows to EMEs in the past has often resulted in episodes of wide-spread financial instability that have been costly to both EMEs and developed countries. The Asian crisis and Russian default are two cases in point. In this article, two studies were presented which add to the growing body of literature that attempts to explain this volatility in a push-pull framework, going beyond traditional explanations of flows which focused exclusively on pull factors such as borrower creditworthiness.

The main lesson to be drawn is that banking flows and bond spreads are both significantly influenced by

6: Haldane and Schiebe (2004) also discuss creditor moral hazard.

push factors, although banking flows relatively less so, possibly due to the nature of the bank-borrower relationship. This implies a need for caution by EMEs in borrowing too heavily during times of a benign external financing environment, as a reversal in credit conditions is more often than not beyond the control of the borrower. While capitalising on a benign financing environment through, for example, pre-financing may be sensible, it is important to bear in mind that what is a sustainable level of leverage during good times is potentially unsustainable over a longer horizon, regardless of the creditworthiness of the borrower.

This point is illustrated particularly well by recent movements in EME bond spreads. While fundamentals in EMEs have continued to be strong, the expectation of rising US short-term interest rates has widened spreads since the early part of the year, in line with the predictions of the model presented earlier.

However, while sensitivity to push factors is apparent, the models show that pull factors are also important, particularly for banking flows, suggesting that the improvement in EME fundamentals witnessed over the past few years should mitigate the extent to which push factors result in a deterioration of external credit conditions.

Annex

The banking flows model consists of a constrained system of debtor equations using a seemingly unrelated regressions methodology (see Zellner and Theil (1962)). More formally, for each debtor *i*:

$$y_{it} = \sum_{j=1}^{J} \beta_j \chi_{jit} + \varepsilon_{it}$$

i=1,2….N; t=1,2…T

where y_{it} is a T × 1 vector of BIS-bank aggregate cross-border lending observations for debtor *i* at time *t*; χ_{jit} is a T × J matrix of observations on explanatory variables j for debtor *i* at time *t*; β_j is a J × 1 vector of coefficients, and E_{it} a T×1 vector of disturbances. The disturbance and explanatory variables within each debtor equation are assumed to be uncorrelated. But across equations, to reflect common shocks, errors are assumed to be correlated contemporaneously, ie $E[\varepsilon_{it}] \neq 0 = \sigma_{ij}$. Zero correlation is assumed between all lagged disturbances. The model can be estimated by feasible GLS and coefficient estimates are asymptotically valid in the number of time dimensions.

The full bond spreads model's specification for country *i* at time *t* is:

$$\Delta \log s_{it} = \phi_i \left[\log s_{it-1} - \alpha_i - \sum_{j=1}^{J} \beta_{ji} \chi_{jit} \right] - \sum_{j=1}^{J} \gamma_{2ji} \Delta \chi_{jit} + u_{it}$$

where the term in square brackets in this equation is the long-run relationship and the β_{ji} are the long-run elasticities. The assumption of long-run commonalities in the equilibrium relationship (pooled model) requires that β_j applies to all cross-sections *i*; that is constant long-run slope coefficients for all cross-sections. The error correction coefficient (ϕ) and the short-term elasticities (γ_{2ji}) are unrestricted and are allowed to vary in each. However, as discussed, the focus of the article is only on the long-run component of the model, which can be expressed in its general form as:

$$\log s_{it} = \alpha_i + \sum_{j=1}^{J} \beta_{ji} \chi_{jit} + \varepsilon_{it}$$

The bond spreads model, when looked at in the long run only, is therefore directly comparable to the banking flows model.

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