

# DEMAND AND SUPPLY OF LOCAL CURRENCY BONDS IN EMERGING MARKETS: PRIMARY EVIDENCE FROM A NEW DATASET

by Alessio Ciarlone, Paolo Piselli and Giorgio Trebeschi \*

## Abstract

Using a new database comprising issues of all maturities for a set of 13 emerging markets economies over the period 1999-2005, we model demand and supply of local currency government bonds. Our findings suggest that good institutions and sound macroeconomic policies (resulting in low volatility of inflation and low levels of public debt) foster demand for local currency bonds. We also find that the size of the economy (as measured by the level of GDP) as well as the depth of the financial system (as proxied by the stock of domestic credit to the private sector) are important to underpin the demand for such instruments. On the supply side, we find that the higher is the cost of issuing on international markets the higher is the net issuance on local markets. Finally, the demand for longer-term bonds as well turns out to be closely connected with macroeconomic stability and the quality of institutional framework.

**JEL Classification numbers:** C23, F34

**Keywords:** Local bond market, emerging markets, panel data.

---

\* Bank of Italy, International Economic Analysis and Relations Department. We thank Ms. Paola Paiano for her valuable research assistance. The paper benefited from the useful comments from Prof. F. Warnock, Pietro Catte, the participants to the CGFS Workshop on “*Balance sheet effects and emerging market bond spreads*”, Bank of England (2006), the participants to the INFINITI Conference 2007 (Dublin, Trinity College). The opinions expressed hereinafter do not reflect those of the Bank of Italy. Any error and omission remains our own responsibility. Authors’ address: International Relations, Bank of Italy, via Milano 64, 00184 Rome. Telephone: +39-06- 4792-5321/5692/5584. Fax: +39-06-4792-5324. Email addresses: alessio.ciarlone@bancaditalia.it, paolo.piselli@bancaditalia.it, giorgio.trebeschi@bancaditalia.it.

## 1. Introduction

Many episodes of turmoil in emerging market economies (EMEs) have been characterised by ‘sudden stops’, i.e. sharp reversals in aggregate foreign capital inflows that resulted in balance of payments (BOP) crises, real depreciation and a drop in output (Calvo 2003, Catão 2006).<sup>1</sup> Flood and Marion (2006) describe shutdowns as an extreme version of sudden stops where the supply of international capital dries up completely, and conclude that “the shut out can occur without markets first signalling problems through exorbitant lending rates” and that “it may not take a very large shock to shut down international lending completely”.

One interesting feature of recent crises is that closures of international capital markets, as well as the sudden stops, have not only been originated by developments in emerging markets themselves but, in many cases, by developments in mature economies, e.g. a rise in the volatility of U.S. equity markets, rising interest spreads on U.S. high yield bonds or financial scandals like Enron and other corporate cases in the U.S. (Borensztein *et al.* 2006). Contagion has also been a core issue of both the theoretical and empirical research on financial turmoil after the Asian crises (Pericoli and Sbracia 2003).

The effect of financial crises in EMEs has been in many cases amplified by the currency structure of both public and private sector assets and liabilities. Assets tended to be denominated in local currency whereas liabilities were mostly in foreign currency. The inability of EMEs to borrow in international capital markets in their domestic currency has been usually referred to in the literature as the ‘original sin’ (Eichengreen, Hausmann and Panizza 2003). Such a feature of EMEs made currency crises – induced by increased volatility of capital flows or ‘sudden stops’ in international capital markets – more painful by raising the local currency value of foreign currency denominated liabilities, and hence, after devaluation, increasing the likelihood of outright default.

Over the past years, EMEs have put in place a variety of policies to deal with the volatility in international capital flows: external assets and liabilities management has largely

---

<sup>1</sup> Bordo (2006) show that sudden stops are not exclusively a feature of recent financial turbulences. As a matter of fact, the pattern of capital flows in the 90s resembles that of the first era of globalization between 1880 – 1914.

improved, exchange rate arrangements have become more flexible, prudential supervision of financial systems has got near the international 'best practice', reserve and current account positions have strengthened.

Other measures designed to “self-insure” against volatile capital flows and asset prices have centred on developing local currency securities markets - in particular bond markets - to provide alternative sources of funding and to facilitate the management of the financial risks associated with periods of high asset price and exchange rate volatility (IMF 2003). Growth of local currency bond markets in emerging countries has therefore attracted significant interest in recent years, both in official circles and in the academia because, among other things: a) it helps to address currency mismatches; b) it makes financial markets more complete, by providing a term structure for interest yields which is essential for investment and financing decisions and for the creation of a full array of tools for managing financial risk, like repos, swaps and other derivatives; c) it provides, both for sovereigns and the corporate sector, a source of funding alternative to the traditional banking sector and to international capital markets, shielding EMEs from the danger of incurring into new financial crises.

The literature has underscored the role of macroeconomic and institutional factors in explaining the development of local currency bond markets. Claessens *et al.* (2003) have found that larger economies with a relatively wide domestic investor base have proportionally larger amounts of local currency government bond outstanding as a percentage of GDP. Furthermore, countries with more flexible exchange rates are more likely to resort to domestic currency finance. Moreover, higher inflation is associated with smaller stock of local currency bonds; good democratic institutions, as well as good quality and reliability of regulation, lead to more developed local currency markets. These empirical results have been confirmed by Eichengreen and Luengnaruemitchai (2004), who also found that larger and more competitive banking sectors do foster the size of local currency bond market. This latter result suggests that the view that banks are an alternative source of finance, in competition with bond markets, may be misleading. On the contrary, complementarities seems to dominate, maybe because banks serve as dealers, market-makers and investors and thus promote liquidity in the secondary bond market. Burger and Warnock (2006a) have found that creditor-friendly policies (as measured, for example, by low levels of inflation) and laws, as well as stronger institutions, are associated with deeper local currency bond markets; these results are quite

similar regardless whether government or private bond markets are concerned. They have also confirmed that the preconditions for the development of local currency bond market are similar to those that foster development of the banking system, and that countries with a larger banking system tend to have larger bond markets.

In all these pieces of empirical research, the problem of how to measure the degree of development of local currency bond market has been solved by focusing on the existing outstanding stock of such instruments. In this paper, instead, we take a ‘flow’ approach since our main interest is to study the pattern of net issuances. By doing so, we think we are able to shed some light on both flows and yields as resulting from the interactions between the demand side – comprising an undistinguished group of investors – and the supply side – including emerging markets governments or government authorities.<sup>2</sup> The main reason why we take an approach based on flows is that outstanding stocks largely reflect past history and thus react more slowly to new developments in the economy. Therefore, in order to study the determinants of demand and supply for local currency bonds, it seems more appropriate to resort to data on actual bond issuance. To this end, we have constructed a large dataset taking issue-by-issue information available from Bloomberg; for reasons of data completeness and availability, we only covered government debt securities, although it would be interesting to extend this research to the corporate sector as well.

We start by trying to model the demand side of the market for local currency bonds. Our implicit assumption is that the development of these markets is constrained more by the behaviour of the demand stemming from both domestic and international investors rather than by the supply side, i.e. the government’s effort to improve the depth of the local debt markets.<sup>3</sup> Being aware of the potential interactions between the demand and the supply side - which might engender endogeneity problems - we improve upon a simple OLS panel estimation by resorting to instrumental variable techniques. As a next step, we separately estimate the supply of local currency bonds. In addition, thanks to the availability of

---

<sup>2</sup> Local currency bond markets have recently drawn the interest of international investors, reflecting the search for higher returns in a situation of low interest rates and limited volatility in international financial markets. With the decrease in foreign debt and consequent reduction in the volume of emerging countries’ bonds coming onto international markets, investor have extended their search for high yields to these countries’ domestic bond markets.

<sup>3</sup> Governments indeed have a role in a dual capacity: a) on the one hand they are issuers, b) on the other hand they act as regulators and are the authority responsible for macroeconomic conditions.

information on maturity at issuance, we have carried out preliminary research on the determinants of demand for longer term bonds.

The paper is organised as follows: Section 2 covers the descriptive statistics; the econometric analysis and results for the demand and supply of sovereign bond issues are presented in Section 3; Section 4 deals with demand for longer-term bonds; Section 5 concludes.

## 2. Descriptive statistics

The Bank for International Settlements (BIS) publishes in its Quarterly Review data on outstanding domestic debt security, broken down by domestic sector.

Table 1

| <b>DOMESTIC DEBT SECURITIES OUTSTANDING</b> |                |                |                |                |                |                |                |                |              |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|
| <i>(in US\$ billion)</i>                    |                |                |                |                |                |                |                |                |              |
|   | 1999           | 2000           | 2001           | 2002           | 2003           | 2004           | 2005           | 2006           | % GDP        |
| <b>Latin America</b>                        | <b>460,7</b>   | <b>523,2</b>   | <b>560,2</b>   | <b>453,1</b>   | <b>578,5</b>   | <b>699,8</b>   | <b>927,4</b>   | <b>999,9</b>   | <b>42,3%</b> |
| <i>Argentina</i>                            | 42,5           | 47,0           | 37,4           | 31,9           | 46,6           | 50,6           | 72,3           | 74,3           | 35,2%        |
| <i>Brazil</i>                               | 293,9          | 312,0          | 320,1          | 218,2          | 307,5          | 382,7          | 532,1          | 608,4          | 64,2%        |
| <i>Chile</i>                                | 33,0           | 34,9           | 34,7           | 34,6           | 40,8           | 41,8           | 43,0           | 39,3           | 27,7%        |
| <i>Colombia</i>                             | 13,5           | 16,8           | 19,6           | 19,5           | 22,9           | 30,2           | 40,6           | 37,7           | 28,6%        |
| <i>Mexico</i>                               | 74,8           | 108,9          | 144,2          | 145,0          | 155,7          | 187,5          | 232,5          | 233,6          | 27,8%        |
| <i>Peru</i>                                 | 3,0            | 3,6            | 4,1            | 4,0            | 4,9            | 7,1            | 7,1            | 6,6            | 7,1%         |
| <b>Asia</b>                                 | <b>1.002,3</b> | <b>1.082,2</b> | <b>1.217,8</b> | <b>1.494,8</b> | <b>1.750,3</b> | <b>2.203,8</b> | <b>2.628,4</b> | <b>2.948,4</b> | <b>49,3%</b> |
| <i>China</i>                                | 159,3          | 202,3          | 238,4          | 342,3          | 448,5          | 623,8          | 894,0          | 1.047,3        | 39,0%        |
| <i>Hong Kong</i>                            | 43,9           | 44,1           | 45,1           | 46,6           | 46,2           | 48,1           | 49,8           | 50,2           | 26,4%        |
| <i>India</i>                                | 102,1          | 113,6          | 130,2          | 155,8          | 203,2          | 249,5          | 279,1          | 296,5          | 32,8%        |
| <i>Indonesia</i>                            | 49,2           | 53,6           | 49,2           | 58,1           | 65,7           | 61,2           | 54,7           | 68,6           | 18,8%        |
| <i>Malaysia</i>                             | 66,1           | 74,7           | 82,8           | 84,4           | 98,7           | 110,6          | 123,5          | 135,0          | 90,6%        |
| <i>Philippines</i>                          | 22,8           | 20,7           | 23,8           | 27,4           | 30,4           | 35,3           | 40,5           | 40,2           | 34,3%        |
| <i>Singapore</i>                            | 36,4           | 41,9           | 49,6           | 54,0           | 58,3           | 66,2           | 68,3           | 74,8           | 56,7%        |
| <i>South Korea</i>                          | 365,2          | 377,7          | 438,8          | 538,2          | 579,7          | 751,0          | 847,3          | 941,7          | 107,4%       |
| <i>Taiwan</i>                               | 125,9          | 122,8          | 124,3          | 141,2          | 161,6          | 191,8          | 192,3          | 200,7          | 56,4%        |
| <i>Thailand</i>                             | 31,4           | 30,8           | 35,8           | 46,9           | 58,1           | 66,4           | 79,0           | 93,4           | 45,3%        |
| <b>Emerging Europe</b>                      | <b>125,1</b>   | <b>138,9</b>   | <b>187,9</b>   | <b>240,8</b>   | <b>331,8</b>   | <b>424,5</b>   | <b>434,9</b>   | <b>435,9</b>   | <b>21,2%</b> |
| <i>Croatia</i>                              | 1,9            | 2,3            | 2,6            | 3,6            | 4,5            | 6,1            | 7,0            | 7,6            | 17,6%        |
| <i>Czech Republic</i>                       | 24,6           | 22,8           | 25,7           | 43,6           | 55,9           | 64,5           | 62,2           | 70,1           | 51,2%        |
| <i>Hungary</i>                              | 16,6           | 16,5           | 19,7           | 30,8           | 42,1           | 52,9           | 48,5           | 50,2           | 45,2%        |
| <i>Poland</i>                               | 27,3           | 32,1           | 44,2           | 55,3           | 65,8           | 95,9           | 95,7           | 105,6          | 31,2%        |
| <i>Russia</i>                               | 9,2            | 7,7            | 5,3            | 7,7            | 11,6           | 21,1           | 25,1           | 29,7           | 3,0%         |
| <i>Slovak Republic</i>                      | 2,5            | 2,9            | 5,7            | 7,9            | 11,6           | 14,4           | 11,7           | 12,0           | 21,9%        |
| <i>Turkey</i>                               | 43,0           | 54,7           | 84,7           | 91,8           | 140,3          | 169,8          | 185,0          | 160,7          | 40,8%        |
| <b>Others</b>                               | <b>114,4</b>   | <b>103,9</b>   | <b>85,0</b>    | <b>99,3</b>    | <b>129,5</b>   | <b>158,2</b>   | <b>160,8</b>   | <b>148,2</b>   | <b>36,7%</b> |
| <i>Lebanon</i>                              | 16,7           | 17,9           | 18,6           | 16,7           | 17,6           | 17,2           | 19,0           | 18,4           | 91,8%        |
| <i>Pakistan</i>                             | 26,8           | 26,7           | 26,6           | 28,4           | 30,9           | 31,5           | 34,0           | 32,3           | 25,0%        |
| <i>South Africa</i>                         | 70,9           | 59,3           | 39,9           | 54,3           | 81,0           | 109,5          | 107,8          | 97,6           | 38,3%        |
| <b>Total Emerging Markets</b>               | <b>1.702,5</b> | <b>1.848,3</b> | <b>2.051,0</b> | <b>2.288,1</b> | <b>2.790,1</b> | <b>3.486,3</b> | <b>4.151,6</b> | <b>4.532,5</b> | <b>41,9%</b> |
| <i>Memo:</i>                                |                |                |                |                |                |                |                |                |              |
| <i>United States</i>                        | 13.865,5       | 14.307,6       | 15.061,9       | 16.048,7       | 17.320,4       | 18.833,7       | 20.310,5       | 21.431,1       | 175,0%       |

Source: BIS

According to the BIS, the capitalization of domestic bond markets amounted to more than US\$ 4.5 trillions in mid-2006, compared with around US\$ 625 billion for the international markets. The Asian markets account for over 65 percent of all securities in circulation (see Table 1) and recorded the fastest rate of growth in the first six months of 2006 (12 percent).<sup>4</sup>

Net issues of local currency bonds are computed by the BIS as changes in stocks, “(...) which are adjusted for exchange rate valuation effects by converting changes in amounts outstanding in national currency using the average US dollar exchange rate prevailing during the relevant reporting period (...)” (BIS 2003). We attempt to improve upon the measurement of issuance activity by developing a new dataset, made up of bonds in domestic and hard currency issued in 13 emerging economies both in local and global markets between January 1999 and December 2005.<sup>5</sup> The dataset, drawn from Bloomberg, collects issue-by-issue information on: a) the announcement, issue and maturity date of individual bonds; b) the notional amount issued; c) the coupon and the maturity type (including whether the bond is interest- or inflation-indexed); d) the currency and the market where the issue is traded. Unfortunately the price at issuance is not available for all the bonds in the dataset, making it impossible to determine yields for each issue. Given the information contained in the dataset, a bond can be classified as a global bond or a local bond.<sup>6</sup> Among them, a further classification can be devised that comprises: 1) zero-coupon bonds; 2) bonds linked to either inflation or specific interest rates or exchange rates; 3) fixed-coupon longer-term bonds. The availability of single issues allows us to compute actual issuance without having to resort to any “change in stocks” approximation.

Table 2 shows that from 1999 to 2004 the overall gross issuance of emerging market bonds in our sample remained steady and increased in 2005 up to almost US\$ 900 billions; average maturity slightly exceeded two years. The weight of global issues increased between 1999 and 2001, declined thereafter and increased again in 2005; in the time span considered,

---

<sup>4</sup> For a thorough analysis of developments in local markets and the related policy issues see Mathieson *et al.* (2004).

<sup>5</sup> The countries considered are: Argentina, Brazil, Chile, Czech Republic, India, Indonesia, Malaysia, Mexico, Philippines, Poland, Russia, Thailand, Turkey. The 13 countries considered made up about 50 percent of the total outstanding amount of local currency bonds in emerging markets.

<sup>6</sup> For the purpose of this study, domestic issues denominated in hard currency have been considered as global bonds. These issues, anyway, represented only 3 percent of gross issuance for the 13 countries considered in 2005 and, as a matter of fact, are only present in Argentina, Chile and Turkey.

they represented less than 10 percent of sovereign bonds issued by the countries in our sample.

The difficulty of many EMEs in borrowing at long term is witnessed by the fact that the share of bonds with maturity at issuance longer than 1 year (hereafter long-term bonds) has only recently exceeded 50 percent of total issuance; among them, the majority are fixed- or zero-coupon bonds. Among bonds with a floating coupon, it is notable that exchange-rate-indexed bond issuance has decreased,<sup>7</sup> while inflation-linked bonds have increased fourfold since 1999. Particularly in EMEs where monetary policy credibility may not be full established, this kind of bonds can help the government to extend the maturity of debt.

Table 2

**GROSS ISSUANCE IN EMEs**  
(in billions of dollars)\*

|            |               |        |              |       |               |                    |               |            | Long-term issuance by coupon type |                   |               |              |
|------------|---------------|--------|--------------|-------|---------------|--------------------|---------------|------------|-----------------------------------|-------------------|---------------|--------------|
|            | Total         | Global |              | Local |               | Local long-term ** |               | FX-indexed | Zero /fixed coupon                | Inflation indexed | Floating rate |              |
| 1999       | 657.6         | 2.3    | 43.4         | 6.3   | 614.3         | 2.1                | 242.5         | 5.0        | 30.8                              | 87.5              | 5.9           | 118.3        |
| 2000       | 637.1         | 2.7    | 60.9         | 8.6   | 576.1         | 2.3                | 288.7         | 6.1        | 35.2                              | 143.7             | 4.2           | 105.6        |
| 2001       | 655.1         | 3.1    | 103.3        | 9.7   | 551.8         | 2.6                | 246.4         | 6.6        | 38.3                              | 94.8              | 16.1          | 97.2         |
| 2002       | 606.6         | 2.4    | 19.3         | 8.0   | 587.3         | 2.3                | 264.1         | 6.6        | 30.2                              | 140.6             | 21.1          | 72.3         |
| 2003       | 697.0         | 2.4    | 32.9         | 8.5   | 664.2         | 2.3                | 295.6         | 6.7        | 12.4                              | 207.9             | 14.0          | 61.3         |
| 2004       | 656.9         | 2.0    | 32.0         | 11.7  | 624.9         | 1.8                | 241.9         | 5.9        | 6.7                               | 163.5             | 10.5          | 61.2         |
| 2005       | 895.0         | 2.3    | 100.1        | 14.9  | 794.9         | 1.8                | 403.4         | 6.3        | 18.4                              | 269.5             | 22.5          | 93.1         |
| <b>tot</b> | <b>4805.3</b> |        | <b>391.8</b> |       | <b>4413.4</b> |                    | <b>1982.6</b> |            | <b>172.0</b>                      | <b>1107.3</b>     | <b>94.3</b>   | <b>609.0</b> |

Source: Authors' calculation on Bloomberg data

\* Number in italics are average maturity in years.

\*\* Bonds with maturity at issuance longer than 1 year.

Overall Table 2 seems to suggest that EMEs have been able to reduce the number and value of 'dangerous' issues, i.e. those that are sensitive to shifts in market sentiment. Through the composition of new issues, EMEs are addressing those features of their sovereign debt structure that in the past had traditionally made them more crisis-prone than advanced economies (Borensztein *et al.* 2004). However, at least initially, this improvement is obtained by resorting to a greater issuance of short-term bonds, which leaves the debt structure sensitive to rollover constraints.

<sup>7</sup> In table 2, FX-indexed bonds includes some domestic issues in foreign currency.

From a regional perspective (Table 3), almost half of the gross issuance of bonds in our sample took place in Latin America (US\$ 2,200 billions out of 4,800). The second most important area was Asia (US\$ 1,700 billions) followed by Eastern Europe (US\$ 900 billions). Around half of the local issues in Latin America and in Eastern Europe are represented by securities with maturity above one year. This percentage is about 28 percent in Asia.

Taking into account long-term securities, two-thirds of the issues in Latin America are bonds linked to inflation, the exchange rate or short-term rates. On the contrary, zero- or fixed-coupon bonds were the most significant type of long-term issues both in Asia and Eastern Europe.

Despite the differences in the structure of government debt securities, average maturity did not differ noticeably among regions. Asia recorded the shortest average maturity in local markets (1.5 years) but appeared to be able to issue at longer maturities, as shown by the longest average maturity for local long-term securities (7.5 years).

Table 3

### GROSS ISSUANCE IN EMEs BY REGION

(in US\$ billions)\*

|                |               |        |              |       |               |                    |               |            | Long-term issuance by coupon type |                   |               |              |
|----------------|---------------|--------|--------------|-------|---------------|--------------------|---------------|------------|-----------------------------------|-------------------|---------------|--------------|
|                | Total         | Global |              | Local |               | Local long-term ** |               | FX-indexed | Zero /fixed coupon                | Inflation indexed | Floating rate |              |
| Latin America  | 2,233.3       | 2.7    | 275.6        | 7.3   | 1,957.7       | 2.6                | 1,051.7       | 4.5        | 131.0                             | 364.4             | 91.8          | 464.5        |
| Eastern Europe | 915.6         | 2.4    | 75.8         | 10.4  | 839.9         | 1.9                | 484.2         | 4.2        | 40.4                              | 364.6             | 2.5           | 76.6         |
| Asia           | 1,656.3       | 2.2    | 40.4         | 9.7   | 1,615.9       | 1.5                | 446.7         | 7.5        | 0.5                               | 378.2             | 0.0           | 67.9         |
| <b>tot</b>     | <b>4805.3</b> |        | <b>391.8</b> |       | <b>4413.4</b> |                    | <b>1982.6</b> |            | <b>172.0</b>                      | <b>1107.3</b>     | <b>94.3</b>   | <b>609.0</b> |

Source: Authors' calculation on Bloomberg data

\* Number in italics are average maturity in years.

\*\* Bonds with maturity at issuance longer than 1 year.

From a policy and financial stability perspective, investigating the factors which can increase maturity of domestic debt become crucial, now that domestic debt has become the main instrument to fulfil the financial needs of emerging economies. In this vein, Table 4 reports the breakdown by maturity and type of gross issuance of bonds in our sample.



Table 4

**GROSS ISSUANCE OF BONDS IN EMERGING ECONOMIES BY MATURITY AND TYPE**  
(1999-2005)

|                    |              | Maturity (in years) |       |       |       |       |         |
|--------------------|--------------|---------------------|-------|-------|-------|-------|---------|
|                    |              | <1                  | 1-3   | 3-5   | 5-10  | >10   | Tot     |
| <b>Local Bonds</b> | US\$ bln     | 2,430.9             | 975.3 | 363.7 | 328.2 | 315.4 | 4,413.4 |
|                    | %            | 55.1%               | 22.1% | 8.2%  | 7.4%  | 7.1%  |         |
|                    | n°           | 7,017               | 1,031 | 690   | 1,068 | 261   | 10,067  |
|                    | Av. Maturity | 0.4                 | 2.2   | 4.4   | 8.5   | 16.3  | 2.2     |
| <b>Global</b>      | US\$ bln     | 2.0                 | 19.7  | 49.1  | 116.5 | 204.5 | 391.8   |
|                    | %            | 0.5%                | 5.0%  | 12.5% | 29.7% | 52.2% |         |
|                    | n°           | 15                  | 54    | 111   | 152   | 113   | 445     |
|                    | Av. Maturity | 0.9                 | 2.6   | 4.5   | 8.0   | 20.7  | 9.5     |
| <b>Tot</b>         | US\$ bln     | 2,432.9             | 995.0 | 412.8 | 444.7 | 519.9 | 4,805.3 |
|                    | %            | 50.6%               | 20.7% | 8.6%  | 9.3%  | 10.8% |         |
|                    | n°           | 7,032               | 1,085 | 801   | 1,220 | 374   | 10,512  |
|                    | Av. Maturity | 0.4                 | 2.3   | 4.5   | 8.5   | 17.6  | 2.5     |

*Source: Authors' calculation on Bloomberg data.*

Short-term issues, with a maturity with less than one year, are the majority of local currency bonds (55 percent). On the contrary, when these countries borrow on international markets (Global issuance in the table), long-term bonds are the rule.

### 3. Empirical analysis

Two main factors are at play in determining the development of deeper local currency bond markets: the country's necessity to issue local currency denominated debt and the attractiveness of such instruments to both local and international investors.

In any market, changes in both flows and prices must reflect shifts in either the demand or the supply schedule (or both simultaneously) and both schedules will be affected by agents' expectations as to the future evolution of the market. The interaction between demand and supply factors will determine the price and quantity at which the market clears; changes in this equilibrium over time are then the observed flows. Variations in asset quality or fundamentals due to external shocks or domestic politics will be reflected in changing prices and flows, as markets adjust to the changed circumstances.

### 3.1 *The demand side*

As already mentioned, the literature on local currency bond markets has generally investigated the determinants of the outstanding stock, without interpreting the estimated equation as demand or supply functions. The literature on capital flows, on the contrary, explicitly modelled the demand for emerging market assets in terms of factors that might ‘push’ or ‘pull’ international investors:<sup>8</sup> several papers within this strand of empirical research have shown that demand is the main determinant of the level of capital flows. First, the well-known inverse correlation between emerging market bond yields and capital flows intuitively implies the presence of fluctuations in demand rather than supply, a notion supported by the hypothesis that market access is constrained for borrowers (FitzGerald and Krolzig, 2005). Mody and Taylor (2001) have examined capital flows to four emerging markets – Brazil, Mexico, Thailand and Korea – and found evidence that the demand is the ‘short’ side of the market, determining the level of the flows: it is thus possible to observe instances of ‘international capital crunch’ where flows are curtailed because of lender rationing. In particular, these results show that higher US yield spreads are associated with credit crunches for emerging markets.

We believe that the same demand-oriented approach, developed in the literature on capital flows, can be extended to the analysis of local currency bond markets. Recent evidence (IMF 2005) seems to suggest that international institutional investors have shifted as much as 10 percent of their exposure into emerging markets from hard currency-denominated assets to local currency instruments, compared with minimal exposure three years ago.<sup>9</sup> This would indicate that international investors are playing an increasingly important role in the development of local currency bond markets. However, given the lack of breakdown data about holders’ nationality, we are implicitly assuming that domestic investors pose the same

---

<sup>8</sup> The aggregate level of capital flows to emerging markets is held to be determined by the push factors, which include market conditions in the source country and the return on emerging markets as a whole. The pull factors are the conditions in the destination countries, which determine the allocation of the aggregate flow across the emerging markets (FitzGerald 2002).

<sup>9</sup> These investors, such as large pension funds and insurance companies, tend to make long-term allocations, thus they may constitute a relatively stable part of an investor base. Dedicated emerging market bond funds have also increased their exposure to local currency instruments. Global bond funds (those that include bonds from a broad range of countries, both mature and emerging) are also including some emerging market local currency bonds in their portfolios. This trend has been accelerated since the incorporation of bonds from eight investment-grade emerging market countries in the Lehman Global Aggregate Index, a commonly used benchmark for global bond funds.

constraints on the development of local currency bond markets as those stemming from foreign investors.

In what follows, we will explain the amount of net issuance of local currency bonds in terms of some demand-related factors, which could be grouped as follows: a) country-specific macroeconomic and financial variables, which measure the soundness of an emerging economy; b) variables that describe economic freedom and, more generally, the institutional settings; c) a set of country fixed effects, which control for other neglected country-specific effects, together with a time trend, which models the overall cyclical conditions of financial markets.<sup>10</sup>

Our dependent variable, i.e. net bond issuance, is computed as the difference between the logarithm of gross issues in a given year and the logarithm of the amount of outstanding bonds due in the same year. In this definition the amount due serves as a scaling factor.

A first set of regressions are estimated using a pooled least squares method, with a panel made up of the 13 emerging countries mentioned in Section 2. We use annual data between 1999 and 2005 and thus we aggregate amounts of issues by year. After testing for the significance of several variables among the groups outlined above, the final specifications are presented in Table 5 below.

---

<sup>10</sup> See Annex I for a description of the independent variables.

Table 5

**DEMAND ESTIMATION***(Dependent variable: Net issuance; White Heteroskedasticity Consistent Covariance)*

|   | 1                          | 2                          | 3                          | 4                          | 5                          | 6(*)                       | 7(*)                       |
|---|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Institutional Variables                                   | <b>0.051</b><br>(2.625)    | <b>0.050</b><br>(2.558)    | <b>0.054</b><br>(2.181)    | <b>0.054</b><br>(2.238)    | <b>0.041</b><br>(2.607)    | 0.019<br>(1.140)           | 0.017<br>(1.291)           |
| Inflation Volatility                                      | <b>-18.710</b><br>(-4.690) | <b>-20.721</b><br>(-4.944) | <b>-23.413</b><br>(-4.017) | <b>-22.548</b><br>(-4.392) | <b>-16.576</b><br>(-4.551) | <b>-11.810</b><br>(-4.281) | <b>-11.778</b><br>(-5.288) |
| Log(Public Debt) (t-1)                                    | <b>-1.200</b><br>(-4.035)  | <b>-1.185</b><br>(-3.587)  | <b>-1.647</b><br>(-3.807)  | <b>-1.620</b><br>(-3.572)  | <b>-0.676</b><br>(-2.111)  | <b>-0.696</b><br>(-2.799)  | <b>-0.600</b><br>(-2.966)  |
| Log (Interest Rate)                                       | <b>0.428</b><br>(3.099)    | <b>0.461</b><br>(4.127)    |                            |                            |                            |                            |                            |
| Log(Spread)   |                            |                            | <b>0.293</b><br>(2.660)    |                            | -0.091<br>(-1.078)         | <b>0.181</b><br>(3.139)    | <b>0.215</b><br>(3.596)    |
| Log (SD Interest Rate)                                    | <b>-0.010</b><br>(-2.220)  |                            |                            |                            |                            |                            |                            |
| Log (SD ELMI)   |                            | <u>-0.119</u><br>(-1.995)  | <b>-0.115</b><br>(-2.069)  |                            | -0.020<br>(-0.293)         | -0.003<br>(-0.090)         | -0.049<br>(-1.673)         |
| Sharpe ratio  |                            |                            |                            | <b>0.170</b><br>(2.899)    |                            |                            |                            |
| Time trend  |                            |                            |                            |                            | <b>-0.156</b><br>(-6.042)  |                            |                            |
| Log(Stock of Domestic Credit)<br>(% of bonds at maturity) |                            |                            |                            |                            |                            | <b>0.701</b><br>(5.642)    |                            |
| Log(GDP)<br>(% of bonds at maturity)                      |                            |                            |                            |                            |                            |                            | <b>0.722</b><br>(8.419)    |
| R-squared   | 0.687                      | 0.641                      | 0.598                      | 0.589                      | 0.711                      | 0.817                      | 0.823                      |
| Sum squared residual                                      | 10.408                     | 11.322                     | 12.073                     | 12.324                     | 8.670                      | 5.062                      | 5.048                      |
| Total obs.  | 85                         | 84                         | 75                         | 75                         | 75                         | 64                         | 71                         |

*In bold, at least 5 % significant coeffs; underlined, at least 10% significant coeffs.*

*Two specification tests have been carried out: Jarque-Bera's normality test and autocorrelation test of order one (see Wooldridge 2002, p.274-276 ). Normality is generally accepted and autocorrelation is rejected in all cases. Hence, t-statistics of coefficients are robust to heteroskedasticity only (White's heteroskedasticity consistent covariance matrix).*

*\*\* Argentina is not included in the sample.*

*\*\*The variable is not in log.*

The price variable is measured in two alternative ways: a) as the absolute level of the domestic interest rate; b) as the spread on US government bond yields (Eichengreen and Luengnaruemitchai 2004). Therefore, the first two columns of Table 5 refer to a demand equation where the price variable is a measure of the average domestic interest rate; in the other columns, the price variable is the spread between the domestic interest rate and the

corresponding U.S. interest rates.<sup>11</sup> At this stage, these price variables are assumed to be exogenous. Regardless of the price variable taken into account, some clear results stand out:

1) Institutional variables do matter in determining the amount of local currency bond issues. Indeed the legal framework and the freedom for foreign residents to invest in a country contribute to the growth of local markets and foster issuance of new debt.<sup>12</sup> The demand-related explanation could be that the more developed is the legal system and the property rights established, the more likely are investors, including international ones, to be willing to engage in transactions in local markets.

2) The macroeconomic framework is important as well: the more volatile inflation, the lower the demand for local currency bonds. Volatile inflation can be interpreted as a result of bad economic policy management: macroeconomic instability generates a negative environment for investments, depresses new issues of domestic bonds and makes it more difficult to roll over existing debt. These results confirm previous research based on the analysis of the stock of outstanding bonds (Claessens *et al.* 2003; Eichengreen and Luengnaruemitchai 2004). In addition to those results, we find that a higher public debt to GDP ratio has a negative effect on bond issuance: investors find that highly indebted countries are riskier and thus they shun their debt instruments unless they can earn higher interest rates, as documented by the positive coefficient on the nominal interest rate.

3) As expected in a standard portfolio model, demand for local currency bond is positively related to yields (both expressed in absolute terms and as a spread on US government yields) and negatively related to volatility. We measure the latter either as the volatility of the interest rate variable included in our dataset (column 1) or as the standard deviation of the JP Morgan ELMI+ index (columns 2 and 3).<sup>13</sup> In column 4 we introduce a

---

<sup>11</sup> We are aware that we should also consider expected exchange rate variation or use a covered interest rate parity to model it. Unfortunately forward rates were not readily available for all the currencies in the sample. We therefore tried to include several measures of expected exchange rate, based on available macroeconomic variables including inflation rate differentials, without reaching significant results. In addition, historical exchange rate volatility turned out to be insignificant. See Annex 1 for a detailed description of all the regressors.

<sup>12</sup> The institutional variable is an average of six indicators, three of which closely related to the legal framework and the others to capital account liberalisation (see Annex 1). When introduced separately in the regressions, they generally have the same coefficient, so they have been taken as a single variable in the final specifications.

<sup>13</sup> J.P. Morgan's Emerging Local Markets Index Plus (ELMI+) tracks total returns for local-currency-denominated money market instruments in 24 emerging markets countries. We are aware that we are

measure of the Sharpe ratio, obtained dividing the spread by the standard deviation of the ELMI+: this variable can be viewed, in fact, as an important indicator of asset quality in EMEs that highlights the advantages of the emerging debt asset class in terms of return/volatility.<sup>14</sup> As expected, this measure is significant and its coefficient is positive.

4) The specification in column 5 shows that there is a common significant time trend in the data, meaning that a common dynamics across countries emerges over the sample. The trend makes the coefficient on the spread insignificant: this suggests that, conditioned on the other variables, domestic spreads might have experienced the same generalised reduction recently observed for international bonds denominated in hard currency.

5) In the last two specifications (columns 6 and 7), we tried to account for the dimension of the economy and the degree of financial deepness. In that respect, we used domestic credit as a proxy of the development of the financial and the banking systems,<sup>15</sup> and nominal GDP as a proxy of the size and the potential liquidity of government bond market. The significant sign on domestic credit confirms the evidence found in previous research with respect to a complementary, rather than antithetic, role of the banking system in the development of local currency bond markets (Eichengreen and Luengnaruemitchai 2004, Burger and Warnock 2006a). Banks, in fact, can be intermediaries, acting as market makers, subscribers or even as investors thus contributing to enhance the liquidity - and hence the attractiveness - of local currency bond markets. Burger and Warnock (2006a), indeed, suggest that the debate in the literature on the ‘finance and growth’ nexus might as well shift from the relative merits of bank-based and (equity) market-based financial systems to debt (banking and bonds) versus equity financing. The positive and significant sign of the GDP coefficient confirms that size matters and that large countries have a larger local investor base that fosters issuance.<sup>16</sup>

---

using proxies both for yields and for their volatility, but we couldn’t calculate the actual return because of lack of bond prices series.

<sup>14</sup> This is especially true in Asia (IMF, 2005; BIS, 2004).

<sup>15</sup> Also in Borensztein *et al.* (2006) the size of the domestic financial system is proxied by stock of domestic credit. They note as well that, although when scaled by GDP, local currency bond market capitalization in Latin America lags behind that in the East Asia region and is one order of magnitude smaller than in advanced economies, if we instead scale bond market capitalization by the domestic credit, Latin American markets are larger than those in Emerging Asia, and are respectable when compared to advanced economies.

<sup>16</sup> Note that GDP and the domestic credit variables are scaled to the amount of bonds at maturity in the year. This amounts at regressing gross issuance, rather than net issuance, on those variables.

So far, yields have been assumed to be exogenous. However, this approach has a serious drawback in that, since quantities and prices are simultaneously determined, a simple OLS estimation is inconsistent.<sup>17</sup> In order to address this problem we resort to an instrumental variable estimator (Burger and Warnock, 2006b) for the bond yields. Obviously, in-sample, a single equation IV estimate is bound to be biased, although it provides consistent estimates.

Table 6 hosts the results of four out of the six columns in the original regression (columns 1, 3, 6, 7 in Table 5), obtained by instrumenting interest rate and spread with lagged inflation, assumed as predetermined and hence orthogonal to the shocks in the current demand equation. We choose to use lagged inflation as an instrument since interest rates and spreads are expressed in nominal terms so that they are correlated with domestic prices. As expected, the instrument - conditioned on the other exogenous variables - turns out to be highly correlated with the two endogenous variables.<sup>18</sup> Therefore, these new regressions can be effectively interpreted as demand schedules for domestic bonds, supposing that no other simultaneous effects are at play.

Table 6 confirms that good institutions do have a positive effect on demand for local currency bonds. More volatile inflation, on the contrary, depresses demand. Finally, public debt over GDP has a negative impact on demand for local currency bonds, since a high ratio might signal a riskier country. Compared to OLS estimates, it is worth pointing out that, although the exogenous variables basically display similar coefficients, those relative to the instrumented interest rate and spread significantly change, as preliminary evidence of price endogeneity, particularly the latter: the elasticity of the demand of local currency bonds to spread almost doubles from 0.29 to 0.52.

---

<sup>17</sup> Potentially there could be other endogenous variables (i.e. risk appetite, domestic creditworthiness), that would require a system of more than two equations to model demand and supply. The complexity involved by such a model goes beyond the scope of this paper.

<sup>18</sup> First stage regressions show high  $R^2$  (around 0.90) and the coefficients display the expected sign: the higher the inflation, the higher the nominal yield or the spread on the bonds to be issued.

Table 6

### INSTRUMENTAL VARIABLE ESTIMATES

*(Dependent variable: Net issuance; White Heteroskedasticity Consistent Covariance)*

|  | A                          | B                         | C*                         | D*                         |
|--|----------------------------|---------------------------|----------------------------|----------------------------|
| Institutional Variables  | <b>0.051</b><br>(2.865)    | <u>0.052</u><br>(1.898)   | <b>0.018</b><br>(1.245)    | <b>0.016</b><br>(1.379)    |
| Inflation Volatility   | <b>-19.238</b><br>(-5.313) | <b>-23.927</b><br>(4.188) | <b>-10.857</b><br>(-6.084) | <b>-11.017</b><br>(-7.965) |
| Log(Public Debt) (t-1)   | <b>-1.164</b><br>(4.802)   | <b>-1.747</b><br>(-5.334) | <b>-0.665</b><br>(-2.591)  | <b>-0.563</b><br>(-3.105)  |
| IV Log(Interest rate)  | <b>0.559</b><br>(5.127)    |                           |                            |                            |
| IV Log(Spread)   |                            | <b>0.522</b><br>(-4.020)  | 0.052<br>(0.332)           | 0.129<br>(1.422)           |
| Log (SD Interest rate)   | <b>-0.008</b><br>(-2.153)  |                           |                            |                            |
| Log (SD ELMI)  |                            | <u>-0.012</u><br>(-1.730) | -0.003<br>(-0.076)         | -0.049<br>(-1.632)         |
| Log(Stock of Domestic Credit)<br><i>(% of bonds at maturity)</i> |                            |                           | <b>0.718</b><br>(6.282)    |                            |
| Log(GDP)<br><i>(% of bonds at maturity)</i>                      |                            |                           |                            | <b>0.738</b><br>(9.762)    |
| R-squared  | 0.705                      | 0.576                     | 0.811                      | 0.821                      |
| Sum squared residual   | 9.786                      | 12.589                    | 5.208                      | 5.116                      |
| Total obs.   | 84                         | 74                        | 64                         | 71                         |
| Significance of instruments (p-value of t/F test)                |                            |                           |                            |                            |
| Log(inflation)(t-1)  |                            | 0.0000                    | 0.0000                     | 0.0000                     |
| Log(inflation)(t-1); Log(inflation)(t-2)                         | 0.0000                     |                           |                            |                            |
| Hausman's test of endogeneity (p-value)                          | 0.098                      | 0.081                     | 0.442                      | 0.453                      |

*In bold, at least 5 % significant coefficients; underlined, at least 10% significant coeffs.*

*Two specification tests have been carried out: Jarque-Bera's normality test and autocorrelation test of order one (see Wooldridge 2002, p.274-276 ). Normality is generally accepted and autocorrelation is rejected in all cases. Hence, t- statistics of coefficients are robust to heteroskedasticity only (White's heteroskedasticity consistent covariance matrix).*

*\* Argentina is not included in the sample.*

As a formal test of exogeneity of the instrumented price variables, we carried out the Hausman's test in the version suggested by Wooldridge (2002). In practice, we included in



the initial OLS estimation the residuals coming from IV first-stage regression of the endogenous on the instrument and all the other exogenous variables.

Evidence of endogeneity would amount to finding these residuals significant in the OLS regression. Exogeneity is rejected at 10 percent in the specifications in columns A and B – characterised by yields and volatility – while it is accepted when the development of financial market is taken into account (columns C and D).

Overall, therefore, endogeneity cannot be ruled out. Such a result suggests that modelling the supply side of the market could potentially add useful information and that perhaps we should challenge our initial assumption that what matters is only the demand side. We try to address this issue in the following section.

### 3.2 *The supply side*

As already mentioned above, in a market in equilibrium price and quantity are simultaneously determined by both demand and supply; therefore, in a single equation model of demand, it is correct to assume that at least prices (yields) are endogenous. In the previous paragraph we tackled the problem of price endogeneity through an instrumental variable approach. This allowed us to overlook, at least in terms of consistency of our estimations, the supply side of the market.

In this section, we go a step further and try to estimate the supply of local currency bonds. To our knowledge, there have been only a few attempts in this direction:<sup>19</sup> as already noted, most of the empirical work does not distinguish demand from supply factors;<sup>20</sup> in other cases a demand-driven approach is followed without testing this assumption.<sup>21</sup>

---

<sup>19</sup> FitzGerald and Krolzig (2005) have recently carried out a joint estimation of flows and yields, applied to the estimation of the demand schedule for US investors acquiring emerging market bonds during 1993-2001. A two-equation reduced form model is tested on monthly data using the general-to-specific approach.

<sup>20</sup> See, among others, the recent Mehl and Reynaud's (2005) work.

<sup>21</sup> See, among others, the recent Burger's and Warnock's (2006a) work.

We have specified the supply of local currency bonds in terms of net issuance as a function of the domestic spread - as already defined above -<sup>22</sup> and other exogenous regressors. The domestic spread measures the cost of borrowing for the issuer; therefore, its coefficient is expected to be negative in a supply schedule. Among exogenous variables, we include the spread on global issues.<sup>23</sup> While until recently EMEs suffered from the “original sin”, nowadays they are able to issue in domestic currency in local markets. Being EMEs confronted with the choice on where to issue (CGFS 2007), it seems important to allow for the opportunity cost of local currency issuances, represented by the sovereign spread that governments have to pay when issuing abroad. For this purpose, this opportunity cost is measured by means of the respective spread on JP Morgan EMBI Global index. As global issuance is an alternative way to meet financing needs, its coefficient is supposed to be positive: the lower is the opportunity cost of borrowing in foreign currency, the lower net domestic issuance will be.

Net issuance in domestic markets might depend on other variables such as the government’s financing needs as well as on the same institutional variables that were significant in determining the demand schedule. The institutional setting is important and is expected to be positively correlated with issuance activity: good institutions, as well as a better legal framework, are generally a prerequisite for the development of the market infrastructures (efficient clearing and settlement system, transparency regulation, etc.) needed to foster the ability to issue in local markets.

Finally, an index of metal prices is also added. Many EMEs, in fact, are commodity exporters and largely benefited - in terms of reduced borrowing needs - from the increase in prices observed in the last years; therefore, this variable is expected to have a negative effect on net issuance.

---

<sup>22</sup> When the price variable is measured by interest rate, results are similar; for brevity’s sake, we do not show the results, but they are available from the authors upon request.

<sup>23</sup> The interest rate spread on global issues is not adjusted for exchange rate risk. Implicitly, it is assumed that the exchange rate is expected neither to appreciate nor to depreciate in a systematic way during the life of the bonds. For most of the countries in the sample and for the sample period under consideration, this assumption is not totally unreasonable, given the significant narrowing of inflation differentials vis-à-vis advanced countries. In any case, it would be very difficult to find a good proxy for the expected rate of exchange rate depreciation/appreciation.

The results of both OLS and IV estimations are presented in Table 7,<sup>24</sup> which underscores some interesting findings.

Table 7

|   | LS                               |                                  | IV                               |                                  |
|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
|   | 1                                | 2                                | 3                                | 4                                |
| Log(spread)                             | <b>-0.309</b><br><u>(-2.870)</u> | <b>-0.340</b><br><u>(-3.007)</u> | <b>-1.095</b><br><u>(-2.168)</u> | <b>-1.076</b><br><u>(-2.478)</u> |
| Log(international spread)               | <b>0.593</b><br><u>(5.692)</u>   | <b>0.545</b><br><u>(5.674)</u>   | <b>1.038</b><br><u>(4.116)</u>   | <b>0.900</b><br><u>(4.075)</u>   |
| Institutional Variables                 | <b>0.044</b><br><u>(2.037)</u>   | <b>0.044</b><br><u>(2.053)</u>   | <b>0.047</b><br><u>(3.273)</u>   | <b>0.047</b><br><u>(3.022)</u>   |
| Metal price                             |                                  | -0.004<br><u>(-1.656)</u>        |                                  | <u>-0.009</u><br><u>(-1.922)</u> |
| R-squared                               | 0.538                            | 0.547                            | 0.302                            | 0.348                            |
| Sum squared resid.                      | 12.200                           | 11.970                           | 18.439                           | 17.214                           |
| Total obs.                              | 73                               | 73                               | 73                               | 73                               |
| Significance of instruments (p-value)   |                                  |                                  | 0.0000                           | 0.0000                           |
| Hausman's test of endogeneity (p-value) |                                  |                                  | 0.000                            | 0.001                            |

*Two specification tests have been carried out: Jarque-Bera's normality test and autocorrelation test of order one (see Wooldridge 2002, p.274-276 ). Normality is generally accepted and autocorrelation is rejected in all cases. Hence, t-statistics of coefficients are robust to heteroskedasticity only (White's heteroskedasticity consistent covariance matrix). In bold, at least 5 % significant coefficients; underlined, at least 10% significant coeffs.*

First of all, the supply of local currency bond is much more elastic than demand, as shown by the higher coefficient for the spread. This outcome is partially supportive of the assumption of a demand-driven market, in that changes in the observed flows of net issues reflects mostly shifts in the demand schedule than in the supply.

As expected, the coefficient on the international spread (JP Morgan EMBI Global) has a positive sign, meaning that the higher is the cost of issuing on international markets the higher

<sup>24</sup> Lagged inflation volatility turns out to be a good instrument for the spread. We also tried to instrument the domestic spread with lagged inflation, as already done in the demand schedule estimation, but conditioning on the other exogenous variables it turned out to be uncorrelated.

is the net issuance on local markets. When corrected for endogeneity, elasticity of supply to foreign and domestic spread is of the same magnitude suggesting that, from an issuer's point of view, local and international bonds are alternative ways of financing.

Moreover, the effect of metal price is weak but not negligible: as already mentioned, it controls for the reduced financial needs across most EMEs, due to increased budget revenues.

Finally, institutional variables have the same positive impact on supply as the one observed on the demand side (see Table 5).

In order to identify the supply function, we had to specify an equation with at least one regressor not already included in the demand function, i.e. the average spread on JP Morgan EMBI Global and the metal price index. Factors affecting demand could be relevant on the supply side as well, but they should appear with the expected sign according to economic theory. For instance, institutional variables are significant on both the demand and supply sides; on the contrary, public debt on GDP has a negative coefficient and must be excluded from the supply function.<sup>25</sup> Exogeneity of spread is strongly rejected, as shown by Hausman's test: OLS and IV coefficients of domestic and international spreads differ substantially.

The evidence of endogeneity of price variables in both demand and supply equation (although weak for the former) suggests that estimating a simultaneous system could be a useful device. Unfortunately, with the data available and after many attempts with an ample set of variables, we conclude that it is statistically impossible to identify such a system. Although we initially managed to identify the two curves by means of some identification restrictions drawn from economic theory, such restrictions have not subsequently passed the standard over-identification test on the residuals of the system estimated through a 2SLS procedure. This is not necessarily bad news. In fact, system procedures are more efficient than a single equation IV procedure only if all the equations of the system are correctly specified. Viceversa, if just one equation is misspecified, system estimations of all parameters are generally inconsistent. In that respect, single equation methods are more robust.<sup>26</sup> The drawback of not identifying a system is that we cannot consider the single equations in the IV

---

<sup>25</sup> In principle, it would be desirable to have a budgetary variable to control for changes in the government's financing needs. Hence, we tried government revenues, expenses and government balance on GDP, but this variables turned out to be insignificant. We therefore dropped them from the final specifications in Table 6.

<sup>26</sup> See Wooldridge (2002), p.222.

approach as structural equations of the demand and the supply side of the market. Their coefficients, while consistently estimated, are likely to be a combination of supply and demand factors; nevertheless this problem does not appear to be substantial on the demand side, due to the weak evidence of endogeneity as highlighted by Hausman's test.

#### **4. Determinants of long-term borrowing**

There is growing awareness that a major reason why EMEs are more prone to financial crises than mature economies is the composition of their debt. Many of them are compelled to borrow either in foreign currency or at short-term maturities or to resort repeatedly to instruments with indexation features. The drawbacks and risks of excessive reliance on short-term debt are well known (see for instance Mehl and Reynaud, 2005):

- It exposes borrowers to rollover risk and interest rate risk and increases vulnerabilities to volatile capital flows.
- It may discourage central banks from increasing policy rates in order to fight inflationary pressures.
- When a large share of their debt is short-term, countries can experience maturity mismatches and liquidity risk if their assets are illiquid.
- Indexation – to either short-term interest rates, a price index or the exchange rate – renders liabilities uncertain and increases their burden in bad times.

In addition, the lack of markets for long-term bonds can lead to:

- An inadequate range of assets available for local investors, in particular institutional investors. Pension funds and insurance companies, in fact, need assets that match their long-term liabilities.
- Concentration of credit and maturity risks in banks, which in the absence of markets for long-term bonds, become the only source of long-term local currency financing.
- Lack of a complete benchmark yield curve, which is essential for monitoring market reactions to monetary policy moves and is a prerequisite for the development of a full array of tools to manage financial risk in private bond markets.

From a policy and financial stability perspective, investigating the factors that can increase maturity of domestic debt becomes crucial, especially now that domestic debt has become the an increasingly important instrument to meet the financial needs of emerging

economies. An additional reason to focus on long-term bonds is that in some EMEs the issuance of large amounts of short-term instruments may be driven in part by special factors, such as the need to sterilize the effects of the accumulation of official reserves (Mohanty and Turner 2006).

Owing to the lack of regular issues in all countries at longer maturity, we lump together both medium and long-term bonds, i.e. all those with maturity above one year. The dependent variable is now the difference between the logarithm of gross long-term issues and the logarithm of the amount of outstanding bonds due in the same year.<sup>27</sup> On the right hand side we tried the same determinants used in the case of the entire sample (see Table 5, columns 3) except for the interest rate, which is computed as an average yield on the bonds in our sample with maturity above one year.<sup>28</sup> Our preliminary estimates confirm that demand for long-term bonds is closely connected to the quality of institutions and macroeconomic stability. Also the long term interest rate turns out to be significant and with the expected sign.

Table 8

### DEMAND FOR LONG-TERM BONDS

*(Dependent variable: Net issuance; White Heteroskedasticity Consistent Covariance)*

|                               | OLS                        | IV                         |
|-------------------------------|----------------------------|----------------------------|
| Institutional Variables       | <b>0.054</b><br>(2.296)    | <b>0.055</b><br>(2.311)    |
| Inflation Volatility          | <b>-21.397</b><br>(-5.239) | <b>-21.653</b><br>(-5.300) |
| Log(Public Debt) (t-1)        | -0.171<br>(-0.434)         | -0.225<br>(-0.522)         |
| Log (Long-term Interest Rate) | <u>0.431</u><br>(1.933)    | <b>0.551</b><br>(2.753)    |
| R-squared                     | 0.510                      | 0.520                      |
| Sum squared resid.            | 71.157                     | 69.652                     |
| Total obs.                    | 84                         | 83                         |

*In bold, at least 5 % significant coefficients; underlined, at least 10% significant coeffs.*

<sup>27</sup> We leave out of the denominator bonds and notes that are issued and expire in the same year to make it comparable with the numerator thus avoiding the over counting of short term issues that are rolled over with other short term issues.

<sup>28</sup> We also did not put any measure of standard deviation of long term interest rates because the lack of comprehensive data series on either prices or yields.

From a policy perspective, these results match those of Mehl and Reynaud (2005), who found that sound macroeconomic policies (on the monetary front, in particular), along with attractive long-term yields and the lifting of restrictions in capital markets, help the move to longer-term instruments. It is also worth recalling that our institutional variable captures, to a certain extent, the effect of regulation in capital markets on the development of local currency bond markets.<sup>29</sup>

## 5. Conclusions

This paper contributes to the existing literature on the developments of local currency bond markets in EMEs in several ways. The literature has so far concentrated on the determinants of the outstanding stocks as a measure of development of such markets. In our paper we use a new dataset that collects information on individual issues, instead. Data are taken from Bloomberg for a set of 13 countries, over the period ranging from 1999 to 2005. The new dataset allows us to shed some light on the pattern of net issuance activity and the different determinants of demand and supply for local currency government bonds. By recurring to instrumental variable techniques we are able to control for simultaneity of yields and quantity issued.

On the demand side, our findings suggest that good institutions and sound macroeconomic policies (resulting in low volatility of inflation and low levels of public debt) do foster demand for local currency bonds. In line with standard portfolio theory, we find that the demand for local currency bonds is positively related with returns and negatively with their volatility. We also find that the size of the economy (as suggested by a large GDP) as well as the deepness of the financial system (as proxied by a high stock of domestic credit to the private sector) are important to underpin the demand for such instruments. The weak evidence of endogeneity problems, as highlighted by Hausman's test, seems to suggest that we obtain reasonable estimates for the demand schedule.

---

<sup>29</sup> When we use the legal framework and the capital account liberalization indicators separately, only the latter is strongly significant. Such results would suggest that long-term bonds are more attractive to foreign investors, whose presence is made easier when capital account transactions are less regulated. As a caveat, though, one should mention that this analysis overlooks the role played domestic institutional investors, that could be potential buyers of longer term bonds. Also because of the presence of large measurement errors in this kind of indicators, we do not carry much weight on these results.

We also estimated the supply function, explained by domestic yield, the opportunity cost of issuing on international markets, the quality of institutions and an index of metal prices. We found that the higher is the cost of issuing on international markets the higher is the net issuance on local markets. The same magnitude of elasticity of supply to foreign and domestic spread seems to suggest that, from the issuer's point of view, local and international bonds are alternative ways of financing.

Our estimates for long-term bonds confirm the previous results obtained considering bonds of all maturities: demand is closely connected to the quality of institutions, macroeconomic stability and interest rate.

Future research should aim at extending the analysis of this paper in several respects. First, the analysis could be further broadened by taking on board the already available information on the types of domestic issuance (e.g. fixed vs. floating) addressing the "domestic" original sin topic. In addition, although the original 13 countries of our analysis represent the bulk of the issuance activity on local currency bond markets, more countries might be added to test the robustness of the conclusions. Likewise, corporate issues could be considered: this would allow to investigate the investors' behaviour toward different types of issuers. Finally, lack of identification of a structural system for demand and supply points at the need for further effort on the determinants of the supply. This could be done taking on board more data on the behaviour of issuers to supplement information contained in macroeconomic data.



## Annex 1

The data sources for the variables used in this paper are the following:

| Variable                | Source  |
|-------------------------|---|
| Institutional Variables | <p><a href="http://www.freetheworld.com">http://www.freetheworld.com</a></p> <p>The institutional variable is an average of six indicators that look at: a) the dependence of the judiciary from the government and political parties; b) the impartiality of courts and whether a trusted legal framework exists for private businesses to challenge the legality of government actions or regulation; c) the integrity of the legal system; d) the freedom to own foreign currency bank accounts domestically and abroad; e) the access of citizens to foreign capital markets and foreign access to domestic capital markets; f) restrictions on the freedom of citizens to engage in capital market exchange with foreigners.</p> |
| Inflation volatility    | <p>EIU, IMF-IFS, National Sources.</p> <p>Inflation is computed as the percentage annual change of consumer prices. Annual inflation volatility is the standard deviation of quarterly inflation each year.</p>   |
| Public Debt             | EIU, IMF-Government finance statistics Yearbook, IMF-IFS, World Bank  |
| International Spread    | <p>JP Morgan, Bloomberg</p> <p>The international spread is computed for each country as an average of daily observation for the JPMorgan EMBI Global Index. Whenever the EMBIG was not available we used the spread of quasi-government issues.</p>   |
| Metal Prices            | <p>Bloomberg.</p> <p>The variable is computed as the average annual returns on the following commodities: gold, silver, palladium, aluminium, copper, lead and zinc.</p>  |
| GDP                     | <p>EIU, World Bank</p> <p>The GDP variable is at purchasing power parity</p>  |

|                          |  |
|--------------------------|--|
| Stock of Domestic Credit | Bank lending to public and private; IMF-IFS, National Sources, EIU data  |
| Interest rate            | <p>Authors' calculations on Bloomberg, IMF-IFS and EIU data.</p> <p>The variable was computed as a weighted average (by the amount issued in US\$) of the yields to maturity from each issue. For the issues where market data was not available (i.e. we lacked the price) we filled the gaps according to the following procedure:</p> <ul style="list-style-type: none"> <li>- First of all we computed average yield to maturity in the dataset, taking into account bonds for which market data was available. In doing so we split the sample in two, according to maturity: short term debt, with maturity less than a year, and long term debt, with maturity above one year. After this step we obtained two grids of interest rates along two dimensions: time and countries. Any remaining gap in these grids was filled with IFS-IMF and EIU data in that order.</li> <li>- We then used the two grids described above to assign an interest rate to the observations in the original dataset for which we were not able to derive a market rate. In this way we are conscious that we used an average measure for all missing values, but we were at least able to discriminate between short term and long term debt.</li> </ul> |
| Spread                   | <p>Authors' calculations on Bloomberg, IMF-IFS and EIU data.</p> <p>The variable was computed as a weighted average (by the amount issued in US\$) of the differences between the yield to maturity of local currency bonds (as computed in the Interest rate variable above) and the yield of the U.S. Treasury bond/bill with corresponding maturity.</p>  |
| SD Interest rate         | <p>Authors' calculations on Bloomberg, IMF-IFS and EIU data.</p> <p>The variable is the standard deviation of the "Interest rate" variable above mentioned.</p>  |
| SD ELMI                  | <p>Authors' calculations on JPMorgan data.</p> <p>The variable is the annual volatility of the ELMI+ index, based on daily index levels.</p>   |

## References

- BIS (2003) "Guide to the international financial statistics", *BIS Papers No 14*, Monetary and Economic Department, February 2003
- BIS (2004) "Diversifying with Asian local currency bonds", *BIS Quarterly Review, International banking and financial market developments*, Sept.
- Bordo, M.D. (2006), "Sudden Stops, Financial Crises and Original Sin in Emerging Countries: Déjà vu?", *NBER Working Paper Series, N° 12393*, July, Cambridge MA.
- Borensztein, E. Chamon, M. Jeanne, O. Mauro, P. Zettelmeyer, J. (2004), "Sovereign Debt Structure for Crisis Prevention", *IMF Occasional Paper n° 237*, Washington D.C.
- Borensztein, E. Eichengreen, B. Panizza, U. (2006), "Debt Instruments and Policies in the new Millenium: New Markets and New Opportunities", *Inter-American Development Bank WP N°558*, Prepared for the annual meeting of the Board of Governors, Belo Horizonte.
- Burger, D. Warnock, F.E. (2006a), "Local Currency Bond Markets", *NBER Working Paper Series, N° 12552*, September, Cambridge MA.
- Burger, D. Warnock, F.E. (2006b), "Foreign Participation in Local Currency Bond Markets.", *NBER Working Paper Series, N° 12548*, September, Cambridge MA.
- Calvo, G.A. (2003), "Explaining Sudden Stop, Growth Collapse, and BOP Crisis: The Case of Distortionary Output Taxes", *IMF Staff Papers, Vol. 50, Special Issue*, Washington D.C..
- Catão, L.A.V. (2006), "Sudden Stops and Currency Drops: A Historical Look", *IMF Working Paper N° WP/06/133*, Washington D.C..
- CGFS (2007), Report of the Working Group on Financial Stability and Local Currency Bond Markets, *Bank for International Settlements*, forthcoming, Basel
- Claessens, S. Klingebiel, D. and Schmukler S. (2003), "Government Bonds in Domestic and Foreign Currency: The Role of Macroeconomic and Institutional Factors", *CEPR WP N° 3789*, London.
- Eichengreen, B. Hausmann, R. Panizza, U. (2003), "Currency Mismatches, Debt Intolerance and Original Sin: Why They Are not the Same and Why it Matters", *NBER Working Paper Series, N° 10036*, October, Cambridge MA.
- Eichengreen, B. Luengnaruemitchai, P. (2004), "Why Doesn't Asia Have Bigger Bond Markets?", *NBER WP N° 10576*, Cambridge, MA.
- FitzGerald V. (2002) The Instability of the Emerging Market Assets Demand Schedule, United Nation University, *WIDER Discussion Paper No. 2002/80*.

- FitzGerald, V. Krolzig, D. (2005), "Modelling the Demand for Emerging Market Assets", *Financial Economics Working Paper FE-10*, Oxford University, Oxford.
- Flood, R. Marion, N. (2006), "Getting Shut Out of the International Capital Markets: It Doesn't Take Much", *IMF Working Paper N° WP/06/144*, Washington D.C..
- International Monetary Fund (IMF), (2003), "Local Securities and Derivatives Markets in Emerging Markets: Selected Policy Issues", *Global Financial Stability Report*, March 2003, Washington D.C..
- International Monetary Fund(IMF) (2005), "Global Financial Market Developments", *Global Financial Stability Report*, September 2005, Washington D.C..
- Hausmann R.and U. Panizza (2003), "On the determinants of Original Sin: an empirical investigation", *Journal of International Money and Finance*, 22, 957–990.
- Mathieson, D.J. Roldos, J.E. Ramaswamy, R. Ilyina, A. (2004), "Emerging Local Securities and Derivatives Markets", *International Monetary Fund Selected Topics*, Washington D.C..
- A. Mehl, J. Reynaud (2005), "The determinants of domestic original sin in emerging market economies", *ECB Working Paper*, no.560
- Mody, A., and M. P. Taylor (2001), 'International Capital Crunches: The Time-Varying Role of Informational Strategies', *IMF Working Paper 02/43*, Washington.
- Mohanty M.S. and P. Turner (2006) Foreign exchange reserve accumulation in emerging markets: what are the domestic implications?, *BIS Quarterly Review*, sept.
- Pericoli, M. Sbracia, M. (2003), "A primer on Financial Contagion", *Journal of Economic Surveys Vol. 17 N° 4*, Oxford.
- Wooldridge J. M. (2002), *Econometric Analysis of Cross-Section and Panel Data*, MIT Press.