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**Indicators of Currency Crisis: Empirical
Analysis of Some Emerging and Transition
Economies**

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Abstract

This paper focuses on the measurement of a contemporaneous currency crisis. The analysis covers 14 "emerging" or "transforming" economies that experienced episodes of currency crises over the last decade. It adds to well-known examples relatively little-known evidence on the crisis depth in some of the CIS countries. Following the Eichengreen, Rose, and Wyplosz (1994) definition of a currency crisis, the emphasis is primarily put on the examination of changes in relative reserves, exchange rates, and real interest rates during periods of exchange rate pressure. Other measures of the depth of a currency crisis as well as measures of external vulnerability are also discussed. The findings support the adequacy of the Eichengreen, Rose, and Wyplosz (1994) definition in analyzing crisis developments in emerging economies.

I. Introduction

The aim of this paper is to provide a comprehensive definition of a contemporaneous currency crisis and to illustrate this definition by examples of currency crises of the 1990s. The discussion follows a text on theoretical aspects of currency crises [Antczak, 2000], where the occurrence of such crisis is described [after Eichengreen et al., 1994] as a change in either a country's exchange rate, its level of foreign reserves, or its interest rates. Thus, in the following parts, there is an illustration of what was happening with these – and some other – macroeconomic variables during the times of most recent currency crises.

In order to give some background, the research starts from description of pre-crisis developments that show external vulnerability of countries in question. The analysis is restricted to so called "emerging" or "transforming" economies. And adds to the well-known examples relatively little known evidence on the crisis depth in some of the CIS countries. The paper concludes with the assessment of the adequacy of proposed definition in the measurement of recent crises.

2. Definition and Types of Financial Crises

Financial crises are usually grouped into the three broad categories: currency crises, banking crises, and foreign debt crises [Aziz et. al, 2000]. A **currency crisis** occurs when a speculative attack on a currency results in a sharp devaluation (or depreciation) of the exchange rate, or when authorities try to defend the currency using its foreign reserves or sharply raising interest rates [Eichengreen et. al, 1994]. A **banking crisis** usually demonstrates itself in bank runs or failures which "induce banks to suspend the internal convertibility of their liabilities or which compel the government to intervene to prevent this by extending assistance on a large scale" [Aziz et. al, 2000: 5]. The causes of banking crisis frequently lie in a prolonged deterioration of banks' assets quality. When a country cannot service its foreign debt, we speak about the **debt crisis**.

However, there are many cases, where elements of all or of any two of the described types of financial crises may take place simultaneously. Moreover, one type of crisis may develop itself into another. This is to say that often the symptoms of a currency crisis may be also linked with other financial problems in the economy, and it is sometimes hard to

isolate the "pure" currency case. There are examples of both simultaneous symptoms of banking, currency, and debt crisis (East Asia, Mexico), as well as banking crisis preceding currency crisis (Bulgaria) in the countries included in the sample.

This paper concentrates on the *measures of a currency crisis*. Following Eichengreen, Rose, and Wyplosz (1994), the attention is primarily put on the examination of changes in relative reserves, exchange rates, and real interest rates during periods of exchange rate pressures. Because one of the aims of this study is to describe the currency crises, some other symptoms of the loss of confidence in domestic money are also included. These are: shrinking money demand and sudden real exchange rate depreciation.

Since the measurement and dating of currency crises pose some difficulties, episodes of significant currency pressures were identified *ex ante*, based on existing information in the economic literature on the subject. Only then statistical tools were applied to describe their characteristics.

The analysis covers 14 emerging economies that experienced episodes of currency crises over the last decade. These are: Argentina (1995 crisis), Brazil (1999), Bulgaria (1997), the Czech Republic (1997), Georgia (1998), Indonesia (1997), Korea (1997), the Kyrgyz Republic (1998), Malaysia (1997), Mexico (1994), Moldova (1998), Russian Federation (1998), Thailand (1997), and Ukraine (1998) [1]. Due to the lack of data on individual time series, some of these countries had to be excluded from discussion on particular indicators.

The rest of the paper is organized as follows: reserve-based indicators of external vulnerability plus real exchange rate developments are discussed first, followed by the fall in reserves and nominal depreciation at a crisis date, then by the sudden fall in demand for money, and interest rates differentials. Assessment of the adequacy of proposed definition of the measurement of recent currency crises is given in conclusions.

3. Indicators of External Vulnerability to a Financial Crisis

Warning signals of financial distress had been present in the majority of sample economies months before the currency crisis hit. This part shows how financially fragile these economies have been by comparing pre-crisis reserve-based indicators of external vulnerability and real exchange rate developments.

[1] More precise timing of each crisis is given in Table 2.

3.1. Reserves in Months of Imports

The traditionally used measure in assessing the reserve adequacy is external reserves in months of imports of goods and services. It is a useful indicator of reserve needs for countries with limited access to capital markets. However, since there is no reference to capital account, it is claimed that there is a weak relation between reserves over imports and the occurrence or depth of crises in the more recent periods of financial turmoil [IMF, 2000].

It is commonly agreed that three months is the minimum period during which a country can continue to support its current level of imports if all other inflows and outflows cease. As it can be seen from Table 1, this condition has never been met by Ukraine, Russia, Georgia, the Kyrgyz Republic, and Mexico. On the contrary, East Asian countries and Brazil recorded relatively safe reserves to imports ratio in 1997 and in 1998. Foreign reserves held by Argentina in 1995 fell when compared to previous years, but were still sufficient to support, on average, more than 4 months of imports.

The low ratio of reserves in terms of imports does not seem to describe well crisis economies included in the sample, therefore there is a need to examine other measures of reserve adequacy.

3.2. Reserves over Short-term External Debt

Measure that compares net reserves to short-term external debt captures well risks associated with adverse developments in international capital markets. It shows how quickly a country would be forced to adjust if it were cut off from external borrowing [IMF, 2000]. It is claimed that this is the most important indicator of reserve adequacy in countries with significant but uncertain access to capital markets. A smaller ratio suggests greater incidence and depth of crisis [IMF, 2000].

IMF suggests that reserves should at least exceed official and officially guaranteed short-term debt [IMF, 2000: 15]. The most recommended period for judging the reserves to short-term debt ratio is the month prior to the crisis date, that is before a crisis took full effect and impacted reserve levels.

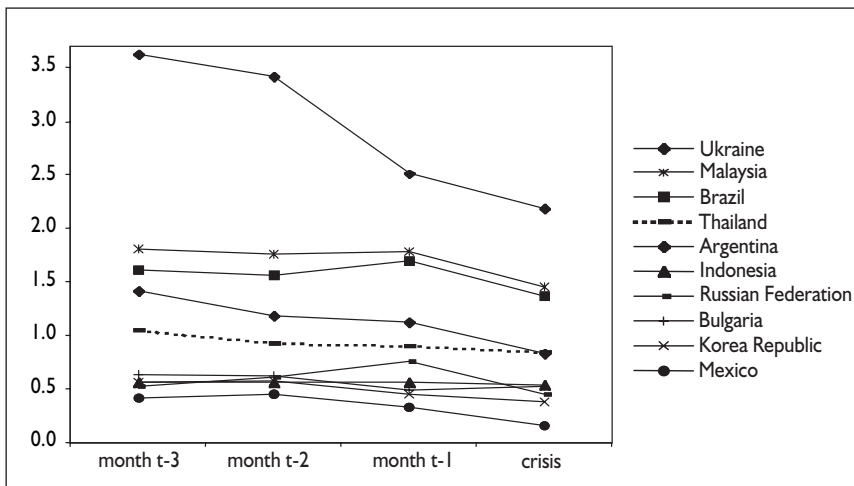
Table I. Reserves in Months of Imports

| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|-----------------|-------|-------|-------|-------|-------|-------|-------|
| Argentina | 4.289 | 4.917 | 6.181 | 4.280 | 4.722 | 5.989 | 7.044 |
| Brazil | 5.701 | 5.884 | 6.976 | 6.905 | 8.219 | 8.612 | 8.813 |
| Bulgaria | | | 1.796 | 3.175 | 1.488 | 3.421 | 6.085 |
| Czech Republic | | 1.247 | 2.013 | 3.531 | 4.663 | 3.778 | 3.943 |
| Georgia | | | | | 2.280 | 1.869 | 1.812 |
| Indonesia | 3.311 | 2.966 | 2.438 | 2.563 | 3.071 | 5.569 | 5.453 |
| Korea | 1.935 | 1.979 | 1.711 | 2.019 | 2.418 | 3.131 | 4.182 |
| Kyrgyz Republic | | 1.165 | 0.413 | 0.873 | 1.365 | 1.473 | 2.029 |
| Malaysia | 3.375 | 3.411 | 4.351 | 3.304 | 3.273 | 4.355 | 3.720 |
| Mexico | 2.926 | 2.989 | 2.775 | 1.437 | 1.707 | 2.139 | 2.642 |
| Russian Fed. | | 1.083 | 0.761 | 1.223 | 1.649 | 2.806 | 1.823 |
| Thailand | 4.461 | 4.421 | 4.053 | 4.782 | 6.774 | 7.989 | 6.856 |
| Ukraine | 0.657 | 0.180 | 0.101 | 0.708 | 0.635 | 1.867 | 1.304 |

Source: Own calculations on the basis of data from IFS, Bulgarian National Bank, Georgian Economic Trends No. 1/2000, and Ukrainian Statistical Bulletin.

Notes: Average level of total reserves minus gold and imports over the next 12 months is used. Actual data on imports are included only in the ratios for 1998.

Figure 1. Reserves over Short-term Debt



Source: Own calculations on the basis of IFS, Global Development Finance, and World Development Indicators databases.

Notes: The stock of reserves is taken from the months prior to the crisis dates, and at the crisis dates. Crisis dates are listed in Table 1. Short-term external debt is the end-year value reported in GDF.

If we were to characterize the pre-crisis vulnerability by the reserves to short-term debt ratio, Mexico, Korea, Indonesia, Russia, Bulgaria, and Thailand would be among most severely affected, with international reserves well below their short-term debt obligations. Argentina also recorded a very low level of reserves to short-term external debt ratio, but no earlier than at the crisis date. Although the ratio declines for Malaysia and Brazil the closer we move to the crisis date, with its value above 1.5 it still does not indicate any danger of a currency crisis. High values for Ukraine (above 4) and – probably – Moldova reflect improper classification of reserves.

3.3. Reserves to Reserve Money

The vulnerability of an economy to a financial turbulence can be also captured by the developments in the ratio of reserves to a measure of money. The problem, however, appears when deciding which monetary aggregate should be used. Traditionally, it is the ratio of reserves to broad money. Yet, this poses difficulties, as it is hard to interpret when the demand for money is generally low. Another puzzle is connected with the inclusion

of hard currency deposits in the broad money aggregates. It is then hard to differentiate between a change in the demand for domestic currency and a demand for foreign currency.

The analysis of evolution of hard currency deposits held in commercial banks during the crises (see the Appendix) shows the validity of this last doubt. The section on money demand further confirms the inappropriateness of looking at the broad money aggregates in the case of low-monetization countries of our sample.

Therefore, in assessing the financial fragility of an economy, author concentrates here on the ratio of gross reserves to reserve money (the latter otherwise known as monetary base). This measure has obvious advantages, that makes its use the most suitable here. First of all, it shows well by how much the reserve money are backed by the official reserves. And since, among all the monetary aggregates, it is the reserve money, which is the most affected by changes in the exchange rate, it seems appropriate to examine it here. Again, as with all the reserve-based indicators, its importance is especially high when judging the reserve adequacy under fixed exchange regimes, which credibility needs to be established [IMF, 2000:1]. The rationale behind this measure is that an unstable demand for high-powered money suggests greater probability of a capital flight.

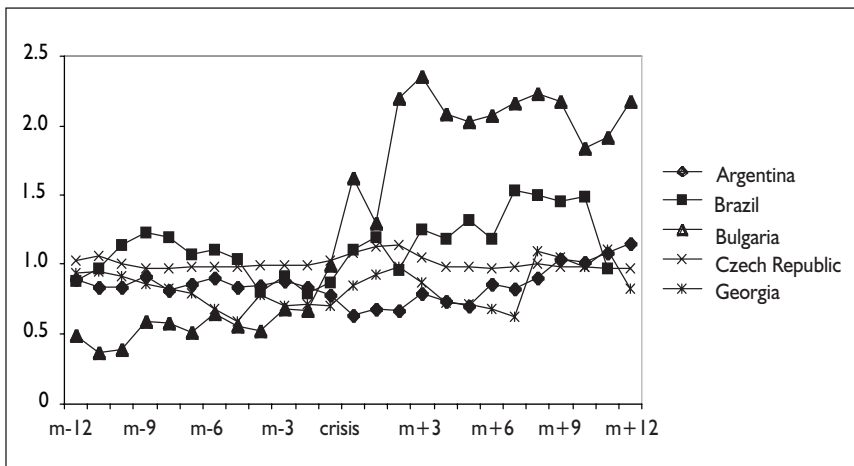
Problems with the liquidity within the monetary system characterize well pre-crisis months in Argentina, Brazil, Bulgaria, Russia, Ukraine, Georgia, the Kyrgyz Republic, and to some extent in Mexico (see Chart 2 and 3). East Asian economies recorded relatively safe values of this measure in the months prior to the Asian crisis, but nevertheless – substantially lower during the last months preceding the crisis – than at other times. A ratio of reserves to reserve money falling below one indicates potential difficulties with the commitment to a nominal anchor in all of these countries. This indicator does not have any importance when referring to the case of Malaysia which kept floating exchange rate regime around the crisis time.

As it has already been noted, relative importance of indicators based on monetary aggregates for the countries in our sample is discussed in the sections that follow. These analyses show that the meaning of monetary measures is especially weak in Ukraine. Low monetization coupled with a very little change in hard currency deposits during the 1998 crisis show overall low confidence in the domestic currency and in the banking system.

3.4. Real Exchange Rate Developments

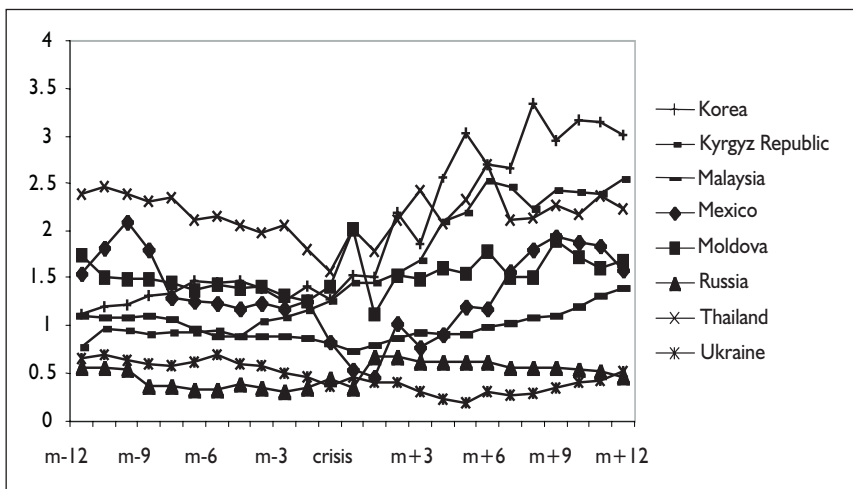
Real appreciation of a currency may reflect a loss of international competitiveness, and increasing expectations of an exchange rate adjustment as the appreciation is

Figure 2. Reserves over Reserve Money



Source: Own calculations based on IFS IMF.

Figure 3. Reserves over Reserve Money



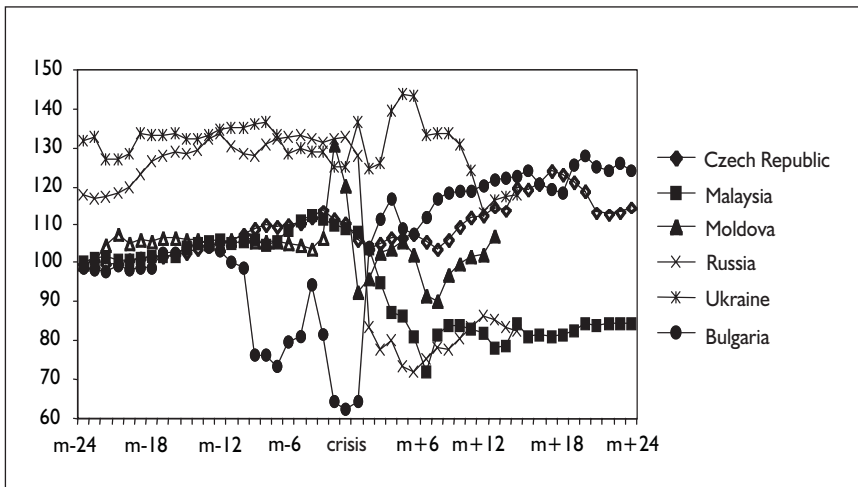
Source: Own calculations based on IFS IMF.

expected to worsen the current account. If the real exchange rate appreciation leads to a misaligned currency value, the current account deficit may be less sustainable in such situation. Then the large current account deficit coupled with the perception that a currency is overvalued may lead to a balance of payments type of crisis. However, not every real appreciation creates current account sustainability problems (Balassa-Samuelson effect, return to its long-run value after an initial overshooting).

We can see from Figure 4, that real effective exchange rates have been indeed appreciating through several months prior to the crises in Russia, Malaysia, the Czech Republic, and to some extent in Moldova. The same has been true for Bulgaria but when we consider the 1996 banking crisis, which preceded currency crash. The real effective exchange rate has not been appreciating in Ukraine during at least six months prior to the crisis.

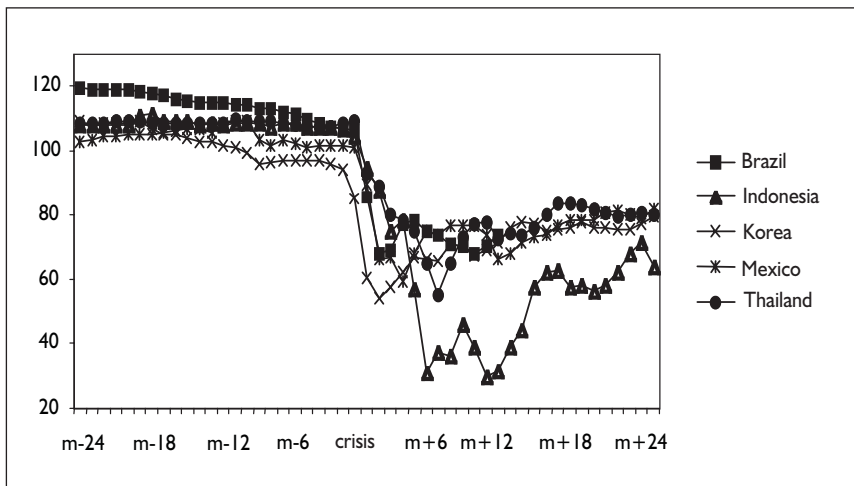
Data from the *International Financial Statistics* of the IMF were used to describe the evolution of real effective exchange rates. These data are available only for some of the countries in the sample. Therefore, CPI based real exchange rates versus the US dollar are used to show these developments in other economies (see Figure 5). The results of real appreciation is not very much visible, partly because some of the countries maintained peg to the dollar.

Figure 4. Real Effective Exchange Rates



Source: IFS IMF.

Figure 5. Real Exchange Rates, CPI Based



Source: Own calculations based on IFS IMF.

Beginning of a currency crisis is marked by the large real exchange rate depreciation in every economy. Next part of the paper describes changes that took place precisely at the crisis time.

4. Loss of Reserves and Nominal Depreciation

International reserves held by monetary authorities are available for financing external payments imbalances, thus helping to maintain liquidity, allow to absorb shocks, and provide confidence in the authorities commitment to support the value of domestic currency. Since it is very costly for a country to run short of liquidity, maintaining a sufficient level of external assets is important in preventing currency crises.

When there is a sudden change in the direction of capital flows and capital starts flowing out of a country, this outflow can be accommodated through a reserve decline, without any change in the central bank interest or exchange rates. However, if monetary authorities decide to devalue the currency or alter the level of interest rates, most of such a shock can be absorbed through these changes [Berg, 1999].

Table 2 provides data on reserve losses in 14 economies that suffered from a currency crisis in the 1990s. There were four economies – Malaysia, Indonesia, Bulgaria, and Kyrgyz Republic – whose reserve assets fell by less than 20% at the time of a crisis. Malaysia and Bulgaria were the only countries in the sample that kept floating exchange rate regimes when financial crisis occurred, and lost "only" less than 20% of its external reserves. However, Malaysian reserves deteriorated again during the next year and started to rebuild at the end of 1998. Bulgaria experienced a banking crisis in 1996, during which the central bank has already severely depleted its exchange reserves. The monetary authorities of Indonesia decided to float the rupiah in August 1997, following intensified pressure on the currency since the Thai baht was floated in July. The external reserves fell then only by \$1.1 billion (5.2% from June 1997), but they continued to fall, and the lowest level was recorded in February 1998. By then, international reserves of Indonesia fell by 24% (4.8 \$ billion) when compared to the pre-crisis period.

At the other end of the spectrum, there are countries affected by the Tequila crisis of 1994–1995, Russia, Ukraine, who lost over 40% of their external reserves in 1998, and also Brazil. Russian central bank lost over 40% of its external reserves in just one month

Table 2. The Severity of the Currency Crises Measured by Reserve Losses

| Country | Crisis date | Loss of reserves | | Nominal depreciation against USD at a crisis date |
|-----------------|-------------|------------------------------|----------------|---|
| | | Reserves/M2 at a crisis date | in percent [2] | |
| Mexico | Dec 1994 | 8.2% | 64.5% | 54.6% |
| Argentina | Mar 1995 | 18.3% | 41% | 0% |
| Bulgaria | Feb 1997 | 25.8% | 16.8% | 100.98% |
| Czech Republic | May 1997 | 29.6% | 23.0% | 5.44% |
| Thailand | Jul 1997 | 23.3% | 23% | 24.34% |
| Malaysia | Jul 1997 | 23.2% | 18.4% | 4.19% |
| Indonesia | Aug 1997 | 18.3% | 5.2% | 16.78% |
| Korea | Dec 1997 | 17.0% | 33.2% | 45.64% |
| Russian Fed. | Aug 1998 | 14.9% | 40.6% | 26.72% |
| Ukraine | Sep 1998 | 25.2% | 58.1% | 51.11% |
| Moldova | Nov 1998 | 111.2% | 35% | 55.41% |
| Kyrgyz Republic | Nov 1998 | 87.96% | 18.71% | 19.40% |
| Georgia | Dec 1998 | 59.9% | 24.5% | 16.8% |
| Brazil | Jan 1999 | 24.2% | 53.5% | 64.08% |

Source: Own calculations based of IFS data.

[2] Monetary authorities' reserve loss is calculated from the month the stock of these reserves peaks until the crisis date [after Choueiri and Kaminsky, 1999].

trying to defend the exchange rate band. At the end of 1998, foreign reserves of the central bank of Moldova fell to the 1994 levels.

5. Fall in Demand for Money

Demand for money is analyzed here for two reasons. First of all, a sudden fall in the demand for a currency indicates the substitution of domestic money by the foreign exchange and thus, a loss of confidence in this currency which may lead even to a crisis. The second reason is to give a picture of how strongly demanded are local currencies in the sample economies. This analysis supports the earlier discussion on the relative importance of measures based on monetary aggregates.

The contraction of money demand is approximated here by indicators of monetization. Monetization of an economy is defined as a ratio of a measure of money to an annualized value of GDP in current prices [after Jarociński, 1998]. A decrease in monetization means that holding money becomes more costly.

There are also other factors that may influence the monetization in our sample. One example being inflation, which may have an additional negative impact.

Table 3. Broad Money Monetization in the Crisis Countries, 1992–1998

| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|-------------|-------|-------|-------|-------|-------|-------|-------|
| Argentina | 11.2% | 16.3% | 19.4% | 18.8% | 21.1% | 24.0% | 27.5% |
| Brazil | 20.9% | 22.9% | 25.1% | 26.3% | 25.7% | 26.4% | 29.9% |
| Bulgaria | | | 61.9% | 55.7% | 42.8% | 23.7% | 26.7% |
| Czech Rep. | | 61.1% | 62.3% | 68.7% | 70.9% | 65.6% | 63.9% |
| Georgia | | | | | 5.8% | 6.6% | 7.6% |
| Indonesia | 38.3% | 38.7% | 40.4% | 42.3% | 46.1% | 49.4% | 53.4% |
| Korea | 35.7% | 37.3% | 36.8% | 36.6% | 38.4% | 42.1% | 50.7% |
| Kyrgyz Rep. | | | | | 12.8% | 11.9% | 13.8% |
| Malaysia | 67.3% | 73.7% | 78.6% | 77.8% | 83.1% | 88.5% | 93.2% |
| Mexico | 22.7% | 24.6% | 25.7% | 25.1% | 23.7% | 25.1% | 24.6% |
| Moldova | | 10.4% | 11.4% | 14.5% | 17.6% | 18.9% | |
| Russia | | | | | 14.6% | 16.4% | 17.8% |
| Thailand | 69.5% | 71.8% | 71.0% | 72.2% | 75.4% | 85.9% | 99.0% |
| Ukraine | | 13.1% | 12.1% | 9.6% | 9.4% | 11.8% | 13.1% |

Source: Own calculations based of IFS data.

First, it should be noted that Georgia, the Kyrgyz Republic, and Ukraine have been monetized on such a small scale that it is doubtful that monetary measures can capture the symptoms of a currency crisis there. Very low monetization also characterises Russia and Moldova. They rather indicate overall low confidence in the banking system and government policies. And indeed, we can see from Table 3 that broad money monetization did not fell, and even increased for Georgia, the Kyrgyz Republic, Ukraine, and Russia in 1998.

There was a visible fall in demand for money in Mexico in 1994, in Argentina in 1995, and in the Czech Republic in 1997. The indicators show that monetization was depressed during the two years following crises in Mexico and in the Czech Republic.

However, there were no signs of a decrease in the demand for money in any of the East Asian economies. This result may either indicate that the nature of the East Asian crisis was different or that the broad money aggregate is not a good measure for changes in the money demand [3].

6. Real interest Rate Differentials

A central bank may also try to defend a currency when it comes to a pressure by raising interest rates. Table 4 shows the real interest rate differentials in our crisis countries versus the US deposit rate. High real interest rates were in place in every country, for which calculations were available, when the crisis hit. However, their relative magnitudes varied.

The highest interest rates have been present in Brazil around the 1999 crisis, which followed a relatively free exchange rate regime at this time. Significant increases at the time of the crisis were in place in Argentina, Russia, Thailand, and Ukraine.

7. Conclusions

The gradual shrinkage of reserves, taking place in the months preceding currency crisis, is probably best captured by an indicator relating its level to the short-term debt.

[3] This may be also due to the inclusion of foreign currency deposits in the measure of M2. See the discussion in the Appendix on this issue. However, data on this type of deposits are not available for Malaysia and Indonesia.

Table 4. Real Interest Rate Differentials around Crisis Dates, Monthly

| | Argentina | Brazil | Mexico | Moldova | Russia | Thailand | Ukraine |
|---------------|--------------|--------------|-------------|--------------|-------------|-------------|--------------|
| m-6 | 2.57 | 11.32 | 6.90 | 14.90 | -1.30 | 2.99 | 6.32 |
| m-5 | 1.94 | 11.51 | 7.93 | 17.89 | -1.58 | 3.06 | 6.76 |
| m-4 | 1.99 | 23.61 | 5.84 | 17.20 | -1.11 | 2.45 | 7.76 |
| m-3 | 2.08 | 30.63 | 4.85 | 17.25 | 1.51 | 2.05 | 10.21 |
| m-2 | 2.17 | 24.87 | 3.95 | 17.98 | 3.68 | 1.47 | 11.93 |
| m-1 | 3.30 | 23.03 | 4.16 | 15.97 | 5.66 | 1.50 | 11.98 |
| crisis | 11.65 | 29.84 | 4.53 | 23.22 | 3.96 | 3.21 | 12.90 |
| m+1 | 11.36 | 37.97 | 11.59 | 26.49 | -32.33 | 1.47 | 9.12 |
| m+2 | 8.40 | 35.60 | 12.08 | 26.73 | -35.25 | 1.15 | 5.13 |
| m+3 | 4.29 | 26.91 | 23.68 | 25.20 | -48.19 | 0.72 | -0.01 |
| m+4 | 4.07 | 19.79 | 23.35 | 24.61 | -62.23 | -0.04 | -0.69 |
| m+5 | 3.31 | 15.77 | 8.45 | 21.18 | -75.96 | -0.22 | -3.18 |
| m+6 | 3.86 | 15.25 | -1.44 | 24.53 | -83.80 | -1.03 | 1.89 |

Source: Calculations of author's, R. Antczak, W. Paczyński, and A. Radziwiłł, on the basis of IFS data.

Note: The interest rates are the real deposit rates compared with the real US deposit rate.

Although its magnitude is related to the exchange rate arrangement of a given economy, there has been observed a downward movement of this measure at a crisis date in every analyzed country. Also, the indicator of reserves expressed in terms of reserve money describes well the episodes of currency crises in this sample of countries. However, its use is limited only to the cases of fixed exchange rate arrangements.

What also seems to properly characterize the pre-crisis situation is the real appreciation of domestic currencies. Real effective exchange rates of the analyzed economies have been appreciating through several months prior to a crisis. Then, the crisis was marked by their sharp decline.

The currency crises in our sample rather did not manifest themselves by the fall in the demand for money. This measure is probably of little use in the case of very low monetization countries. What more, any decrease in the broad money monetization has not been observed during East Asian crisis.

High domestic interest rates have been present in every of the analyzed countries at times when their currencies came under a pressure. There were also significant increases when a crisis hit, or shortly before, in nearly every of them, indicating the attempts of the central banks to defend the currency.

If we were to find the symptoms of a currency crisis that have been most universal throughout the emerging economies, we would have thus pointed on loss of international reserves or serious nominal depreciation, coupled with a period of high real interest rates, and preceded by the appreciation of real effective exchange rate. This finding confirms the adequacy of Eichengreen, Rose, and Wyplosz (1994) definition of a currency crisis in analyzing the developments in the "emerging" or "transitional" economies.

Finally, it should be noted that the episodes of currency crises have been sometimes difficult to identify using the standard measures in the case of the Kyrgyz Republic, and to some extent, also for Ukraine and Moldova. This may either indicate the different nature of these crises or simply the data problems.

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Data sources

The calculations presented in this paper are primarily drawn on the International Financial Statistics of the Monetary Fund, unless otherwise stated in the text.

In addition to the IFS numbers, data on foreign currency deposits of the banking systems come from:

- Banco de Mexico at <http://www.banxico.org.mx>
- Bank of Korea at <http://www.bok.or.kr>
- Bank of Thailand at <http://www.bot.org.th>
- Bulgarian National Bank at <http://www.bnb.bg>
- Georgian Economic Trends No. 4, 1999 at <http://www.geplac.org>
- Moldovan Economic Trends at <http://www.moldova.md/economy/Tacis/met.htm>
- Alberto Ramos from the IMF

Appendix: What Was Happening with Hard Currency Deposits?

Some authors suggest that the decrease in monetary aggregates has not to be always observed. This is because the aggregates include hard currency denominated deposits [Berg, 1999]. Since some of the measures analyzed in this paper might have been influenced by this fact, the time path of foreign currency deposits is shown and analyzed here. This analysis is heavily constrained by the availability of data. The author could not find numbers on foreign currency deposits for Brazil, Indonesia, Malaysia, and the Kyrgyz Republic.

In order to filter the impact of exchange rate changes, foreign currency deposits – expressed in national currencies in the balance sheet of deposit money banks – have been converted to US dollars using the end-period exchange rate.

Table 5 presents month-on-month changes in the relative magnitudes of foreign currency deposits. We can see that these deposits dropped in almost every country at the crisis time. The only exception being the Czech Republic, where there has not been a deviation from the trend in the value of foreign currency deposits. Also in Thailand, despite the significant fall one month before the crisis, the general trend has been upward. But generally, the results support the opinion that when analyzing broad money aggregates, foreign currency deposits should be subtracted.

Table 5. Monthly Changes in Foreign Currency Deposits around the Crisis Dates

| | Argentina | Bulgaria | Czech Rep. | Georgia | Korea | Mexico | Moldova | Russia | Thailand | Ukraine |
|---------------|----------------|---------------|---------------|--------------|----------------|---------------|----------------|---------------|---------------|----------------|
| crisis date | 1995M3 | 1997M2 | 1997M5 | 1998M12 | 1997M12 | 1994M12 | 1998M11 | 1998M8 | 1997M7 | 1998M9 |
| m-12 | 1.55% | -13.14% | 3.48% | -1.62% | -6.71% | -1.10% | -0.32% | 0.47% | -3.64% | 1.07% |
| m-11 | 2.00% | 0.65% | 0.51% | 8.65% | 86.24% | 5.67% | -2.34% | 5.23% | -11.03% | -7.47% |
| m-10 | 0.18% | -2.59% | -4.47% | 2.44% | 47.04% | -7.21% | -0.74% | 6.21% | -18.69% | -1.42% |
| m-9 | 1.88% | -15.90% | 0.74% | 1.24% | -4.25% | 7.15% | 6.12% | 1.39% | 26.56% | 1.43% |
| m-8 | 2.66% | -6.01% | 2.35% | 5.20% | -20.74% | 38.56% | 2.98% | 2.57% | -9.97% | -0.05% |
| m-7 | 1.77% | -0.51% | 1.36% | 6.59% | -25.26% | -2.39% | 7.52% | -15.70% | 17.47% | 9.59% |
| m-6 | 1.81% | 3.82% | -3.95% | 3.42% | -24.07% | 3.63% | 11.02% | 5.87% | 24.70% | -4.10% |
| m-5 | 1.25% | -8.57% | 1.62% | -1.63% | 41.47% | 4.57% | 4.50% | 3.15% | -4.85% | 3.73% |
| m-4 | 2.40% | -5.74% | 4.92% | 2.04% | 20.55% | 14.65% | -4.19% | -0.25% | -7.55% | 7.75% |
| m-3 | 3.08% | -6.10% | -2.71% | -7.91% | 13.33% | 1.96% | 6.20% | 2.94% | 73.27% | -6.99% |
| m-2 | 2.49% | -2.11% | 37.99% | -4.37% | 22.92% | -5.09% | 7.20% | -1.95% | -4.54% | 8.02% |
| m-1 | -2.42% | -2.18% | 3.07% | -13.93% | 12.48% | 6.25% | 1.49% | 1.97% | -10.48% | 4.59% |
| Crisis | -10.62% | -3.49% | -7.92% | 0.25% | -31.42% | 19.86% | -15.42% | -7.24% | 18.25% | -11.08% |
| m+1 | -5.46% | 3.64% | 7.41% | 4.63% | 33.03% | -25.79% | -3.96% | -14.08% | 15.36% | -3.46% |
| m+2 | 0.81% | 1.19% | 1.37% | 6.86% | 18.55% | -20.40% | -3.28% | -9.46% | 34.91% | 0.02% |
| m+3 | 3.64% | 3.56% | 3.80% | 1.33% | 18.03% | -10.37% | 0.66% | -2.16% | -9.82% | 1.74% |
| m+4 | 2.02% | 2.15% | -3.62% | 3.36% | 17.85% | -3.03% | 2.74% | 2.61% | -10.95% | -0.62% |
| m+5 | 2.80% | 1.56% | 7.00% | 4.14% | 25.65% | 3.56% | 0.43% | -2.21% | -1.68% | -0.68% |
| m+6 | 2.43% | 3.44% | -4.45% | 9.67% | -5.78% | -0.03% | 1.43% | -0.28% | 6.38% | -0.22% |
| m+7 | 3.73% | 1.53% | 0.77% | -0.73% | 25.39% | 3.86% | 32.46% | -1.36% | -2.90% | 2.32% |
| m+8 | 2.62% | 4.52% | 0.69% | 4.02% | -0.14% | -10.20% | -5.81% | 4.06% | 4.33% | 2.65% |
| m+9 | -1.65% | -0.93% | 1.00% | 1.50% | 3.92% | 4.08% | -0.37% | -0.91% | -5.52% | 5.31% |
| m+10 | 4.48% | -10.24% | 4.80% | -4.38% | 2.32% | 8.62% | 6.93% | 5.26% | -6.57% | -1.67% |
| m+11 | 1.87% | 7.49% | 2.70% | 1.93% | 1.04% | -11.47% | 2.90% | -4.19% | 13.61% | 3.13% |
| m+12 | 2.29% | -1.35% | 10.71% | 0.69% | -25.17% | 13.95% | -1.09% | 4.20% | 30.74% | 1.07% |

Source: Own calculations on the basis of IMF and central banks data (see Data Sources section).