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## Currency crises: the case of Hungary (2008 - 2009) using two stage least squares

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## Editorial

On 19-21 November 2009, the Bank of Greece co-organized with the Bank of Albania the 3<sup>rd</sup> Annual South-Eastern European Economic Research Workshop held at its premises in Athens. The 1<sup>st</sup> and 2<sup>nd</sup> workshops were organized by the Bank of Albania and took place in Tirana in 2007 and 2008, respectively. The main objectives of these workshops are to further economic research in South-Eastern Europe (SEE) and extend knowledge of the country-specific features of the economies in the region. Moreover, the workshops enhance regional cooperation through the sharing of scientific knowledge and the provision of opportunities for cooperative research.

The 2009 workshop placed a special emphasis on three important topics for central banking in transition and small open SEE economies: financial and economic stability; banking and finance; internal and external vulnerabilities. Researchers from central banks participated, presenting and discussing their work.

The 4<sup>th</sup> Annual SEE Economic Research Workshop was organized by the Bank of Albania and took place on 18-19 November 2010 in Tirana. An emphasis was placed upon the lessons drawn from the global crisis and its effects on the SEE macroeconomic and financial sectors; adjustment of internal and external imbalances; and the new anchors for economic policy.

The papers presented, with their discussions, at the 2009 SEE Workshop are being made available to a wider audience through the Special Conference Paper Series of the Bank of Greece.

Here we present the paper by Dimitrios Dapontas (Technological Education Institution of the Ionian Islands) and its discussion by Claire Giordano (Banca d'Italia).

February, 2011

Altin Tanku (Bank of Albania)  
Sophia Lazaretou (Bank of Greece)  
*(on behalf of the organizers)*



# **CURRENCY CRISES: THE CASE OF HUNGARY (2008-2009) USING TWO STAGE LEAST SQUARES**

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## **ABSTRACT**

This paper deals with the currency crisis episode in Hungary that lasted from October 2008 to March 2009 and tries to empirically determine its key driving forces. The forward spread of the domestic currency, the forint, is selected as the dependent variable along with a set of independent macroeconomic and social variables such as the balance of payments, contagion, economic freedom, foreign exchange reserves, the price of gold, the lending rate spread, money, consumer prices and GNP, over a fourteen year period from 1995 to 2009. The estimation method used is the two stage least squares and fundamentals not strictly connected with the official forward rate are chosen as instruments. The main purpose of this exercise is to examine whether there is a relationship between the global credit crunch and the collapse of the Hungarian currency. The results show that the crisis primarily had its roots in the structural problems of the domestic economy, followed however by risk aversion and the current financial and banking crisis that hit the world economy in 2008.

*JEL classification:* F41, P33

*Key words:* currency crisis, emerging economies, structural reforms

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## **1. Introduction**

Hungary joined the EU in 2004 having transformed itself into a market economy. From then on, like other new EU members, it embarked on an attempt to converge on the standards-of-living of the old EU member states. Despite its encouraging growth, the inappropriate economic policies pursued and the structural inefficiencies of the domestic economy along with a lack of confidence on the part of foreign investors led to the financial crisis in the fall of 2008, followed by a currency crisis. 2008 saw the Hungarian currency, the forint, at both its strongest and weakest in a decade.

Economic theory tells us that the exchange rate fluctuations of the domestic currency reflect shortcomings in the structure of the national economy. The first interpretation of the Hungarian currency crisis emphasizes the fact that the forint weakened in a delayed fashion, at a time when the economic fundamentals no longer justified a currency crisis. In this interpretation, speculative pressures on the forint were strong and speculators picked Hungary as the next weak candidate to share Iceland's fate. The second interpretation is that the international financial environment was reshaped by the global crisis and dramatic changes in lending policies led to a predictable demise of Hungary's debt-ridden, lackluster economy, aggravated by a credibility gap in the government's economic policy. The combination of weak fundamentals, market expectations and contagion effects seem to explain the Hungarian episode of currency crisis.

The rest of the paper is as follows. Section 2 provides an introduction to the crisis episodes presenting a chronicle of the Hungarian crisis and its solution. Section 3 deals with the empirical model chosen and its estimation, and discusses the findings obtained. Section 4 closes the paper with some useful concluding remarks.

## **2. The facts of the crisis**

As Horvath (2009) argues, the Hungarian crisis of 2008 can be explained without the need to appeal to irrational panics. The global crisis caused financial markets to re-evaluate risk. Increased risk aversion and the decline in global liquidity changed the risk

ratings of the emerging markets, leading to an appraisal of the Hungarian assets as more risky based on an identification of some vulnerabilities specific to the domestic economy.<sup>1</sup>

The American credit crunch which increased the likelihood of recession in the euro area raised the perceived risk of Hungary, with its high external debt, large current account deficit and maturity and currency mismatches in the financial system, both within individuals, households and the corporate sector.

Whilst the banking system was not exposed directly to the sub-prime crisis, Hungarian subsidiaries were exposed through their European parent banks. The majority of loans in the private sector were denominated in foreign currency due to high spread prevailed between the domestic and foreign lending rates. Net foreign currency liabilities thus increased, raising indirectly the risk to the banking system.

The country also suffered from a lack of credibility, in part as a result of its large fiscal deficit and public debt. Even though short-term debt was roughly covered by net international reserves<sup>2</sup>, gross external financing needs were high. Overall, in 2007, Hungarian performance across all the basic macroeconomic statistics was worse than a common point of reference, i.e. the Visegrad countries (Hungary, Poland, Czech Republic and Slovakia). GDP growth was lower; inflation and the current account were higher.<sup>3</sup>

The forint fluctuated into a target zone<sup>4</sup> until February 2008. As known, a target zone operates in the following way. When the exchange rate gets close to the upper or lower band, the authorities intervene to prevent it moving outside the target zone. The flexibility of the band, namely whether it can be adjusted and under what conditions, are key questions. Frequently, traders face one-way bets since they know that the authorities will eventually intervene to keep the rate into the zone or they know that the central rate will be changed in a particular direction. The authorities can use the target zone to change the economic fundamentals in order to achieve domestic policy targets such as inflation

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<sup>1</sup> See Gyofi-Toth (2009) for the facts of the crisis.

<sup>2</sup> Under 10 percent. See World Bank (2008).

<sup>3</sup> See Horvath (2009).

<sup>4</sup> Ranges within the authorities are committed to keep the nominal exchange rate.

reduction, while at the same time having a smaller range of fluctuation compared to the free floating rate (see Sarno and Taylor 2002, p99 and p114).

The changes in the width of the band in Hungary were significant. On 4 May 2001, the band was widened from  $\pm 2.25$  to  $\pm 15$  percent. The wider band protected the country from speculative attacks in 2003, but no structural reform policy measures were taken in response to the attacks. Ultimately, in early 2008, the high cost of preserving the band caused the central bank to abandon it.

On 10 October 2008<sup>5</sup>, the Hungarian National Bank (MNB) and the ECB jointly announced an agreement to support the MNB's instruments of euro liquidity provision and announced new open market operations to support liquidity in the domestic foreign exchange swap market. This was achieved through a repurchase agreement of 5 billion euros between the MNB and the ECB. This offered the opportunity to establish an overnight foreign exchange swap facility to provide euro liquidity from October 2008 onwards. In other words, the 'lender of last resort' facility was in operation.<sup>6</sup>

Six days later, the MNB and primary government securities dealers undertook to make continuous bid and ask prices, tending to reduce yield volatility and improve market transparency. On the same day, an agreement was made and primary dealers provided continuous bid and offers on the Budapest stock exchange for forints with residual maturities of more than 90 days for a minimum of 100 million forints. For maturities of less than one year, a bid-ask spread of maximum 50 basis points was established. For maturities of one year or more, the spread was 30 basis points. It also introduced two new lending facilities including a weekly tender for two-week fixed-rate secured loans for an unlimited amount and six-month variable-rate secured loans for pre-specified amounts.

On 17 October, representatives from seven commercial banks with a market share of almost 80% and the MNB issued a joint statement. They foresaw that foreign currency lending would continue to grow at an adequate pace but conditions would tighten compared to the previous period. It was expected that the currency composition of the

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<sup>5</sup> See *Budapest Times* English version for the dates and Horvath (2009).

<sup>6</sup> See MNB and ECB articles on [www.mnb.hu](http://www.mnb.hu) time series and statistics and [www.ecb.europa.eu](http://www.ecb.europa.eu) statistics.

loans would change, with the volume of the loans denominated in Swiss francs falling compared to the loans denominated in euros.

On Monday, 20 October, the central bank announced that the 5 billion euros bailout package would not be accessed immediately. The Governor said that the banking sector was not on the brink of bankruptcy and flatly rejected comparisons with Iceland running at that time in the international media. But he noted that assistance had to be given to people that borrowed in foreign currency because of the high currency fluctuations observed.<sup>7</sup> He also said that the economy was weak and thus the structural reforms and the growth process had to be stimulated. The forint acted negatively during the day and on Tuesday 21, public confidence in the banking sector fell to a low. After the announcement, the effects of the financial crisis reached the country. The budget deficit forecasts were missed due to high public expenditures whereas the policies pursued to reduce the budget deficit focused on a speedy entry into the euro area. The tax cutting program proposed for 2009 was postponed and an economic policy rethink was instigated.

The central bank raised its interest rate by 300 basis points to 11.5 percent in order to support the forint which had dropped 14 percent against the euro during the previous three weeks. On the stock market, the value of lead banks' stock fell dramatically. To prevent short selling, the stock exchange obliged investing firms to report intraday transactions greater than 0.01 percent of the firm's total shares value. The credit rating of the economy was downgraded. The authorities increased deposit guarantees following similar actions by other EU members.<sup>8</sup>

On Friday 24, the interest rates were raised to a historical level of 13 percent for the overnight rate, the cumulative depreciation rate against the euro reached 13% and the country's foreign reserves were drained. The sights of a full blown crisis had already started to emerge. The preliminary discussions on an IMF bailout package had started 10 days earlier. On Sunday 26, the IMF and the Hungarian government agreed on a set of policies to ensure economic stability and strengthen the financial sector. The government

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<sup>7</sup> The forint lost 2 percent intraday lowering confidence.

<sup>8</sup> For example, Greece and Ireland guaranteed 100 percent of their commercial bank deposits.

began talks on facilitating the ability of the commercial banks to pay off installments of the foreign currency retail loans.

The economy's major vulnerability was that government debt was largely owned by foreign investors. As the crisis evolved, foreign investors asked selling the Hungarian government bonds; however, buyers did not exist and the market dried up. Auctions of new issues were also unsuccessful despite the efforts made by the MNB to promote foreign currency liquidity and the government bond market.

The IMF approved a \$15.7 billion loan for Hungary as part of a rescue programme designed to ease financial market stress; an additional \$8.4 billion was also forthcoming from the European Union and \$1.3 billion from the World Bank. The stabilization programme accompanying the financial support aimed at fiscal consolidation *via* reductions in the government wage and pension bill. In the banking sector, measures included a recapitalization of eligible banks and a strengthening of the supervisory and crisis management abilities. By the end of 2009, inflation was under the lower bound proposed by the IMF band, interest rates fell by 200 basis points and the MNB introduced new liquidity facilities.

Economic activity was adversely affected by the decline in aggregate demand. Real GDP fell by 6.7 percent year-on-year in 2009Q1. Unemployment rose by 2.2 reaching 9.9 percent. Inflation reached 3.8 percent in May 2009. Whilst the forint declined to a historical low of 317 against the euro, the effect of the J-curve caused the current account deficit to rise. The promise that the foreign banks would fund their Hungarian subsidiaries caused the forint to appreciate and finally it was stabilized at a rate of 270 per euro. By the end of September 2009, the IMF announced that they would extend their stand-by agreement by six months up to October 2010. Almost one year after the IMF intervention, the Fund officers admitted that the economy was now on track, but they advised major structural reforms on pensions and social transfers as well as a tax system reform. Figures 1 to 3 provide evidence on the volatility of the forint exchange rate, the drain on foreign reserves and the rise in the lending rate to historical highs.

### 3. Methodology, data set and results

The variables used in the analysis are drawn from the literature on the theoretical and empirical determinants of the currency crises. We group the explanatory variables into four categories those related to monetary policy; the external sector; contagion and specific institutional variables. The data sources are the International Financial Statistics of the IMF, the MNB and the Heritage foundation. Data frequency is monthly with the exception of the economic freedom index which is on an annual basis. Variables' description and their economic justification are as follows:

#### A. Variables related to monetary policy

1. International reserves (FOR\_EX): foreign exchange reserves are expressed in US dollars. All previous theoretical and/or empirical models use foreign exchange reserves as the main determinant of the likelihood of a crisis event. The lower reserves, the higher are the probability of speculative attacks and thus currency crises (negative effect). We should note, however, that the central bank can also hold other reserves beyond foreign exchange such as gold, SDRs etc. Therefore, foreign reserves are expected to have a negative effect if they are used to fend off a crisis and positive if not.

2. Money (Money): it includes *quasi* money. Previous studies have used M2 excluding broader types of money. According to the first generation models, the months preceding the crisis event will be characterized by a highly expansionary monetary policy (i.e. positive effect). However, the effect can be negative if the central bank aims to preserve the money supply level and continuously finances the demand for foreign exchange.<sup>9</sup>

3. Domestic inflation (PRICE\_LE): the monthly change in the Hungarian CPI is used as a proxy for macroeconomic mismanagement. It is positively related both to the incidence of a crisis episode and money supply.

4. Lending rate (LENDING): it refers to the official annual lending rate of the country's central bank. Interest rates can play a crucial role in the case of a collapse in public confidence in the macroeconomic policy stance. In the case of an expansionary

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<sup>9</sup> See Copeland (2008), pp. 446-447 and pp.450-451.

monetary policy, for example, a collapse in the confidence of forward looking participants in the foreign exchange market pushes the monetary authorities to steeply increase interest rates and devalue the official rate. Therefore, the lending rate is expected to have a positive effect.

5. GNP (Y): it refers to GNP per capita in million US dollars. In both theoretical and empirical analysis, GNP is closely associated with the exchange rate. Higher income reduces the likelihood of currency depreciation and *vice versa*. Theory predicts a negative sign between income and the average spot/forward exchange rate differential and a positive one between income and money supply.

#### *B. Variables related to the external sector*

6. Balance of Payments (BALANCE): it is expressed in US dollars. The conventional view is that the balance of payments exerts a negative effect because a deficit can cause capital flight. However, the theoretical discussion regarding the effect of the current account deficit on the incidence of a currency crisis is not clear-cut. According to Edwards (2001, p37) deficits 'may matter'. Moreover, Sasin (2001) provides an overview of the empirical studies which have tried to provide links between current account deficits and currency crises.

7. Gold price (Gold\_Pri): it refers to the price of fine troy ounce in the London exchange market, in US dollars. The inclusion of the price of gold in the set of the model's determinants mirrors the importance of gold in the global financial market. Even after the gold standard, the central banks used to keep gold reserves which can be sold in the international market for foreign exchange (usually US dollars). Moreover, economic agents used to see gold as being a safe shelter in crisis periods when the gold price usually rallies. Thus, the gold price has an effect on currency crises and is connected to money reserves. The effect depends on the central bank's policy. If the bank tends to keep gold reserves, the effect is positive; if not, it is negative.

8. Lending rate differential (dif): it is defined as the difference between the annual base rates of the MNB and the ECB. The increased risk in the Hungarian economy even

well before the forint crisis episode caused the interest rate on national currency assets and liabilities to rise notably compared with the interest rate on foreign currency assets of lower risk. Thus, we expect to get a positive effect.

### *C. Variables related to contagion*

9. Crisis elsewhere (CRISIS\_E): it is a categorical binary variable which denotes the presence of a crisis in other country (1) or not (0). The so-called ‘crisis elsewhere’ or ‘butterfly effect’ in chaos theory has a significant impact on a currency crisis development. If a country has trade and financial relations with a country hit by turbulence, then the country itself will be badly affected. This occurs both because of the economic contagion between the two countries but also because of the behaviour of the speculators. If a major trading partner of a regional economy collapses, then the other partners will collapse too, with a time lag of one or two months. In the ruble crisis of 1998, the ruble collapse was followed by a delayed collapse in other countries of the former Soviet Union. This is because when a speculator decides to attack, he will hit multiple markets in the same region and at the same time, as it happened in the Asian crisis of 1997. Thus, we expect a positive effect.

### *D. Institutional variables*

10. Economic freedom (ECO\_FREE): the Heritage index of economic freedom is a total score consisting of indicators on trade, fiscal burden, government intervention, monetary policy, foreign investment, banking, wages and prices, property rights, regulation and informal market. It is provided annually by the Heritage Foundation and presents the progress that countries achieve in the implementation of structural reforms. Market and institutional reforms (e.g. the establishment of a sound financial and banking system, the well functioning of fiscal institutions etc) offer great assistance to the countries in their effort to prevent a crisis. Consequently, its effect is expected to be negative.

Based on Esquivel and Larrin (1998), we combine variables which represent the main predictions of all generations of speculative attack models. Variables 1 to 5 are closely associated with the first-generation models. Variable 10 is closer to the second

generation models. Variables 6 to 9 are associated with the third generation models.<sup>10</sup> The empirical literature provides little guidance as regards a generally accepted definition of currency crisis. The majority of the studies refer to devaluation as large, unique and infrequent or a set of small and repeated incidents.<sup>11</sup> Others use the weighted average of the monthly depreciation rate compared to the depreciation rate of the previous year.<sup>12</sup> Chionis and Liargovas (2002) define a currency crash as the nominal depreciation of the monthly average exchange rate of the domestic currency against the dollar of at least 10%, irrespective of whether this comes as the result of a speculative attack or not.<sup>13</sup> Composite indices of pressure including the official rate, interest rates and foreign reserves are also used.<sup>14</sup> Others use the official rate as a measure of pressure. If the official rate rises, then the country has to buy the national currency using its currency reserves in order to keep the exchange rate in the band and *vice versa*. But, in the case of Hungary, the official rate is not a good measure of the currency crisis. As Dornbusch (1980) suggested, on the assumption that the foreign exchange market is efficient, any difference between the spot rate and the forward rate of the previous month (i.e. forward spread,  $F_t = S_t - \frac{f_{t-1}}{t-1}$ ) will reflect the unexpected risk premium and changes in fundamentals. In the present analysis, 8 out of 10 of the explanatory variables described above are used to explain the forward spread (F) while five variables are chosen to explain money supply over a period of 14 years (January 1995-March 2009).

Analytically, for the first stage, I use the following equation:

$$F_t = c + \beta_1 \widehat{Money}_t + \beta_2 for\_ex_t + \beta_3 Balance_t + \beta_4 Gold\_Pri_t + \beta_5 Crisis\_e_t + \beta_6 Eco\_freed_t + \beta_7 Y_t + \beta_8 dif_t + \varepsilon_t$$

I also use a set of fundamental variables based on money supply for the second stage where:

$$Money_t = C + \beta_1 Price\_level_t + \beta_2 Y_t + \beta_3 lending_t + \beta_4 \hat{F}_t + \varepsilon'_t$$

<sup>10</sup> Kaminsky, Lizondo and Reinhart (1998).

<sup>11</sup> See, Edwards (1989), Milesi-Ferretti and Razin (1998) and Flood and Marion (1999).

<sup>12</sup> See, Kaminsky, Lizorno and Reinhart (1998) and Frankel and Rose (1996).

<sup>13</sup> 95% of the international money transfer is powered by speculation.

<sup>14</sup> See Eichengreen, Rose and Wyplosz (1995).

The results (see Tables 1 and 2) suggest that the impact of five variables, namely economic freedom, gold price, GNP and money supply, is statistically significant. All regressors have the expected sign. Economic freedom exerts a negative influence on the forint crisis. Further, we find that Hungary does not tend to use gold as policy instrument and the rise in money supply is statistically important. GNP has a strong negative effect too.

By contrast, the contagion effect and the interest rate spread seem to be less significant. This finding can be explained by the size and the effect of the domestic economy's structural vulnerabilities. As seen, the importance of the macroeconomic aggregates is crucial. Further, the unfavourable international surrounding might not help much the economy in coping with the crisis. However, the structural inefficiencies of the domestic economy were in the root of the currency turbulence. The country's currency reserves soon were depleted due to the increased demand by the domestic banking sector and foreign investors. However, depletion of any amount of currency reserves would not be adequate enough to preserve exchange rate stability against strong speculative pressures, and liquidity would not be able to meet demand given the upper band limit, even though it was abandoned in 2008. We also find that the effect of current account deficit is not so important. This can be explained by the fact that capital flight began much earlier than the crisis event. Finally, the price of gold and the lending rate seem to be statistically insignificant.

By contrast, money supply seems to be guided by GNP; its impact is positive as expected and inelastic ( $\beta$  or  $n$  references are 0.12). The lending rate also exerts a positive and significant effect on money. Surprisingly, the effect of the price level and the forward spread is rather weak.

#### **4. Conclusions**

The main question of this paper is whether the 2008 currency crisis in Hungary was a home-grown event or was attributed to the current global financial crisis. As the results have shown, the forint devaluation was not significantly related to the global credit

crunch. Explanatory variables such as crisis elsewhere (contagion), interest rate spreads, foreign exchange reserves and the current account were all insignificant in determining the key drivers of the forint devaluation rate. Instead, findings suggest that the Hungarian currency crisis had to do more with the structural inefficiencies of the domestic economy following its transition to an emerging market economy. For example, domestic banks stimulated capital outflows when they encouraged their customers to be exposed to exchange rate risk by giving them incentives to borrow extensively in hard foreign currency.

However, other countries in the region made major progress and successfully enacted the needed reforms in their economic and political systems. The importance of these reforms in the prevention of crises is reflected in the statistical significance of the economic freedom index in our empirical model.

Further, serial policy mistakes might lead to the crisis event. The official exchange rate had been placed in a band which was abolished in February 2008 as the policy makers recognized the major disadvantage of the target zone model after a short lived honeymoon effect<sup>15</sup>: it is a one way bet for the trader because he knows the intervention points. The depreciating exchange rate reflects the weakened economic conditions of the country in the wake of a turbulent international environment. Money supply grew significantly and inflation soared. Crisis experience thus show that the policies pursued proved to be ineffective in the long run. However, the policy makers in Hungary falsely believed that it was only a matter of time before Hungary would join the euro area.<sup>16</sup>

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<sup>15</sup> I refer to the term proposed by Sarno and Taylor (2002) used to describe the country's ability to modify the target zone at will.

<sup>16</sup> The MNB hoped that the country would adopt the euro no later than 2012.

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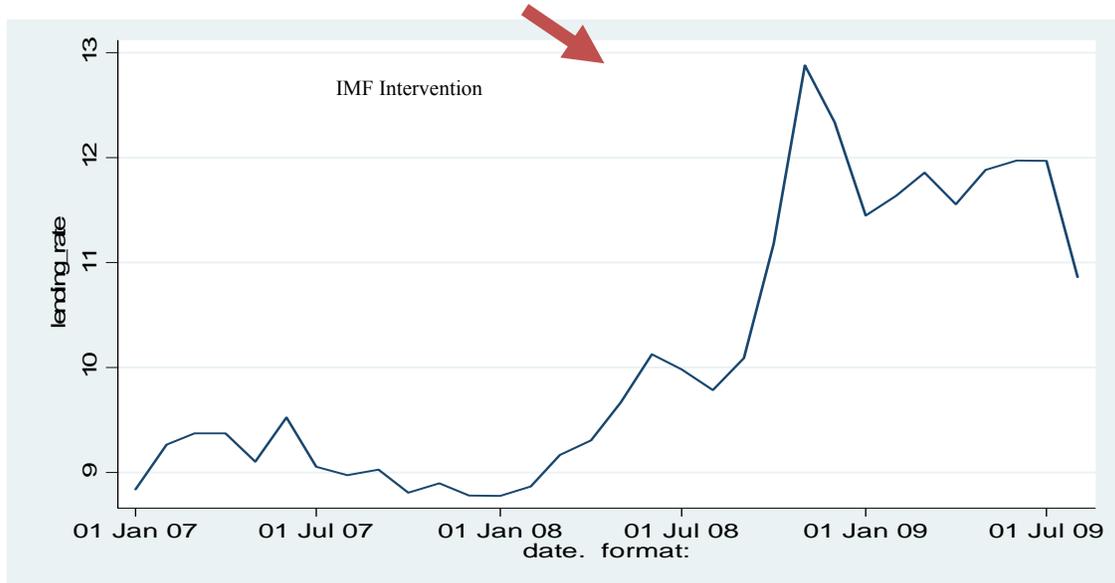
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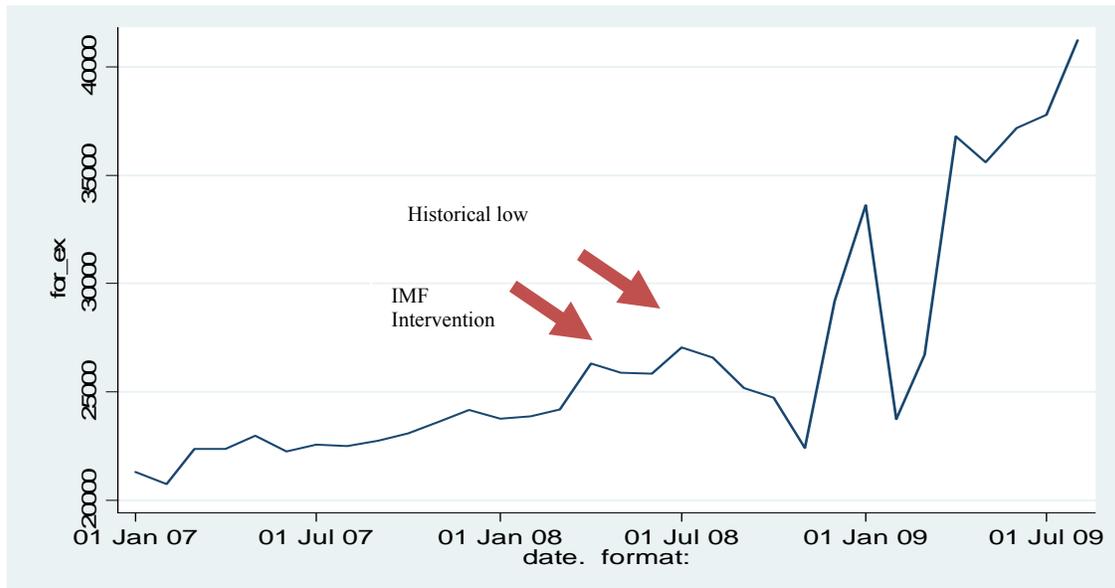
Budapest Times: [www.budapesttimes.hu](http://www.budapesttimes.hu)

## Appendix: Figures and Tables

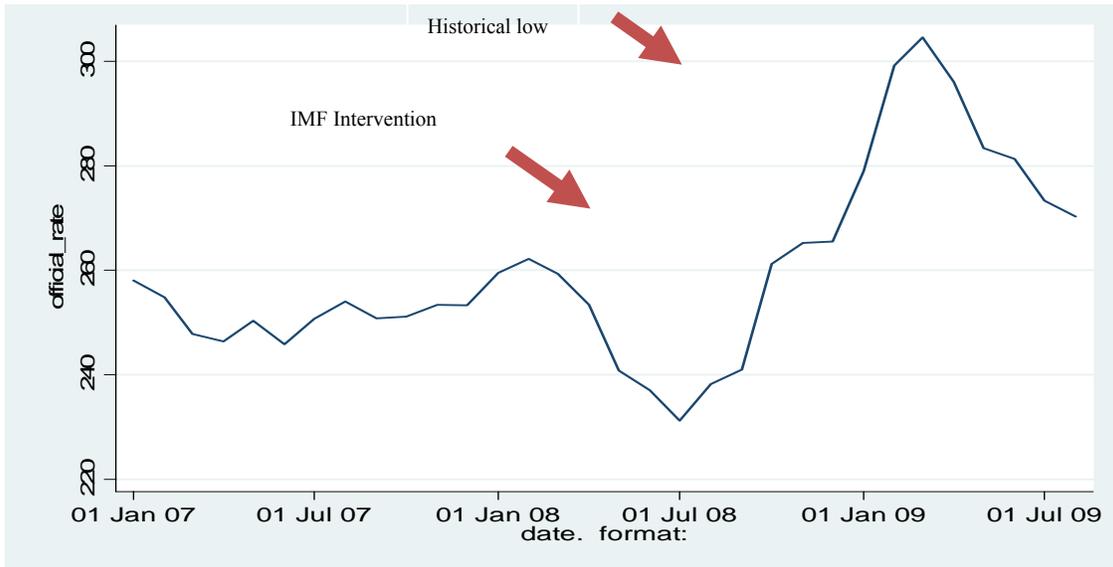
**Figure 1. The Forint lending rate, 2007-2009**



**Figure 2. Foreign exchange reserves, 2007-2009**



**Figure 3. The forint euro exchange rate, June 2007- March 2009.**



**Table 1. Forward spread results**

Forward Spread	
Variable	Coeff.(std.error)
<b>Money</b>	<b>0.0383</b> <b>(0.157)</b>
Exchange reserves	-0.002 (0.002)
Balance of payments	-0.001 (0.004)
<b>Gold Price</b>	<b>-0.538</b> <b>(0.024)</b>
Crisis Elsewhere	-1.573 (1.941)
<b>Economic Freedom</b>	<b>-0.971</b> <b>(0.487)</b>
<b>GNP Per Capita</b>	<b>-0.001</b> <b>(0.007)</b>
Interest spread	0.032 (0.250)
<b>Constant</b>	<b>148.86</b> <b>(56.46)</b>
<b>R<sup>2</sup></b>	<b>0.2513</b> <b>(6.25)</b>

**Table 2: Money results**

Money	
Price level	-1.965 (29.77)
<b>GNP Per Capita</b>	<b>0.12</b> <b>(0.005)</b>
<b>Lending rate</b>	<b>15.08</b> <b>(0.016)</b>
<b>Forward spread</b>	<b>17.43</b> <b>(11.07)</b>
<b>constant</b>	<b>-3911.75</b> <b>(323.74)</b>
<b>R<sup>2</sup></b>	<b>0.88</b> <b>(267.16)</b>

## Discussion

Claire Giordano  
*Banca d'Italia*<sup>17</sup>

### 1. Introduction

The paper, a case-study of Hungary's currency crisis of 2008 by Dimitrios Dapontas, hereafter Dapontas (2009), may be divided into two parts:

- (i) a qualitative analysis of the run-up to and the outbreak of the 2008 Hungarian crisis episode, followed by a detailed listing of the domestic and international measures undertaken to manage it, up until the IMF loan extended to Hungary on 6 November 2008;<sup>18</sup>
- (ii) an econometric model, aimed at explaining the main determinants of the currency crisis under study, in order to suggest possible policy prescriptions.

The present discussion is structured as follows. Section 2 rapidly recalls some terminology and the prevailing classification of the existing literature on currency crises. In Section 3, a brief historical comparison with Italy's last major currency crisis before the adoption of the euro is drawn out, in order to gain further insight on the (different) mechanisms underlying currency crises in two countries whose currencies were similarly confined to fluctuate within a band, with the prospect of later adopting a single currency (the euro), but who were at a different stage of development (a G7 country in the case of Italy; an emerging economy in the case of Hungary). In Section 4, the empirical evidence presented in Dapontas (2009) is analysed in depth and some shortcomings of the econometric model adopted are thus pointed out. Section 5 closes the discussion with some conclusions.

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<sup>18</sup> The Stand-By Arrangement offered to Hungary was initially a 17-month loan, in the amount of SDR 10.5 billion, which was later extended to twenty-three months at the Third Review on 25 September 2009.

## 2. A theoretical premise

As a general comment, Dapontas (2009) would benefit from a survey of the existing literature on the subject, which would give the paper a sounder theoretical background. For example, one could start from the very basics of terminology: how have currency crises been defined in literature?

Currency crises have been identified by the occurrence of certain “signalling” events, such as:

- a) a drastic nominal depreciation with respect to the relevant anchor currency;
- b) an abandonment of a pegged exchange rate;
- c) a forced intervention by domestic authorities to ward off speculative attacks (e.g. interest rate hikes or the expenditure of large amounts of international reserves);
- d) an international rescue (e.g. a lending facility which signals external support to the country);
- e) a combination of two or more of the preceding events.

Empirical papers prefer to adopt quantitative benchmarks. For example, Frankel and Rose (1996) define currency crises as an annual nominal depreciation of the currency of at least 25%, which is also at least a 10% increase in the rate of depreciation with respect to the previous year. Kaminsky *et al.* (1998) use an exchange market pressure index, *i.e.* a weighted average of monthly percentage changes in the exchange rate and monthly percentage changes in gross international reserves; if the index is above its mean by more than three standard deviations, then a currency crisis is occurring. Reinhart and Rogoff (2008) consider an annual nominal depreciation *versus* US\$ (or the relevant anchor currency) of 15% or more.

Dapontas (2009) aims at explaining the main determinants of Hungary’s 2008 currency crisis and, in doing so, implicitly attempts to answer the following question: what type of theoretical model fits the crisis episode under study the best? In extremely loose terms, was the crisis due to *a)* a fundamental inconsistency between domestic (fiscal and monetary) policies and the pegged exchange rate, which led to a depletion of

currency reserves (*i.e.* a first-generation model)? Or *b*) was the crisis a result of an inter-temporal minimization of a welfare loss function by economic authorities – who balance a trade-off between the two objectives of maintaining a fixed parity (e.g. to encourage international trade and investments) and abandoning it (e.g. to implement an expansionary monetary policy in order to alleviate unemployment), with the cost of the fixed rate increasing if private agents expect a future depreciation – maybe accompanied by herding or information cascade phenomena (*i.e.* a second-generation model)? Or *c*) were there imbalances in the banking and financial sector which triggered the currency crisis (*i.e.* a third-generation model)?

### **3. A historical international comparison**

In the first part of the paper, Dapontas (2009) underlines how prior to the currency crisis, in 2007, Hungary’s macroeconomic performance was far from reassuring.<sup>19</sup> This evaluation of macroeconomic fundamentals is confirmed by the data presented in which covers a longer period (2005-2008), in order to gauge the key variables’ progressive deterioration in the build-up to the crisis. In 2007, the year before the outbreak, Hungary in fact was characterised by low GDP growth (1.2%), high inflation (7.9%), a large current account deficit (9.1 billion US\$), and a significant government budget deficit (-4.9% of GDP).

We can compare Hungary’s macroeconomic performance to that of Italy, proxied by the same indicators, for the same time period of three years prior to its 1992 currency crisis (see Tables 1-4). Again, the weakness of fundamentals emerges. However, whilst GDP growth rates did fall progressively over the years, and the current account deficit (in absolute values) did increase, the inflation rate had already begun to fall after 1990 and the government deficit remained stable for the three years prior to the crisis.

As well as weak fundamentals, Dapontas (2009: 3) briefly refers to “maturity and currency mismatches in the financial system” and to “the majority of the loans in the private and household sector credit” being “in foreign currency”. The existing literature

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<sup>19</sup> In comparing Hungary’s performance to the Visegrad (Hungary, Poland, Czech Republic and Slovakia) in 2007, the source of the data presented in Dapontas (2009) is not specified.

defines these as balance-sheet factors in financial crises. As well as going over this literature in the suggested survey, it would also be interesting to attempt to empirically discern whether Hungary was suffering from what Eichengreen *et al.* (2003a) have described as being the “original sin”, typical of peripheral countries (*i.e.* the inability of a country to borrow abroad in its own currency);<sup>20</sup> from currency mismatches (*i.e.* differences in the currencies in which assets and liabilities are denominated);<sup>21</sup> from what Reinhart *et al.* (2003) have defined as debt intolerance (*i.e.* the inability of emerging markets to manage levels of external debt that are manageable for advanced countries);<sup>22</sup> or from a combination of all three. Sensible policy prescriptions can, in fact, only emerge from a correct diagnosis of the problem.<sup>23</sup> Eichengreen *et al.* (2003b) suggest an empirical approach for each of these three factors separately.

Dapontas (2009)’s qualitative analysis thus points to the first- and third-generation models as explanations of Hungary’s currency crisis, conclusion later confirmed by the results of the quantitative model. What about Italy? The weak fundamentals presented in were accompanied, as we shall see, by the interplay between government and financial markets, which suggest a combination of first- and second- generation models.

In 1989, Italy was already part of the European Monetary System (EMS) and its currency, the Italian lira, was allowed to fluctuate around a central parity by  $\pm 6\%$ .<sup>24</sup> In January 1990, Italy entered the narrow band ( $\pm 2.5\%$ ). Furthermore, in May 1990, the liberalization of international capital flows was completed. The leader country of the

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<sup>20</sup> In a country plagued by its “original sin”, real exchange rate depreciation, by reducing the purchasing power of domestic output over foreign claims, makes it more difficult to service the foreign-denominated debt. Knowing this, foreigners are rendered less willing to lend. And since the real exchange rate tends to strengthen in good times and weaken in bad times, foreign-currency debt is harder to service in bad times, thereby accentuating the pro-cyclical nature of capital flows (Eichengreen *et al.* 2003a).

<sup>21</sup> Currency mismatches in the economy as a whole lead to a net debt to foreigners denominated in foreign currency. Real exchange rate depreciation by raising the value of a country’s external net debt in terms of the value of its national output also creates adverse balance-sheet effects.

<sup>22</sup> Reinhart *et al.* (2003) measure this debt intolerance by considering the relationship between a country’s credit rating and its external debt: they report that ratings fall more rapidly with debt in emerging markets than advanced countries, as if the former have less debt management capacity. The country’s track-record of defaults, and in general its repayment history, are considered as important determinants of debt intolerance.

<sup>23</sup> Whilst debt intolerance, for example, depends on a country’s structural weaknesses, which leads it to run feeble and unreliable policies, the original sin may instead be traced back to problems in the structure of global portfolios and international financial markets.

<sup>24</sup> For a personal recollection of the 1992 currency crisis by a major Italian economist see Spaventa (2007).

EMS, Germany, was intent on tackling the inflation consequent to its recent political unification, and hence adopted a tight monetary policy. Italy also had a high inflation compared to the other partner EMS countries – yet decreasing relative to previous years – as well as large government deficits, which however were stable. The Danish rejection of the ratification of the Maastricht treaty in June 1992 made Italy extremely vulnerable. The Banca d'Italia increased the discount rate and began selling foreign currency reserves to sustain the domestic currency. The Bundesbank, however, increased its discount rate in July, whilst the Fed reduced it, creating even more divergence. The pressure on the lira was temporarily eased when the G7 decided to adopt measures to support the dollar. However, at the end of August, the doubtful outcome of the French referendum and the downgrading of Italy's rating caused a drop in the lira below the Exchange Rate Mechanism (ERM) floor; the discount rate reached 15% in September 1992. On 12 September 1992, Italy suspended its participation in the Exchange Rate Mechanism, leaving the lira to float. The currency crisis was also accompanied by a more general financial crisis in Italy. The Treasury had difficulty in placing even short-term bonds and the Banca d'Italia intervened on the secondary market to limit the large price fluctuations and to guarantee orderly trading. Massive deposit withdrawals were registered and Banca d'Italia again intervened to reassure depositors and stabilize the situation.

Two empirical models, which explain Italy's currency crisis, are here reported. Fratianni and Artis (1996) insist weak fundamentals were the force underlying the September 1992 currency crisis. The drive for European political unification and the commitment to monetary union had temporarily slowed in the summer of 1992, thus influencing market psychology. Financial markets hence began "cherry picking" those currencies that were most vulnerable in the ERM, *i.e.* the Italian lira, whose fundamentals were undoubtedly weak. Canale *et al.* (2008) instead used a model in which they considered both monetary policy behaviour and market expectations. With the monetary authority strongly defending the external parity, via hikes in the interest rate, all things equal, the growth rate of income was negatively affected. The markets, expecting an ever increasing cost in defending parity and hence a shift in policy behaviour, thereby increased the pressure on the exchange rate. Ultimately, "one-side betting" expectations forced the authorities to reconsider their loss function and to opt out of the fixed parity.

The empirical literature therefore points to a combination of first- and second- generation models as fitting for the Italian 1992 currency crisis episode. Finally, Saccomanni (2007: 137)'s analysis underlines as drivers of the crisis not only the country's "fundamental imbalances", but also an underestimation of the dynamism of "global" financial markets and players.<sup>25</sup>

To conclude the historical comparison, we can state the following. In both Italy in the early 1990s and in Hungary in the second half of the 2000s, fundamentals were weak (low growth, high inflation, large current account deficits), both absolutely and also relative to the other countries in the neighbouring area (EMS for Italy; Visegrad for Hungary). However, in the Italian case, inflation at least was decreasing with respect to previous years. Both countries were plagued by the large magnitude of public debt. However, the magnitude of the external debt was another major issue in Hungary, as well as the nature of its internal debt, which was denominated largely in foreign currency. Central banks responded with similar policies in both countries: increase in the interest rates and use of international reserves. However, Italy was operating in a tighter band than that in Hungary, where instead the width of the latter was increased, in an opposite process. Finally in the 1992 crisis episode, there was also a significant "coordination failure" between the EMS countries (Padoa-Schioppa 1994) and insufficient dialogue between all the market participants of global finance (Saccomanni 2007, pp137-8). Hence, if not in preventing currency crises, maybe a lesson was learned from the 1990s in managing them.

#### **4. The econometric model**

As previously stated, the second part of Dapontas (2009) is an empirical model aimed at capturing the underlying forces of the 2008 currency crisis in Hungary. The explanatory variables chosen are well explained.<sup>26</sup> Of the two models presented,

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<sup>25</sup> Fabrizio Saccomanni is currently the Director General of the Banca d'Italia.

<sup>26</sup> Some clarifications are, however, needed. With respect to the variable "crisis elsewhere", it is not clear to the reader what set of "other" countries is taken into account: all the countries of the world, only geographically neighbouring countries, only trading partners, or what? Furthermore, a more detailed explanation of the variable "balance of payments" would be useful. Finally, the results concerning "oil price" are not presented in the general model (Dapontas 2009: 11) and the reason is not stated.

Dapontas (2009) then relies on the results of the second, nested model, obtained by eliminating the statistically insignificant variables from the first, more general model. The adjusted R square, and the information criteria, support this choice.

The variables selected and classified into groups by Dapontas (2009) are compared to those discussed in Kaminsky *et al.* (1998)'s seminal paper, which surveys the existing empirical literature assessing potential indicators of currency crises and identifies the seemingly most effective ones. Kaminsky *et al.* (1998) found that the variables, flagged in by three asterisks, were highly relevant; money growth turned out to be moderately useful as a currency-crisis indicator. The remaining variables did not prove to be significant in their paper. The results obtained in Dapontas (2009) are hence largely consistent with this analysis. It would be interesting, however, to introduce into the model a real sector variable, such as GDP growth, as well as a fiscal variable, such as the government deficit, since *a*) in the qualitative part of Dapontas (2009) the deterioration of these key macroeconomic variables is mentioned as an important factor; and *b*) in Kaminsky *et al.* (1998)'s benchmark paper these variables are found to be two powerful early warning signs of currency crises. Moreover, the introduction of these two variables in the model would reduce the potential issue of omitted variables.

Another observation is that in the time period considered in Dapontas' (2009) empirical analysis, i.e. from 1995 through to 2009, major exchange rate regime switches occurred.<sup>27</sup> Initially, Hungary was on an adjustable peg; in March 1995 the country adopted a crawling peg to the euro that devalued the forint in line with inflation, as part of an austerity package. In May 2001, the intervention band was widened from 2.25% to 15% above and below the central parity; as previously recalled, an opposite process to what happened in Italy where the band was instead narrowed. In October 2001, the crawling peg was abandoned and a target zone adopted. In February 2008, Hungary went back to a floating rate. It could thus be useful to divide the overall period into sub-periods and conduct the same analysis for each one, as well as for the period as a whole. Structural break analyses and Chow tests may also be interesting to run.

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<sup>27</sup> The listed exchange rate regime switches exclude changes in the basket to which the forint, Hungary's currency, was pegged and small variations in the band width.

Finally, two methodological issues arise. If a least-squares framework is deemed suitable for the empirical analysis conducted, one must at least test the robustness of the results obtained by the simple OLS method used by Dapontas (2009). Working with a time series, the presence of autocorrelation is highly probable. A glance at the Durbin-Watson statistic confirms this suspicion. One would thus have to at least resort to OLS with adjusted standard errors (Newey-West), if not even to FGLS. It is also worth testing for the presence of endogeneity in the model to verify if OLS is a consistent estimation method. If endogeneity results, then, the search for strong instrumental variables must begin and a 2SLS may have to be implemented. Again, all this if one wishes to remain in a least squares framework.

## **5. Conclusions**

The aim of Dapontas (2009) is to qualitatively and empirically assess the drivers of the 2008 currency crisis in Hungary. However, the theoretical model needs to be clarified, and would benefit from being nested in, or juxtaposed to, the existing literature on the topic. Moreover, the empirical model, as it stands in Dapontas (2009), does not appear to be robust, since the estimation method used, OLS, has not been tested in any way to justify its feasibility and consistency. This point is crucial, since only once the empirical results are solid, possible policy measures may be spelled out. Notwithstanding these critiques, the topic chosen is of extreme interest, and deserves to be further developed, since only by understanding the determinants of past (currency) crises can we hope to better forecast and manage future ones.

**Table 1. Key macroeconomic variables in Hungary (2005-2008)**

<i>Hungary: Key Macroeconomic Variables</i>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
GDP Growth (%)	4.0	3.9	1.2	0.6
CPI Growth (%)	3.6	3.9	7.9	6.1
Current Account Balance (billions US\$)	-8.2	-8.6	-9.1	-13.0
Government Budget Balance (%GDP)	-7.8	-9.2	-4.9	-3.4

Source: Consensus Economics.

**Table 2. Key macroeconomic variables in Italy (1989-1992)**

<i>Italy: Key Macroeconomic Variables</i>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>
GDP Growth	2.9	2.1	1.2	0.7
CPI Growth	6.3	6.5	6.3	5.3
Current Account Balance (billions US\$)	-16.2	-20.0	-29.8	-36.0
Government Budget Balance (%GDP)	-11.4	-11.4	-11.4	-10.4

Source: Banca d'Italia, Istat, IMF.

**Table 3. Potential indicators of currency crises**

<i>Variables selected</i>	<i>Dapontas (2009)</i>	<i>Kaminsky et al. (1998)</i>
1. Real effective exchange rate***	Monetary policy variable	Current account variable
2. International reserves***	Monetary policy variable	Capital account variable
3. Money**	Monetary policy variable	“Other” financial variable
4. Inflation***	Monetary policy variable	“Other” financial variable
5. Central Bank lending rate	Monetary policy variable	“Other” financial variable
6. Balance of Payments	External sector variable	
7. Gold price	External sector variable	International variable
8. Oil price	External sector variable	International variable
9. Crisis elsewhere	Contagion variable	International variable
10. Economic freedom index	Institutional variable	Institutional/structural variable

Sources: Dapontas (2009) and Kaminsky et al. (1998).

**Table 4. Exchange rate regime switches in Hungary (1995-2009)**

<i>Period</i>	<i>Exchange Rate Regime</i>
-February 1995	Adjustable peg
March 1995-April 2001	Crawling peg
May 2001-September 2001	Widening of band
October 2001-January 2008	Abandonment crawling peg; target zone
February 2008-	Free floating exchange rate

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**Bank of Albania-Bank of Greece**  
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