

Currency speculation and exchange rates

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In recent years, some academic work highlighted currency speculation as a cause of exchange rate distortion and the build-up of current account imbalances in several countries. The impact of the crisis on exchange rate trajectories brought new and stronger evidence on this issue, which tends to confirm the role of currency speculation in a global perspective. This paper examines this new evidence and proposes some policy options to mitigate the problem. In this context, we seek to answer why exchange rates don't follow "fundamentals", why different countries have a similar exchange rate trend, and why countries with higher interest rate have experienced greater exchange rate depreciation during the crisis.

The first section of the paper describes the Foreign Exchange Market (Forex) regarding general features, as market participants, leverage level, market dimension and investment strategies. The purpose is to characterize the *locus* of currency speculation. The following section analyses the relation between exchange rate variations and others economic variables such as inflation, current account balance, the accumulation of foreign reserves and interest rate level in a large group of countries. Statistic results indicate that exchange rate trends are mostly financially driven and that interest rate level is a relevant variable affecting exchange rates. Therefore, this paper argues that a financial operation driven by interest rate differentials called "carry trade" constitutes a major force of exchange rate distortions.

Hence, carry trade can reasonably explain why countries can have the same exchange rate trajectories despite few common aspects beyond the interest rate level. Similarly, this speculative strategy could have been the cause of continuous appreciation of several exchange rates against the dollar before September 2008, apparently dissociated from any economic fundamentals. Furthermore, during the crisis

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the unwinding of carry trade operations caused a subsequent depreciation of those currencies since the leverage assumed in carry trade operations induces to quick reversals of capital flows and derivatives positions.

The last section indicates the way forward by presenting ideas for policy measures; in particular a domestic financial tax on financial flows and a restriction of carry trade operations. The understanding that financial flows and derivative markets are not neutral and affect the adjustment of freely floating exchange rates implies that nationally oriented monetary policy is inconsistent with liberalized and global finance. Thus, the policy challenge is to preserve autonomy of monetary policy while keeping exchange rates safe from financial distortions. The final goal is to neutralize the effects of speculation on exchange rates and consequently on current account balances.

1. Foreign Exchange markets

General features

The foreign exchange market, FX market or simply “Forex” is the locus of currencies negotiation. By definition, the transactions in that market set exchange rates in spot and future markets between the various currencies of international monetary system. The Forex market is by far the world's most important market considering the volume of transactions. Its size is a multiple of the stock market and bonds market. This market has some important characteristics as the dominance of over-the-counter (OTC) transactions, a low degree of regulation, a high degree of liquidity, a high leverage and the absence of bullish or bearish bias. These characteristics are considered separately below.

In its large majority, Forex transactions are carried out in the OTC market. That is to say, there is no centralized place where transactions occur and the market activity is sprayed in a wide range of agents. Therefore, unlike stock markets, the degree of regulation is smaller, there is less transparency, and there is no accounting of most operations. However, the currency market is highly integrated with modern information and telecommunications technologies. There are two major electronic transaction platforms: Reuters Dealing 2002-2 System (Reuters) and the Electronic Broking System Spot Dealing System (EBS). These platforms provide the automatic closing of

transactions within the system and, in some ways, replace the role of brokers and clearing houses¹.

Forex offers twenty-four hours of liquidity for major currencies in the market. This implies that traders are free to choose when to operate and, more importantly, it significantly reduces the transaction's price risk since operations can be settled at any time of day in virtual platforms that are directly connected with different marketplaces. The spread charged on each Forex transaction is a liquidity measure for a currency pair: the more liquid is the currency pair, the lower is the price difference between buying and selling and the lower is the spread cost. The spread also varies along the day according to financial markets opening and closing times. The lower spreads occur when London market is operating and New York has not yet closed, and when Tokyo and London are open. Therefore, American Forex investors usually prioritize operating in the morning while Asian operators tend to operate in the afternoon. The most liquid moments in Forex are also associated with higher exchange rates volatility due to the transaction volume².

Another important feature in Forex is agent's high leverage degree. Exchange rates of major currencies pairs rarely vary more than 2% per day, which favors highly leveraged exposures with short term and high liquidity contracts. Likewise, the use of stop-losses and stop-gain strategies, which enables investors setting margins that automatically close positions to avoid losses or realize profits, is a common practice in Forex. Some Forex brokers offer up to 200 to 1 leverage; in other words, a variation of 0.5% in exchange rate price generates a 100% gain or a loss of 100%.

In stock markets, it's usual to have a market bias characterized by a positive correlation between shares. The market is bullish when in general the shares are valuing and is bearish in the reverse situation. In Forex such trend does not occur. In fact, a transaction between currencies is characterized by two simultaneous operations, the purchase of one currency and the selling of another, and by definition the negotiation price is given by the exchange rate. Thus, if a currency loses value, the other wins.

¹ "It seems likely that the continued development of these services may lead to the 'virtual centralization' of the foreign-exchange market through the computer network." (SARNO e TAYLOR, 2001: 9)

² See Ito e Hashimoto (2006) for a broader view on Forex intraday activity and its impact on spreads and exchange rate volatility.

Therefore, there is no bullish or bearish bias in this market; hence, there is always scope for gains even in periods of financial crisis³.

Foreign exchange market turnover

According to the 2010 BIS triennial survey, the foreign exchange market turnover is around US\$ 4 trillion a day⁴. This enormous amount of money far exceeds the needs of the real economy: in 15 business days the currency market trades an amount equivalent to the world GDP in one year, or even, Forex needs five days to negotiate the world's whole shares in stock⁵. This is a market that trades far beyond the flows of trade and services. In fact, Forex deals with the stock of global wealth constantly changing its currency denomination form.

Figure 1 shows the evolution of currency market activity in terms of its daily turnover and in comparison with the sum of world's exports and imports. It finds a significant increase in daily turnover - from US\$ 1.52 trillion to US\$ 3.98 trillion - from 2001 to 2010. Those amounts were equivalent to 35.7 times the sum of exports and import in 2001 and rose up to 49.4 times in 2010. Accordingly, the BIS triennial survey of 2010 shows that despite the crisis, the foreign exchange market follow the increasing turnover trajectory⁶.

A turnover comparison for periods prior to 2001 is hampered by the incoming of the European currency in the market. The euro substantially reduced the turnover volume as it eliminated the operations between the old European currencies such as the mark, the franc, the lira, the peseta, the escudo, and the drachma, among others. *Figure 1* illustrates this turnover drop between 1998 and 2001.

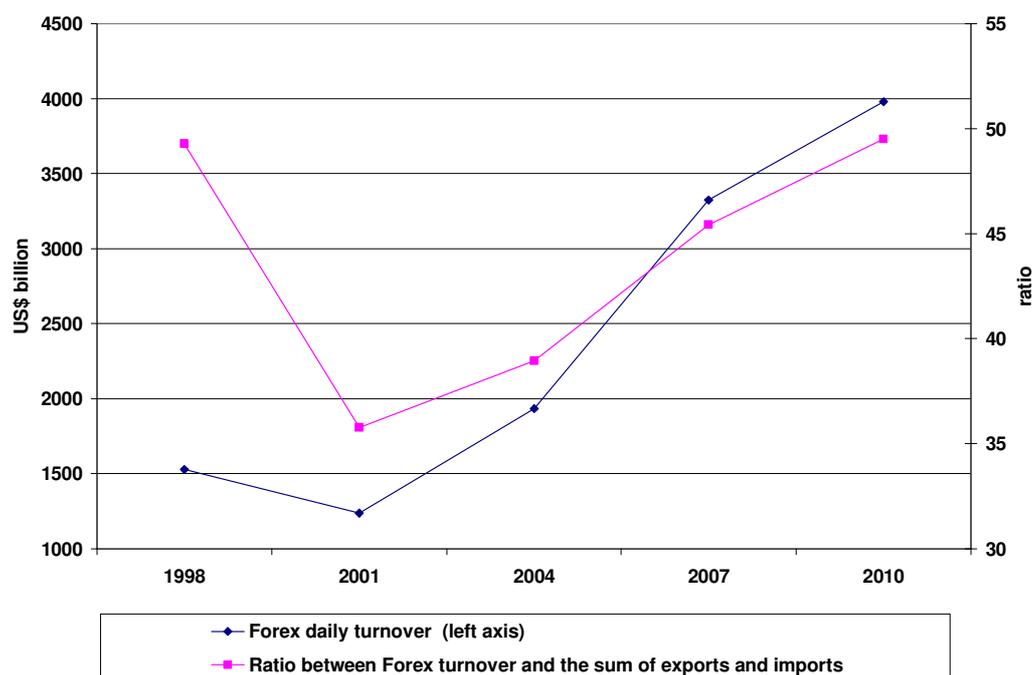
³ Naturally, despite no market bias, there are different degrees of market liquidity and profitability depending on the considered period and currency pairs.

⁴ The *Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity* is a survey conducted every three years since 1989. In 2010, 54 central banks collected data from 1309 banks and other dealers (called "reporting dealers"). Data are collected throughout April and reflect all transactions occurred in that month. See BIS (2010) for more information about the survey.

⁵ The IMF estimate for the world GDP in 2010 is US\$ 61.7 trillion according to the World Economic Outlook released in April 2010. The overall value for global stock of shares was \$ 17.1 trillion in 2007 according to CPIS data (August 2010). This number was reduced to \$ 9 trillion in 2008 with the financial crisis.

⁶ In fact, market turnover is expected to increase in moments of crisis since agents are rebalancing portfolios and protecting themselves from currency mismatches. However, speculative activities are expected to reduce in a continuous period of risk aversion.

Figure 1: Forex daily turnover and ratio between Forex turnover and the sum of exports and imports*



Source: BIS and IMF, author's calculations.

* Daily data of exports and imports were estimated based on IMF data, considering April data of the respective year and dividing monthly data by 30.

Given these data parameters, it is natural to blame speculation for the excessive turnover in the Forex market. However, there are some impediments that make it impossible to distinguish speculative operations from activities linked to the real world. According to Lyons (1996), most of the Forex transactions occur among financial intermediaries, in order to balance their balance sheets. For example, a financial institution, on behalf of a client needs, sells dollars and buys Turkish lira. Not wanting to be exposed in Turkish lira, the institution sells off part of the value in Turkish lira to a commercial bank. This bank also wants to avoid being exposed in Turkish lira, thus hedges itself in the future market by selling future contracts in that currency. And so it continues until someone wants to be exposed in Turkish lira by the amount it was acquired. In the literature this is called the "hot potato process" (LYON, 1996).

Investment Strategies

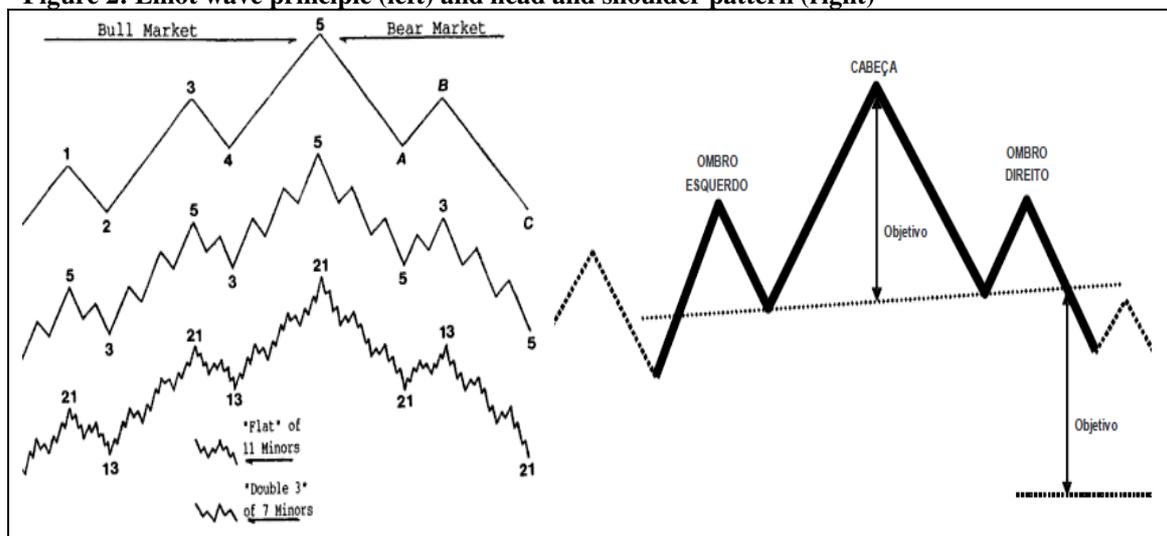
The way Forex participants define their investment strategies is of crucial importance as these can potentially impact short-term exchange rate behavior. The so-called "exchange rate micro-structural approach" literature indicates that the "chartist" or "technical" analysis used by Forex investors is one of the causes that explain

exchange rates deviation from fundamentals (SARNO and TAYLOR (2001) and FRANKEL *et all* (1996)).

In fact, the use of macroeconomic models based on fundamentals to forecast exchange rates is very unusual among traders. Fundamentals as the political context, monetary policy and macro variables are used in a freely way establishing out directions for investment. In short-term, investment strategies are guided by chartist analysis. These are techniques based on inductive analysis of past movements of exchange series (MENKHOFF and TAYLOR, 2006).

Among instruments of chartist analysis there are descriptive statistics such as moving average and volatility indicators. However, other less conventional instruments are part of that group; for example, the Fibonacci sequence which consists of numerical nexus that derived from natural laws which is used to set exchange rate prices that should start or end an speculation strategy. Other curious methods are the "Elliott wave principle" and "head and shoulders pattern" that are based on the assumption that human behavior is repetitive. In the first method investor psychology tends to produce five waves in favor and three waves against the trend and the second method establishes a pattern of exchange rate trend reversal (*Figure 2*).

Figure 2: Elliott wave principle (left) and head and shoulder pattern (right)



Source: Prechter (2004: 195) e Boainain e Valls (2009: 7)

It may seem anecdotal, but the use of these techniques is in fact widespread in the financial markets as shown by Menkhoff and Taylor (2006) and Taylor and Allen

(1992). A former study of the Group of Thirty (1985) reinforces the idea that technical analysis is an important market convention:

“Most respondents think that the use of technical models has had a definite impact, mostly by making markets more volatile, at times onesided, and by exacerbating trends. Because technical models have gained wide support, they have introduced new parameters in the market, which dealers cannot afford to ignore. There has also been an impact on turnover; trading is often triggered by the availability of information, and technical models appear to have built confidence among the believers, making them more inclined to trade.” (GROUP OF THIRTY, 1985: 45)

Indeed, the widespread use of techniques or behavior rules can self-fulfill profits of an investment strategies considering that it defines collectively when to buy or sell a particular currency. Moreover, the widespread use of these techniques accuses a market behavior pattern that can be rational from speculators angle but also harmful to the macroeconomic equilibrium⁷.

2. Exchange rate misalignments

The spreading of the global financial crisis in September 2008 stressed the global imbalances as a fundamental disturbance of the international monetary system. These imbalances – put in evidence by current account balances and foreign reserves accumulation - are associated to exchange rates distortions, sometimes politically imposed as in China, but also market driven. Following this study hypothesis, the failure of exchange rates as a macroeconomic adjustment mechanism is due to the role of the foreign exchange market that imposes significant distortions in several exchange rates.

The purpose of this section is to investigate the association between the exchange rates behavior and other economic variables. Thus, it analyzes the behavior of macroeconomic variables of a group of 32 selected economies⁸. The variables

⁷ "Algorithmic trading" is another way of trading currencies that is gaining prominence. It consists basically in the use of computers to perform orders of buying and selling currencies. The funds managed by computers can increase profits in normal times since the diffusion of algorithmic trading strategies is equivalent to a herd behavior and tends to move the market in a certain direction. However, the sub-prime crisis led to large losses in these funds, the passage below clearly points out the reasons: “Computer programs base their decisions on past data and may not recognize that the past data are driven by their own trading activities. Moreover, automated trading programs tend to have similar trading strategies (because they are based on the same set of past information) and this may lead to herding. Thus, automated trading could not deal with exceptional volatility and forced selling. Computer models assume that trading is driven by valuation and not by liquidity needs, if trading decisions are not driven by valuation, computerized model become useless or, as it happened in the past week, predict the opposite of what the market will do.” (KHALIDI et al, 2007: 28)

⁸ The 32 selected economies are South Africa, Argentina, Australia, Brazil, Bulgaria, Canada, Chile, Colombia, Denmark, England, euro area, Hungary, India, Indonesia, Japan, Korea, Malaysia, Morocco, Mexico, New Zealand, Norway, Philippines, Poland, Romania, Russia, Serbia, Singapore, Sweden,

concerned are those commonly used in exchange rate forecasting models based on "fundamentals" such as interest rate, current account balance, inflation rate and reserve accumulation.

The review period runs from the third quarter of 2006 to the fourth quarter of 2009. The timeline is divided into three parts featuring the "full", the "crisis" and the "resumption" of global liquidity. The three sub-periods are: third quarter of 2006 to third quarter of 2008, fourth quarter of 2008 to first quarter of 2009 and the second to the fourth quarter of 2009. This subdivision shows the impact of the crisis on exchange rates and a parallel between the pre-crisis and post-crisis. The choice of these periods obeys the hypothesis that the liquidity cycle has a important role in determining exchange rates.

It is understood that the second half of 2006 was a period of global liquidity boost due mainly to the end of the rising interest rate cycle in the U.S. economy⁹. According Biancareli (2009), the second liquidity cycle for emerging and developing countries of globalization - or "super cycle" - gained momentum in 2006 and crumbled in 2008. After global liquidity tightening in the sharpest phase of the financial crisis, the international financial flows returned to significant levels from March 2009.

Two studies of BIS, Kohler (2010) and McCauley and McGuire (2009), showed a positive association between the level of interest rates and exchange rate depreciation in the 2008 crises. With some methodological differences our findings - represented in *figure 3* - corroborate these studies. The line at the top of the graph shows a positive correlation between average interest rate and exchange rate depreciation during the crisis period, in other words, countries with higher interest rates had a higher depreciation of its currency against the dollar¹⁰.

Besides the crises analysis, the panel of countries also shows some linear association in the pre-crisis period, which is consistent with the hypothesis that the pre-crisis exchange rates appreciation process is due to interest rate differentials. In

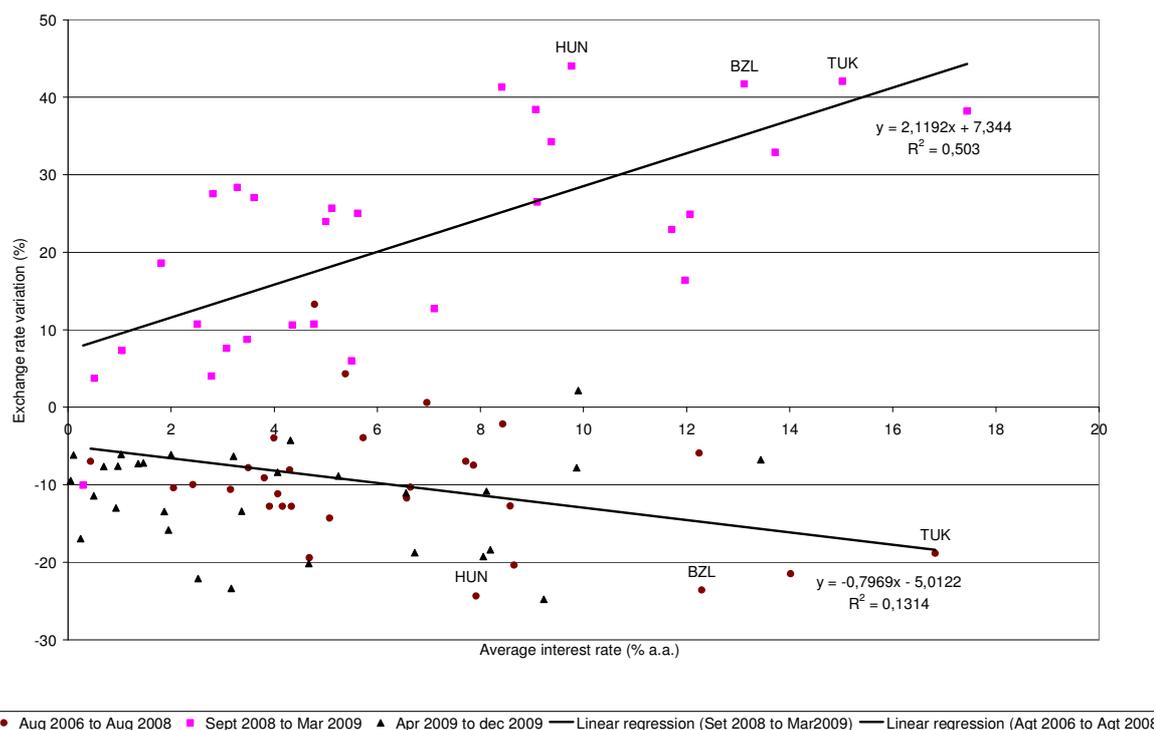
Switzerland, Thailand, Turkey and Uruguay. The sample selection criteria were: exchange rate regime (countries with fixed regimes were not incorporated such as China, Venezuela and Saudi Arabia) and economic importance. The United States were not included because exchange rates are accounted in dollar. Nominal exchange rate series are those provided by the IMF and refers to "market rate" period-end. For some countries the available data refers to the "official rate" or "primary rate".

⁹ U.S. interest rate, measured by the Federal Funds Rate, runs from 1% in June 2004 to 5.25% in July 2006. This last rate stays stable for over a year and then falls sharply from August 2007.

¹⁰ In this work, exchange rate exchange rate references concern a currency measured in U.S. dollar (monetary unities per dollar), in other words, a positive change indicates a depreciation of the actual currency against the dollar, and a negative change, an appreciation.

addition, economies with a highest appreciation before the crisis were the same that had the highest depreciation during the crisis: those are Brazil (23% appreciation and 41% depreciation), Hungary (24% and 44%) and Turkey (19% and 42%). Therefore, interest rate differential reinforces exchange rate trend upwards and downwards.

Figure 3: Average interest rate and exchange rate variation against the US dollar of a selected group of economies*



Source: IMF, author's calculations.

* Regression coefficients denote significance at 1% level for the period from September 2008 to March 2009 and at 5% for the previous period. Interest rate series are those available in IFS-IMF: "money market rate" is applied to the majority of countries. When needed, others series as "call money rate", "deposit rate" and "interbank rate" were used. Poland and South Africa were excluded from the group of 32 selected economies due to data discrepancies.

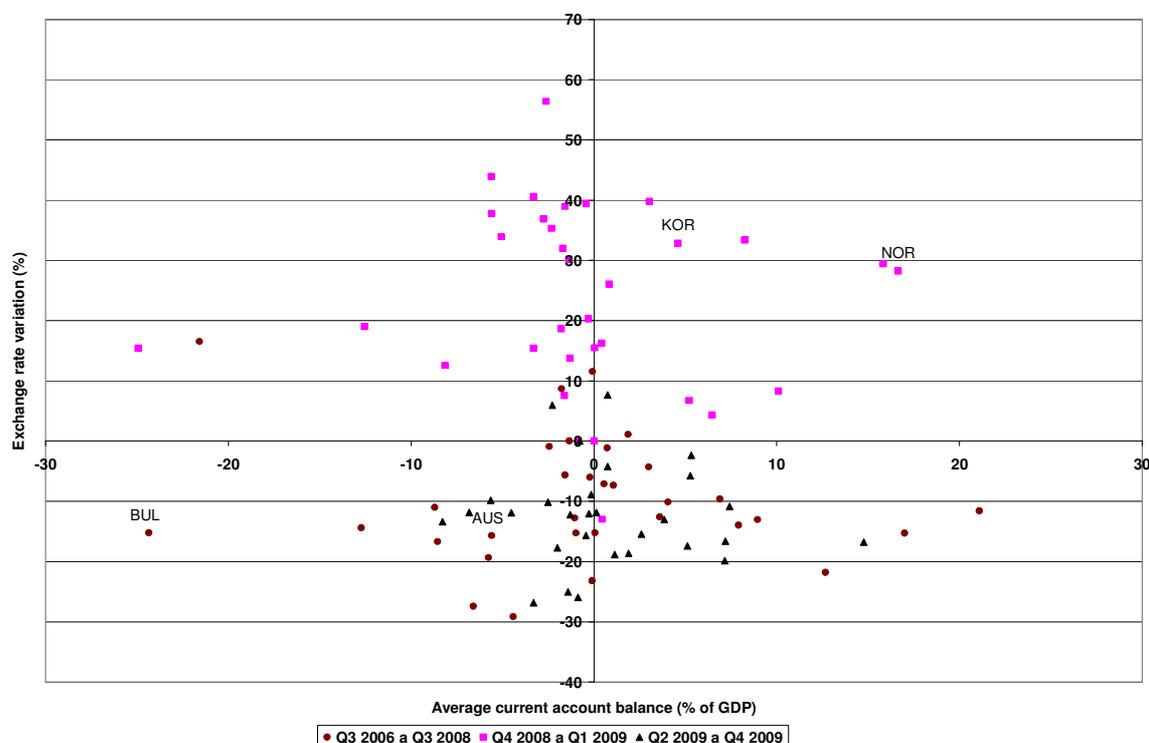
In contrast, the interest rate differential seems to have cooled its effect on exchange rate variation in the post-crisis. As shown in *figure 3*, despite a surprising revival of currencies appreciation in developing countries there is no obvious correlation with the level of interest.

In economic theory the main macro-fundamental used to explain exchange rate adjustments is the current account balance. The theoretical defense of floating exchange rate regime supports that, without policy restrictions, markets tend to adjust the exchange rate at an optimal rate that balances the external accounts, making null the current account balance. However, the analysis of *figure 4* shows that there is no

apparent association between the current account balance and exchange rate changes during the period under review.

In the pre-crisis period – from the third quarter of 2006 to the third of 2008 – there is a strong concentration of observations below the horizontal axis, which indicates the appreciation of most currencies against the dollar and a complete dissociation between exchange rate and the current account balance. Some countries have appreciated its currency against the dollar despite large current account deficits, for example: Bulgaria had experienced a 24.3% GDP deficit and a 15.2% appreciation and Australia had a deficit of 5.6% and an appreciation of 15.7%.

Figure 4: Current account balance and exchange rate variation against the US dollar of a selected group of economies*



Source: IMF, author's calculations.

* Serbia and Uruguay were excluded from the group of 32 selected economies due to lack of data.

One would expect that the economic crisis would promote a sudden exchange rates adjustment to the current account financing conditions. However, *figure 4* shows no linear association between the two variables during the period of crises. Moreover, economies like Norway and Korea, despite significant current account surplus (16.6% and 4.6% of GDP respectively), suffered serious exchange rate depreciation (28.1% and 32.8% respectively). In general, the third period of analysis characterizes a revival of

currency appreciation of several countries once again independently of current account results.

Another theoretically important variable for exchange rate dynamics is the inflation rate. In an ideal model, the nominal exchange rate should adjust to new price conditions keeping a constant real exchange rate. This adjustment is especially important for domestic production competitiveness *vis-à-vis* foreign products. In contrast - as noted in *figure 5* – in the first reported period the nominal exchange rate does not respond to rising domestic prices. Instead, the largest set of observations is in the right lower quadrant indicating appreciation and positive inflation. Considering a 3.2% U.S. average inflation from August 2006 to August 2008, the real exchange rates appreciation of most countries was greater than the nominal exchange rate appreciation¹¹.

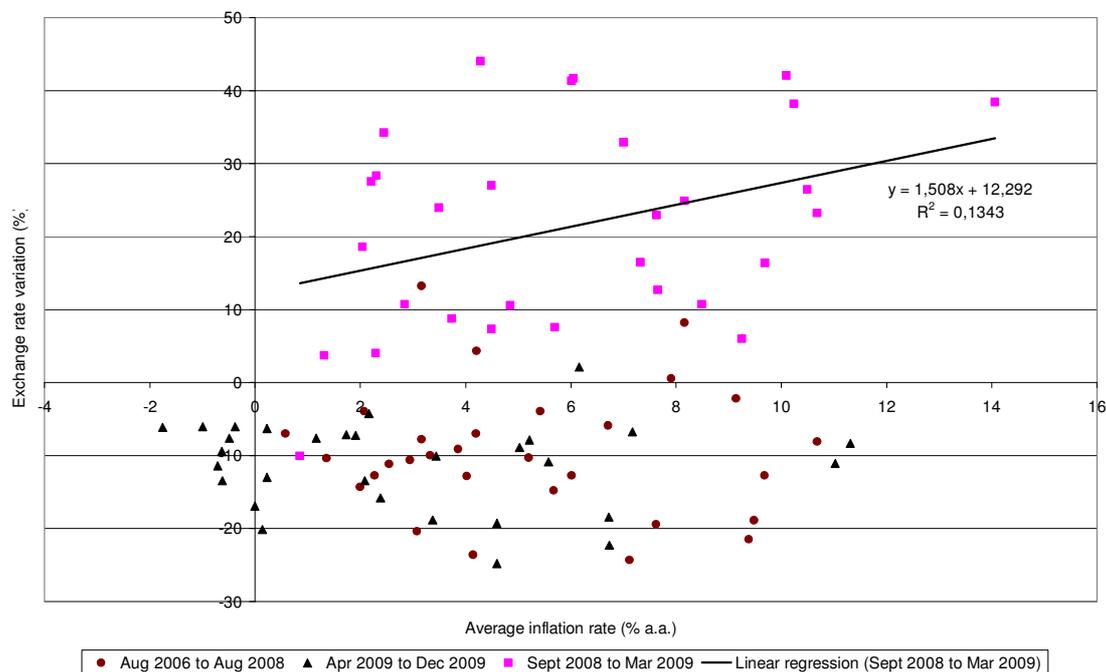
The non-adjustment of nominal exchange rate to domestic prices variations in the medium term is particularly severe in countries that use high interest rates as a tool for anti-inflation policy. On the one hand, high interest rates attract carry trade and promote an appreciation of the nominal exchange rate. On the other hand, the inflation rate above the average promotes an even more serious real exchange rate appreciation. The result is a loss of competitiveness of domestic production and a tendency toward current account deficit.

In the crisis period, the analysis of *figure 5* indicates a positive correlation between the variables. A linear regression for this data set shows a weak positive association between inflation and exchange rate changes. However, this association may have been caused by pass-through effects due to the large exchange rate depreciation in many countries. In other words, a plausible interpretation is that there was not a nominal exchange rate adjustment due to increase in domestic prices, but, actually a response of the domestic prices of some countries to the exchange rate depreciation. The post-crisis period experienced a return to the previous pattern, however, with a fall in the average inflation rate of all countries¹².

¹¹ During this period, the average inflation was 5.2% and a median of 4.2%. for the group of countries studied.

¹² The average inflation rate for all countries rose by one percentage point, from 5.2% between August 2006 and August 2008 to 6.2% during the crisis. Between April 2009 and December 2009, the average inflation rate falls to 3.1% due to the effect of the crisis and the appreciation of many currencies.

Figure 5: Average inflation rate and exchange rate variation against the US dollar of a selected group of economies*



Source: IMF, author's calculations.

* Regression coefficients denote significance at 5%. Interest rate series used are consumer price index (CPI % change). Poland was excluded from the group of 32 selected economies due to data discrepancies and Australia and New Zealand due to lack of data.

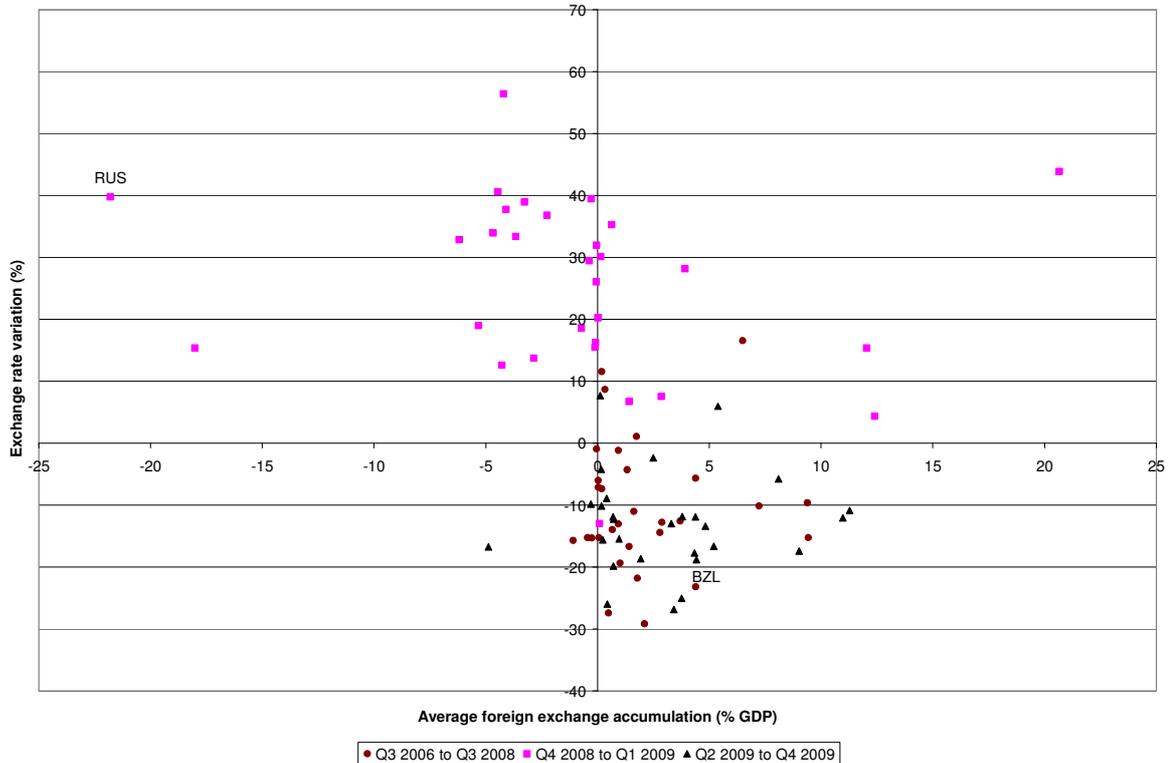
One can say that exchange rates do not fit to fundamentals due to government interventions in currency markets associated to the “fear of floating”¹³. Accordingly, the public buying and selling of foreign currency would prevent a deeper exchange rate adjustment and foreign reserves accumulation would be a factor that leads to global imbalances. Theoretically the argument described is reasonable; however, data analysis does not corroborate this argument.

In general, empirical evidence shows that central banks interventions prevented even greater exchange rate distortions. That is, the majority of countries that appreciated its exchange rate in the first and third periods of analyses also accumulated foreign reserves (see *figure 6*). Brazil, for example, had an average foreign exchange reserves accumulation of 4.3% of GDP per quarter and even so its currency has appreciated by 23.1% from the third quarter of 2006 to the third quarter of 2008. In the most severe period of economic crisis - with exchange rates trends reversal - there was also a change in foreign reserves policy direction. Mostly, central banks started to sell foreign

¹³ On the fear of floating see Calvo e Reinhart (2000).

currency to avoid a higher depreciation. An extreme example occurred in Russia where there was a 39.7% currency depreciation combined with a sale of foreign reserves of around 21% of GDP¹⁴.

Figure 6: Foreign reserves accumulation and exchange rate variation against the US dollar of a selected group of economies*



Source: IMF, author's calculations.

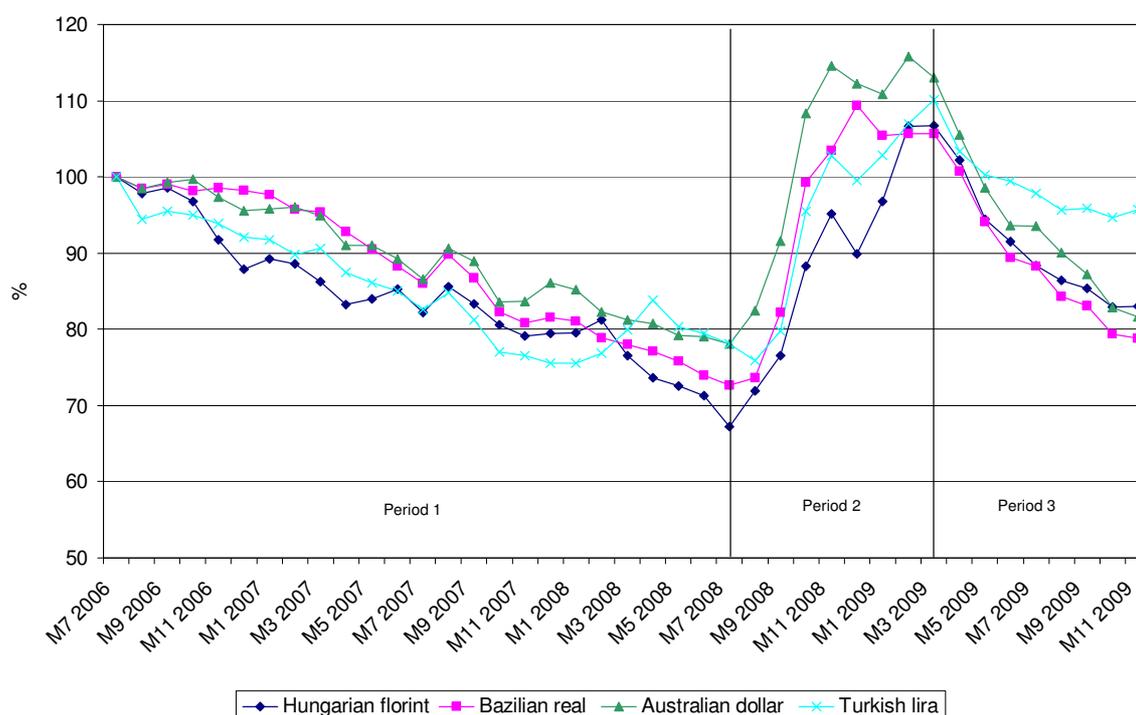
* Regression coefficients denote significance at 5%. Interest rate series used are consumer price index (CPI % change). Serbia, Uruguay, Singapore and Malaysia were excluded from the group of 32 selected economies due to lack of data.

When analyzing the exchange rate trajectories of four high-yield economies, namely Hungary, Brazil, Australia and Turkey, from July 2006 to November 2009, it is surprising to see a uniform behavior, as shown in *Figure 7*. This similarity occurs despite the heterogeneity among this group of countries in several economic indicators such as the current account situation, inflation, private and State indebtedness, composition of exports, growth pattern, etc. For these economies, it seems that one of the few similarities is a high level of interest rates, which, nevertheless, appears to be a crucial factor influencing the exchange rate trend.

¹⁴ Some countries generated outlier observations, such as Hungary, which has accumulated around 20% of GDP in foreign reserves in the period of crisis. This amount is due to a 20 billion euros IMF loan.

Figure 2 shows three distinct periods with different exchange rate trends in all the four countries. *Period 1* is characterized by a strong exchange rate appreciation; in addition, most of the economies examined had current account deficit during that time¹⁵. An enormous exchange rate depreciation is a leading feature of *Period 2*, due to the effects of the crisis. Finally, in continuation of the roller coast pattern, another round of appreciation starts in March 2009.

Figure 7: Exchange rate trajectory against the US dollar in Hungary, Brazil, Australia and Turkey from July 2006 to November 2009 (July 2006=100)



Source: IMF, author's calculations.

3. The carry trade operation

The economic correlations mentioned above are not fully predictable and coherent for mainstream economics and require an effort to re-think the role of finance and more specifically to understand distortions caused by financial flows and derivatives market speculations. In this sense, a key factor acting as an engine of speculative flows is particularly the carry trade.

¹⁵ Brazil had a current account surplus during 2007 and deficits in 2008 and 2009. Hungary had deficits until 2009. Australia and turkey had current account deficits during the all period.

This operation is a leveraged trading strategy involving two currencies that can be operated through the banking system or by bets in derivatives market. In its first form it consists basically in borrowing funds from economies with low interest rates like the US, Japan and Switzerland and applying them in high interest countries such as Brazil, Turkey and Australia. This operation leads to a financial flow that tends to depreciate the “funding currency” and appreciate the “target currency”.

In derivatives markets there is no need to take out a loan to perform a carry trade neither applying in any asset that yields interest. An instrument such as foreign exchange swap generates the same effect in a more efficient way and the investor does not assume a debt, nor acquires an asset. In this kind of swap, the price of a future exchange rate brings along the interest rate differential between two currencies¹⁶. The position is measured by the agent’s exposure: *short* when he is betting against a currency and *long* when he is betting for a particular currency.

An arbitrage gain overcomes from interest rate differentials but the final gain depends on an unknown exchange rate behavior. The speculator bets on a stable exchange rate or a depreciation of the funding currency and an appreciation of the target currency. The latter form is even more advantageous for the speculator since it depreciates the loan and appreciates his yield¹⁷.

The carry trade often fulfills the speculator's expectations as the magnitude of the flow tends, *per-se*, to cause exchange rate variations. In other words, the intensity of the flow tends to further reinforce the expectation that it was created. In addition, this operation weakens the borrowed currency and appreciates the target currency of this operation, as investors sell the former and convert it into the latter one. The higher the interest rate differential, the more attractive the carry trade is.

The carry trade is increasingly more recurrent in economic literature. Some UNCTAD documents highlight this speculation strategy as a cause of global imbalances in works as Flassbeck e La Marca (2007) e UNCTAD (2007 e 2010):

“Flows moving from low-yielding, low-inflation countries to high-yielding, high-inflation countries would cause the currencies of the latter to appreciate, and provoke the paradoxical

¹⁶ Covered interest rate parity implies that the forward exchange rate is the spot rate added by an interest rate differential (ISARD, 2008).

¹⁷ A theoretical specificity of the carry trade is that this strategy is a bet against the uncovered interest rate theory (UIP). That is, the carry trade is unprofitable if the UIP is valid. The logic is simple; the parity condition states that the currency with a higher interest rate tends to depreciate against the currency with lower interest rate. In other words, the interest differential is as a way of rewarding the investor for future devaluations of the higher interest rate currency, making null the carry trade return. Thus, the foreign exchange market is in equilibrium when the expected returns of similar applications in all currencies are equal when measured in the same currency.

and dangerous combination of surplus economies experiencing pressures to depreciate, and deficit countries facing a similar pressure to appreciate.” (UNCTAD, 2007)

Hence, the carry trade can reasonably explain why countries can have the same exchange rate trajectories despite few common aspects beyond the interest rate level. Similarly, this speculative strategy could have been the cause of continuous appreciation of several exchange rates against the dollar before September 2008, which looked like dissociated from economic fundamentals and the subsequent depreciation during the crisis.

It can also explain the apparent paradox in which the epicenter of the crisis became the safe haven of financial flows since the leverage assumed in carry trade operations induces quick reversals of those flows to their origin, aiming to re-pay loans and avoid losses. Therefore, the unwinding of carry trade operations added to others financial flows caused reversals in exchange rate trends.

4. Policy paths to counteract carry trade

An impetus for re-thinking economic theory is an opportunity that emerged from the crisis. New approaches to old issues are important to enable re-visiting of policy recommendations. The understanding that financial flows and derivatives markets are not neutral and affect the adjustment of freely floating exchange rates implies that nationally oriented monetary policy is inconsistent with liberalized and global finance. In other words, a national interest rate that moves in response to domestic targets such as inflation provides incentives for financial investments driven by interest rate differentials.

The adequacy of domestic interest rates to international standards would be an easy way to reduce carry trade activity. Naturally it also represents a resignation from an independent monetary policy since the rate consistent with the international level may differ from domestic monetary policy objectives. Ideally, an international monetary policy coordination as the one proposed by UNCTAD (2009) would bring more efficiency to the system than unilateral national measures. While a broad new financial architecture doesn't take place some domestic policy measures are necessary to reduce carry trade attractiveness. The policy challenge is to preserve the interest rate as a monetary tool of economic policy while keeping exchange rates safe from financial distortions.

Central Bank interventions in foreign exchange markets

The central bank may act in the currency markets by preventing the formation of speculative positions or even imposing losses to speculators holding long or short positions. Accordingly, he can operate as a market player changing exchange rate quotations in spot or future market. In spot market, Central Bank can impose losses to speculators by buying foreign currency unexpectedly and thus depreciating the exchange rate. Moreover, it can inhibit new speculative positions if agents interpret that the institution will not allow the currency appreciates.

However, the spot market intervention can create arbitrage opportunities between the spot and futures markets. The purchase of large amounts of foreign currency in spot market can reduce the forward premium and make the forward exchange rate more attractive¹⁸. Thus, arbitrage works as follow: agents borrow from abroad, sell foreign currency to the Central Bank, apply the resources in domestic interest rates and simultaneously hedge their position in futures markets, buying cheap foreign currencies. This dynamic involves a foreign exchange inflow and reduces the effectiveness of Central Bank intervention. Therefore, to avoid distortions and arbitrage opportunities it is better to intervene simultaneous in both spot and future markets.

The Central Bank can operate in futures market through foreign exchange currency swaps. The purchase of forward foreign currency (reverse swap) depreciate forward exchange rate and increases the forward premium. Thus, the depreciation of forward exchange rate is transferred by arbitrage to the spot market since agents borrow in national currency to acquire foreign assets and simultaneously sell foreign currency futures contracts, ensuring a return without risk.

Controlling foreign exchange market

Two economic policy directions can be exploited; the first focuses on reducing the carry trade attractiveness, and the second, maps and limits the currency exposure of agents. In the first case, a financial tax is used to impose a cost to short-term capital inflows and neutralize the earnings related to interest rates differential. Thus, domestic interest rate (i^d) should be equal to an international rate (i^i) plus a sovereign risk (ω) and a financial tax (λ).

¹⁸ The forward premium is a measure of the difference between spot and forward exchange rates. The higher is the forward premium, the higher is the cost of exchange rate hedging.

$$i^d = i^i + \omega + \lambda$$

This domestic financial tax works as the adjustment variable of the equation and can be brought to zero according to the equation equilibrium. A negative sign in the financial tax can occur if the domestic interest rate is lower than the international rate plus the sovereign risk. In that case the tax should be applied to capital outflows (and not inflows) as is illustrated in the case of currencies that originate funds for the carry trade. These forms of capital control tend to discourage financial speculation by influencing directly the investor's return.

A second direction of economic policy consists in regulating spot and derivatives foreign exchange market. A first step is to register all foreign exchange transactions and market participants' exposure on their balance sheets. Furthermore, it is important to limit long and short positions of different domestic agents in the spot and derivatives markets to prevent the formation of large speculative positions.

The above policy measures can be part of a broader new financial architecture, which will include national and international measures that aim to pursue stability through financial regulation. Their final goal is to neutralize the effects of speculative flows on exchange rates and consequently on current account balances. As a result, nominal exchange rates would be able to float according to real economic fundamentals and without financial distortion.

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