

External capital flows' management in the great recession: the Brazilian experience (2007-2013)

42° Encontro Nacional de Economia

Área 4 (macroeconomia, economia monetária e finanças)

Cesar R. van der Laan - Central Bank of Brazil. E-mail: cesarvdl@yahoo.com

Marcos Tadeu C.Lélis - Associate Professor – Department of Economics/Unisinos. E-mail: mcaputi@uol.com.br

André Moreira Cunha – Associate Professor – Department of Economics and International Relations/UFRGS; CNPq Research Fellow. E-mail: andre.cunha@ufrgs.br

Address: Federal University of Rio Grande do Sul

Faculty of Economic Sciences

Graduate Program in Economics

Av. João Pessoa, 52 sala 33B - 3rd. Floor

Zip Code 90040-000 - Centro - Porto Alegre/RS - Brazil

Phone: +55 51 3308-3440 or +55 51 3308-4050

Resumo: O artigo analisa a legislação tributária sobre os fluxos externos e contribui realizando testes econométricos para identificar a significância dos efeitos das mudanças no Imposto sobre Operações Financeiras (IOF). Como estratégia, simulam-se modelos estruturais univariados. Identifica-se que o IOF foi relevante ao introduzir quebra estrutural no fluxo de investimento estrangeiro em carteira.

Palavras-chave: controle de capitais, medidas macroprudenciais, fluxos de capitais, conta de capital.

JEL: E44, F43, O16

Abstract: We consider tax implementation on external capital flows to Brazil, in a monthly basis, since 2007, aiming to identify significant effects of changes on tax legislation over the pattern of financial flows from abroad. Using univariate structural models, results show IOF has introduced a structural break on foreign portfolio investment inflows.

Key Words: capital controls, macropudential policies, capital flows, capital account

External capital flows' management in the great recession: the Brazilian experience (2007-2013)

Introduction

Even though mainstream economists usually agree that there are substantial benefits from international financial integration, the extension by which countries open their capital accounts to external capital flows still remains a controversial question (Arestis and De Paula, 2008; Claessens and Kose, 2013; Rey, 2013; Wolfson and Epstein, 2013). The cyclical and the volatility of the flows rise concerns regarding the macroeconomic stability and the potential impacts on the development of the receiving economies. As a consequence, and with more emphasis during the so-called "great recession", policymakers started revising the adopted instruments to manage the potentially destabilizing flows on emerging economies (Ostry *et al.*, 2010, 2011; Cynamon, Fazzari, Setterfield, 2013; Gallagher, 2014).

The post 2007/2008 crisis period has raised active monetary policies on advanced countries as a way to avoid recession in their economies, with the "currency wars" and "monetary tsunamis" being part of the global economic agenda. Likewise, external capital flows have constituted a relevant preoccupation not only on emerging economies but also on the developed ones (such as Japan, by the effect on the competitiveness of its manufacturing sector, and Switzerland, by the inflation bias), notwithstanding with the volatility of the exchange rate and its effects on the real economy. The response of the economies to the instabilities of the capital flows is not consensual, with each country developing their own domestic solutions, adapted to their very realities (IMF, 2012; Akerlof *et al.*, 2014; Eichengreen and Rose, 2014).

Brazil has not been an exception in this scenario. The recent years have given rise to a more energetic action of the central government, through the Ministry of Finance, on the managing of capital flows. In particular, a market friendly tradition has been developed with the application of the so called "*Imposto sobre Operações Financeiras*" (IOF), which is a tax on financial transaction, as a prudential measure to reduce the volatility of the capital flows and restrain the spillovers identified on the economy. According to Olivier (2011), Brazil is one of the most active countries, after the 2007/2008 crisis, regarding the adoption of measures to control capital flows. The policies effects, nevertheless, are a matter of discussion on the literature, with many researchers pondering what would be the best policy to be adopted (Goldfajn and Minella, 2005; Carvalho and Sicsú, 2007; Carvalho and Garcia, 2008; De Paula, 2010; Jinjarak, Noy, Zheng, 2013; Chamon and Garcia, 2013). The effectiveness of the use of capital control has been a controversial matter; therefore further studies on the subject should be welcomed.

This research is embedded in this context and wishes to contribute in the debate in two main aspects: (i) we long to identify the edited macroprudential measures, based on the IOF, considering that the underlying period witnessed the destabilising effects of financial cycles (Borio, 2012), when Brazil had to deal with both excess of external capital inflows and sudden stops; (ii) from them test the effectiveness of the capital controls in Brazil, using monthly data from January 2007 to December 2013. Using the methodology of state space time series analysis, we have found that capital controls through IOF were effective, meaning that it has introduced a structural break on capital inflows series.

2. Revision of the Literature: theory and empiric evidence

The regulation of capital flows is a subject that has been constantly revisited. Tobin (1978) long ago already defended that a global tax on foreign currency transactions would reduce the destabilizing speculation on international financial markets. Recently, since the 2000's, the discussions have been focused on the use of punctual restrictions on the mobility of capitals in emerging countries, dealing with issues such as optimal mobility degree, relation with economic growth, and the effectiveness of the managing of capital flows (IMF, 2012). After the 2007/2008 financial crisis, interest in capital controls has suddenly become fashionable again, now as part of the so-called macroprudential policies (Akerlof *et al.*, 2014).

During the 30 years period while countries moved towards a globalized financial market, we verified a paramount of different perspectives and experiences in the managing of capital flows in the

receiving economies. We are talking about a technical regulation, but there is no systematization or unified international rule to be followed by countries; some measures may be suitable under certain circumstances, while others may not. IMF (2011, 2012) has been trying to advise a pattern of characteristics for optimal international regulation policies on capital accounts. The same has also been suggested by Olivier (2011). The objective is to be a framework of rules to orientate countries on how to deal with the capital flows. The capital flows control measures are suggested for specific situations, such as when the exchange rate is undervalued, and when the economies are overheated and there is no room for tightening fiscal policies (IMF, 2011). In the same way as for international trade, the recommended, if needed, would be transparent measures as anti-cyclical taxes over certain kinds of capital flows, seeking financial stability; topic that has gained more attention after the 2007/2008 economic crisis. However, the international financial framework rules out the adoption of a unified international measure on the matter, with countries not being able to reach an agreement on how to regulate the financial flows, what recalls the discussion on the post-war period at Bretton Woods (IMF, 2012; Wolfson and Epstein, 2013; Akerlof *et al.*, 2014).

According to what Griffith-Jones, Ocampo and Stiglitz (2010), Blanchard *et al.* (2012), Gallagher (2014), among others, suggest, the 2007/2008 crisis recalled the need for a regulation on financial flows, with the adoption of prudential measures, correcting distortions created under the *laissez-faire* policies. Korinek (2011), for instance, suggests that there are spillovers related to financial crisis due to the fact that market agents do not internalize their contribution to financial instability upon taking decisions on resource allocation or debt collection in the short term, generating excessive risk taking. In this case, prudential capital controls may lead to the internalization of costs and to increasing macroeconomic stability and economic well-fare.

The empiric literature on the subject faces the heterogeneity of time-frames and samples on the research works, besides the multiple definitions on what constitutes the effectiveness, not to mention the lack of a common methodology. Anyway, the rationale subjacent to capital controls encompasses what academics refer to as “four fears”: the fear of currency appreciation; the fear of hot money; the fear of excessive inflows; and the fear of the loosening of monetary autonomy. Insofar, capital controls would aim to reduce the volume of capital flows or change its composition (aiming towards a longer maturity), reducing pressure on the real exchange rate and allowing a higher degree of autonomy to the monetary policy. Baba and Kokenyne (2011) suggest that the macroeconomic impact of capital controls must be assessed under its capacity to achieve four basic objectives: contain capital flows; widen the maturity of inflows; reduce the appreciative pressure on the exchange rate; and grant more autonomy to the calibration of interest rates on the monetary policy.

Assessing the efficiency of the controls, Schneider (2000) suggests that they may be effective on influencing the composition of capital inflows, granting better external managing conditions to the emerging economies, in the short and medium terms. The quarantine experience upon the Chilean capital inflows in the 1990’s is usually considered to be effective, being frequently mentioned in scientific researches. Magud and Reinhart (2007), in their survey, concluded that the capital inflow controls do not reduce the volume of liquid capital flows in a given economy, questioning the effectiveness of that measure, but acknowledging that they produce a modification in the nature and composition of the capital flows. Qureshi *et al.* (2011) examined the contribution of capital controls to the increasing of financial stability in the context of large capital inflows, analysing 51 emerging economies in the 1995-2008 period. They associated capital controls to a lower proportion of foreign currency loans in relation to the total domestic bank credit, and to a lower proportion of portfolio debt in relation to the total external obligations.

Magud, Reinhart and Rogoff (2011) indicated several evidences that capital controls are effective, at least, in the short term. Their extensive analysis shows that capital controls over capital inflows increase the autonomy of the central bank, change the composition of the capital flows and reduce, to some extent, the pressures over the real exchange rate. However, the impact on the long term appears to be a more controversial question, with some researches emphasizing temporary effectiveness on capital flows and asset prices, while others suggesting that capital controls are harmful to the increase of the well-fare state in the long-term (Magud, Reinhart and Rogoff, 2011; Blanchard *et al.*, 2012).

Nevertheless, at first, these authors agree that it is possible to guarantee the capital controls effectiveness with the monitoring and regulation of markets with some compliance cost. Moreover, there would be idiosyncratic characteristics in each economy that would determine the effectiveness of capital controls, what would explain why some capital control experiences were effective while others were not. Therefore, the positive experience in a given economy is not emulatable to another economy without considering the specific particularities of each economy (Wolfson and Epstein, 2013).

Likewise, IMF (2011a, 2012) shows recent cases of adoption of capital flows in emerging economies. The effects of the policies adopted by Brazil and other six emerging economies (Indonesia, South Korea, Peru, South Africa, Thailand and Turkey) are analysed in episodes of the augmentation of the foreign exchange capital. According to the IMF (2011a), the rapid economic growth after the global crisis, added to the high interest rates, made Brazil one of the preferred destinies to capital flows among emerging markets. The organization understands that the IOF had an impact on the contention of speculative capital flows in the short term, possibly due to the high levels of uncertainty over other measures it may have potentially generated and that may have affected the composition of the capital flows.

However, the IMF (2011a, 2012) did not identify impacts on the long-term, due to the fact that the introduction of the IOF did not provoke a significant reduction on the activity of non-residents on future markets. Likewise, it did not identify a clear and long-lasting effect over the exchange rate, and stressed the necessity of the authorities considering the dollars future market upon defining the tax, that only in 2011 went under taxation through the IOF (decree 7.563/11). Baba and Kokenyne (2011), on the other hand, assessed the effectiveness of the capital controls on a group of emerging countries in the 2000's, including Brazil; they conclude that the capital controls are usually associated to a decreasing in the capital inflows and to a widening of the maturation deadlines, even though the effects may be temporary. In order to do so, they build a *de jure* index observing the normative modifications on the capital flows on a monthly basis, using the methodology proposed by Van der Laan *et al.* (2010) in evaluating the normative changes exposed in the IMF AREAER.

Forbes *et al.* (2012) presented another interesting research to evaluate the effectiveness of the IOF on foreign flows of portfolio. The research used changes on the IOF taxation over the foreign investors in Brazil from 2006 to 2011 to assess the multilateral effects of capital controls in the global portfolio flows. Taking into account information provided by several global investors, the research concludes that the increase in capital controls in Brazil led international investors to reduce the allocation of portfolio in the country, denoting, therefore, the effectiveness of the regulation. More specifically, an increase in the IOF reduces significantly the percentage of the fixed and variable income portfolios allocated in Brazil, even though that this reallocation does not happen instantaneously, or even in the month of the announcement of the changes. The researchers identify that the process occurs gradually in a period of around three months. Moreover, an increase in the IOF may reduce smoothly the risk of the formation of bubbles and overheating of the stock market, what seems to be the case in Brazil; this conclusion is easily derived while observing the tamed capital flows and the lower financial turbulence, for instance, during the beginning of the second part of the international financial crisis in August 2011. In fact, the controls may reduce the portfolio flows and, therefore, potentially help the management of risks originated from inflow waves.

Simultaneously, investors would decrease their portfolio allocation to other countries with the probability of using controls (that would be encouraged to adopt similar managing policies, ahead of the experience of other economy with similar external projection). This denotes that the government's signalization in this way, and the expectation originated from the market, constitutes an important channel to the effectiveness of the regulation, accepting rational expectations. At the same time, a positive effect is the reallocation of capital to countries with a certain similarity with Brazil, should it be in the same geographic region, should it be with a similar external economic approach, constituting a substitute for the risk diversification in a global portfolio. Therefore, the results suggest that a big part of the capital controls over portfolio flows happens through signalization, instead of the direct cost originated from the controls already implemented.

Baumann and Gallagher (2012) examine the effectiveness of the capital regulation in Brazil (basically the IOF) and, not deviating from the literature, they find a small, though significant, impact on the change of the composition of the capital inflows in the direction of an investment with a longer maturation, on the level and volatility of the exchange rate, on the price of assets, and on the ability of the country to implement an autonomous monetary policy. They also conclude that the Brazilian regulation temporarily had an outcome that increased the capital flows to Chile. Therefore, they indicate that adopted measures helped the economy to face the turbulence of the external situation, even though they were not enough to control the monetary “tsunami”.

In Brazil, in fact, very few researches were made with a specific focus on the efficiency of the capital controls under an IOF taxation bias. The tradition, actually, was developed under the analysis of the Central Bank’s legislation on capital account flows, narrowing or not determining the kind of inflow or financial remittance, with main focus on the effects of the reduction on the capital controls on the growing of the domestic economy. The subject gathered research interest especially after the publications of Arida (2003a, 2003b) and Arida, Bacha and Lara-Resende (2003), that proposed full convertibility of the capital account, by means of the withdrawal of the capital controls from the Central Bank. The full convertibility would eliminate the risk of currency convertibility related to the capital controls discretionary of the Central Bank from the international transactions (the so called “jurisdictional insecurity” of the country), what would reduce significantly the sovereign risk – in its conception, substantially high –, and the domestic interest rate, finally promoting growth. A series of posterior works, such as Oreiro, Paula e Silva (2004), for instance, proposed a partial convertibility regime in the country, that should still adopt a more precautional strategy on the managing of international financial flows, including the (re)introduction of selective controls on the capital account. The same idea is inferred by Ono et al. (2005), Sicsú (2007), De Paula (2010), among others, such as Munhoz and Libânio (2010), pointing out the necessity to reduce the speculative bias of the international capital flows, suggesting that the benefits of the controls would overcome the costs.

Carvalho and Garcia (2008) also used a VAR model, assessing that the effectiveness of the Central Bank regulations on the country may last for (only) six months, being therefore ineffective from then on, what took them to conclude that these regulations are ineffective in the long-term. However, given that the VAR technique only generates simulations of temporary shocks decreasing in the short-term, so this conclusion should be relativized. The response of an innovation shock in one of the model equations necessarily decreases over time; otherwise, the model would be unstable and not stationary (see Patterson, 2000, p. 601). The shocks of transitory nature in the model do not show an evidence of inefficiency on the capital controls. The relevant result is the acknowledgement of the efficiency of the controls in the short-term, as showed in the model. Previously, the VAR model of Cardoso and Goldfajn (1998) identified that the tightness on the control of capitals is effective in short term, granting conditions to the emerging countries to breath in spite of the external financial turbulences, avoiding the sudden and massive departure of capital. In other words, the volume and the composition of the capital flows respond to restrictive measures. In the same way, Carvalho e Sicsú (2007, cap. 7) suggest that the capital controls were already adopted with success in several countries, while Goldfajn e Minella (2005) point out that control over the capital inflows affect the volume and the composition of the flows in Brazil, implicitly recognizing the effectiveness of the Central Bank’s actions.

Munhoz (2013) focus specifically upon the effectiveness of the IOF. Using a VAR model, results suggest that the speculative financial flows respond in a small degree to small alterations in the aliquot of this interest. Due to a low efficiency, in her point of view, of the capital controls through IOF, the author remarks the necessity of more concrete measures that would evade effectively the speculation of foreign investors and the consequent destabilizing effect of the financial flows in Brazil. However, we suggested that the used methodology may have a few problems, starting by the variable used as proxy for the modelling of the IOF. The author uses the collection of IOF on foreign exchange operations to gather the alterations on the IOF aliquot. Therefore, she assumes the inelasticity of the capital flows against the increase of the IOF, contradicting evidence that there is a change in the composition of the capital flows. Moreover, the collection of IOF used encompasses all the foreign exchange operations, while the IOF was applied on a few kinds of inflows, not representing therefore all the variations. The primary attempt to

modelling only the capital controls, using the IOF collection over all the foreign exchange operations to gather the IOF alterations on the specific flows does not seem to be adequate.

Besides not having the collection only for the short-term flows (portfolio-stock market), the focus of her study, the author suggests that the increase on the IOF generates an augmentation in the collection, as if the flows did not fall, in contradiction with the reality. The meaning of the supposedly direct relation (sic) between the collection of IOF and the increase in the aliquot also does not seem to be correct, ahead of the reduction of the inflows in a context of rising of taxes. At the same time, she uses only the time series for portfolio investments, for instance, but deduces conclusions for time series with no direct relation with it. Even the proxy shows constancy in the collection of IOF from 1995 to 2008, not identifying the variations in the controls that actually happened in this wide time-frame. A preliminary methodological approach would be to use the own IOF aliquot as a more appropriate indicator for the use of capital controls, and, therefore, for the analysis of the process of capital controls – however, the most adequate would be to follow the tradition inaugurated by Cardoso and Goldfajn (1998).

However, as the author stresses, “there is no data availability about the IOF aliquot in a systematized way, making the analysis more difficult” (Munhoz, 2013) – what grants room for the economic research, in the forms proposed in this article, as a way to systematize all data about the IOF modifications. This is the original contribution of this research. Other series of modelling problems, such as the selection of series, the use of net flows instead of total flows or inflows (over which the IOF is applied), ignoring all flows upon which IOF is applied, apart from using data in a monthly basis (available), also potentially jeopardizes the conclusive potential of Munhoz’s (2013) efforts. Therefore, using the balance of portfolio investments as if they were flows (incomes and outcomes) of a country with abroad, neither the IOF modifications nor the flows were modelled. It would be similar to taking the trade balance result, of USD 2.5 billion in 2013, and not the sum of import and export total turnover, which accounted for more than USD 480 billion and is the real flow to be controlled. The most interesting part was the conclusion of the IOF ineffectiveness with the simultaneous suggestion of a increasing of the aliquots of the tax.

The endogeneity of the capital controls is also a relevant matter. Henry (2006) stresses that the current and prospective performance of a given economy influences the extent to which policymakers decide to manage the capital controls; the same capital controls endogeneity idea, of Cardoso and Goldfajn (1998), is corroborated by Soihet (2002) and Paula, Oreiro and Silva (2003), in the sense that capital controls are more or less restrictive considering the performance of the capital flows. In other words, the endogeneity of the capital flows plays a role of reaction of the monetary authorities in the external managing of the economy, given the volatility of the autonomous capital flows. Collins (2007) also concludes that the capital controls seem to be endogenous in regressions modelling growth time series. Silva and Resende (2009) conclude that the capital controls in Brazil were indeed endogenous and effective in avoiding a significant part of the capital drain in the 1990’s.

In this context, it is important to observe the schedule of the panel of restrictive measures implemented by the Central Bank, easily concluding that they usually derive from an unfavourable external situation, being revoked afterwards. Usually the capital controls are applied upon the entrance of foreign funds and done fundamentally through the charging of IOF on the gains of financial investments in the country, creating a tradition to use market-friendly instruments in the managing of flows. One advantage is the familiarity that the government has to control capital flows allowing a better calibration of the IOF tax rate, given the knowledge accumulated through previous experiences. It also allows the financial system to introduce new measures more easily, which are also better assimilated by the economic agents (Ostry et al., 2010). This creates an environment with more “jurisdictional safety”, according to Arida, Bacha and Lara-Resende (2003) with the advantage of the IOF being a market instrument, not prohibiting the capital flows, but creating a directional incentive to guide them, applied on the capital inflows. Moreover, the capital controls tradition in Brazil has focused only on portfolio flows, not affecting the foreign direct investment (FDI) transactions, only recently being applied also on foreign loans, suggesting that the focus is the volatility of short-term flows. In this way, external flows tend to determine the level of capital controls, instead of them being determined by the level of controls.

Finally, Barroso (2012) makes a preliminary effort to estimate an optimal level of taxes to be charged over the capital inflow, with a 17 Latin-American economies database, for the 1970-2007 period, trying to anticipate crises caused by sudden economy turnovers. The author identifies as most relevant conditioning factors to the taxation of capital flows the agent's degree of aversion to international risk, the international liquid position of assets, the level of international foreign exchange reserves (which minimize the incidence and extent of economic crises) and the index of exchange rate over evaluation. His estimation suggests that taxes charged over the capital flows should be proportional to the square root of the probability of an external crisis. In this case, if we have a 10% increase in the probability of a crisis, there should be an additional increase of 1% over the taxes of capital flows to become an optimal taxation. This suggests that the current IOF taxation levels, which may represent more than 6% of the flows, would be too high of a level and implicitly unnecessary. Implicitly, despite of this conclusion, the author still recognizes the effectiveness of the capital controls.

More recently, Jinjark, Noy, and Huanhuan Zheng (2013) analysed five changes in the Brazilian capital account regime in 2008-2011. Using the synthetic control method, they constructed counterfactuals (i.e., Brazil with no policy change) and concluded that there was no evidence that any tightening of controls was effective in reducing the magnitudes of capital inflows. Nevertheless, authors suggested that capital controls had some short-lived success in preventing further declines in inflows when restrictions were relaxed.

Chamon and Garcia (2013) studied the impact of the controls and restrictions on capital inflows that Brazil has adopted since late 2009. Their results suggested that the controls were effective in the sense of creating distortions in the pricing of financial assets, making the domestic assets more expensive. As a consequence, controls were effective in partially segmenting the Brazilian financial market from the international market. Nevertheless, they also concluded that the controls were not able to avoid the volatility of the domestic currency when capital inflows were strong, which would be an important goal objective of the Brazilian authorities.

3. Recent measures and the direct effects on the exchange rate flow

The compilation of IOF's aliquot variations focused in studying the decrees edited in the post-2007 period, available in the Brazilian Ministry of Finance's website. Other legislation instruments of inferior hierarchy were not considered, such as resolutions or administrative measures, as they do not issue new IOF aliquots, only regulating the tax collection or clearing ambiguous points regarding the application and incidence of the tax. The IOF, originally established in 1993, has been used eminently as an economic policy instrument, and with a revenue bias only on the back burner.

Recently, the IOF collection in foreign exchange operations has been more active. Apart from substituting the CPMF¹, extinguished in late 2007, the IOF gained room in the regulation of foreign exchange flows after the issuing of a new basic regulation through the decree 6.306 in Dec, 2007, which came to substitute its predecessor, decree 4.494, from 2002. In this interlude, there was no modification of the IOF application over foreign exchange operations, apart from the edition of the decree 5.172, in 2004, which only changed aliquots for the insurance operations.

Lately, the IOF has been a key-tool to the capital controls. The Ministry of Finance has been more active ahead of the international financial market's turbulence and has been adopting measures to fight the "currency wars", to restrain the money inflow or the "monetary tsunami" coming from developed countries that have low interest rates (sometimes even negative) and have increased the money supply to heat up their economies after the 2008 economic crisis.

As foreign capitals returned to Brazil after the sudden reversal in 2008, Brazil introduced the IOF on capital inflows in October 2009, initially under a 1.5% aliquot, but soon increasing it to 2%, charged on every foreign capital inflow but the FDI. The easiness of its implementation is related to the fact that the Central Bank's electronic registration systems of financial operations allow easy distinction of the

¹ "Contribuição Provisória sobre a Movimentação ou Transmissão de Valores e de Créditos e Direitos de Natureza Financeira" (CPMF) was another tax on financial transaction, imposed on any removal of funds from bank accounts maintained in Brazil, in order to improve tax collection from the central government.

flows in relation to current account or FDI transactions, constituting a reason for its success. As the aliquot is not proportional to the amount of time capitals remain invested in Brazilian assets, the implicit tax rate was relatively lower to longer term inflows; the same happens to repeatedly rolled short-term assets, however economically derailing short-term operations. In other words, a disincentive has been imposed, via taxation, for foreigners to invest short term in Brazil, at the same time spurring them to remain with domestic assets for longer periods. This is now new, and one may consider it follows the same logic of the well-known Chilean quarantine of the 1990's.

A first step to evaluate the use of IOF in Brazil is to identify each normative measure issued during the analysed time-frame, just as its effects on the capital flows. We choose as a time-frame the Brazilian experience the recent period in which the capital controls through the IOF were used more intensely. In fact, the decree 6.306/07 is the basic legislation of the IOF that substituted previous law from 2004, but with no modifications on the aliquots applied on foreign exchange operations. Table 1 summarizes the main modifications upon foreign capital inflows. Basically, we may observe that the IOF was applied on two basic kinds of foreign capital inflows: loans and foreign investment in portfolio (stocks or fixed income), with foreign direct investment (FDI) remaining tax-free.

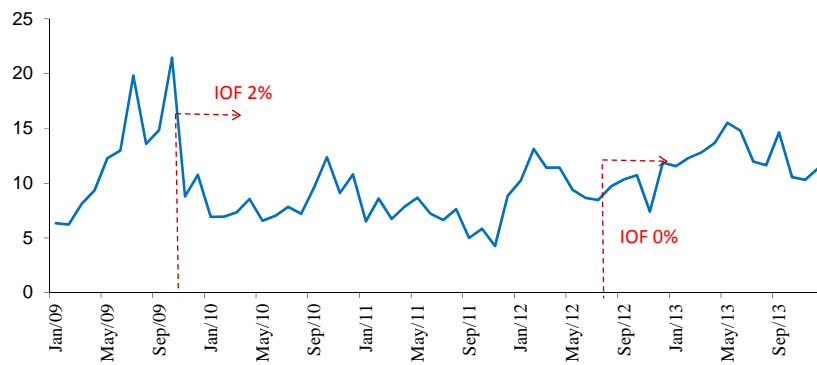
Table 1: IOF aliquots upon foreign capital inflows (2008/13)

Modality	Date (new taxation)					
Portfolio Foreign Investment-Stocks	Sep/09 (2%)	Dec/11 (0%)				
Portfolio Foreign Investment-Fixed Income	Mar/08 (1,5%)	Oct/08 (0%)	Sep/09 (2%)	Oct/10 (4%)	Oct/10 (6%)	Jun/13 (0%)
Up-to-90-days loan	Mar/11 (6%)					
Up-to-1-year loan	Mar/11 (6%)					
Up-to-2-years loan	Apr/11 (6%)	Dec/12 (0%)				
Up-to-3-years loan	Feb/12 (6%)	Jun/12 (0%)				
Up-to-5-years loan	Mar/12 (6%)	Jun/12 (0%)				

Source: Ministry of Finance. Obs. IOF current regulation imposed by Decree 6.306 (Dec/2007); IOF also imposed on portfolio-guarantee margin directed to derivatives market, though not consider in this paper due to its small relevance to capital flows.

The effectiveness of the IOF may be evaluated observing the response of the flows after each aliquot change. A clear IOF effect on stocks-driven portfolio inflows is noticed in the monthly average volume of the foreign investments directed to the stock market. As may be seen, the period registered the rising and decreasing of IOF over external inflows. Figure 1 shows that IOF has been imposed in September, 2009, with the return of portfolio inflows to stocks in 2009, while in December of 2011 it has been zeroed, as portfolio inflows came to a halt. In fact, after the decree 7632 issued on December, 2011 has eliminated the IOF, the monthly average increased from less than USD 7 billion (in the past 12 months) to USD 12 billion, a 68.6% increase.

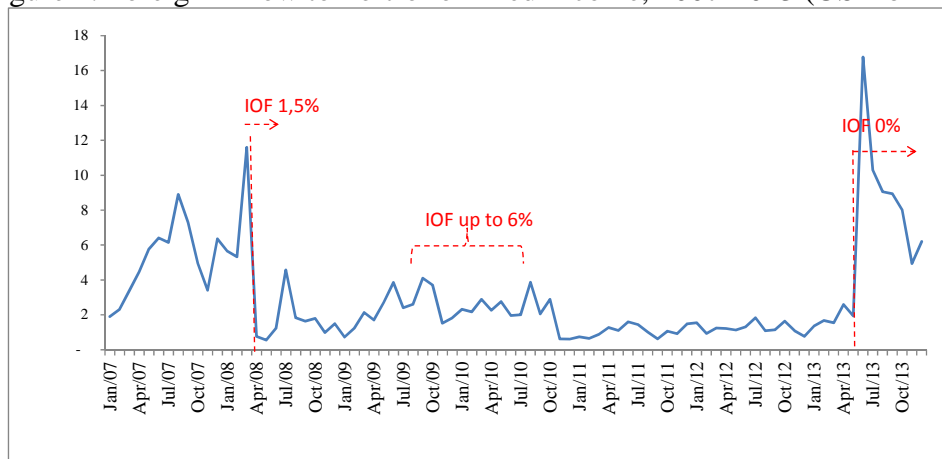
Figure 1. Foreign Inflow to Portfolio-Stocks, 2009-2013 (USD billion).



Source: Central Bank of Brazil

Excessive flows directed to funding the public deficit (fixed-income) have led the Government to impose IOF in two main periods. Firstly in the first semester of 2008, but soon reverted in September due to the crisis drying the local forex market; and later in 2009-2010 gradually achieving 6%, reverted only in June, 2013, with the cease of the foreign tide (figure 2).

Figure 2. Foreign Inflow to Portfolio-Fixed Income, 2007-2013 (USD billion)



Source: Central Bank of Brazil

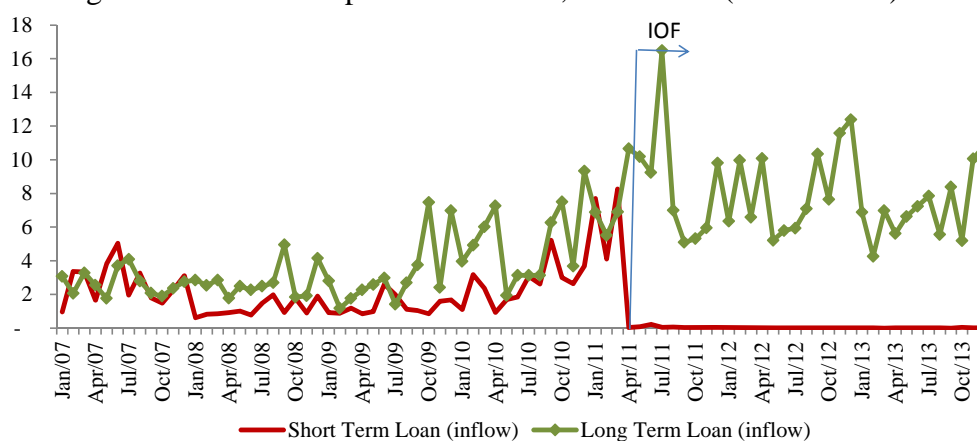
In fact, the foreign exchange flow becomes of better quality, for instance in 2011, in the sense of being less volatile than in 2008, when the reversion of the capital flows started to deepen the situation of stoppage of new inflows. This means less cyclic reversion potential: exportations and FDI receive more attention, ahead of the contention on stock-portfolio flows. In 2011, the FDI had record inflows inside the researched time-frame, and the same happened to the exportations, which are more resilient flows and less prone to sudden reversions. They are less volatile flows that usually offer less pressure to the domestic foreign exchange market ahead of external crisis. At the same time, in 2011, the more volatile flows of portfolio investment were considerable reduced, as related to the IOF measures; the stocks-portfolio inflows fell from USD 220 billion in 2008 to USD 85 billion in 2011. Therefore, the cease and reversion potential became much lower.

It's important to highlight the intrinsic instability of this short-term flow, which may move in or out the country at any unscheduled date. Indeed, it may constitute a leading indicator to financial crises. In the 2008 economic crisis, e.g., the reversion of this capital flow to the stock market started before September, with statistics registering negative net capital flows to Brazil since June (only balanced after March 2009). In 2011, such capital flow reversion has not been observed, certainly associated to the Ministry of Finance's attitude to avoid the creation of bubbles in the stock market with the implementation of the 2% IOF in September 2009, then restraining the enlargement of these financial inflows.

On the other hand, another clear effect on the inflows happened in 2011 due to the extension of IOF upon the short-term loan inflows. From then on, the flows with an average amortization time minor to one year virtually disappeared (figure 3). Also, IOF on foreign loans have been imposed up to maturities of 5 years, then returning to the level of 1 year in Dec/2012. Actually, the decree 7698/2012 affected the external loans granted by enterprises and financial institutions, with the monthly average inflow volume decreasing from USD 9.3 billion (in the 12 past months) to USD 6.3 billion, which represented a 31.8% decrease in the capital inflow. In net terms, the balance decreased 60%, from a monthly average of USD 3.7 billion to USD 1.4 billion. Extension of the external funding maturities was also observed, suggesting that the IOF has the capacity to extend the deadlines of new financial inflows, with agents adapting operations to a more stable scenario.

Even though short-term inflows may have partially migrated to longer term operations, this is an expected effect, as authorities allowed companies and banks to fund abroad in a time window when international rates were substantially low, linked to monetary easing policies in central countries (figure 3). In fact, measures were implemented in order to stabilize the inflows and avoid excessive external exposition to the more volatile financial flows.

Figure 3. IOF Effect upon loan inflows, 2007-2013 (USD billion)



Source: Central Bank of Brazil

4. Methodology, Data and Evidence

In a given economy the measurement of the degree of capital controls and, as a consequence, the degree of capital mobility is not an easy task. The difficulty starts with the definition and identification of the capital controls. The biggest part of the researches has used a qualitative measure, based on the existence or not of restrictive rules on the capital mobility, as suggested by the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). This work proposes a division of restrictions of transactions of the capital and financial account (where the financial flows are registered) in eleven sub-categories, informing the existence or not of restrictions in each sub-category. Then, the researches create indexes for each publication year and indicate the number of categories with flow restriction, and from that deriving an index for each year. There are many versions or methodological alternatives for the construction of *de jure* indexes, but they are all based on the data compiled at AREAER (see Qureshi *et al.*, 2011, for a recent work).

However, such kind of indicator has been criticized for not setting a degree between the various intensities in the level of financial liberalization, or the effectiveness of the regulations of a given country. The variations in the time-frame would be the result of variations on the existence or not of controls over the flows, without the capacity of measuring the effectiveness of the flow controls. Therefore, indicators based on these terms are restricted to the differentiation of regimes with or without controls, under a dualist point of view, without reflecting the dynamism of changes implemented over time on the flow controls. In the same way, the indicators would not distinguish restrictions on specific capital flows of non-residents. This puts different economies, that have different control regimes, in the same level of

capital controls, without representing the own particularities of each economy, in terms of controls. Moreover, the small frequency of IMF's data base source would also fail in collecting temporary control programs on capital flows, which may have a time-frame inferior to one year, ahead of not prolonged crisis.

As an option to works with panel data, which did not capture adequately the extension of the control measures, the individual country analysis is deeper. A credible methodological possibility was developed by Cardoso and Goldfajn (1998), who evaluate punctually each legislation change set forth on the foreign exchange market, instead of only observing if a given year's financial flow category has restrictions or not. While evaluating each regulation that was set forth, the authors built an index that captures the real measures that were set forth during time; this time-frame series was called Capital Controls Index (CCI). Basically, they classified each regulation in liberalizing (has the intention of encouraging the capital movement), restrictive (discouraging) or regulate (with a neutral effect on the capital flows), attributing each case with the following codes +1, -1 or 0, respectively. There is recognition that this index is more effective to capture the modification in the capital control levels. A series of works in Brazil followed this tradition, such as Soihet (2002), Van der Laan (2007), De Paula (2010), among others.

As an alternative, an index based directly on the nominal aliquot of the IOF could be used. A 2% aliquot in a given year, afterwards increased to 6% on the following year, could seem, at first, of a higher effectiveness, due to the fact that it would make the economic transactions more difficult. However, the conjuncture may indicate that a 2% aliquot has lost its effectiveness only during time, in the sense that it does not have the capacity of impacting the relative prices between the domestic economy and other financial markets – considering the differentiation of the capital interest between them. In its place, the increase to 6% may constitute a new efficiency point, ahead of a change of other relative prices, for instance. At the end, the aliquots can be equivalent in efficiency terms to contain a given foreign exchange flow through time, for instance. We did not choose to distinguish the measures in relations with the aliquots themselves, since ahead of different specific conjunctures, IOF aliquots of 2% or 6% may be sufficient or excessive to contain capital flows, considering the interest gap and other economic conditions that change along over time. Therefore, the more appropriate alternative would be to grant same importance to regulations introducing different aliquots, independently of the subjacent aliquot to each regulation that was set forth.

Having the above in mind and the fact that research conclusions in Brazil tend to show not so significant results linking series of macroeconomic variables (especially about the economic activity levels) to capital controls in models of autoregressive vectors, which are usually inconclusive, so we choose to work with a model of structural univariate time series (Harvey, 1989; Harvey and Shephard, 1993). We keep focusing on the primary capacity of the capital controls in explaining the changes, in a significant way, about the performance of external financial flows. Instead of building a own time-frame to represent the modifications in capital controls, the statistics identification of structural breaks or outliers, which results from the model, will point out the extent of the impacts of the regulation modifications. More specifically, we use the state space time series analysis (Harvey and Koopman, 2005; Commandeur and Koopman, 2007; Durbin, 2012). A structural time series model (STM) is formulated in terms of unobserved components, such as a trend (level and slope), a seasonal, a cycle and an irregular component (disturbances). This is called 'decomposition', and each component can have direct economic interpretation through this process. The model proposed is formulated as follows:

$$y_t = \mu_t + \gamma_t + \psi_t + \varepsilon_t \quad (1)$$

The unobserved components are: trend (μ_t), seasonality (γ_t), a cyclical component (ψ_t) and irregularities (ε_t). All four components are stochastic and their distributions are mutually uncorrelated. That is, in Structural State of Space models, it is allowed that the estimated parameters are not fixed over time. Thus, by observing the movements of perturbations of these parameters, it is possible to establish the precise period of time when an exogenous shocks in each component not observed in the studied

series² occur. Here, we use this econometric approach to identify periods when it is possible to identify structural changes in the portfolio investment inflows³. The starting point was a model called local trend, where, on the one hand it is assumed that there are no seasonality and a cyclical component, on the other, there is a trend⁴, with: a fixed slope; and the level defined as a random walk.

$$y_t = \mu_t + \varepsilon_t \quad \varepsilon_t \sim NID(0, \sigma_\varepsilon^2) \quad (2)$$

$$\mu_t = \mu_{t-1} + \eta_t, \eta_t \sim NID(0, \sigma_\eta^2) \quad (3)$$

In this specification it is allowed that the level of the trend changes over time, according to the trajectories of η_t . Therefore level breaks can be identified by this component. Exogenous shocks are not randomly defined, but are identified by the movements of the trend level's residuals estimated by the model. Moreover, state space time series model allows for the introduction of other exogenous explanatory variables, which follows (4):

$$y_t = \mu_t + \sum_{j=1}^k \beta_j x_{jt} + \varepsilon_t \quad (4)$$

Where: x_{jt} is the value of the j-explanatory variable in time t; and β_j is its estimated parameter. It is also important to notice that following this methodology it is not necessary to test stationary properties before or after the differentiation of the time series used in our models.

We report in the sequence two different models that try to identify the effects of chance in the IOF in our dependent variable – portfolio investment inflows (PORT)⁵. As control variables we use: official consumer price inflation, IPCA (CPI)⁶; Central Bank Index of Economic Activity – Brazil (IBC-Br)⁷; interest rates differentials between Brazil and the United States (INT/DIF)⁸; country risk (RIS)⁹; nominal exchange rate, Brazilian; nominal exchange rate, Brazilian Real per U.S. Dollar (EX)¹⁰; and the VIX - Chicago Board Options Exchange Market Volatility Index¹¹. Our analysis encompasses the period of the so called “great recession”, from January 2007 to December 2013. We use logarithm scale for all variables. Except from INT/DIF¹², all economic series were seasonally adjusted.

In a general way, we outlined a more restrict focus than the tradition of research in Brazil, which, in a general way, while considering all the regulation changes on foreign exchange flows implemented by the Central Bank, did not identify major effects on capital controls, especially on the domestic level of economic activity. The chosen option is to identify the direct effects of the main instrument for managing foreign capital flows, verifying whether they produce significant impacts on the financial flows. In other

2 According to Portugal (1993), Structural State of Space models, which use the Kalman Filter, are superior in the statistical treatment when compared with other types of models of variable parameters. Furthermore, by allowing the estimated coefficients to change throughout the sample, the hypothesis of stationarity loses relevance.

3 We have also tested for loan inflows. Nevertheless, results were not statistically significant. Due to lack of space we present here only the estimations for portfolio inflows.

4 All series are already seasonally adjusted by the method of X-12 Arima. Notice that the restrict number of observations did not allow us to introduce a seasonal component (or to characterize business cycles).

5 Source: Banco Central do Brasil. BC-8216 series, monthly, in million USD.

6 Source: Instituto Brasileiro de Geografia e Estatística, Sistema Nacional de Índices de Preços ao Consumidor (IBGE/SNIPC) (www.ibge.gov).

7 Source: Banco Central do Brasil. 17632 series–Central Bank's Economic Activity Index (IBC-Br) – with seasonal adjustment – index.

8 Source: Banco Central do Brasil e Ipeadata. BC 4189 series–Selic interest rate accumulated in the month and annualized, by percentage in the year, divulged by DEMAB; USA–basic interest rate - Federal Funds –fixed by FOMC - (% p.y.)

9 Source: IPEADATA. Country's Risk (risco Brasil), calculated by JPMorgan. Ipeadata EMBI+ Risco-Brazil Series. Monthly average.

10 Source: Banco Central do Brasil. Monthly average of the daily closing of Ptax800 calculated by the Brazilian Central Bank, with basis on the BC-1series Free Exchange.

11 Serie: VIXCLS. Source: Chicago Board Options Exchange. Not Seasonally Adjusted. Aggregation Method: Average. Available: <http://research.stlouisfed.org/fred2/series/VIXCLS/downloaddata>.

12 This series does not show any pattern of reduction or elevation during any time frame, following idiosyncratic movements determined the respective monetary policies of Brazil and The United States.

words, it is emphasized the issue of the efficiency of the control mechanisms. Ahead of the direct observation of the aggregated foreign flow, we seek to verify the statistic relevance of the regulation modifications in introducing breaks or irregularities in the external financial flows.

Having a general view of the research model, the modifications of each specific flow can be evaluated independently, so as to build a specific model for each external flow under which the IOF is applied. Considering the research historic in the country, such methodological alternative may be appropriate to identify a significant effect on the flows, instead of aggregating all IOF measures in a single index and all flows in another series. In this paper we report the results for the portfolio investment inflows. We estimate two models. The main difference between them is that model 1 includes EX as a control variable. Considering that there is a risk of endogeneity problem due to the potential effect of PORT in EX, and vice-versa, we also run model 2, where we introduce the first differentiation in EX¹³.

Table 1 reports our results. Firstly, it is important to state that: in both models that are no residuals autocorrelation (Q(22,23)); and homoscedasticity of the residuals is respected (H(22))¹⁴. Annexes 1 and 2 show normality and stability in the estimated residuals. Nevertheless, model 1 presents a better performance. Considering the control variables it is important to emphasize that:

- (1) Exchange rate (EX and EX_{t-1}) was statistically significant in both models, with a negative signal, meaning that national currency depreciation was associated with reduction in portfolio inflows;
- (2) In model 1, INT/DIF and RIS were statistically significant, but with signals that would usually be considered theoretically wrongs. That is, a reduction of interest rate differentials was associated with an increase in portfolio investment inflows, while an increase in international financial markets' volatility was associated with a surge in the portfolio inflows in Brazil. However, such result is consistent with the abnormal period of the so-called "great recession". Unconventional monetary policies in advanced countries, particularly in the US, created the perfect environment for arbitrage operations such as "carry trade", despite the overall increase in volatility capture by VIX. Therefore, "quantitative easing" and zero interest rates at the centre channelled funds to countries with high yields such as Brazil, even with a reduction in the interest rates differentials.
- (3) In model 2, IBC-Br, with the right signal (an increase in domestic activity associated with an increase in portfolio investment inflows), EX_{t-1} and VIX were all statistically significant.
- (4) Model 1 shows more irregularities (outliers) than model 2, which suggest that the introduction of EX_{t-1} as a proxy for expectations captures at least part of the exogenous alterations on PORT. Most of irregularities occur in periods of stress in financial markets, due to the effects of subprime crisis and the subsequent "great recession". Nonetheless, we must emphasize two particular months: 2010 (10) and 2013 (6).
- (5) Notice that in 2010 (10) IOF increased from 2% to 6%, during the boom of capital flows to emerging and developing economies, derived from the so-called "currency war". In 2013 (06) IOF aliquot was once again reduced to 0%, in the context of an increase risk-aversion of international investors, considering what at that time was perceived as an eminent change in quantitative easing policy in the United States. Brazilian Monetary Authorities promptly reacted to both movements, using IOF as macroprudential tool.
- (6) In such a context, 2013 (6) was identified as a level break in model 1 and an irregularity in model 2; while 2010 (10) was an outlier in both models. In 2010 a surge of foreign investors were directed to portfolio, which may explain the positive signal in the estimated parameter, as the fear of new taxation over stock-directed inflows may have anticipated other foreign inflows. In 2013

13 This procedure corrects the potential endogeneity. Moreover, it is consistent with exchange rate determination models that explicitly consider expectations. According to the seminal paper of Meese and Rogoff (1983), economic fundamentals – such as the money supply, trade balance and national income – are of little use in forecasting exchange rates, at least over short to medium time horizons. They compared existing models to an alternative in which fundamentals are excluded and any exchange rate changes are purely random. Nevertheless, once one considers exchange rate expectations, it is important to note that "...the empirical evidence concerning which expectation mechanisms are best for modelling exchange rate expectations is very mixed. The most plausible story is that the appropriate mechanism is itself time-variant, with market participants sometimes having static expectations, sometimes extrapolative expectations, sometimes regressive expectations and so on." (Pilbeam, 2013: 227). Therefore, EX first difference is a plausible proxy for exchange rate expectations.

14 We verify the presence or not of the autocorrelation in the time series, through the Box-Ljung test, which follows a Chi2 distribution. Homoscedasticity test follows an F distribution. Details in Commandeur and Koopman (2007) and Durbin (2012).

(06), the level break (model 1) and the outlier (model 2) have the correct signal, meaning that the reduction of the IOF was associated with a positive change in the trend level or, at least, an irregularity (model 2).

Table 1: Estimations – Models 1 and 2, Jan/2007 to Dec/ 2013

Components	Model 1	Model 2
Level 2008 (10)	0.4555(0.000)	-
Level 2009(11)	-0.6677(0.000)	-0.7670(0.000)
Level 2013 (6)	0.7955(0.000)	-
Outlier 2007 (9)	-0.3462(0.001)	-
Outlier 2008 (4)	-0.3134(0.000)	-0.4054(0.001)
Outlier 2008 (6)	0.4816(0.000)	-
Outlier 2008 (8)	0.4003(0.000)	-
Outlier 2008 (9)	-	-0.509(0.000)
Outlier 2010 (5)	-	0.4128(0.000)
Outlier 2010 (10)	0.5646(0.000)	0.5571(0.000)
Outlier 2011 (9)	-0.5648(0.000)	-0.4662(0.000)
Outlier 2011 (10)	-0.3511(0.001)	-
Outlier 2013 (6)	-	0.5803(0.000)
μ_t	10.2292(0.204)	-16.3935(0.109)
CPI_t	-0.0090(0.970)	-0.3410(0.257)
IBC/BR_t	0.1731(0.914)	5.7587(0.006)
INT/DIF_t	-0.1002(0.000)	0.0050(0.875)
RIS_t	0.4086(0.077)	0.2685(0.302)
VIX_t	-0.1962(0.122)	-0.6832(0.000)
EX_t	-3.0972(0.000)	-
EX_{t-1}	-	-0.9645(0.038)
σ_ε^2	0.0051	0.0084
σ_η^2	0.0047	0.0072
Statistics – Estimated Residuals		
H(22)	1.203(1.000)	0.667(1.000)
Box-Ljung. Q(24,23)	26.612(0.273)	22.311(0.502)
R ²	0.929	0.879
AIC	-4.139	-3.702
BIC	-3.618	-3.268

Notes: p-value in brackets. Estimations using STAMP 8.

In short, the econometric approach used here allows us to suggest that portfolio investment inflows were affected by changes in the IOF. The 2010 (10) change introduced what can be interpreted as an anticipation movement by investors, who decided to bring their funds to Brazil before other elevation in taxation directed to stocks. In 2013 (6), the aliquot reduction was associated with a permanent elevation in capital inflows (model 1) or, at least, a temporary increase, where both results can be considered theoretically consistent. Our result, using an alternative econometric methodology, converges with previous researches that point out that capital controls were effective as a macroprudential tool, at least in the short term (see section 2). This effectiveness, of course, is still a matter of controversy, because it has many dimensions. It is far from clear that capital controls can, in all circumstances, isolate one country from external shocks, or can be efficient in the long term. Nevertheless, it is also a matter of theoretical and empirical divergence the sometimes assumed positive connections between economic growth or macroeconomic stability and financial integration to global capital markets. We hope to shed some light in this re-emerging research topic by exploring Brazil's recent experience in taming volatile capital flows and its effects over the domestic economy.

5. Final Comments

The foreign financial integration has constituted a main economic policy objective of emerging countries, even though the way that this integration takes place does not represent a consensus among countries. In Brazil, in particular, the country took advantage of the capital flows, which granted the possibility both to the access of a relatively cheaper international credit – especially if compared to the domestic costs – and to a resources flow that made possible the maintenance of significant commercial deficits during an important period of domestic price stabilization in the first phase of the *Plano Real*. However, the dependency that rose from foreign capital and from the international financial system brought together the drawbacks of the capital flows instability, the ease in which crisis in other countries may affect the local economy and a decrease of liberty in the conduction of domestic economic policies. It is worth recalling that one of the country's advantages was the low exposition of the national financial system to the United States' credit derivatives, which mitigated a strong and direct contagious channel of the economic crisis over the Brazilian domestic economy – it was the cut of credit lines, temporarily substituted by Brazilian Central Bank's resources, that affected the local economy.

In this context, the use of capital controls has proved to be a useful tool ahead of the unstable financial flows, constituting a recommendable institutional array flexible enough to guarantee a friendly environment for local and foreign investments, apart from counterbalancing the fluctuations of external shocks. The IOF, in Brazil, has been recognized as a mechanism of effective regulation of the financial flows. We sought to analyse, particularly, the change in the composition of the foreign loan flows, in the direction of the extension of the deadlines (section 3). The econometric effort, on the other hand, resulted in the identification of a significant effect of IOF alteration on the portfolio investment flow, introducing structural breaks and irregularities in the series. Even though we brought into play a different econometric research methodology, the empiric efforts share the same difficulty of other researches on the subject, especially regarding the indication of more significant changes in the capital controls. Finally, we ponder about what are the costs of the imposition of such controls to the domestic economy, ahead of the potential benefits of the extension of deadlines which make the financial flows more predictable and stable, keeping the economy away from potential risks of foreign instability.

References

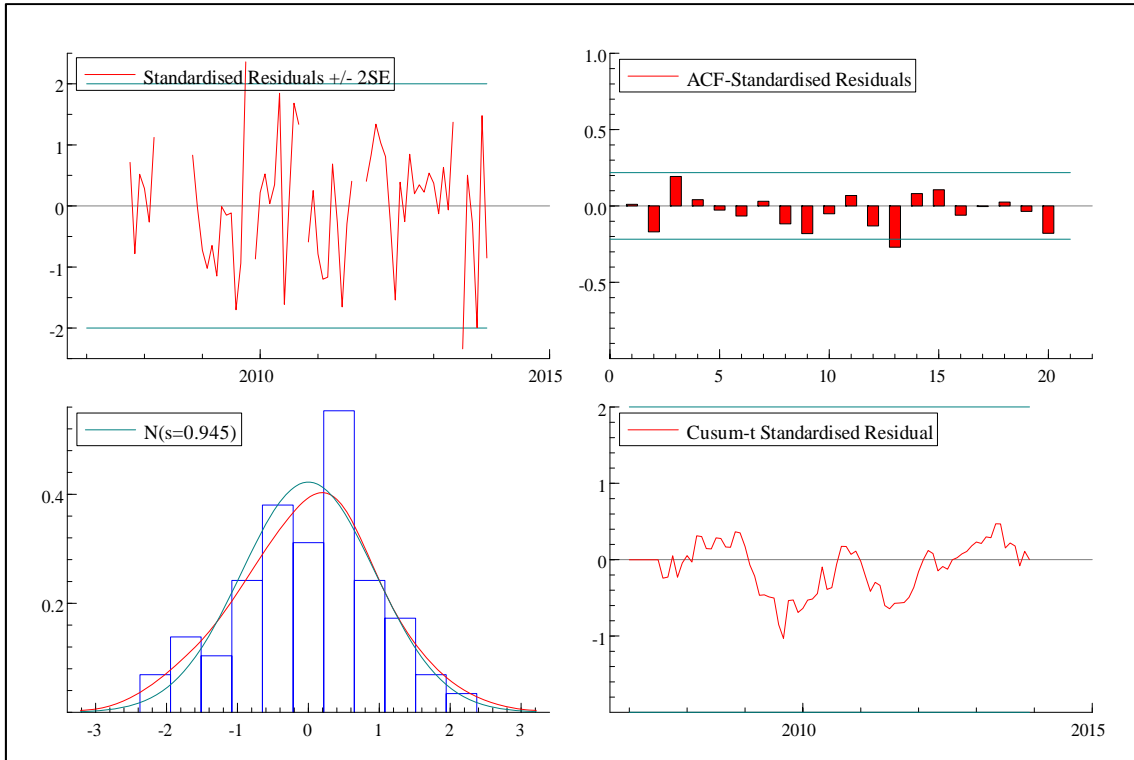
- AKERLOF, G. A. *et al.* (2014) What Have We Learned? Macroeconomic Policy after the Crisis. The MIT Press.
- ARESTIS, P.; DE PAULA, L.F. (2008). Financial Liberalization and Economic Performance in Emerging Countries. Palgrave Macmillan; First Edition.
- ARIDA, P. (2003a). Por uma moeda plenamente conversível. *Revista de Economia Política*. 23(3). Jul-Set.

- ARIDA, P. (2003b). Ainda sobre a conversibilidade. *Revista de Economia Política*. 23(3): 135-142. Jul-Set.
- ARIDA, P.; BACHA, E.; LARA-RESENDE, A. (2003). High interest rates in Brazil: conjectures on the jurisdictional uncertainty' (mimeo). Disponível em: <http://www.iepecdg.com/DISK%201/paginabacha.html>. Acesso em: 03 Mar. 2011
- BABA, C.; KOKENYNE, A. (2011). Effectiveness of Capital Controls in Selected Emerging Markets in the 2000s. IMF Working Paper 281/11.
- BARROSO, J. B. R. B. (2012). Optimal Capital Flow Taxes in Latin America. Working Paper 268. Brasília: Banco Central do Brasil.
- BAUMANN, B.; GALLAGHER, K. (2012). Navigating Capital Flows in Brazil and Chile. Initiative for Policy Dialogue Working Paper Series. June 2012
- BLANCHARD, O. et al. (eds) (2012). In the Wake of the Crisis: Leading Economists Reassess Economic Policy. The MIT Press.
- BORIO, C. (2012). The financial cycle and macroeconomics: What have we learnt? BIS Working Papers. No 395. December. Basle. BIS.
- CARDOSO, H.; GOLDFAJN, I. (1998). Capital Flows to Brazil: The endogeneity of Capital Controls. IMF Staff Papers. 45 (1)
- CARVALHO, B. de M.; GARCIA, M. G. P. (2008). Ineffective Controls on Capital Inflows under Sophisticated Financial Markets: Brazil in the Nineties. In: Edwards. S.; Garcia. M. G. P. (eds.) *Financial Markets Volatility and Performance in Emerging Markets*. Cambridge. Massachusetts. National Bureau of Economic Research.
- CARVALHO, F. J. C.; SICSÚ, J. (2007). Controvérsias recentes sobre controles de capitais. In Sicsú, J. *Emprego. Juros e Câmbio: finanças globais e desemprego*. Rio de Janeiro. Elsevier. 2007.
- CHAMON, M.; GARCIA, M. (2013). *Capital controls in Brazil: effective?* Texto para Discussão n. 622. Rio de Janeiro. PUC-RJ.
- CLAESSENS, S.; KOSE, M. (2013). Financial Crises Explanations: Types and Implications. Working Paper No. 13/28. Washington. DC: IMF.
- COLLINS. S.M. (2007). Comments on "Financial Globalization. Growth. and Volatility in Developing Countries" by Prasad, E. et al. In HARRISON. A. (ed.). *Globalization and Poverty*. University of Chicago Press. 2007.
- COMMANDEUR, J.; KOOPMAN, S. (2007). *Practical Econometrics: an introduction to state space time series analysis*. Oxford: Oxford University Press.
- CYNAMON, B. Z.; FAZZARI, S.; SETTERFIELD, M. (2013, Eds.). *After the Great Recession: The Struggle for Economic Recovery and Growth*. Cambridge University Press.
- DE PAULA, L. F. (2010). *Financial Liberalization and Economic Performance: Brazil at the Crossroads*. Routledge. 2010.
- DURBIN, J. (2012). *Time Series Analysis by State Space Methods*. Oxford Statistical Science
- EDISON, H.; WARNOCK, F. (2003). A simple measure of the intensity of capital controls. *Journal of Empirical Finance*. vol. 10(1-2). pp 81-103.
- EDWARDS, S. (2007). Capital controls, capital flow contractions, and macroeconomic vulnerability. NBER Working Paper No. 12852. January, 2007.
- EICHENGREEN, B.; ROSE, A. (2014). Capital Controls in the 21st Century. Centre for Economic Policy Research Policy Insight n. 72.
- FORBES, K. (2007). The Microeconomic Evidence on Capital Controls: No Free Lunch. In EDWARDS, S. (org.). *Capital Controls and Capital Flows in Emerging Economies: Policies. Practices. and Consequences*. Chicago: University of Chicago Press. pgs. 171-202. Ou NBER Working Paper 11372.
- FORBES, K.; FRATZSCHER, M.; KOSTKA, T.; STRAUB, R. (2012). Bubble Thy Neighbor: Direct and Spillover Effects of Capital Controls. NBER Working Paper No. 18052. May.
- GALLAGHER, K. P. (2014). *Ruling Capital: emerging markets and the reregulation of cross-border finance*. Cornell University Press

- GOLDFAJN, I.; MINELLA, A. (2005). Capital flows and controls in Brazil: what have we learned? NBER Working Paper n.11640.
- GRIFFITH-JONES, S.; OCAMPO, J. A.; STIGLITZ, J. E. (eds.) (2010). Time for a visible hand: lessons from the 2008 World Financial Crisis (New York. Oxford University Press).
- HAMILTON, J. (1994). Time Series Analysis. Princeton University Press.
- HARVEY, A. (1989). Forecasting Structural Time Series Models and the Kalman Filter. Cambridge University Press.
- HARVEY, A. C.; DURBIN, J. (1986). The Effects of Seat Belt Legislation on British Road Casualties: a case study in structural time series modelling. Journal of the Royal Statistical Society. Vol. 149. Nº 3.
- HARVEY, A.; KOOPMAN, S. (2005). Diagnostic Checking of Unobserved-Components Time Series Models. In: HARVEY, A.; PROIETTI, T. (Eds). Readings in Unobserved Components Models. Oxford University Press
- HARVEY, A.; SHEPHARD, N. (1993). Structural Time Series Models. In: MADDALA, G.; RAO, C.; VINOD, H. Handbook of Statistics. Vol. 11. cap.10. Elsevier Science Publishers B.V.
- HENRY, P. (2006). Capital account liberalization: theory, evidences, and speculation. NBER Working Paper 12,698. Cambridge (MA): National Bureau of Economic Research. Nov. 2006.
- IMF (2011). Recent Experiences in Managing Capital Inflows – Cross-Cutting Themes and Possible Policy Framework. Feb 14. 2011.
- IMF (2012). The Liberalization and Management of Capital Flows - An Institutional View. Policy Paper. November 4. Washington. DC: International Monetary Fund.
- JINJARAK, Y.; NOY, I.; HUANHUAN ZHENG (2013). Capital Controls in Brazil: Stemming a Tide with a Signal? Journal of Banking & Finance, vol. 37(8), pages 2938-2952.
- KORINEK, A. (2011). The New Economics of Capital Controls: Imposed for Prudential Reasons. IMF Working Paper 298/11.
- MAGUD, N.; REINHART, C. (2007). Capital controls: an evaluation. In EDWARDS, S. (ed.). Capital Controls and Capital Flows in Emerging Economies: policies, practices, and consequences. Chicago: University of Chicago Press.
- MAGUD, N.; REINHART, C.; ROGOFF, K. (2011). Capital Controls: Myth and Reality - A Portfolio Balance Approach. NBER Working Paper 16805. Feb. 2011.
- MEESE, R. A.; ROGOFF, K. (1983). Empirical Exchange Rate Models of the Seventies: Do They Fit Out of Sample? Journal of International Economics, vol. 14, February, pp. 3–24.
- MUNHOZ, V. C. V. (2013). Vulnerabilidade externa e controle de capitais no Brasil: uma análise das inter-relações entre câmbio, fluxos de capitais, IOF, juros e risco-país. Nova Economia, v. 23. p. 371-402.
- MUNHOZ, V.C.; LIBÂNIO, G. (2010). Revisitando os controles de capitais: notas teóricas e evidências empíricas. In: Anais do XXXVIII Encontro Nacional de Economia – ANPEC. Salvador. 2010.
- OBSTFELD, M. (2009). International Finance in Developing Countries: what have we learned? NBER Working Paper 14,691. Cambridge. MA.
- OLIVIER, J. (2011). Who Needs to Open the Capital Account? Peterson Institute of Intl Economics.
- ONO, F. H.; SILVA, G. J. C.; OREIRO, J. L.; PAULA, L. F (2005). Conversibilidade da conta de capital, taxa de juros e crescimento econômico: uma avaliação empírica da proposta de plena conversibilidade do real. Revista de Economia Contemporânea, 9(2): 231-261.
- OREIRO, J. L.; PAULA, L. F.; SILVA, G. (2004). Por uma moeda parcialmente conversível: uma crítica a Arida e Bacha. Revista de Economia Política, Vol.24 (2).
- OSTRY, J. et al. (2011). Managing Capital Inflows: What Tools to Use? IMF Staff Discussion Note.
- OSTRY, J. et al. (2010). Capital Inflows: The Role of Controls. IMF Staff Position Note. Feb 19. 2010. International Monetary Fund.
- PATTERSON, K. (2000). An Introduction to Applied Econometrics: A Time Series Approach. Basingstoke. UK: Palgrave. 2000.
- PAULA, L. F.; OREIRO, J. L.; SILVA, G. (2003). Fluxos e Controle de Capitais no Brasil: Avaliação e Proposta de Política. In. Agenda Brasil: Políticas Econômicas para o Crescimento com Estabilidade de Preços. São Paulo: Manole.

- PILBEAM, K. (2013). *International Finance*, 4th edition. Palgrave McMillan.
- QURESHI, M.; OSTRY, J.; GHOSH, A.; CHAMON, M. (2011). *Managing Capital Inflows: The Role of Controls and Prudential Policies*. NBER Working Paper 17363.
- REINHART, C.; REINHART, V. (2008). *Capital Flow Bonanzas: An Encompassing View of the Past and Present*. NBER Working Paper. 14321.
- REY, H. (2013). *The Global Financial Cycle and Monetary Policy Independence*, August. Available at: http://www.helenerrey.eu/RP.aspx?pid=Working-Papers_en-GB.
- SCHNEIDER, B. (2000). *Issues in capital account convertibility in developing countries*. London: Overseas Development Institute.
- SICSÚ, J. (2007). *Emprego, Juros e Câmbio: finanças globais e desemprego*. Rio de Janeiro: Campus
- SILVA, G.; RESENDE, M. (2009). *Controles de Capitais no Brasil: uma abordagem teórica e empírica alternativa*. In: *Anais do XXXVIII Encontro de Economia da Anpec*. Foz do Iguaçu. 2009
- SOIHET, E. (2002). *Índice de controle de capitais: uma análise da legislação e dos determinantes do fluxo de capital no Brasil no período 1990-2000*. Dissertação (Mestrado em Economia) - FGV. Rio de Janeiro. 2002
- VAN DER LAAN, C. R. (2007). *Liberalização da Conta de Capitais: Evolução e Evidências para o Caso Brasileiro Recente (1990-2005)*. Rio de Janeiro: BNDES.
- VAN DER LAAN, C. R. et al. (2010). *External financial liberalization and growth in emerging countries: a panel data estimation using a new index (1990-2004)*. *Journal of Post Keynesian Economics*, vol. 33 (2): 307-332.
- VENTURA, A.; GARCIA, M. (2012). *Mercados futuro e à vista de câmbio no Brasil: o rabo abana o cachorro*. *Revista Brasileira de Economia*, vol. 66 n.1. Rio de Janeiro. Jan/Mar.
- WOLFSON, M. H.; EPSTEIN, G. A. (Eds. 2013). *The Handbook of the Political Economy of Financial Crises*. Oxford University Press.

Annex 1 – Residuals Stability – Model 1



Annex 2 – Residuals Stability – Model 2

