EXCHANGE RATE POLICY AND EXTERNAL DEBT IN EMERGING ECONOMIES: AN EMPIRICAL ANALYSIS

by

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Abstract

In this thesis, we empirically analyze the effects of exchange rate policy on external debt accumulation in emerging market economies with a sample of 15 countries over the period 1998-2010. The exchange rate policy is captured by the de facto exchange rate classification of Ilzetzki, Reinhart, and Rogoff (2008). This classification is based on the actual exchange rate behavior rather than the officially declared regimes. Therefore, it is expected to better reflect the exchange rate policies actually followed by the countries. In the baseline regression, we find that fixed exchange rate regimes have a significantly negative effect on debt accumulation compared to flexible regimes while intermediate regimes do not have a significant effect. When we separate the intermediate flexibility group into two, we see that a lower level of flexibility leads to a positive effect on debt accumulation, while a higher level of flexibility still does not a have significant effect relative to full flexibility. However, this result is mostly driven by Argentina in the sample. When we look at the effect of periods in which there is a transition in exchange rate policy, we observe that these periods have a significantly positive effect on debt accumulation. Our results are robust to several tests.

GELİŞMEKTE OLAN ÜLKELERDE DÖVİZ KURU REJİMİ POLİTİKALARI VE DIŞ BORÇ: AMPİRİK BİR ÇALIŞMA

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Anahtar Kelimeler: fiili döviz kurları, dış borç, gelişmekte olan ekonomiler.

Özet

Bu çalışmada, gelişmekte olan ülkelerde döviz kuru politikalarının dış borç birikimi üzerine olan etkisini inceledik. Kullanılan veri seti 15 ülkeden oluşup, 1998 ve 2010 yılları arasını kapsamaktadır. Döviz kuru politikası Ilzetzki, Reinhart ve Rogoff (2008) fiili döviz kuru sınıflandırması kullanılarak modele yerleştirilmiştir. Bu sınıflandırma, ülkelerin resmi açıklamalarından ziyade fiili davranışları göz önünde bulundurularak oluşturulmuş bir sınıflandırmadır. Bu nedenle, ülkelerin takip ettiği döviz kuru politikalarını daha iyi yansıtması beklenmektedir. Temel model regresyonunda, sabit kur rejimlerinin gelişmekte olan ülkelerde dış borç birikimini negatif yönde etkilerken, ara rejimlerin esnek kurlara göre istatistiksel bir farklılık yaratmadığını gördük. Ara rejim grubunu ikiye ayırdığımızda, sabit kur rejimlerinin borç birikimini negatif etkilemeye devam ederken, ilk grup ara rejimlerin pozitif etkilediğini, ikinci grubun ise esnek kur rejimlerine göre istatistiksel bir farklılık yaratmadığını gördük. Ancak bu sonuç büyük ölçekte Arjantin'den kaynaklanmaktadır. Geçiş dönemlerine ayrı bir değişkenle baktığımızda ise, geçiş dönemlerinin borç birikimini pozitif yönde etkilediğini gördük. Sonuçlarımız, çeşitli sağlamlık testleriyle de tutarlı sonuçlar vermektedir.

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1 Introduction

The choice of exchange rate regime has been a debatable issue for many years, especially after the collapse of the Bretton Woods system. Although it is possible to find some common results about the structure, advantages, or disadvantages of different exchange rate regimes in the literature; the discussion has not ended and it seems that it will continue in the future since many new theoretical perspectives and empirical studies are emerging every day.

Why is the exchange rate so important? First of all, it is the most important "price" in international finance as it affects both trade flows and financial flows. Its movements have a signaling effect on international markets about the financial state of the economy. It conveys information on monetary policy conduct and affects expectations about macroeconomic stability. Since it is an important economic variable, it holds an important place in the literature. However, the literature has mainly focused on the impact of exchange rates on inflation, growth and economic crises throughout the time after the Bretton Woods system collapsed. A few studies on the relationship between exchange rates and risk premia also exist in the literature but much less than the ones on inflation, growth, or crises. The relation between exchange rate policy and external debt, on the other hand, has not been studied extensively up to now. The purpose of this thesis is to analyze the effects of exchange rate policy on external debt accumulation in emerging market economies.

The importance of the subject comes from the fact that, especially for small economies, it is not possible to borrow in their own currencies in international financial markets (the "original sin" hypothesis proposed by Barry Eichengreen, Ricardo Hausmann and Ugo Panizza in a series of papers at the beginning of 2000s). As the

results of the comparative research between core and periphery countries of pre-First World War period conducted by Bordo and Flandreau (2003) suggest, core countries were financially mature and therefore they were able to borrow in their own currency in international markets, so they could allow their currencies to float. On the other hand, peripheral countries did not have mature financial systems, so they were not be able to borrow in their own currencies at international arena which led to the preference of fixed regimes by those countries at that period. The strong link found by Bordo and Flandreau (2003) underlies the importance of analyzing the effect of exchange rate regime choice on debt accumulation. This thesis tries to find an empirical result for this question for emerging economies given the constraint with the access to the necessary data.

The general arguments about the advantages and disadvantages of fixed or flexible exchange rate regimes can be summarized as follows: Fixed exchange rates provide better "discipline" on the policymakers to prevent continuing inflation. From the policy effectiveness perspective, as commonly known, fiscal policy is more effective under fixed rates in affecting the national income in case of mobile short-term capital flow. With fixed exchange rate regimes, there will be no wasteful resource allocations with continuously changing tradable sectors stemming from the substantial movements in exchange rates. On the other hand, in part of flexible rates, high inflation can actually be seen a "signal" of poor macroeconomic policy performance and it is questionable to provide such a "discipline" provided by fixed regimes by ignoring the other macroeconomic goals such as maintaining a low level of unemployment and a high level of output growth. Monetary policy is more effective under flexible rates regardless of the degree of the international capital mobility and international reserves do not face a risk to be exhausted quickly. In far as we are concerned with the resource allocation, flexible rates allow to move one of the most important prices of the economy freely, i.e., the exchange rate, while fixing it can cause itself an inefficient resource allocation. The arguments can be ongoing in similar ways, those above are the main, commonly known ones and they are given place here just to remind them briefly.

Exchange rate regime options for a country lie on a spectrum from pure flexibility to pure rigidity. The exchange rate regimes declared by countries are grouped into eight categories according to the IMF *de jure* classification, starting from the "currency union" at one extreme to "pure float" at the other. This *de jure* classification reflects what countries say or officially declare about their exchange rate regime policies. Nonetheless, a new kind of classification has emerged since the officially declared regimes do not always reflect the actual exchange rate behavior. The classifications based on observed movements of the exchange rate are called *de facto* classifications. There are many attempts to construct the most realistic de facto classification by many authors; in this thesis, the classification of Reinhart and Rogoff (2004) is used, and more information is given in the third section.

The exchange rate regime choice issue has especially gained attention for underdeveloped or emerging economies at recent times due to the currency crises witnessed by them through the last 10-20 years. For developed economies, there is a clear picture about exchange rate regime; to be more clear, they tend to choose "flexibility" unless they are in a monetary union (like EMU). However, the picture is still less obvious for emerging economies. The debate has been going on about what these economies will do in the future; which kind of regime is suitable for their macroeconomic performance; or, whether they will only tend to the extreme cases of flexibility or rigidity by moving away from the intermediate regimes as proposed in the "hollowing-out hypothesis" or "bipolar view"[1].

We investigate the relation between external debt and exchange rate regime policy for this reason. Since there is no clear picture for emerging economies, we want to see the different effects of a vast spectrum of exchange rate policies on the debt accumulation process. Since emerging economies generally borrow in terms of foreign currencies, exchange rate regime is expected to have a direct effect on debt accumulation through affecting its nominal value at first stage. On the other hand, it

[1]Countries will tend to the polar extremes of exchange rate regimes - they will choose either hard pegs or poor floating and intermediate regimes will eventually disappear (Eichengreen (1994), Fischer (2001) and Obstfeld and Rogoff (1995)).

affects other macroeconomic variables like real GDP growth, inflation, interest rate movements, or financial inflows and through its effects on these variables, it may affect the external debt through a secondary mechanism. Different exchange rate regimes may lead to different forms of capital flow to the economy, and this may also affect the debt accumulation process of the country. In addition, exchange rate regime affects the borrowing incentives of economic agents of the economy such as the government or the banking sector. For example, with a fixed exchange rate regime, the government cannot use seigniorage as a source of revenue and this may create an incentive for more borrowing. Moreover, fixed rates may increase the borrowing incentives of the private sector by decreasing the uncertainty about the exchange rate in the economy. On the other hand, a high level of external debt may increase the susceptibility to an economic crisis, in a fixed exchange rate regime; so this may create a disincentive for more borrowing. Which mechanism will dominate the other and determine the borrowing behavior of the economy is a question that may be answered through an empirical analysis.

We conduct our empirical analysis with 15 countries over the period 1998-2010. The data are obtained on a quarterly basis. Panel data-fixed effects regression analysis is used. We include the lag of real GDP growth rate, inflation rate, financial openness, investment over GDP and the lag of sovereign spreads in the baseline model as explanatory variables to control for their effects. The main results of the thesis are as follows: Fixed exchange rate regimes have a negative effect on external debt accumulation relative to flexible regimes in the baseline model. This finding may be the result of the following: Fixed regimes prevent large devaluations, so the nominal value of the debt is protected. In addition, if they fix the macroeconomic balances by reducing inflation and providing fiscal discipline, they may decrease the need for borrowing. Or, fixed regimes may change the form of capital inflow; for example, they may lead to more foreign direct investment by increased stability and trust in the economy rather than short-term capital flows. The intermediate regime dummy has a positive coefficient although it is statistically insignificant which shows that choosing an intermediate regime does not make a difference relative to flexible

regimes. On the other hand, in the first extension of the baseline model, when we look at the effects of two separate intermediate regime categories instead of one, we see that first group of intermediate regimes has a positive effect on debt accumulation while the second group makes no difference relative to flexible rates again. However, this result is mostly driven by Argentina in the sample. When we exclude Argentina from the sample, we see that this result weakens: The positive coefficient reduces in magnitude as well as its statistical significance decreases. Moreover, when we look at the effect of periods in which there is a transition in exchange rate policy, we observe that these periods have a significantly positive effect on debt accumulation. Finally, currency crises have a positive effect on debt accumulation but when currency crises, banking and debt crises are all taken into account together, we cannot see a significant effect. Our results seem to be robust to several tests which will be explained in detail in the fourth section.

2 Literature Review

The choice of exchange rate regime has been a debatable issue in the literature of international economics. An extensive literature exists related with this issue from different perspectives. For years, the literature has mainly focused on the effect of the exchange rate regime on inflation or growth as the macroeconomic performance indication. For many emerging economies, the exchange rate has been an important tool to stabilize the inflation rate until the end of 1990s. On the other hand, this has led to the investigation of the growth performance of these economies by many economists.

Ghosh, Gulde, and Wolf (2002) makes a detailed empirical analysis based on a comprehensive data set of IMF member countries and reach quite important conclusions related with inflation and growth, to count a few: First of all, pegged exchange rate regimes have a better inflation performance with respect to the floating regimes which is an important benefit for most of the emerging economies. Secondly, they find no strong evidence that pegged regimes have a better growth performance. Thirdly, output is more volatile under fixed regimes. And, lastly, pegged exchange rate regimes are more likely to confront a currency crisis, not a banking crisis.(See also Ghosh, Gulde, Ostry, and Wolf (1997)).

Bailliu, Lafrance, and Perrault (2003) conducts an empirical analysis using a panel data of 60 countries over the 1973-98 period. Their study shows that all exchange rate regimes characterized by a monetary policy anchor have a positive effect on growth, but in case of without a policy anchor, intermediate and flexible rates have a negative effect. So, they reach a conclusion that presence of monetary policy anchor is the determining factor rather than the exchange rate regime itself.

Bleaney and Francisco (2007) paper is another example investigating the effect of exchange rate regimes on inflation and growth by using the data for 91 developing countries over the period 1984-2001. Their econometric analysis for four types of different exchange rate regime classification suggests that growth rates (growth in per capita terms) in developing countries under soft pegs and floats are similar, and inflation rates are also close for three of the four regime schemes; however, hard pegs produce lower inflation and slower growth when compared with other regimes.

Levy-Yeyati and Sturzenegger (2001) and Levy-Yeyati and Sturzenegger (2003) have remarkable results related with this issue. In Levy-Yeyati and Sturzenegger (2001), they use a sample of 154 countries covering the period 1974-1999. By using the Levy-Yeyati-Sturzenegger(LYS) type of *de facto* classification of exchange rate regimes, they conduct their empirical analysis and find that there is no significant link between regimes and economic performance for industrial countries while for non-industrial economies, there is a robust relationship between fixed regimes and lower inflation only in case of long pegs. Short pegs perform slower growth as well as poor gain in inflation. In Levy-Yeyati and Sturzenegger (2003), the data cover 183 countries over 1974-2000 period. This paper also supports the finding of previous paper.

Rogoff, Husain, Mody, Brooks, and Oomes (2003) finds no support for the bipolar view(countries will tend to move to the polar extremes of exchange rate regimes (either pure float or rigid peg) over time). In addition, their study supports the idea that economies which are at their early stage of financial development and integration, fixed or relatively rigid regimes have some advantage to gain anti-inflation credibility without a significant sacrifice of growth. The more economies mature, the more valuable flexibility becomes (Husain, Mody, and Rogoff (2005) have very similar results also)[1].

In summary, fixed exchange rates give advantage of lowering inflation but lead to a relatively slower growth rate and more volatile output with respect to flexible

[1]One more study of this literature: De Grauwe and Schnabl (2005) analyzes the impact of exchange rate regime on inflation and output in Southern and Central Europe.

rates in emerging economies. For advanced economies, the choice of exchange rate regime is not as much important as in the emerging economies but floating brings more advantage about growth rate.

On the other hand, the impact of exchange rate regimes on the risk premia is rather a new subject in the literature; Janjah and Yue (2004), Barajas, Erickson, and Steiner (2008), and Gumus (2011) are studies of this literature.

Janjah and Yue (2004) use de facto classification of exchange rate regimes and real exchange rate misalignment to capture the exchange rate policy. Their main findings indicate that the real exchange rate overvaluation leads to more debt issuing.Thus, the probability of sovereign bond issuing increases. However, the debt sustainability is deteriorated in case of the depreciation risk associated with overvalued real exchange rates; therefore, bond spreads increase especially under hard pegs. On the other hand, borrowing becomes more costly for countries with floating regimes in crises periods; therefore, hard-peg regimes have an advantage over floating regimes in those periods due to the lower spreads.

Barajas, Erickson, and Steiner (2008) use a de jure exchange rate classification and analyze the effects of de jure regime choice on sovereign spreads. In addition, they analyze the effects of the actual degree of intervention into the exchange rate market on the spreads by using an intervention index they construct. Their results basically suggest that spreads tend to be lower in countries with fixed exchange rate regimes no matter it is in de jure or de facto terms. Also, there is no punishment of intervention, because exchange rate intervention leads to lower spreads as well.

Gumus (2011) analyzes the relationship between exchange rate regime policy and sovereign risk premia in emerging market economies empirically. She uses both the *de jure* and *de facto* classification of exchange rate regimes to see the difference of results when countries deviate from what they officially declare. The conclusion of the paper is that floating regimes and pegged regimes face similar spreads but intermediate regimes face higher spreads. In *de jure* analysis, she founds that pegged rates are more advantageous than the intermediate and floating regimes.

The paper most closely related with the subject of this thesis is Alper and Yilmaz

(2003). The authors particularly emphasizes the point that the literature should focus on the role of exchange rate regimes in the accumulation of external debt in emerging markets in the post-capital account liberalization era, especially after the recent crises emerged in these economies like Argentina and Turkey, instead of elaborating on the growth or inflation issue. In the econometric analysis of the paper, panel data for 57 countries from 1975 to 2000 are used to analyze the relationship between exchange rate regimes and debt accumulation. As the exchange rate regime classification, LYS type of de facto classification of exchange rate regimes is used. An unbalanced panel regression analysis is conducted due to the fact that not all countries have data for every year from 1975 to 2000. The dependent variable is chosen as $\frac{DebtBurden_t}{DebtBurden_{t-N}}$ to indicate whether the debt accumulation was rapid between t-N and t. Explanatory variables other than the exchange rate regime dummies are government budget deficit as a percentage of GDP and gross fixed capital formation as a percentage of GDP. The results of the empirical analysis suggest that countries with lower exchange rate flexibility accumulate debt faster and are more likely to meet debt sustainability problems.

Our study is different from Alper and Yilmaz (2003) in a few ways. Firstly, we have 15 countries, significantly smaller than 57 obviously. In addition, we have a dataset on a quarterly basis from 1998 onwards while they use annual data over 1975-2000, so our dataset gives the opportunity to see the most recent impacts while Alper and Yilmaz (2003) provides the opportunity to see the relation through a wider time range. The reason why we use a quarterly data is that we want to differentiate the immediate effects on external debt when there is a change in exchange rate regime policy and investigate the short run relation rather than the long run. On the other hand, our sample is smaller on the country basis because there is a severe data limitation for most of the emerging countries, and also because of the fact that countries which are in an economic policy adjustment process to join in European Union like Bulgaria, Croatia etc. are left out of the sample to prevent a bias in the analysis. Secondly, our dependent variable is differently defined, as "change in external debt over nominal GDP" rather than the percentage change in debt as in

Alper and Yilmaz (2003) because we think that evaluating the debt accumulation with respect to the national income is more reasonable in macroeconomic terms. Whether the increase in debt is faster or slower with respect to the increase in GDP is an important question in emerging economies. Thirdly, our explanatory variables have differences: Since we do not have a proper data for budget deficit, we cannot use it as an explanatory variable. Investment over GDP is controlled for in this study as Alper and Yilmaz (2003). On the other hand, we include real GDP growth rate, financial openness, inflation rate, sovereign spreads as control variables which are absent in Alper and Yilmaz (2003). Most importantly, we use the exchange rate classification of Reinhart and Rogoff (2004) while they use the classification of Levy-Yeyati and Sturzenegger (2005). They extend their analysis by using the lags of the exchange rate dummies and average of these lag terms. In conclusion, we reach different results. Our results indicate in general terms that fixed exchange rate regimes lead to a decrease in external debt accumulation while their study indicates that fixed exchange rate regimes lead to faster debt accumulation. This difference may come from the coverage of different time periods in both analysis, different control variables used, different classification of exchange rate regimes and different specification of the model.

3 Empirical Analysis

We construct the baseline model and its extended versions as a linear fixed-effects regression model. Using the quarterly panel data, an unbalanced panel regression analysis is conducted since we do not have complete data for all countries over the time period we consider. The model of the baseline regression is:

$\frac{D_i t - D_{it-1}}{GDP_i t} = \alpha_i + \beta * X_{it} + u_{it}$

where i is the country and t is the time subscript. The dependent variable refers to *"the change in debt over nominal GDP"* as mentioned in the previous section. X_{it} refers to the vector of the explanatory variables, namely the lag of real GDP growth rate, financial openness, inflation rate, investment over GDP, lag of the sovereign spread and the exchange rate regimes. For the real GDP growth rate and sovereign spread, the lag terms are used in order to reduce the endogeneity problem. Moreover, new variables are added in the robustness checks; namely, trade openness, US 3-month deposit rate, and crisis dummies. The detailed information is given related with the variables are given in the next section. α_{it} captures the country fixed effects and u_{it} is the stochastic error term. The coefficients of the exchange rate dummies show the effects of the specified exchange rate regime on the external debt accumulation relative to the flexible rate regime, which is omitted. In order to prevent a potential heteroscedasticity and serial correlation problem, we use the t-statistics from the cluster-robust covariance matrix.

4 The Data

We have an unbalanced dataset for 15 countries from the beginning of 1998 until the end of 2011 on a quarterly basis. The countries are Argentina, Brazil, Chile, Colombia, Egypt, Indonesia, Korea, Malaysia, Mexico, Peru, Russia, South Africa, Thailand, Turkey and Ukraine.

External Debts and Explanatory Variables

In the empirical analysis, the external debt data for the sample countries are derived from Quarterly external Debt Statistics (QEDS) in the World Bank. External debt is the sum of the debt of *general government, monetary authorities, banks* and *other sectors* which gives an equal value of *gross external debt position* in the constructed data set by World Bank. The dependent variable is $\frac{D_t - D_{t-1}}{GDP_t}$ where D denotes *debt*.

The explanatory variables used in the empirical analysis are the lag of growth rate of real GDP, financial openness of the country, inflation rate, investment over GDP, lag of the sovereign spread and exchange rate regimes respectively as stated in the previous section. The growth rate of real GDP is derived from IFS dataset, it is simply the percentage change of the GDP volume of the country. Financial openness is the de jure index created by Chinn and Ito (2008), known as *Chinn-Ito index*. As the authors explain, the index focuses on regulatory aspects of capital account openness and it is constructed based on the IMFs Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). It is de jure in the sense that it attempts to measure regulatory restrictions on capital account transactions. That is, the legal regulations related with financial markets by governments of countries are taken into account while constructing the index rather than the actual behaviors

of the country. We cannot use the de facto index of Lane and Milesi-Ferretti (2003) which creates a serious endogeneity problem in our empirical analysis since it is constructed by the ratio of assets plus liabilities of the country over its GDP. Inflation rate is derived from IFS dataset, measured as the percentage change in the CPI. Investment over GDP is also derived from the same dataset, which is just the value of gross fixed capital formation over nominal GDP. As the sovereign spread data, the Emerging Market Bond Index - Global (EMBIG) is used from J. P. Morgan. The index of J.P. Morgan is constructed by using a sample of 33 countries on a daily basis, the data go back as early as the beginning of 1998. The quarterly version of it is calculated by taking the 3-month average of the daily data to be used in the current analysis. The index measures the premium above US Treasury securities for dollar denominated sovereign debt.

As it is widely known that, there are two main classifications of exchange rates: *de jure* and *de facto*. *De jure* classification is concerned with what the countries officially declare about their exchange rate regimes and it is collected by International Monetary Fund (IMF).The IMF's classification scheme is an eight regime scheme since 1998, namely; (1) Currency Union, (2) Dollarization, (3)Currency Board, (4) Conventional Peg, (5) Crawling Peg, (6) Bands, (7) Managed Float, (8) Pure Float. However, recently, the studies related with the choice of proper exchange rate regimes started to see a necessity to look at what the countries actually do in practice rather than what they declare since it is realized that countries deviate from their announcement. This led to the construction of *de facto* exchange rate classification based on the actual practices of the countries. Therefore, the *de facto* classification of exchange rates by Reinhart and Rogoff (2004) is used in the empirical analysis of the paper as the exchange rate variable. The classification is constructed by analyzing market determined dual and parallel exchange rates in addition to a statistical analysis of observed behavior in the exchange rate for 153 countries over the period 1946 - 2001 (Reinhart and Rogoff (2004)). The data set is extended to the end of 2010 by Ilzetzki, Reinhart, and Rogoff (2008), and this latest version of the data is used in this paper (so we call the classification as IRR classification). The quarterly version of

the data is reproduced from the monthly coarse classification of IRR's data set. Another mostly used de facto classification is the one of Levy-Yeyati and Sturzenegger (2005). These authors make the classification according to the data of three variables: changes in the nominal exchange rate, the volatility of these changes and the volatility of international reserves from all IMF reporting countries over the period 1974-2000, and four main groups of exchange rate regimes are constructed: pegged, intermediate (crawling peg and dirty floats), flexible and inconclusive regimes. The former classification is preferred in this paper because it gives a chance to have significantly more observations with respect to the LYS classification which covers the period until the end of 2004. Besides, it is more advantageous because of the commonness of dual markets in emerging market economies (Reinhart and Rogoff (2004)). The table of IRR classification is available at Appendix. However, we reclassify these categories to three basic categories as fixed, intermediate and floating regimes, respectively when constructing dummy variables.

For the first extension to the baseline model, we define two separate intermediate exchange rate categories and use two different dummies for them. Another extension is added to the baseline model by separating the quarters where there is a transition from one exchange rate regime to another; and the dummies are reconstructed for fixed exchange rate, intermediate regimes and transitional periods.

For the robustness checks of the model, two new explanatory variables; *trade openness* and *US 3-month deposit rate* (or world interest rate) are added. Trade openness is constructed by dividing the sum of exports and imports of a country to its GDP. The relevant data are taken from IFS. US 3-month deposit rate is also taken from IFS, it is used to see whether the results are affected or not according to the movements of the world interest rate. Two *crisis dummies*; one from the paper of Kaminsky (2006) (CrisisK) which describes the chronology of currency crises for a sample of countries and another dummy including crisis dates both from Kaminsky (2006) and Laeven and Valencia (2008)(CrisisKLV) are included into the model also for the robustness checks. Laeven and Valencia (2008) defines the timing of systematic banking crises, currency crises and debt crises for a large sample of

countries. We also add the last 2008 global crisis to this second dummy to see the effects of all types of crises to the debt accumulation.

5 Results

5.0.1 Baseline Regression Results

Table 1 represents the results of the fixed-effects regression of the baseline model, with the first column referring to the results of the original model and the remaining ones to the robustness checks. As can be seen, the real GDP growth rate, the inflation rate, the sovereign spread and the fixed exchange rate dummy have statistically significant coefficients. Real GDP growth rate has a high positive coefficient, indicating that higher growth leads to higher external debt accumulation. The rationale behind this result can be the fact that most emerging countries finance growth by borrowing abroad. Or, this may indicate that as countries grow, they can borrow more easily and tolerate huger amounts of debts. Financial openness has a negative coefficient but statistically insignificant. The result may come from the fact that during the time period we analyze, there is not much change of the status of financial openness of the countries; as it is commonly known, the financial integration of the most emerging economies occurred at the beginning of the 1990s. In addition, we use a *de jure* financial openness index, Chinn-Ito index which may not truly reflect the actual behavior of the countries, so this may also lead to an insignificant coefficient of financial openness. Inflation rate has a positive effect on debt accumulation, with 1 point increase in inflation will lead to approximately 0.003 point increase in debt accumulation. Inflation may affect debt accumulation through two channels. Inflation can make borrowing harder for emerging economies since high inflation indicates that the economy is "shaky" or "unhealthy". On the other hand, a positive relation between inflation rate and debt accumulation is compatible with

the economic observation that countries with high inflation generally have high level of debts, controlling for other factors. Our result shows that the second effect outweighs in the analysis of the current study. Sovereign spread also has a significant positive effect on the dependent variable which is an expected result, with 1 point increase in interest rate will lead to a 7 per cent increase in debt accumulation approximately. Investment may affect external debt through two ways. If the country makes investment by borrowing abroad, then the external debt increases with increased investment indicating a positive relationship between them. On the other hand, if the country invests by using their own resources, then external debt decreases as investment increases indicating a negative relationship. Investment over GDP has an insignificant coefficient in the current analysis. This may be the result of the collinearity between the investment over GDP and the growth rate of real GDP. The coefficient of the real GDP growth rate may capture the investment effect, so the investment over GDP coefficient may become insignificant due to this fact.

Controlling for other variables, we see that fixed exchange rate dummy has a negative coefficient of 6.5 per cent approximately. This reflects that choosing a fixed exchange rate regime will lead to a 6.5 per cent decrease in debt accumulation with respect to a flexible regime. In fact, fixed exchange rate regimes may affect the debt accumulation process in a few ways. Governments cannot exploit the benefit of seigniorage under fixed exchange rate regimes, so they may tend to borrow more since there is not another alternative to generate revenue other than taxation. This tendency, if it exists, will create a positive relationship between debt accumulation and fixed regimes. On the other hand, fixed regimes may have a debt decreasing effect in several ways. Since the large devaluations are prevented, the nominal value of the debt is protected. If fixed regimes fulfill their duty by fixing macroeconomic balances, they decrease the need for borrowing. Moreover, they can change the form of capital inflow and lead to more foreign direct investment by decreasing uncertainty or increasing the trust into the economy. The data analysis in this study reveals a negative relationship between the fixed regimes and external debt accumulation, so some of the latter mechanisms may occur in the process over the

Table 5.1: Baseline Regression Results

VARIABLES	(1)	(2)	(3)	(4)	(5)
Real GDP growth rate	1.311***	1.273***	1.373***	1.310***	1.221***
	(5.711)	(5.425)	(5.949)	(5.703)	(5.285)
Financial openness	-0.007	-0.016	-0.009	-0.008	-0.007
	(-0.221)	(-0.429)	(-0.274)	(-0.240)	(-0.201)
Inflation	0.003**	0.003**	0.003**	0.003**	0.003**
	(2.540)	(2.513)	(2.860)	(2.520)	(2.546)
Investment over GDP	-0.126	-0.170	-0.131	-0.127	-0.061
	(-0.320)	(-0.401)	(-0.334)	(-0.323)	(-0.173)
Trade openness		0.163			
		(1.288)			
Sovereign spread	0.069**	0.067**	0.070**	0.070**	0.069**
	(2.760)	(2.754)	(2.820)	(2.809)	(2.733)
Fixed	-0.066***	-0.106***	-0.056***	-0.062***	-0.073***
	(-10.389)	(-3.642)	(-3.406)	(-9.252)	(-7.513)
Intermediate	0.016	0.026	0.023	0.020	0.017
	(0.680)	(1.090)	(0.855)	(0.849)	(0.673)
US interest rate			-0.003		
			(-0.645)		
Crisis-K				0.100***	
				(6.032)	
Crisis-KLV					-0.020
					(-0.846)
Observations	386	386	386	386	386
R-squared	0.28	0.287	0.281	0.282	0.283
Number of groups	15	15	15	15	15

Robust t-statistics in parentheses

***, **, * denote significance at 1%, 5% and 10%, respectively.

sample. Intermediate regimes have an positive effect in a small percentage but statistically insignificant in the regression. This indicates that there is not much significant difference between floating or staying at an intermediate level.

The other columns remaining refer to the robustness checks with the added variables, namely trade openness, the US interest rate or world interest rate, and the two crisis dummies. Trade openness and US interest rate have insignificant coefficients and do not cause the other parameters to change in magnitude and direction, and statistical significance, so our results are robust to these variables. The crisis dummy obtained by using the currency crisis dates from Kaminsky (2006) which have a positive and highly significant coefficient, indicating approximately a 10 per cent increase in external debt accumulation in currency crisis years. This is an expected result because in emerging countries, the currency crisis is accompanied by a very sudden and high devaluation (depreciation) which leads to a rapid increase in external debt in value. Moreover, we do not see a crucial change in other parameter values and their statistical significance which means that our results are still robust. The other crisis dummy incorporating systematic banking crisis, currency crisis and debt crisis years from Laeven and Valencia (2008) in addition to the currency crises from Kaminsky (2006) has not a statistically significant coefficient which means that we do not see a crucial crisis effect when we take all kind of crises into account. This may be the reason of the fact that banking crises and debt crises may have a decreasing impact on debt accumulation while currency crises have the opposite effect. In times of banking and debt crises, some amount of debt of the countries are defaulted and also future borrowing gets harder, so there can be a canceling out effect. On the other hand, other parameters are not much different from the initial model meaning that the baseline model are robust to alternative modifications.

5.0.2 Extensions of The Baseline Model

Extension I: Two Separate Intermediate Dummies

In this subsection, we extend our baseline model by using two separate dummies for intermediate regimes instead of uniting them in one dummy to see the impact of

intermediate regimes more clearly. First intermediate dummy includes the regimes pre-announced crawling peg, pre-announced crawling band that is narrower than or equal to +/-2 per cent, de facto crawling peg, and de facto crawling band that is narrower than or equal to +/-2 per cent. The second one includes pre-announced crawling band that is wider than or equal to +/-2 per cent, de facto crawling band that is narrower than or equal to +/-5 per cent, moving band that is narrower than or equal to +/-2 per cent (i.e., allows for both appreciation and depreciation over time), and managed floating. As can be seen from the tables, all explanatory variables including the fixed exchange rate dummy have more or less the same coefficients and significance levels as the ones above. When we look at the intermediate exchange rate dummies, we see that the first one has a highly significant positive coefficient, approximately 15 per cent which means that the countries using exchange rate regimes in this category face 15 per cent higher debt accumulation when compared with the countries using flexible exchange rate regimes. The second dummy, on the other hand, has a positive coefficient but much smaller than the previous one and no statistical significance. This shows that soft pegs and narrow bands show a positive relation with debt accumulation while fixed rates keep their negative relation. It is difficult to make a comment on the coefficient of the first intermediate dummy. We think that some of the sample countries may lead to such a big coefficient in magnitude, i.e. 15 per cent, although the regimes in this group do not much deviate from fixity. Therefore, to better understand the country specific effects on this coefficient, we run regressions by excluding the countries one by one and see that when we exclude Argentina, the results change significantly: The coefficient of first intermediate group falls to 9 per cent approximately and its statistical significance falls to 10 per cent from 1 per cent which is a more expected result with respect to our baseline regression. This result shows that the former coefficient (15 per cent) is basically due to Argentina. Such a dominating effect of Argentina may be related with the debt-restructuring process of her which started at the beginning of 2005 after the 2001 Argentinean crisis. With debt-restructuring, the debt accumulation process and the trend of other macroeconomic variables of Argentina may

Table 5.2: Regression Results: Extension I

VARIABLES	(1)	(2)	(3)	(4)	(5)
Real GDP growth rate	1.300***	1.264***	1.350***	1.299***	1.169***
	(6.419)	(6.108)	(6.450)	(6.413)	(5.720)
Financial openness	0.003	-0.005	0.002	0.003	0.005
	(0.093)	(-0.133)	(0.050)	(0.073)	(0.135)
Inflation	0.003**	0.003**	0.003**	0.003**	0.003**
	(2.664)	(2.647)	(2.958)	(2.644)	(2.626)
Investment over GDP	-0.095	-0.137	-0.098	-0.096	0.002
	(-0.246)	(-0.330)	(-0.257)	(-0.249)	(0.007)
Trade openness		0.153			
		(1.246)			
Sovereign Spread	0.067**	0.065**	0.068**	0.068**	0.067**
	(2.663)	(2.660)	(2.719)	(2.710)	(2.618)
Fixed	-0.068***	-0.106***	-0.060***	-0.064***	-0.078***
	(-11.474)	(-3.757)	(-3.976)	(-10.150)	(-8.353)
Intermediate 1	0.148***	0.155***	0.152***	0.151***	0.157***
	(10.600)	(13.188)	(8.418)	(11.265)	(12.410)
Intermediate 2	0.010	0.020	0.015	0.014	0.010
	(0.437)	(0.829)	(0.614)	(0.608)	(0.415)
US interest rate			-0.002		
			(-0.542)		
CrisisK				0.098***	
				(6.014)	
CrisisKLV					-0.029
					(-1.154)
Observations	386	386	386	386	386
R-squared	0.303	0.309	0.304	0.305	0.308
Number of groups	15	15	15	15	15

Robust t-statistics in parentheses

***, **, * denote significance at 1%, 5% and 10%, respectively.

have changed significantly, and this may be the reason of such a high-valued and statistically much significant coefficient of first intermediate group. On the other hand, wide bands and managed float regimes do not differ from the flexible ones in terms of debt accumulation.

Robustness checks also give the same results above; trade openness, US interest rate and second crisis dummy have insignificant coefficients as well as leaving the other parameters almost unaffected in the model. The first crisis dummy(CrisisK) has a significant and positive coefficient again here indicating that currency crises lead to an approximate 10 per cent increase in debt accumulation.

Extension II: Transitional Periods

In this subsection, we investigate the effect of making a transition in the exchange rate policy. We will reorganize the exchange rate dummies of the baseline model by separating the quarters in which there is a transition from one regime to another and creating a dummy for these periods. As can be seen from the table 3, all explanatory variables other than the exchange rate regime dummies have coefficients in the same direction with the baseline model and also more or less in the same magnitude. Fixed exchange rates again lead to a decrease in debt accumulation, in an amount of 7.2 per cent approximately. Intermediate exchange rate dummy has a positive but insignificant coefficient again; however, the transitional dummy has a positive coefficient at 10 percentage significance, indicating that transitional periods lead to a 12 per cent increase in debt accumulation. This can be due to the uncertainty in the economy stemming from a macroeconomic policy change.

Robustness check give the same results with the previous sections except with the regression with the *trade openness*. As can be seen from the second column of the table 3, trade openness gains significance in statistical terms while transitional dummy loses it. In this regression, it seems that one point increase in trade openness leads to a 20 per cent increase in debt accumulation while transitional periods have a coefficient near to its counterpart in the first column in magnitude, but statistically insignificant. Therefore, except this one, our extended model also passes robustness tests. Dummy for currency crises(CrisisK) indicates again nearly a 10 per cent

Table 5.3: Regression Results: Extension II

VARIABLES	(1)	(2)	(3)	(4)	(5)
Real GDP growth rate	1.305***	1.257***	1.376***	1.304***	1.199***
	(5.696)	(5.432)	(5.914)	(5.688)	(5.193)
Financial openness	-0.010	-0.022	-0.013	-0.011	-0.010
	(-0.346)	(-0.735)	(-0.420)	(-0.374)	(-0.311)
Inflation	0.003**	0.003**	0.003**	0.003**	0.003**
	(2.514)	(2.470)	(2.845)	(2.492)	(2.511)
Investment over GDP	-0.136	-0.194	-0.141	-0.137	-0.061
	(-0.346)	(-0.451)	(-0.361)	(-0.349)	(-0.174)
Trade openness		0.206*			
		(1.843)			
Sovereign spread	0.070**	0.067**	0.070**	0.071**	0.070**
	(2.786)	(2.718)	(2.856)	(2.840)	(2.755)
Fixed (transitional)	-0.072***	-0.124***	-0.062***	-0.068***	-0.082***
	(-9.094)	(-4.401)	(-3.693)	(-8.427)	(-5.886)
Intermediate (transitional)	0.019	0.034	0.025	0.023	0.017
	(0.723)	(1.582)	(0.885)	(0.894)	(0.628)
Transitional dummy	0.124*	0.154	0.130*	0.127*	0.131*
	(1.857)	(1.758)	(1.956)	(1.928)	(1.998)
US interest rate			-0.003		
			(-0.751)		
CrisisK				0.105***	
				(6.239)	
CrisisKLV					-0.023
					(-0.973)
Observations	386	386	386	386	386
R-squared	0.288	0.298	0.29	0.29	0.291
Number of groups	15	15	15	15	15

Robust t-statistics in parentheses

***, **, * denote significance at 1%, 5% and 10%, respectively.

increase in debt accumulation during the times of currency crises.

6 Conclusion

The analysis of this thesis aims to shed light on the relationship between the exchange rate regime behavior of emerging countries and their external debt accumulation. The results of the empirical analysis show that choosing a fixed exchange rate regime in *de facto* terms leads to a slower debt accumulation relative to flexible exchange rate regimes.On the other hand, in the first extension of the baseline model, we see a positive impact of the relatively soft pegs and narrow bands on debt accumulation as the first group of intermediate regimes while the second group including more wider bands and managed floats do not seem to have a significant impact on debt accumulation compared with the freely floats. However, when we leave Argentina out of the sample, we see that the positive effect of the first group decreases in magnitude and also its statistical significance falls substantially. Moreover, switching from one regime to another has a cost over the debt accumulation. Lastly, currency crises have debt increasing effect in emerging economies as a natural realization of the economic expectation since currency crises in those economies mean sudden and large devaluations (or depreciations).

As the results show that fixed exchange rate regimes lead to slower debt accumulation, we can conclude that keeping the exchange rate fixed can help emerging economies in maintaining a low debt level and avoiding solvency problems. However, slower debt accumulation can also be viewed as a deliberate policy choice since keeping the debt level under control reduces the possibility of a financial crisis, which may be viewed as more likely under fixed exchange rate regimes. The reasons behind this result merit further investigation and should be the subject of future research.

7 Appendix

Table 7.1: The Ilzetski-Reinhart-Rogoff classification of de facto exchange rates

The coarse classification codes:	The fine classification codes:	
1	1	No separate legal tender
	2	Pre announced peg or currency board arrangement
	3	Pre announced horizontal band that is narrower than or equal to +/-2%
	4	De facto peg
2	5	Pre announced crawling peg
	6	Pre announced crawling band that is narrower than or equal to +/-2%
	7	De factor crawling peg
	8	De facto crawling band that is narrower than or equal to +/-2%
3	9	Pre announced crawling band that is wider than or equal to +/-2%
	10	De facto crawling band that is narrower than or equal to +/-5%
	11	Moving band that is narrower than or equal to +/-2%
		(i.e., allows for both appreciation and depreciation over time)
	12	Managed floating
4	13	Freely floating
5	14	Freely falling [1]
6	15	Dual market in which parallel market data is missing.

[1] Freely falling: The authors define this category for the case where the country's annual inflation is greater than or equal to 40 per cent and when in these episodes of inflation, there is no official announcement of the exchange rate regimes by the authority. Also, they use this category during the six months immediately after a currency crisis, but only for those cases where there is a sudden transition from a fixed regime to a managed or independently floating regime.

Table 7.2: Reclassification of IRR classification in the current analysis:

Fixed	No separate legal tender Pre announced peg or currency board arrangement Pre announced horizontal band that is narrower than or equal to +/-2% De facto peg
Intermediate	Pre announced crawling peg Pre announced crawling band that is narrower than or equal to +/-2% De factor crawling peg De facto crawling band that is narrower than or equal to +/-2% Pre announced crawling band that is wider than or equal to +/-2% De facto crawling band that is narrower than or equal to +/-5% Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time) Managed floating
Flexible	Freely floating
Intermediate 1	Pre announced crawling peg Pre announced crawling band that is narrower than or equal to +/-2% De factor crawling peg De facto crawling band that is narrower than or equal to +/-2%
Intermediate 2	Pre announced crawling band that is wider than or equal to +/-2% De facto crawling band that is narrower than or equal to +/-5% Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time) Managed floating

Data Sources and Definitions

- *External debt*: World Bank Quarterly External Debt Statistics Database.
- *Real GDP growth rate*: Quarterly growth rate of real GDP. Real GDP data from IMF's International Financial Statistics database (IFS).
- *Inflation rate*: Quarterly inflation rate measured by CPI, from IFS.
- *Financial openness*: De jure financial openness index by Chinn and Ito (2008).
- *Sovereign spread*: Emerging Markets Bond Index Global (EMBIG), J.P. Morgan. Quarterly data are obtained by taking averages of daily data.
- *Investment*: Gross fixed capital formation, IFS.
- *Trade openness*: Exports plus imports over nominal GDP. Export, import and GDP data from IFS.
- *US interest rate*: Three-month US deposit rate, IFS.

Table 7.3: Percentage of exchange rate regime observations in each category

	Fixed	Intermediate	Flexible	Intermediate 1	Intermediate 2
Percentage	18.6	69.0	12.4	18.1	50.9

Table 7.4: Summary Statistics for other explanatory variables

	Financial openness	Real GDP growth rate	Inflation	Investment over GDP	Trade openness	US interest rate	Sovereign spread
Mean	0.252	0.037	9.486	0.210	0.523	3.264	2.764
Std. Dev.	1.280	0.048	14.585	0.044	0.443	2.112	1.739

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