What is driving the Capital Inflows to Costa Rica? Risk Premium and Interest Rate Differentials

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Abstract

The goal of this paper is to analyse the interest rate differential as possibly the main factor behind the capital inflows experienced by Costa Rica during the second semester of 2012. For this purpose, a panel data model for interest rate differential is estimated taking into consideration an array of relevant macroeconomic variables. The results suggest that interest rate differentials for Costa Rica in 2012 are above what the estimated model predicts for the lending rate and deposit rate by 8.4 pp., and between 2.7 pp. and 1.7 pp., respectively. This excess in the interest rate differential could explain the observed capital inflows. Therefore, a reduction of lending and deposit interest rate differentials is crucial, but an extra effort has to be made to reduce the lending rate differential. As a consequence of the prevailing situation, the difference between lending and deposit rate in Costa Rica is greater than in countries with similar levels of risk.

Key Words: Interest Rate, Risk Premium, Uncovered Interest Rate Parity.

JEL Classification: F36, G15

Resumen

El objetivo del presente estudio es analizar el diferencial de tasas de interés puesto que se considera como el principal factor detrás de las entradas de capitales observadas en el segundo semestre del 2012 en Costa Rica. Se realiza una estimación de un modelo de datos de panel para el diferencial de tasa de interés, teniendo en cuenta una serie de variables macroeconómicas relevantes. Los resultados del modelo sugieren que los diferenciales de tasas de interés en el 2012 para Costa Rica están por encima 8.4 pp. para el caso de las tasas activas y entre el 2,7 pp. y 1,7 pp. por encima para las tasas pasivas de acuerdo con los diferenciales. Este exceso en el diferencial de tasas de interés podría explicar los flujos de capital observados durante este periodo. Por lo tanto, una reducción del diferencial de ambas tasas de interés es crucial. Sin embargo, se debe realizar un esfuerzo extra para tratar de reducir el diferencial de la tasa activa. Como consecuencia de la situación prevalenciente, el margen entre tasas activas y pasivas para Costa Rica es mayor que para países con un riesgo similar.

Palabras clave: Tasas de Interés, Riesgo País, Paridad Descubierta.

Clasificación JEL: F36, G15

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1 Introduction

The present document estimates the main factors determining the interest rate differential between local and international interest rates. An econometric estimation using panel data analysis is performed in order to model the country's risk premium with an array of relevant macroeconomic variables that have been assessed in previous investigations and theoretical literature[1].

The results of the estimated model suggest that the interest rate differentials in 2012 for the case of Costa Rica were 8.4 pp. above for the case of the lending rate, and between 2.7 pp. and 1.7 pp. above for the deposit rate. This excess in the interest rate differential could explain the observed capital inflows during the same period.

In order to estimate the model, more than 20 variables from 92 countries using yearly data from 1995 to 2012 are tested to evaluate the model's specification. The model was estimated with four different groups given the level of country risk. The complete data panel set is considered as the benchmark. The same model is estimated with three subgroups: countries with investment level, countries without investment level and countries with similar level of risk. This last specification is particularly important in order to make comparisons between observed results and the ones predicted by the model.

[1] See Ades, Kaune, Leme, Masih, and Tenengauzer (2000)

This topic has become extremely relevant due to the fact that Costa Rica has received an above average capital inflows during the last semester of 2012. This is particularly evident for the fourth quarter of 2012, in which the result of the capital account was US$2,337 million, well above the US$743.7 million observed for the same quarter of the previous year.

Furthermore, the composition of the capital inflows has also changed as well. In general the main driving force behind the result of the capital account in Costa Rica has been Foreign Direct Investment (FDI). But during the last semester of 2012 net FDI was US$721.3 million, while net portfolio investment was equal to US$1,985.2. This deviation can be explained by an important increase in debt security buying by foreigners (US$1,801.7). Also, during this period there was an increase in the component of other investment of the capital account, due to an increase in foreign loans to commercial banks [2].

The interest rate differentials that exist between Costa Rica and the international financial markets are pointed-out as the main reason behind the inflow of capital observed during the period[3]. The entry of these external resources has been encouraged by international interest rates historically low and an increase in the appetite for risk by external agents, as well as a relatively stable country risk premiums present in emerging economies, such as Costa Rica. These circumstances have created arbitrage opportunities that have been exploited.

Furthermore, two accompanying circumstances contribute to the capital inflows: first, Costa Rica has free capital movements and second, the exchange rate regime of a crawling band has resulted in an "anchored" exchange rate close to the lower limit of the band[4].

On this topic Leon (2013) illustrates the inflows of capital to a small and open economy such as Costa Rica using the Metzler Diagram. The analysis provides a tractable description to understand the motivation for the inflows of capital, as well as a framework to analyse the policy options available.

Capital inflows are beneficial for an emerging economy, such as Costa Rica [5]. Nevertheless, substan-

[2]For more details of the Balance of Payments of Costa Rica see the annex.

[3]As would suggest the standard open-economy macro analysis using UIP

[4]Since August 2010 the exchange rate has been close to 500 colones per dollar, which is the lower level of the band established by the Central Bank of Costa Rica.

[5]They can benefit country's financial sector to become more competitive, help to soften the adjustment of imbalances

tial increases in the level of capital inflows could destabilize the economy. Among the risks associated with large capital inflows are: (i) a reduced level of control over monetary policy and the resulting risk of higher level of inflation; (ii) an increase of systemic risk in the financial sector; (iii) the possibility of financial assets or real state bubbles.

In this context, the Central Bank of Costa Rica (CBCR) is responsible for enforcing the required policies in order to guarantee macroeconomic and financial stability to protect the progress achieved in terms of maintaining historically low levels of inflation and avoid any unwanted monetary excess. Thus, the CBCR may direct its efforts to reduce the interest rate differential and the entry of capitals. Along these lines, the leading purpose of this paper is to clarify the magnitude of the observed interest rate differentials and suggest policy actions to reduce the differential[6].

The document is organized as follows. Section 2 briefly reviews the literature and the most recent empirical evidence related to the interest rate differentials. Section 3 and 4 describe the model and the data, respectively, that is used to estimate the proposed specification with the four subgroups that were noted above. Section 5 defines the econometric model and discusses the expected signs of the variables. Section 6 presents the main results with the corresponding econometric tests and the interest rates differentials predicted by the model. Finally, section 7 summarizes the main conclusions and the recommended policy actions to reduce the differential.

2 Literature Review

Most of the previous literature that attempted to explain the interest rate differential is based on the principle of arbitrage under two different scenarios: covered and uncovered interest rate parities. Both theoretical relationships have been developed under the assumptions of open economies and international financial integration where local and international investments, measured in a common currency, will

and reach a better allocation of capital.

[6]As a result of capital inflows, the Executive branch has sent to Congress a bill designed to discourage them. The bill includes a temporary increase in the level of taxes on returns of capital assets owned by foreigners living outside the country. It also includes a provision, in which the Central Bank is allowed to increase the level of reserve deposits coming from foreigners not living in Costa Rica. As for July 2013 this bill has not been approved by the Congress.

tend to equalize the returns.

The country risk premium is one of the main factors that has been widely tested under covered and uncovered interest rate parities. Aliber (1973) offers one of the first perspectives that split the differential in two main determinants: exchange risks and political risks. Exchange risks are led by differences in the currency of denomination and the probability that exchange rates could change. On the other hand, the political risks are led by differences in the legal jurisdictions and, the likelihood that additional controls could be applied. In this sense, "the part of the interest agio not explained by exchange risk reflects political risks and perhaps a variety of other risk and costs"(1973, p.1452).

In terms of recent empirical studies, Ades, Kaune, Leme, Masih, and Tenengauzer (2000) present the Goldman Sachs Equilibrium Sovereign Spread methodology (GS-ESS) to estimate the coefficients for a long run equilibrium panel model to value and predict sovereign spreads for emerging markets. For this purpose, 15 countries were selected and, eight explanatory variables [7] were classified under four categories: liquidity variables, solvency variables, variables representing external shocks and dummy variables, using monthly data from 1996 to 2000.

The proposed specification was constructed based on a theoretical model that assumes the existence of imperfect capital markets where the emerging economies are small borrowers. Thus, they "see a country's fair value spread as a function of the probability that it will default on its external obligations. This probability is a function of variables related to the country's solvency, liquidity, debt-service track record, and also to global financial conditions"(p.1). In line with the final results, the paper concludes that two countries are overvalued, twelve are undervalued and one is close enough to equilibrium. The conclusion was reached based on the gap between the estimated probabilities of default and the observed spread values.

In a similar line, Rowland (2004) provides a comprehensive analysis to determine which factors can explain the interest rate differentials between US Treasuries and Colombian sovereign securities using data from 1998 to 2003. On one hand, using an OLS regression framework and daily data to estimate the short-term determinants, he concluded that "the results of this study suggest that the daily spread changes are influenced by the change in the spread of other emerging markets, the change in the S&P

[7] GDP growth rate, total external amortizations, budget balance, exports, REER, LIBOR and a dummy variable to capture the history of default for each country.

500 stock market index, and by the change in the Colombian exchange rate" (p.4). On the other hand, Rowland selects a Johansen framework with monthly data to calculate the long-term determinants. In this way, "exports, the exchange rate, the economic growth rate and the US T-Bill rate all show up as significant explanatory variables of the sovereign spread".

One important observation from Rowland (2004) is that none of the previous studies in Colombia had concluded that the fiscal deficit is a significant variable to explain the interest rate differentials. Consequently, this behaviour could reflect some level of endogeneity in fiscal policies due to external conditions or restrictions established by international financial organizations in order to improve the credit access.

Related to cross-country studies, Rowland and Torres (2004) use annual data from 1998 to 2002 to create a data panel in order to identify the main economic variables that can influence the spreads of 16 emerging market sovereign issuers and the sovereign creditworthiness. Their main conclusion is that "for both the spread and the creditworthiness, significant explanatory variables include the economic growth rate, the debt-to-GDP ratio, the reserves-to-GDP ratio, and the debt-to-exports ratio. In addition, the spread is also determined by the exports-to-GDP ratio, and the debt service to GDP,while the creditworthiness is influenced by the inflation rate and a default dummy variable". One of the interesting points was the selection of the observed dependent variable. The authors decided to work with the Emerging Market Bond Index (EMBI Global) calculated by JP Morgan for the individual countries as an approximation of the sovereign spread. The main justification was that the investigation was focused on evaluating sovereign issuers rather than performance of individual bonds. In this sense, EMBI Global provides a better framework to compare bonds. Also, the index was available for all the required emerging markets.

Comparing the last two studies noted above, it is important to highlight that the empirical results can easily differ in terms of the significant explanatory variables. For example, the LIBOR and the nominal budget balances are relevant variables within the Goldman Sachs Equilibrium Sovereign Spread methodology but, the same variables were not shown to have any significant influence in Rowland and Torres paper. Finally, it is worth noting that there is no previous literature related to the topic of interest rate differential for the specific case of Costa Rica.

3 Theoretical Considerations

In this section, we follow Rojas (1998) to clarify the theoretical framework under covered and uncovered interest rate parities in order to provide a more detailed explanation of the different components that are considered for each of them, and particularly, to clarify the derivation of the risk premium.

3.1 Covered Interest Rate Parity

Under the assumption of free capital flows, the covered interest parity (CIP) arises from the existence of forward and spot efficient markets to guarantee that the interest rate differential between two comparable assets, denominated in different currencies, should be equal to the forward premium of the foreign currency. Arbitrage ensures that any deviation will be adjusted immediately, closing down any opportunity of risk-free returns. It should satisfy the equation (1):

$$\frac{1 + i_{t+k}}{1 + i^*_{t+k}} = \frac{F_{t+k}}{S_t} \tag{1}$$

Where:

i_{t+k} is the domestic nominal interest rate between t and t+k.

i^*_{t+k} is the foreign nominal interest rate between t and t+k.

F_{t+k} is the forward parity at time t to be executed at t+k.

S_t is the spot parity at time t.

In order to eliminate any option of arbitrage, this equation states that the nominal return of the foreign asset covered by a forward contract is equal to the nominal return of the domestic asset.

Subtracting one on each side of the expression, the equation noted above is equivalent to:

$$\frac{i_{t+k} - i^*_{t+k}}{1 + i^*_{t+k}} = \frac{F_{t+k} - S_t}{S_t} \tag{2}$$

Conversely when interest rates are low, the following log approximation is used:

$$i_t - i_t^* \approx f_t - s_t = f_d \text{or forward premium.} \quad (3)$$

Regarding to the decomposition of the interest rate differential under covered parity, Rojas (1998) adopts the methodology proposed by Frankel and MacArthur (1988) to break down each individual component in the following way:

$$i_{t+k} - i_{t+k}^* = (i_{t+k} - i_{t+k}^* - f_d) + (f_d - s^e) + s_{t+k}^e \quad (4)$$

Where: s^e is the expected rate of depreciation of the local currency at time t+k.
f_d is the forward premium or discount.

This expression states that the interest rate differential is composed of the nominal covered parity $(i_{t+k} - i_{t+k}^* - f_d)$, the exchange risk premium $(f_d - s^e)$ and the expected variation of the nominal exchange rate s_{t+k}^e.

In general terms, the first expression of the right hand side of equation (4) is frequently known as the country risk premium. In other words, when the first component is other than zero, the difference is justified by an additional premium demanded by investors to hold assets in the foreign currency based on their evaluation of the economic and political conditions. The second expression takes a value different from zero when there is a divergence between the forward premium and the expected exchange rate. Finally, the third element refers to the expected variation of the exchange rate between t and t+k.

Under the assumption of real interest rates, the equation becomes:

$$r_{t+k} - r_{t+k}^* = [r_{t+k} - r_{t+k}^* - (f_d + \pi^{e*} - \pi^e)] + [(f_d + \pi^{e*} - \pi^e) - (s^e + \pi^{e*} - \pi^e)] + (s^e + \pi^{e*} - \pi^e) \quad (5)$$

Since domestic and foreign interest rates are expressed in real terms, the last element $(s^e + \pi^{e*} - \pi^e)$ is the expected variation of the real exchange rate.

3.2 Uncovered interest parity

The uncovered interest parity (UIP) arises from the absence of forward exchange markets to negotiate future contracts. The prices will reflect all the available information due to the existence of efficient speculative markets. In addition, the theory assumes the hypothesis of efficient markets, rational expectations and risk-neutral investors. Thereby, the capital flows will tend to equalize the expected returns considering the opportunity cost to hold similar assets in different currencies.

Consequently, the arbitrage should satisfy the below equation:

$$\frac{1+i_{t+k}}{1+i^*_{t+k}} = \frac{S^e_{t+k}}{S_t} \tag{6}$$

Where:
S^e_{t+k} is expected exchange rate for the period t+k.

The above expression is equivalent to:

$$\frac{i_{t+k}-i^*_{t+k}}{1+i^*_{t+k}} = \frac{S^e_{t+k}-S_t}{S_t} \tag{7}$$

When interest rates are low, the following log approximation is used:

$$i_t - i^*_t = s^e \tag{8}$$

In this sense, the interest rate differential between two assets which are identical except for the currency denomination, should be equal to the expected change in the exchange rate. It is important to highlight that the expected change is constructed under the assumption of rational expectations based on all the information available at time t.

The model can be modified to introduce risk-averse investors. In this case agents will demand higher returns to hold assets in foreign currencies. As a result equation (6) is rewritten as follows:

$$(1+i_{t+k}) = \left(\frac{S^e_{t+k}}{S_t} + \rho\right)(1+i^*_{t+k}) \tag{9}$$

Where: ρ is the risk premium.

Applying a log approximation, the arbitrage should guarantee that:

$$i_t - i_t^* = s^e + \rho \tag{10}$$

3.3 Alternative considerations under CIP and UIP

Due to the empirical complexity to corroborate the interest rate parity, many investigations have introduced new formulations to integrate the existence of transactional costs into CIP and UIP models and clarify the effects associated to imperfect capital and exchange markets.

As an example, in the presence of operational costs, Frankel and Levich (1975) propose a method based on triangular arbitrage, keeping cross-exchange rates consistency to approximate the magnitude of these costs within the currency exchange market. The authors derive a theoretical model that suggests the existence of neutral bands around the covered interest parity within which arbitrage opportunities are not feasible. Contrasting the model with data from England, Germany and United States for the period 1962-1967, they concluded that: "the empirical data are consistent with the interest rate parity theory in the sense that covered interest arbitrage doesn't seem to entail unexploited opportunities of profits". In other words, apparent deviations from the covered interest parity are largely justified by the presence of transactional costs.

Furthermore, the authors provide two additional reasons to complement the original hypothesis. In the first place, the model is extended to include elasticities of the demand and the supply in the securities and exchange markets. In this way: "The existence of elasticities which are less than infinite will widen the neutral band and will therefore account for a larger percentage of the deviations". Secondly, the role of timing is evaluated in this paper taking into account the lag between the detection of the arbitrage opportunity (period t) and the final execution of the transaction (period t+1) that could reduce significantly the unexploited profit opportunities since prices may change.

4 Data

As previously mentioned, a data panel analysis is performed with a group of relevant macroeconomic variables in order to break down each component that could contribute to explain the country's risk premium and consequently, the interest rate differentials between local and international interest rates. This section provides a short description of the data used.

The database comprises annual data from 1995 to 2012 of 20 variables and 92 countries. In order to do this, the database has been built with information from four official sources: International Monetary Fund (IMF), World Bank, Central Bank of Costa Rica (CBCR) and the Economic Commission for Latin America and the Caribbean (ECLAC). In addition, we have worked with data from Fitch Ratings and the Financial Openness Index calculated by Chin-Itto (2010) in order to complete the panel with information that was not available in the main sources.

It is important to highlight that the interest rate differentials have been estimated with three methodologies. In first place, the nominal lending interest rate calculated by the World Bank and defined as "the bank rate that usually meets the short- and medium-term financing needs of the private sector. This rate is normally differentiated according to creditworthiness of borrowers and objectives of financing". In second place, the nominal deposit interest rate calculated by World Bank and defined as: "the rate paid by commercial or similar banks for demand, time, or savings deposits"[8]. Finally, the model has been estimated with the nominal deposit rate calculated by the ECLAC, on the basis of official information.

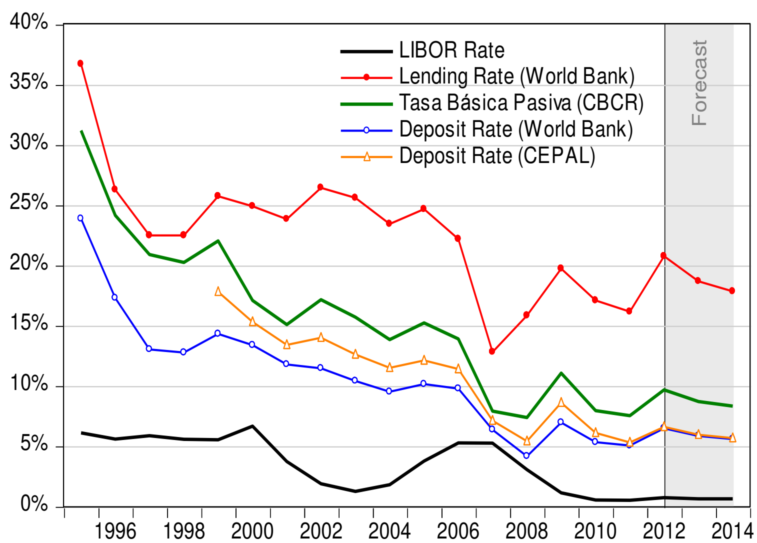
In addition, the proposed methodology requires an explanatory variable to assess the credit risk and define which countries may be comparable to Costa Rica. In the last years, sovereign ratings have become increasingly relevant for all countries that want to improve their position within international financial markets. In general terms, this kind of credit evaluations define consistent methodologies and criteria based on political risks, economic and financial stability, and country regulatory conditions to determinate the probability of a default. Currently, there are three predominant companies that calculate and define sovereign ratings: Fitch Rating, Standard & Poor's and Moody's. In our case, Fitch´s sovereign rating has been selected due to the availability of historical data since 1994.

[8]Definitions provided by The World Bank with the download of the database (http://data.worldbank.org/).

There is an additional group of variables that will be explained in more detail in the econometric model specification. For the purposes of this section, it is simply worth noting that series were constructed with data from the World Economic Outlook of the IMF and, they include: average inflation of each country, general government debt as percentage of the GDP, government net lending as percentage of GDP, observed real exchange rate, annual GDP growth, nominal GDP, nominal GDP per capita, nominal exchange rate volatility, foreign reserves as percentage of GDP and current account as percentage of GDP.

Finally, the Financial Openness Index Chinn-Ito will be also part of the model specification. This index measures a country's degree of capital account openness. It was initially introduced in Chinn and Ito (Journal of Development Economics, 2006). The index is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

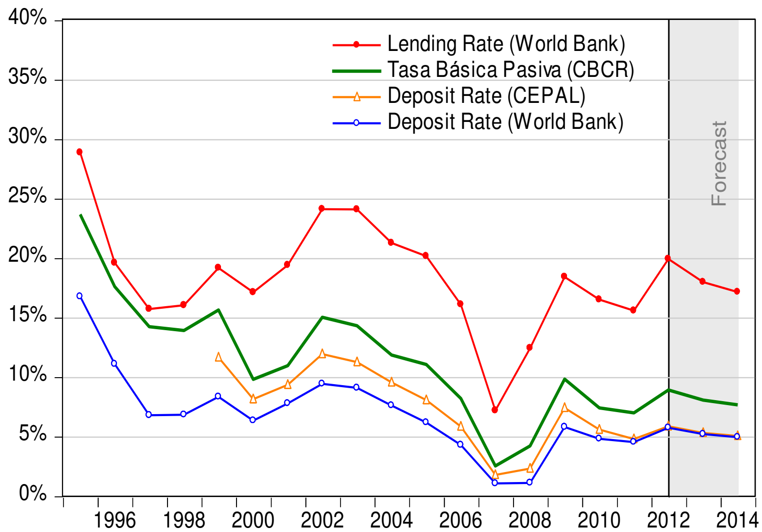
Figure 1: Interest Rates for Costa Rica



Source: Authors calculation, data from FMI and World Bank.

Figure 1 presents the 'Tasa Básica Pasiva', the six-month US LIBOR rate and three different measurements of interest rates obtained from the International Monetary Found (IMF), and the Economic Commission for Latin America and the Caribbean (ECLAC). Excluding the LIBOR rate, all four measurements of interest rate show a considerable level of co-movement. As expected, this is particularly true for the deposit rates and the 'Tasa Básica Pasiva'.

Figure 2: Interest Rate Differentials



Source: Author's calculation, data from FMI and World Bank.

Additionally, the interest rate differentials between the above four measures and the six-month US LIBOR rate are shown in Figure 2. In general terms, an important reduction of the interest rate differential is observed in both 1997 and 2007.

Table 1 presents the countries that have a similar risk profile rating to Costa Rica (BB+) in 2012. The first column shows the countries just below (BB), while the second and third columns show countries with ratings of BB+ (just below investment grade) and BBB- (the first category of investment grade).

In order to asses if the level of premium is greater than its peers, the premium is measured as the interest rates differential minus the observed change in the exchange rate shown for a group of countries with similar level of risk profile. Figures 3, 4 and 5 present the results, with the values for Costa Rica in red and countries with the same risk rating in darker blue.

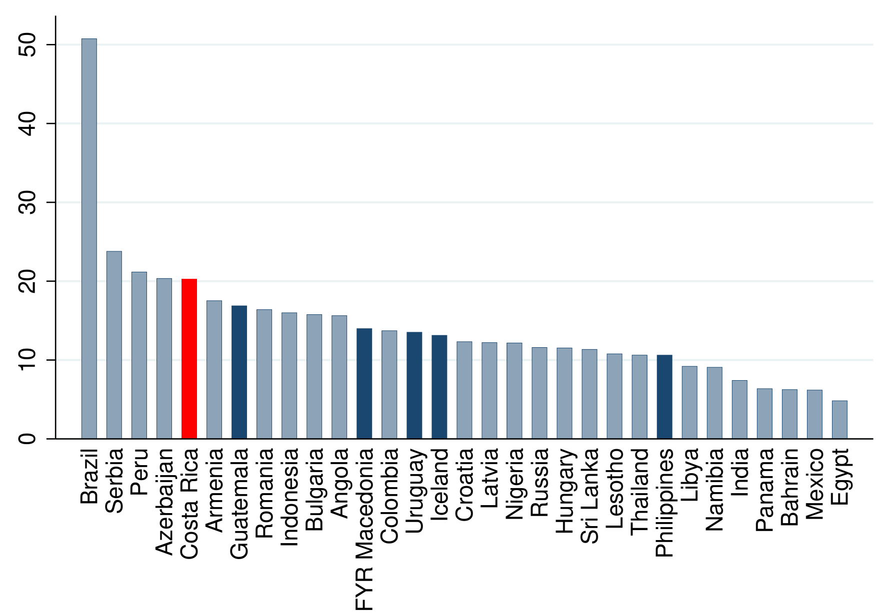
In general, in 2011 the premium[9] for Costa Rica was one of the largest among countries with similar

[9]Measured as the interest rates differential minus the observed change in the exchange rate

Table 1: Fitch Ratings in 2012

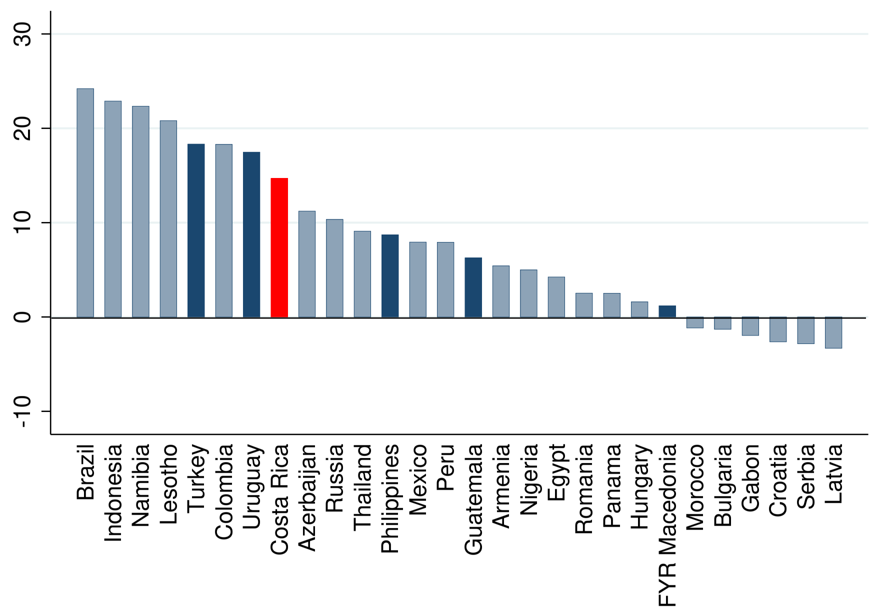
BB	BB+	BBB-
El Salvador	Costa Rica	Azerbaijan
Libya	FYR Macedonia	Bulgaria
	Guatemala	Colombia
	Iceland	Croatia
	Philippines	Iceland
	Turkey	India
	Uruguay	Indonesia
		Latvia
		Morocco
		Namibia
		Romania
		Tunisia

Figure 3: Lending Interest Rate Differential Minus Change of the Exchange Rate



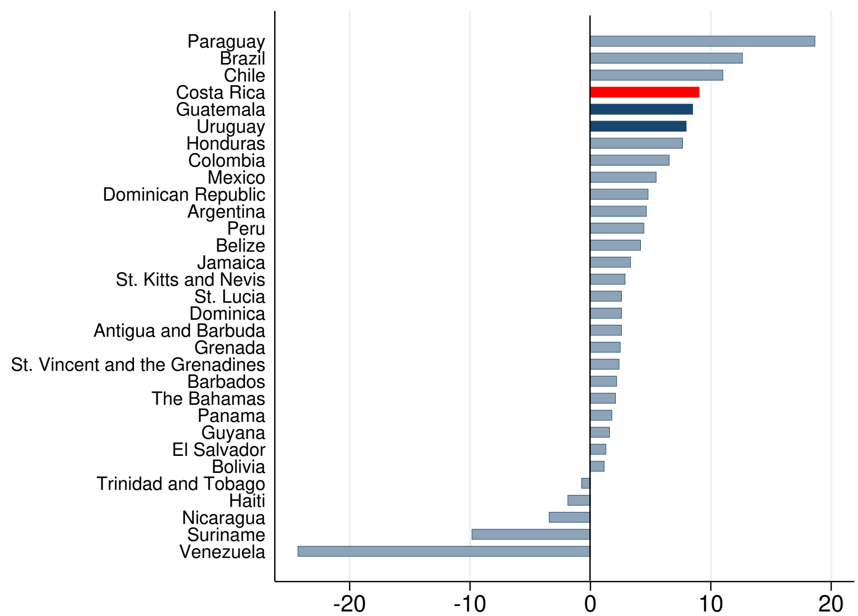
Source: World Bank (2011)

Figure 4: Deposit Interest Rate Differential Minus Change of the Exchange Rate



Source: World Bank (2010)

Figure 5: Deposit Interest Rate Differential Minus Change of the Exchange Rate

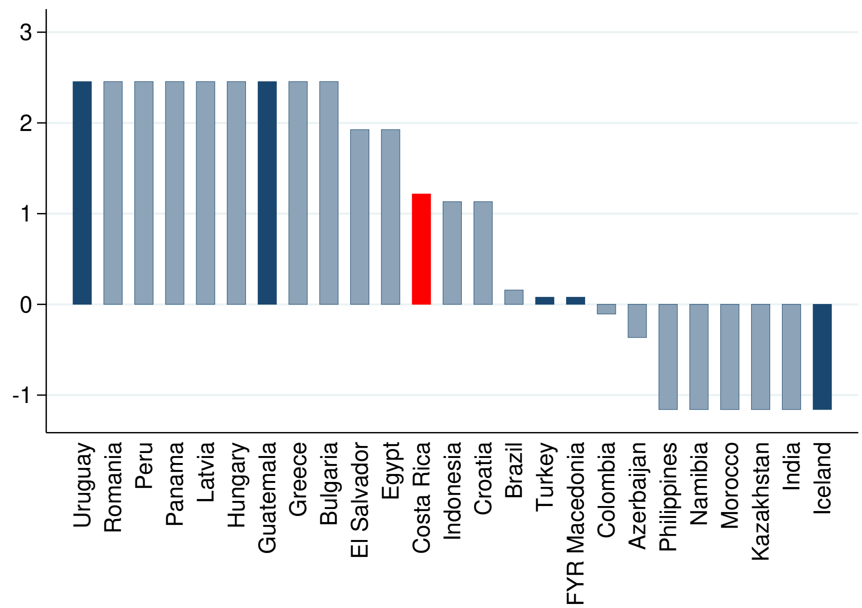


Source: ECLAC (2011)

risk ratings. This is specially true for the lending rate, for which only Brazil, Serbia, Peru and Azerbaijan have larger premiums. Even within Latin America, Costa Rica has a high premium, as it is shown in Figure 5 with data from ECLAC. Costa Rica is only surpassed by Paraguay, Brazil and Chile, but in this case all three countries with rating equal to BB+ are clustered.

Furthermore, this difference in premium moves in opposite direction to the degree of capital account openness. Figure 6 shows the index for countries with risk ratings from BB- to BBB-.

Figure 6: The Chinn-Ito Index



Source: Chinn and Ito (2006)

Figure 6 reports that Costa Rica is located near the middle of the sample of countries with similar risk rating. Costa Rica is more open than Turkey, Macedonia and Iceland, but it is less open than the other Latin American countries with BB+ (Guatemala and Uruguay).

4.1 Capital Flows: Push and Pull Factors

International capital movements are determined by arbitrage opportunities across countries. There are push and pull factors that can explain these movements.

Taking into consideration the capital account of the international balance of payment, capital flows can be divided into: Foreign Direct Investment (FDI), Portfolio Investment, Other Investment and Reserve Account. Foreign Direct Investment is determined by political and economic stability and competitive advantages (pull factors) as well as foreign labour costs and expensive tax systems (push factors). Portfolio Investment refers to the purchase of shares and bonds. Finally, other investment includes capital flows into bank accounts, including the loans.

The literature in general talks about the interest rate differential without specifying if the interest rates under consideration are lending or deposit rates.

$$D_t^{i_t,i_t^*} = i_t - i_t^* \tag{11}$$

In general is assumed that interest rate differential relates to deposit rates $D_t^{i_t^d,i_t^{*d}} = i_t^d - i_t^{*d}$. This differential captures the opportunity costs of an agent to invest in the home country. This specification is useful to help explain the Portfolio Investment section of the Balance of Payments.

In a small open emerging economy such as Costa Rica, loans from foreign banks to local banks can play an important role in the behaviour of capital flows. In this respect, the deposit interest rate differentials explain only a part of the capital inflows.

$$D_t^{i_t^l,i_t^d} = i_t^l - i_t^d \tag{12}$$

Where:
$D_t^{i_t^l,i_t^d}$ is the margin between the local lending and deposit rates.

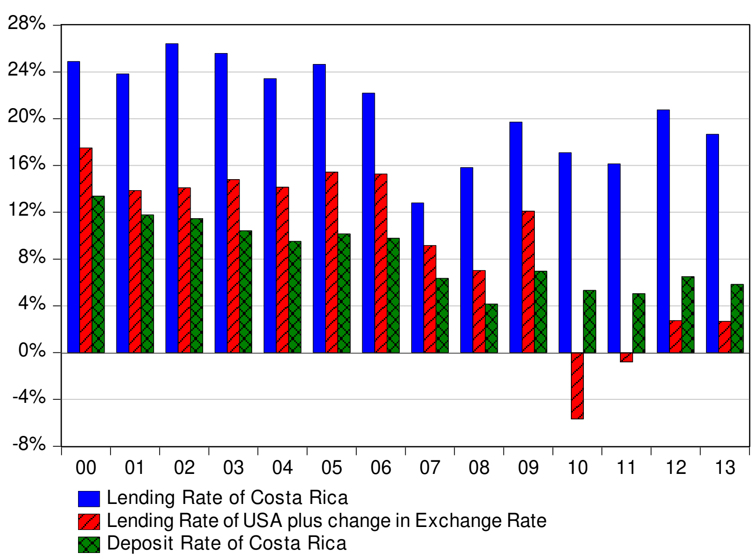
If local savings are not enough to finance the required loans in the economy, local banks could ask for a loan from a foreign bank to cover part of this differential.

Equation 13 shows the interest rate differential that exists between the local and foreign lending rate. This differential can encourage domestic banks to borrow money from foreign banks in order to obtain gains from the arbitrage opportunity.[10]

$$D_t^{i_t^l, i_t^{*l}} = i_t^l - i_t^{*l} \tag{13}$$

After the international financial crisis and with the implementation of the crawling bands exchange rate regime in Costa Rica, the incentive of local banks to obtain loans in the foreign market has increased. In other words, it become more profitable to use external financing than using local deposits; as is shown in Figure 7.

Figure 7: Lending and Deposit Rates Comparison



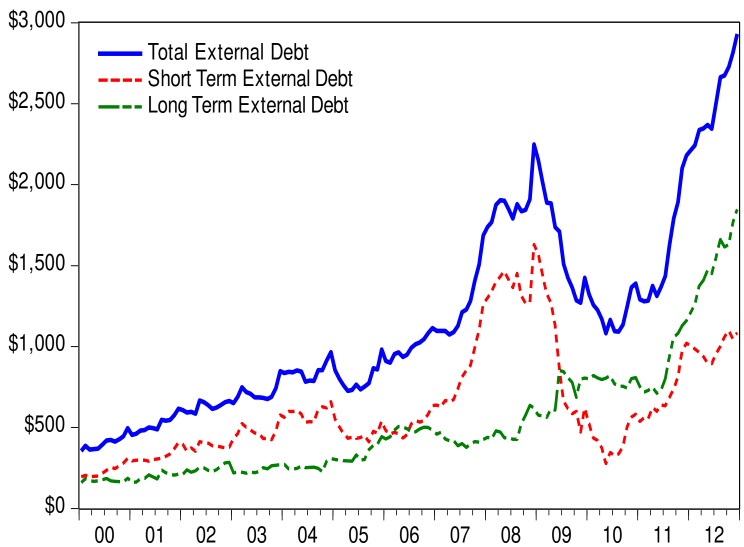
The relatively large gap between lending and deposit rate helps create an incentive for domestic banks to finance their operation with loans from foreign banks. The presence of this large gap could be related to the industrial organization of the financial system in Costa Rica, which is fairly concentrated in a few major banks (see Alonso Alfaro Ureña (2012)) and the fact that these banks are state owned. José

[10] It is possible for foreign banks to take direct advantage of this arbitrage opportunity, but the costs and time associated with opening of a branch in the domestic market can limit or completely eliminate the potential gains.

Pablo Barquero Romero (2011) analyzes which factors determine the financial intermediation margin for Costa Rican banks, and they find that in fact there is market power and it is used to transfer costs to consumers.

As stated previously the stability of the nominal exchange rate and the historic low level of foreign interest rates have created an incentive for commercial banks to borrow in foreign markets. In figure (8) it is possible to observe how after the international financial crisis, commercial banks (both state and private owned) have increase their level of foreign debt. This is especially true for long term debt.

Figure 8: Commercial Banks External Debt



5 Econometric Specification

This section develops the econometric specification used for the estimations. Based on the uncovered interest rate parity presented in the previous sections, we have equation (10):

$$i_t - i_t^* = s^e + \rho \tag{14}$$

This specification can be rearranged [11] for cross sectional estimation as follows:

$$i_t^k - i_t^* = E[\dot{e}_{t+1}^k] + \rho_t^k \tag{15}$$

Where $E[\dot{e}_{t+1}^k]$ is the expected change in the nominal exchange rate and ρ_t^k is the risk premium for country k. For simplicity and availability of the data, it is assumed that agents perfectly predict the future change of the nominal exchange rate. Therefore, $E[\dot{e}_{t+1}^k] = \dot{e}_{t+1}^k$.

Notice that the country risk premium[12] is not constant but changes across time according to internal and external macroeconomic conditions. As a result, it is possible to consider ρ_t^k as a function of many macroeconomic variables. As shown in equation (16).

$$\begin{aligned} \rho_t^k &= f(\rho_t^{f,k}, \pi_t^k, \pi_t^*, gd_t^k, gr_t^k, \\ &\quad rer_t^k, \dot{Y}_t^k, y_t^k, Y_t^k, \dot{e}_t^{V,k}, fr_t^k, ca_t^k, fo_t, D_{FC}) \end{aligned} \tag{16}$$

Under equation (16) the time varying risk premium is a function of qualitative risk rating ($\rho_t^{f,k}$).[13] Local and international levels of inflation (π_t^k and π_t^*) includedto control inflation rate spreads across countries. In order to asses the risk of default the general government debt (gd_t^k) and general government net lending (gr_t^k) as percentage of GDP are considered. Also, taking into account possible misalignments of real exchange rate, the variable (rer_t) is included.

Moreover, equation (16) uses some variables as proxies to measure some important characteristics of the economy. Real annual GDP growth ($\dot{Y}_t^k$) is used as a proxy for return of capital in the economy. Nominal GDP per capita (y_t^k) and nominal GDP (Y_t^k) are used as measurements of financial markets development and deepness.

To asses the external position of each country, the nominal exchange rate volatility ($\dot{e}_t^{V,k}$), the level of foreign reserves (fr_t^k) and the current account (ca_t^k) as percentage of GDP are also considered in

[11] For notational purposes $s^e = E[\dot{e}_{t+1}^k]$.

[12] This paper focuses in economic risk premium, the political risk is not considered for the analysis.

[13] Credit risk rating agencies are: Fitch Ratings (U.S.) Moody's (U.S.), Standard & Poor's (U.S) and Business Monitor International.

the estimation. Finally, the de-jure Financial Openness Index (fo_t) by Chin-Itto (2006) and a dummy variable for the post international financial crisis period (D_{FC}) (2009-2012) are included to complete the specification.

The interest rate differential equation (17) is measured using three different interest rates: the Lending and Deposit Rates (LW and DW) calculated by the World Bank for the whole panel, and the Deposit Rate (DC) obtained by the ECLAC for countries in Latin America and the Caribbean.

$$i_t^{Dj,k} = \frac{1 + i_t^{j,k}}{1 + i_t^{libor}} - 1 \quad \text{for j = LW, DW and DC} \tag{17}$$

In terms of the variables noted in equation (16), $\rho_t^{p,k}$ is operationalized as a quantitative transformation of the Fitch Rating ($AAA = 0, -AAA = 1, AA = 2, AA- = 3, etc.$) (Source: Fitch Ratings), π_t^k is the average inflation (Source: World Economic Outlook of the IMF), π_t^* is the average of the inflation of each country (Source: World Economic Outlook of the IMF), gd_t^k is the deviation of the General Government Debt as percentage of the GDP with respect to the observed average across countries (Source: World Economic Outlook of the IMF), gr_t^* is the deviation to the Government Net Lending as percentage of the GDP with respect to the observed average across countries (Source: World Economic Outlook of the IMF.), rer_t: is the change in the observed Real Exchange Rate (Source: World Economic Outlook of the IMF), $\dot{Y}_t^k$ is the Real annual GDP growth (Source: World Economic Outlook of the IMF.), y_t^k is the Nominal GDP per capital (USD)(Source: World Economic Outlook of the IMF) and Y_t^k is the Nominal GDP (USD).

In addition, $\dot{e}_t^{V,k}$ is the nominal exchange rate volatility that is measured as the 4-year moving average of the standard deviation of the exchange rate. (Source: World Economic Outlook of the IMF.), fr_t^k is equal to Foreign Reserves as percentage of GDP, ca_t^k is Current account as percentage of GDP, fo_t is the de-jure Financial Openness Index calculated by Chin-Itto (2010) and D_{FC} is a dummy variable for the International Financial Crisis.

Based on previous research literature, the econometric model assumes a linear relation with all the variables noted above. The estimated specification of the model is:

$$
\begin{aligned}
i_t^{Dj,k} &= \beta_0 E[\dot{e}_{t+1}^k] + \beta_1 \rho_t^{f,k} + \beta_2 \pi_t^k + \beta_3 \pi_t^* \\
&+ \beta_4 gd_t^k + \beta_5 gr_t^k + \beta_6 rer_t^k + \beta_7 \dot{Y}_t^k + \beta_8 y_t^k \\
&+ \beta_9 \dot{e}_t^{V,k} + \beta_{10} fr_t^k + \beta_{11} ca_t^k + \beta_{12} D_{FC} + \beta_{13}
\end{aligned}
\qquad (18)
$$

Table 2: Expected Signs of the Variables

Variable	Sign	Variable	Sign
$E[\dot{e}_{t+1}^k]$	(+)	y_t^k	(-)
$\rho_t^{f,k}$	(+)	Y_t^k	(+/-)
π_t^k	(+)	$\dot{e}_t^{V,k}$	(+)
π_t^*	(-)	fr_t^k	(-)
gd_t^k	(+)	ca_t^k	(-)
gr_t^k	(-)	fo_t	(-)
rer_t	(+)	D_{FC}	(+)
$\dot{Y}_t^k$	(-)		

A priori, the uncovered interest rate parity (UIP) states that the coefficient of $E[\dot{e}_{t+1}^k]$ should be positive and close to one. The same follows for π_t^k and π_t^*, whose signs one would expect to be positive and negative respectively, and close to one in absolute value.

With respect to the other variables, coefficients should be positive for variables that increase the level of risk for the country such as gd_t^k and $\dot{e}_t^{V,k}$, while negative coefficients are expected for variables that decrease the perceived level of risk: gr_t^k, $\dot{Y}_t^k$, y_t^k and fr_t^k.

The selected specification allows for a general estimation of the country risk taking into account a large number of potential explanatory variables for a significant number of countries. This generality is helpful to understand which variables are relevant for the determination of country risk premium evaluating different subgroups of countries.

6 Results

The Random Effects Model with Maximum Likelihood[14] was used to estimate the equation. Five models are calculated, the first one considers the complete panel of countries, and could be used as a benchmark model. The second model keeps only the countries with investment grade according to the Fitch ratings (BBB- or greater). In this manner, given that Costa Rica's rating is BB+ just a degree below the investment grade, this specification is relevant for a forward looking analysis. A third model uses only countries below investment grade. The fourth and the fifth model are estimated for countries with ratings similar to Costa Rica. The fourth includes a narrow specification of one degree above and below BB+, while the fifth takes into account countries with two degrees above and below BB+.

6.1 Hausman Test

Table 3 shows the results of the Hausman Test for each interest rate differential. In the first and third case, the Random Effect is preferred versus Fixed Effect. For comparative reasons, the random effect model is also used for i_t^{DDW}. In addition, the random effect model was the favored estimation method because the sample of countries in the data could be viewed as a random selection.

Table 3: Results: Hausman Test

Variable	i_t^{DLW}	i_t^{DDW}	i_t^{DDC}
Chi^2	9.71	26.66	8.32
$Prob.$	0.64	0.01	0.76

6.2 Estimated Equations

This subsection presents the estimations of the econometric specification for various relevant subsets of countries. Table 4 shows the results of the estimation using the complete panel data available, for all three possible interest rates. Table 5 presents the results of the estimation for countries rated as

[14]Random Effect model was selected over the Fixed Effect model given the results of the Hausman Test.

Investment Grade by Fitch Ratings (equal or greater than BBB-). Table 6 presents the results of the estimation for countries rated as Non Investment Grade (ratings equal or below BB+) by Fitch Ratings. Additionally, two subgroups are selected to compare countries with a similar rating to Costa Rica (BB+). Tables 7 and 8 present the results for countries between BB to BBB- and BB- to BBB, respectively.

Even though the coefficient for the expected change in the exchange rate is significant and positive for all specifications, the UIP is rejected because the coefficient is statistically different from one. UIP is also rejected in all the other estimations using different subsets of countries across the panel. This outcome reinforces the result of previous research in terms of the empirical complexity of corroborating the UIP.

In general, the quantitative conversion of the Fitch Rating ($\rho_t^{p,k}$) is highly significant across the relevant estimations, but its coefficient is higher for the Non Investment Grade subset. This could be rationalized if we assume that foreign investors will put more weight in this standardized rating for less developed or developing countries than for richer countries, given the asymmetric level of information available. This variable is dropped from estimations in Tables 7 and 8 because it is used as the variable to select the subgroups.

Another result derived from the estimation is the existence of an incomplete (although statically significant) pass-through of local inflation (π_t^k) to interest differentials. On average the coefficient is close to 0.4, meaning that an increase of one percent of local inflation will increase the interest rate differential by only 0.4 pp..

Similar to the results of local inflation, international inflation (π_t^*) also has an incomplete and even lower level of pass-through to interest rate differentials. In this case the average is close to 0.2 pp.. This implies than, although statistically significant, movements of international inflation will have a relatively small effect on the interest rate differentials.

The estimated coefficients for general government debt (gd_t^k) and general government net lending (gr_t^*) have the expected sign. But as a general result, the general government net lending has a larger magnitude and is more significant. This result suggests that foreign agents put a greater attention to size of government deficits more than the level of debt. In addition, both coefficients are higher for the

Table 4: Results: Complete Panel

Variable	i_t^{DLW}	i_t^{DDW}	i_t^{DDC}
$E[\dot{e}_{t+1}^k]$	0.112***	0.069***	0.107***
$\rho_t^{p,k}$	0.449***	0.267***	0.090
π_t^k	0.476***	0.484***	0.368***
π_t^*	-0.362***	-0.292***	-0.050
gd_t^k	0.057**	0.044***	0.028
gr_t^*	-0.723***	-0.655***	-0.721**
rer_t	0.104***	0.110***	0.127***
$\dot{Y}_t^k$	-0.160***	-0.155***	-0.291*
y_t^k	-0.569	0.442	1.579
$\dot{e}_t^{V,k}$	0.066**	0.049**	0.070
fr_t^k	-0.068***	-0.019	-0.150*
ca_t^k	0.058	0.019	0.326**
$cons$	7.398	-6.821	-13.602
$Obs.$	792	727	162
$Countries$	89	91	15

Legend: $*p < 0.05; **p < 0.01; ***p < 0.001$

Table 5: Results: Investment Grade Countries ($\rho \geq BBB-$)

Variable	i_t^{DLW}	i_t^{DDW}	i_t^{DDC}
$E[\dot{e}_{t+1}^k]$	0.055***	0.038***	0.154***
$\rho_t^{p,k}$	0.127	0.307***	0.303*
π_t^k	0.317***	0.310***	0.319***
π_t^*	-0.165**	-0.160***	0.006
gd_t^k	0.035*	0.008	0.028
gr_t^*	-0.632***	-0.693***	-0.502***
rer_t	0.006	0.022	-0.065
$\dot{Y}_t^k$	-0.152***	-0.052*	-0.200*
y_t^k	0.080	0.760*	1.139*
$\dot{e}_t^{V,k}$	-0.029	0.026	0.242***
fr_t^k	-0.010	-0.012	-0.031
ca_t	0.023	0.016	0.027
$cons$	2.901	-8.259*	-14.221**
$Obs.$	501	431	74
$Countries$	60	59	10

Legend: $*p < 0.05; **p < 0.01; ***p < 0.001$

No Investment Grade Countries. In other words, the developing countries can be perceived with a lower level of risk insofar as the governments will be able to manage healthy levels of debt and deficit and, these variables are more relevant if the countries are rated as BB+ or below.

Table 6: Results: Non Investment Grade Countries ($\rho \leq BB+$)

Variable	i_t^{DLW}	i_t^{DDW}	i_t^{DDC}
$E[\dot{e}_{t+1}^k]$	0.095*	0.060**	0.077*
$\rho_t^{p,k}$	0.606*	0.290	-0.006
π_t^k	0.406***	0.457***	0.287***
π_t^*	-0.188	-0.214	-0.195
gd_t^k	0.167**	0.080*	0.098
gr_t^*	-0.885***	-0.782***	-0.675
rer_t	0.147***	0.144***	0.134**
$\dot{Y}_t^k$	-0.234*	-0.208**	-0.476**
y_t^k	0.801	0.992	3.190*
$\dot{e}_t^{V,k}$	0.054	0.038	0.044
fr_t^k	-0.104**	-0.055	-0.146
ca_t	0.052	0.046	0.483**
$cons$	-10.005	-12.627	-27.588
$Obs.$	291	296	88
$Countries$	44	44	11

Legend: $*p < 0.05; **p < 0.01; ***p < 0.001$

The real exchange rate rer_t has a highly statistical significant effect, and its sign is the expected one. A real appreciation (depreciation) will decrease (increase) the interest rate spread.

Real GDP growth ($\dot{Y}_t^k$) has the correct sign and it is statistically significant. As a proxy for the local return of capital, a higher GDP growth will attract more capital inflows, reducing the interest rate differential.

Overall, nominal exchange rate volatility ($\dot{e}_t^{V,k}$) is not significant except for the estimation including the complete panel and the subgroup of Latin American countries with investment grade. However, the sign of the coefficient is the expected one, meaning that a more volatile exchange rate will increase the interest rate differential, as a premium for volatility.

Also, the variables that indicate possible current account crisis, such as current account (ca_t) and net foreign reserves (fr_t^k) as percentage of GDP, have the expected sign.

Table 7: Results: Countries with similar risk to Costa Rica ($BB \leq \rho \leq BBB-$)

Variable	i_t^{DLW}	i_t^{DDW}	i_t^{DDC}
$E[\dot{e}_{t+1}^k]$	0.075*	0.043*	0.137***
$\rho_t^{p,k}$	–	–	–
π_t^k	0.304***	0.225***	0.329***
π_t^*	-0.338**	-0.161*	-0.035
gd_t^k	0.129**	0.059*	0.042
gr_t^*	-0.428*	-0.670***	-0.749***
rer_t	0.027	0.042*	0.027
$\dot{Y}_t^k$	-0.276***	-0.126**	-0.048
y_t^k	0.748	1.030	0.777
$\dot{e}_t^{V,k}$	-0.062	0.017	0.118
fr_t^k	-0.091**	-0.063	-0.116
ca_t	0.058	0.019	0.131
$cons$	-0.755	-8.502	-7.058
$Obs.$	177	152	77
$Countries$	31	30	10

Legend: $*p < 0.05; **p < 0.01; ***p < 0.001$

Finally, the de-jure degree of current account openness and the financial crisis dummy have the expected sign in general, but they were not statistically significant in the specifications. However, as a general comment, the financial crisis increased the interest rate differential between one to two hundred base points.

Table 8: Results: Countries with similar to Costa Rica ($BB- \leq \rho \leq BBB$)

Variable	i_t^{DLW}	i_t^{DDW}	i_t^{DDC}
$E[\dot{e}_{t+1}^k]$	0.0949***	0.0499**	0.0831***
$\rho_t^{p,k}$	–	–	–
π_t^k	0.405***	0.560***	0.323***
π_t^*	-0.315**	-0.248**	-0.021
gd_t^k	0.131***	0.084**	0.058*
gr_t^*	-0.643***	-0.636***	-0.818***
rer_t	0.021	0.102***	-0.029
$\dot{Y}_t^k$	-0.194***	-0.179***	-0.025
y_t^k	0.735	0.852	1.505*
$\dot{e}_t^{V,k}$	-0.019	0.053	-0.049
fr_t^k	-0.065*	-0.012	-0.113
ca_t	0.067*	0.039	0.180**
$cons$	-2.767	-10.730	-14.028
$Obs.$	281	252	100
$Countries$	44	42	11

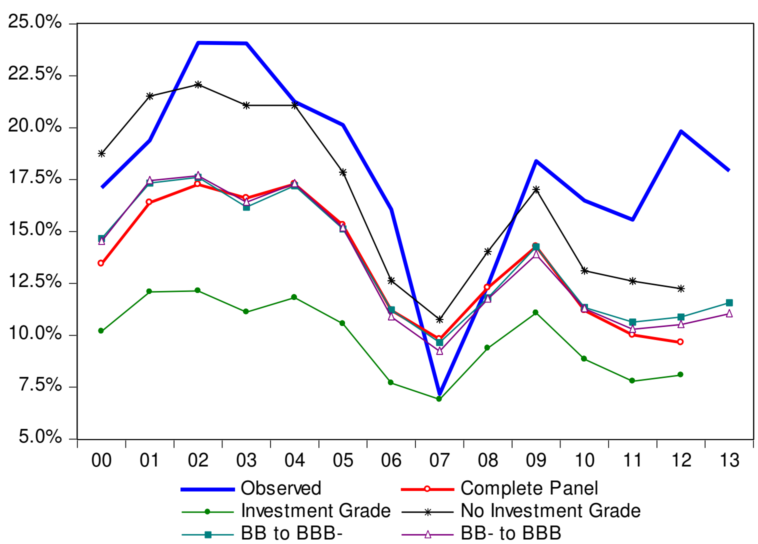
Legend: $*p < 0.05; **p < 0.01; ***p < 0.001$

6.3 Observed versus Predicted Interest Rate Differentials

The estimated models not only provide a reference to understand which variables are relevant to explain the interest rate differentials, but they are also useful to obtain a predicted interest rate differential with current or past data. This prediction is useful to evaluate if the observed interest rate spreads differ of the ones predicted by the model. In this way, the gap observed can be used to explain if the interest rate is above or below what the model predicts given its estimated country risk level. If the observed value is above the predicted value, there is an incentive to take advantage of the arbitrage opportunity. If this arbitrage opportunity exists, it could signal a capital inflow.

Using the estimation from Tables 4, 5, 6, 7 and 8, a predicted interest rate differential is obtained for the case of Costa Rica. The predicted spreads are plotted in Figures 9, 10 and 11 for the Lending and Deposit Rate from the World Bank and the Deposit Rate of the ECLAC, respectively.

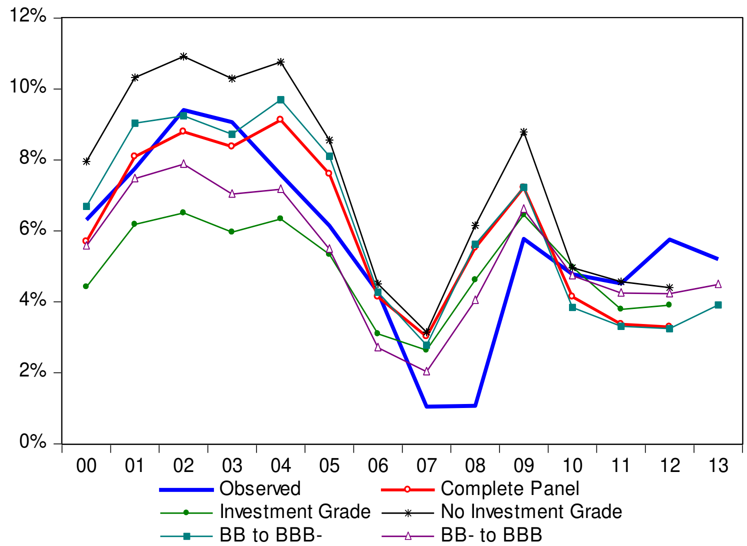
Figure 9: Lending Interest Rate Differential Predicted by the Model



As expected, the predicted interest rate differential is lower for the estimation using only the Investment Grade countries. While, if we use only the subset of Non Investment Grade the predicted interest rate differential is higher.

For the case of Costa Rica, the fifth specification, which only takes into account observations for countries with a risk rating between BB- to BBB, is the relevant one. This specification is preferred to the specification of countries with risk ratings between BB and BBB- due to the higher level of statistical significance of the coefficients and the model in general.

Figure 10: Deposit Interest Rate Differential Predicted by the Model



Using the observed interest rate differential and the one predicted using the data from Table 8, a gap between these two variables can be estimated for the case of Costa Rica. Figure 12 shows the entire sample (2000-2011), while Figure 13 zooms in the years after the international financial crisis.

To expand the analysis, a gap between the observed and predicted lending interest rate differential using the data for Table 8 can be estimated for countries with similar level of risk ratings (BB- to BBB). The results are presented in the Figure 14. Even across countries, Costa Rica has a large positive gap, only Brazil, Peru and Armenia have larger gaps.

The main conclusion is that a positive unexplained gap between the observed and predicted interest rate differential existed for Costa Rica during 2012. This positive gap could explain the capital inflows that have been present during this period. A second point is that the gap is bigger for lending rates than for the two deposit rates used in the estimation. This difference suggests that one of the most

Figure 11: Deposit Interest Rates Differential Predicted by the Model (ECLAC)

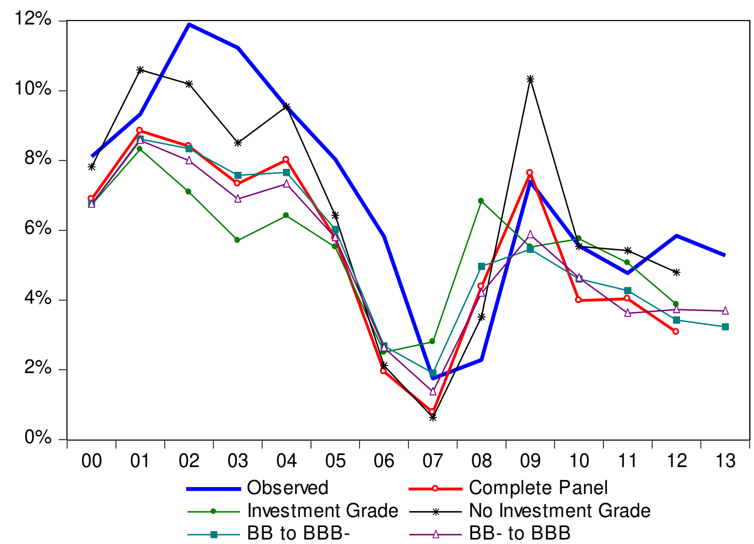


Figure 12: Gap between Observed and Predicted Interest Rates Differential

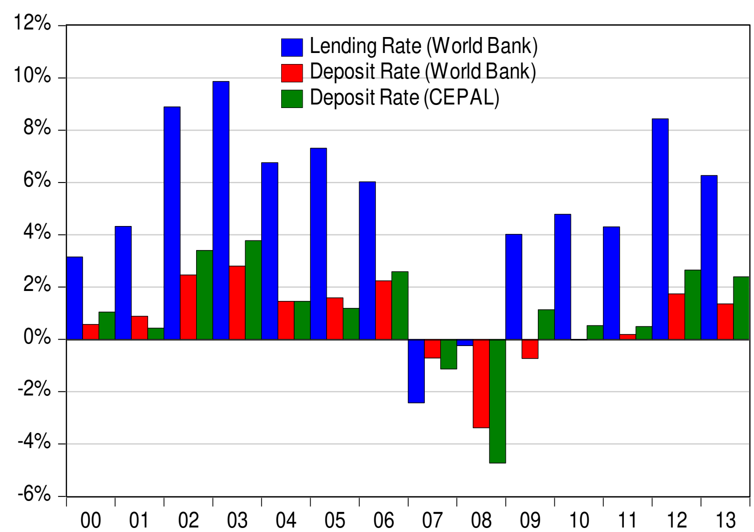
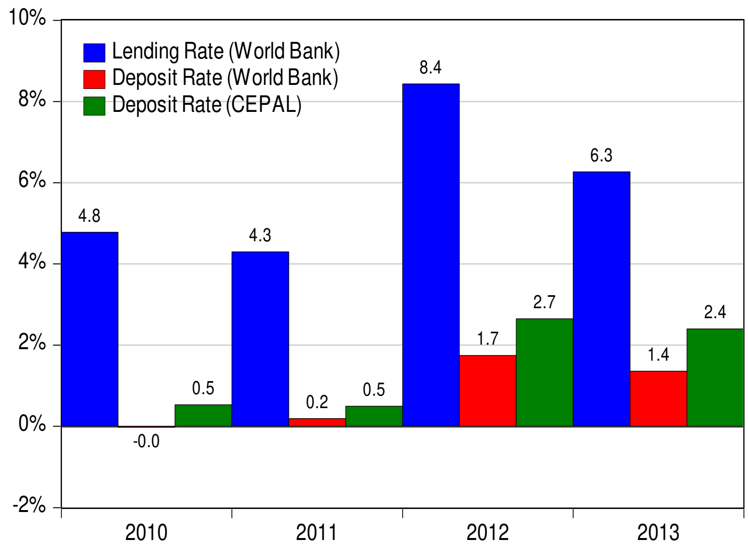


Figure 13: Gap between Observed and Predicted Interest Rates Differential after the Financial Crisis



relevant incentives for capital inflows arises from the lending rate and not necessary from the deposit rates.

In order to achieve a better understanding of the difference between lending and deposit rates, an estimation of the margin is performed. Figure 15 depicts the margin between the lending and deposit rates for Costa Rica and the averages for different groups.

As shown in Figure 15, the margin for Costa Rica is greater than the average of the selected subgroups. Also, the predicted spread suggests a lower differential for Costa Rica than the observed margin, as shown in Figure 16. Thus, a policy recommendation is that by reducing the margin, also the excess in the interest rate differential will be reduced as well.

In this sense, the interest rate differentials for Costa Rica are higher than the ones predicted by the model. This differential creates an incentive for capital inflows. Even though this incentive is active in both, the lending and deposit rates studied in this paper, the gap between the predicted interest rate differential and the observed one is greater for the lending rates.

Figure 14: Gap between Observed and Predicted Interest Rates Differential for selected countries

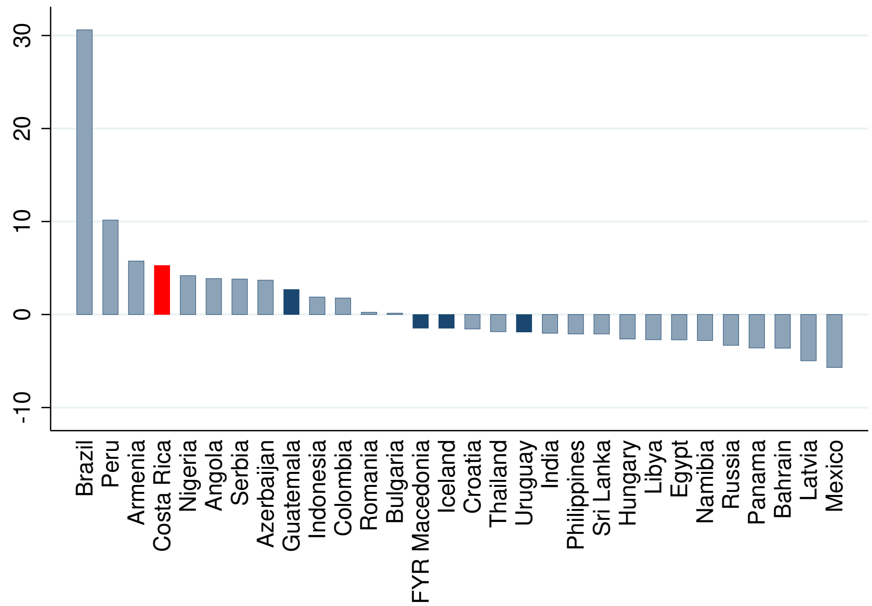


Figure 15: Margin between Lending and Deposit Rates

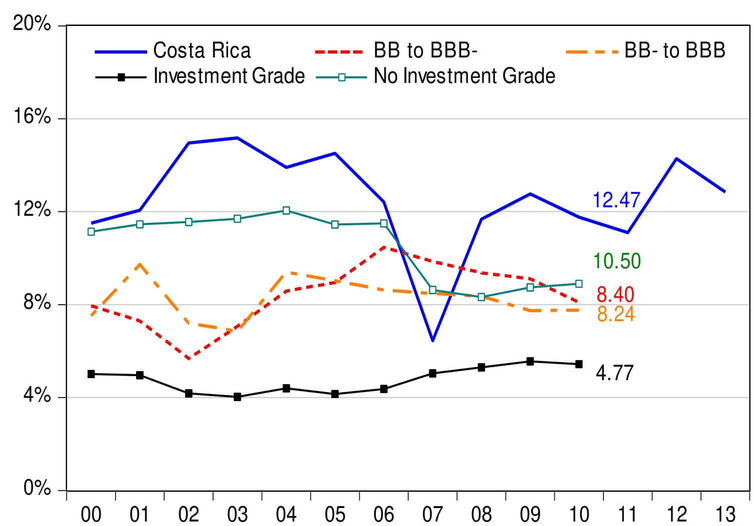
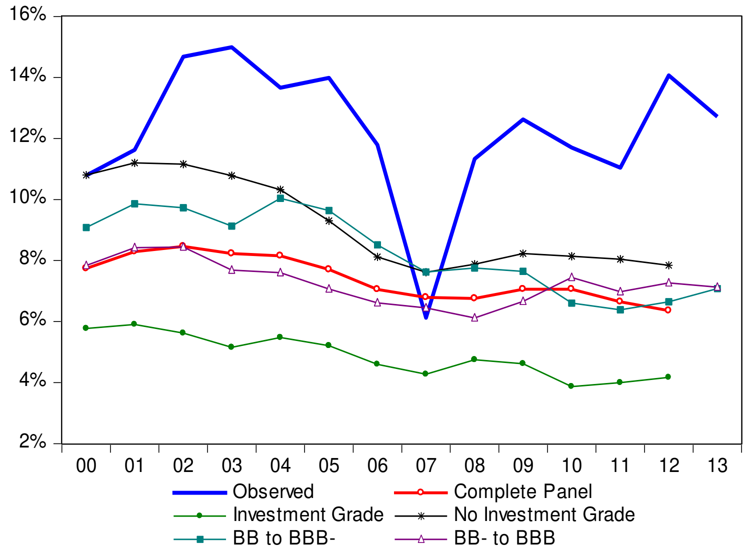


Figure 16: Predicted Margin by the Models



7 Concluding Remarks

This paper aimed to analyze the interest rate differential as the main factor behind the recent capital inflows to Costa Rica. An estimation of a panel data model for interest rate differential that takes into consideration an array of relevant macroeconomic variables was estimated. One of the main contributions of this paper is the use of panel data instead of time series analysis. The panel data estimation allows to predict the level of interest rate differential that the country should have given its particular macroeconomic conditions.

The results of the estimation suggest that interest rate differentials for Costa Rica in 2012 are above what the estimated model predicts for the lending rate and deposit rate by 8.4 pp., and between 2.7 pp. and 1.7 pp., respectively. This excess in the interest rate differential could explain the observed capital inflows.

The fact that countries such as Brazil, Peru and Colombia, which also had important capital inflows in 2012, have an observed interest rate differential above the estimated by the model as well, makes the results more robust.

The difference between lending and deposit rates in Costa Rica is greater than in countries with similar levels of risk. This difference could be related to the industrial organization of the financial system in Costa Rica, which is fairly concentrated in a few major banks and the fact that these banks are state owned. This differential creates an incentive for domestic banks to finance their local operation with loans from foreign banks, therefore increasing the capital inflows and also the systemic risk.

Albeit the gap estimated between the predicted and the observed interest rate differential exists for lending and deposit interest rates, the gap is greater for the lending rates. This result suggests that policy makers should concentrate its efforts in reducing the level of lending rates by decreasing the interest rate spread.

It is relevant to highlight that local banks have the incentive to borrow funds from foreign banks in order to expand their credit in the local economy. This behaviour is explained due to the interest rate differential between local and foreign lending rates adjusted for exchange rate is larger than the local margin between lending and deposit rates.

Unobserved characteristics such as level of competition, asymmetric information, and frictions in the financial markets could explain the above-average margin between lending and deposit rates in Costa Rica. To reduce the incentive for capital inflows a reduction in this margin should be a priority.

Available policy actions to reduce the interest rate differential in order to decrease the incentive for excess capital inflows are an increase in exchange rate volatility, this option should be implemented but given the size of the interest rate differential it will not be sufficient. Therefore, reducing local inflation to a level equal or below international inflation is also needed.

Although there is room for orthodox policy actions such as the stated above, these actions will not solve the core of the problem, which comes from the larger than average margin between lending rates and deposits rates. This margin is possibly originated by imperfect competition in the financial market. This structural problem will have to be solved in order to reduce the incentives for capital inflows in an effective way.

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A Balance of Payments

Table: Balance of Payments of Costa Rica

	2010Q1	2010Q2	2010Q3	2010Q4	2011Q1	2011Q2	2011Q3	2011Q4	2012Q1	2012Q2	2012Q3	2012Q4
Current account	**36.56**	**(224.48)**	**(411.14)**	**(682.12)**	**(191.00)**	**(312.00)**	**(795.25)**	**(904.68)**	**(526.86)**	**(350.18)**	**(590.25)**	**(908.87)**
Financial account	**5.3**	**176.8**	**1,026.8**	**777.4**	**358.7**	**495.2**	**956.5**	**745.7**	**393.2**	**613.4**	**866.9**	**2,368.3**
Direct investment	399.8	307.9	311.4	421.7	523.3	500.3	562.9	511.4	594.9	543.1	619.3	102.0
Portfolio investment	187.3	(129.1)	154.1	160.8	(182.4)	(1.3)	106.6	340.4	46.2	89.2	453.2	1,532.1
Other investment	(581.9)	(2.0)	561.3	195.0	17.8	(3.8)	287.0	(106.0)	(247.9)	(18.9)	(205.5)	734.2
Reserve assets	**(79.7)**	**69.5**	**(485.3)**	**(65.5)**	**(12.8)**	**(196.0)**	**79.3**	**(2.8)**	**8.9**	**(125.5)**	**(274.0)**	**(1,718.9)**

Source: Central Bank of Costa Rica