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HIGH FREQUENCY DYNAMICS OF THE EXCHANGE RATE IN CHILE

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HIGH FREQUENCY DYNAMICS OF THE EXCHANGE RATE IN CHILE

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Resumen

Estimamos un modelo en forma reducida de la dinámica diaria del tipo de cambio contado en Chile. El modelo ajusta en forma razonable la dinámica de corto y largo plazo de la paridad peso-dólar para el período 2001-2006. Adicionalmente, extendemos el modelo para evaluar los efectos de las intervenciones cambiarias del Banco Central, la inversión en el extranjero de los fondos de pensiones, y otros eventos cuyos efectos sobre el tipo de cambio tienen implicancias de política. Encontramos –en línea con previos trabajos realizados en el Banco Central- que el impacto de las acciones del Banco Central en el mercado cambiario se canalizaron mejor a través de anuncios públicos. Asimismo, encontramos que los cambios de límite en la adquisición de activos externos de los fondos de pensiones tuvieron efectos significativos, pero acotados y transitorios sobre el tipo de cambio peso-dólar.

Abstract

We estimate a reduced form model for the daily dynamics of the nominal spot exchange rate in Chile. The model does reasonably well in explaining the long and short run dynamics for the peso-dollar exchange rate for the period 2001-2006. In addition, we extend the model to evaluate the effects of the foreign investment of pension funds, foreign exchange rate interventions by the Central Bank and other events whose effects on the exchange rate have policy implications. We find –in line with previous work conducted at the Central Bank - that the impact of Central Bank actions on the FX market seemed to be better channeled through public announcements. Moreover, we find that changes in the pension funds limits on foreign assets had significant, but small and transitory effects on the spot peso-dollar exchange rate.

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Email: kcowan@bcentral.cl; jselaive@bcentral.cl. Correspondence: Agustinas 1180. Santiago. Tel: 56-2-670-2000, Fax: 56-2-670-2358. Central Bank of Chile. All remaining errors are ours.

I. Introduction

In recent years the increasing availability of high-quality, high-frequency data has led to a large amount of empirical work on exchange rates. Most of recent empirical work, however, has focused on the exchange rates of developed economies, leaving a series questions open on the determinants of exchange rates in the smaller less developed currency markets of emerging economies.

The Chilean exchange rate market is an interesting example of these emerging economies, for several reasons. The first is, that starting in 1999, Chile has operated with a freely floating exchange rate. In fact the Central Bank has only intervened twice -and briefly- in the last eight years. The second is that because of the large share of copper and other commodities in Chile's export basket, Chile potentially is a commodity currency (as characterized by Chen and Rogoff, 2003). The third is the role that large institutional investors (pension funds in particular) and the Central Government may be playing in the currency market in Chile.

This paper estimates a simple -high frequency- empirical model of the dynamics the nominal exchange rate in Chile. The main purpose of doing so is to establish a policy tool with which to gauge the extent to the exchange rate is being driven by fundamentals. Although Chile operates under a flexible exchange rate regime, the Central Bank has the option to intervene in the foreign exchange market when authorities consider that changes in the value of the domestic currency that are not associated to changes in fundamentals. Judging when these deviations take place therefore becomes a central part of exchange rate policy.

In addition, a high frequency model of the exchange rate can be used to study several specific policy questions relevant for the Chilean economy. The first of these concerns the role that pension fund operations may have on the exchange rate. The pension reform of 1981 introduced a fully funded individual account pension system in Chile. Over time the assets administered by the pension funds (PFs) have grown considerably, reaching 60% of GDP in 2005. The size of the funds has raised concerns about its impact on key economic variables such as stock prices, interest rates and the exchange rate. This raises two specific policy questions. The first is the impact on the exchange rate of changes in the PF foreign investment limit proposed in recent pension reform. The second is broader, and refers to the potential impact PF portfolios may have on the exchange rate if they decide to introduce large shifts in their portfolio – such as those that took place in 1998-99.

In addition to gauging the impact of PF, a high frequency model of the exchange rate should also be useful to determine the impact of the few exchange rate interventions that the CBCh has implemented since floating the peso in 1999. Regarding the effectiveness of interventions the only existing study for Chile, Tapia and Tokman (2004) reports transitory effects of verbal interventions. Our objective is to evaluate whether their results are robust to a richer set of control variables.

Finally, a high frequency model can also shed light on the impact of government portfolio changes on the exchange rate. This effect has figured prominently in

recent policy debate in Chile, in relation to the currency in which the central government should be saving the proceeds from the fiscal stability rule. It has been argued that the proceeds should be transferred offshore, so that the lower share of pesos in the government portfolio depreciates the peso. However, there is little empirical evidence of the effects of these portfolio changes on the exchange rate.

To analyze the role of PFs, *forex* interventions and payments from the government to the Central Bank on the exchange rate, we put together series on: the daily portfolios of PFs, announcements and effective changes in the limits to foreign investment by PFs, daily spot interventions by the Central Bank in the foreign exchange market, and daily payments of the Central Government to the Central Bank.

The empirical approach we follow is based on models used to explain the behavior of the real exchange rate, usually estimated using quarterly data (see Faruque, 1995 and Calderon, 2004, for large panel of economics, and Caputo and Dominiquetti, 2005, for Chile). To model the exchange rate dynamics using daily data requires several additional (simplifying) assumptions and proxies for fundamental variables considered as determinants of the parity in the traditional models. We discuss these in detail below. In addition, we allow for financial factors to impact short term exchange rate movements, in particular changes in domestic interest rates, US interest rates and the interest rates of key financial centers in Latin America (Mexico and Brazil).

The baseline model performs reasonably well tracking the long and short run dynamics of the nominal exchange rate and delivers interesting findings about its reaction to copper and oil prices at the daily frequency. We obtain a small and transitory, but significant effect of changes in uncovered foreign currency positions of the pension funds on the exchange rate. Furthermore, we find that announcements of foreign investment limit changes and the changes themselves also have an effect on the exchange rate. Our results for official interventions confirm previous findings that verbal interventions -through a signal effect on expectations- have a small but significant effect on parity. Finally, with respect to the payments of the Central Government to the Central Bank, our results do not show a clear effect on the exchange rate.

This paper is organized as follows. Section 2 discusses our empirical specification. Section 3 presents the data and estimations, and the last section presents the main conclusions.

II. The model

In this section we start by motivating our empirical approach. We also describe the data and sources for the main variables. Individual data sources for central bank exchange rate interventions, pension funds and central government operations are discussed later in their corresponding subsections.

The decision to use a daily data is not arbitrary. Ideally, any study on trading volumes, official interventions and other related events in the FX market which attempts to be informative on both short- and long-term effects should use minute-by-minute data, since this is the time scale on which these events occurs. Nevertheless, daily data may represent a sufficiently good approximation (Sarno and Taylor, 2002).

The estimation approach will be an error correction model for the nominal exchange rate. Thus, we will first estimate the long-run relationship, and then the short dynamics accounting for the fact that the exchange rate should be converging to its long-run level.

II.1. Long-run Dynamics

To derive an expression for the reduced form we take advantage of the extensive literature on the dynamics of the real exchange rate (RER). As the starting point, we consider the same basic specification that has been used elsewhere to evaluate the effect of "fundamentals" on the RER. The specification follows the so-called single equation approach, which relates the RER to a particular set of fundamentals on a reduced form and has a long tradition in empirical international finance[2]. Almost all of them model the real exchange rate from a flow perspective. Higher relative tradable/non tradable sector productivity in the domestic economy will appreciate the domestic currency in real terms (appreciate the RER herein) through the well known Balassa-Samuelson effect. More favorable terms of trade allow the country to spend more, putting pressure on non-tradable goods prices and appreciating the RER. A larger participation of government spending will appreciate the RER through a composition effect (it is usually assumed that government expenditure is relatively more non-tradable good intensive) o just as an aggregate demand effect if there is no perfect capital mobility[3]. A smaller stock of net international assets should lead to RER depreciation because of a transfer problem.

In this context, our approach to estimate a daily model follows the so called *Behavior Equilibrium Exchange Rate* (BEER) models for the equilibrium exchange rate closely. This approach has the advantage that there is no need to make judgments of the economics conditions to identify the equilibrium rate as in the FEER approach (Williamson, 1985).

Base on the previous discussion, it is possible to express the RER and its determinants as:

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[2] Among others, Edwards (1989), Obstfeld and Rogoff (1995) and Faruqee (1994) provide theoretical underpinnings that motivate the type of fundamentals to be considered.

[3] Several previous studies have used this specification to study the effects of different fundamentals on the RER using quarterly data. Goldfajn and Valdés (1999) use that approach to calculate misalignments and study the way they are resolved. Valdés and Délano (1999) use the same type of model to explore the quantitative relevance of the Balassa-Samuelson effect. Razin and Collins (1997) consider panel fundamental RER equations to study the effects of misalignments on growth. Edwards and Savastano (2000) survey other papers which make use of this approach.

$$RER_t = \alpha + \alpha_1 TNT_t + \alpha_2 ToT_t + \alpha_3 (G/Y)_t + \alpha_4 (NFA/Y)_t \qquad (1)$$

This equation does not incorporate variables that may have transitory effects on the RER such as interest rate differential or random shocks. The variable *TNT* corresponds to the ratio of tradable vis a vis non tradable productivity in the domestic economy. *G/Y* corresponds to government expenditure as a proportion of current GDP. *ToT* corresponds to the terms of trade and NFA/Y refers to net foreign assets scaled by GDP. A negative sign is expected for all α. Shifting international prices and domestic prices to the RHS we obtain our baseline model for the nominal exchange rate.

When we work with daily data, series of terms of trade, productivity, government expenditure, foreign assets and prices are not available. Therefore we proxy these variables, which results in the following specification:

$$ER_t = \alpha_1 + \alpha_2 PCopper_t + \alpha_3 POil_t + \alpha_4 EMBI_t + \alpha_4 P^*_t + \alpha_6 P + \zeta_t \qquad (2)$$

Where ER corresponds to the nominal peso/usd exchange rate; *PCopper* is the log of the copper price (cents USD/pound) reported in the London Metal Stock Exchange; *POil* is the log of nominal price of oil (*WTI*) reported in NYMEX. Finally, *P** corresponds to a weighted average of the external prices relevant for Chile, and included in the RER (see appendix A). Variable *P* captures the evolution of the consumer prices and is constructed using the variations of the *unidad de fomento* (daily interpolation of monthly CPI published by the Central Bank of Chile). In addition we add the EMBI, which corresponds to the –weighted average- sovereign spreads for a large group of emerging market economics and is intended to capture changes in the country risk. The source of this variable is JPMorgan (*Bloomberg*). In doing so we follow Neumeyer and Perri (2005), and allow for changes in the real interest to impact wealth and hence consumption decision of emerging market economies.

Equation (2) assumes that movements in the terms of trade are adequately captured by the price of copper and oil. Indeed, as shown in table 1, mining and oil make up large shares of exports and imports respectively. More importantly, however, a simple regression of ln(ToT) against *PCopper* and *POil* has an R^2 of 0.78, as reported in the lower panel of the table.

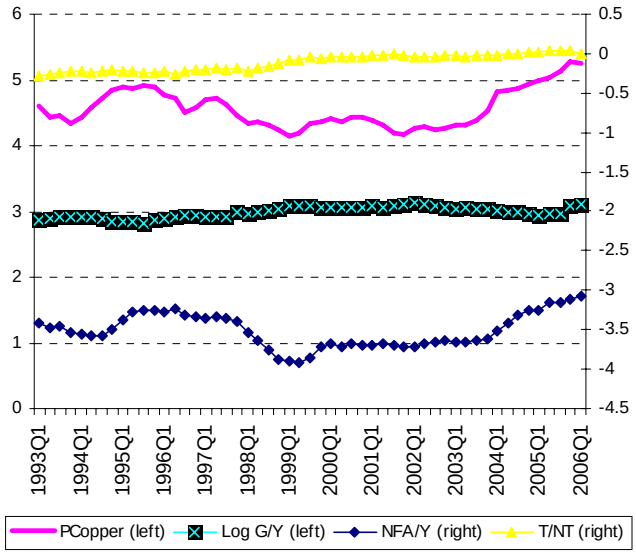
Table 1
Copper and Oil as Proxies for TT

Year	XMining/Xtotal	MOil/Mtotal
1993	41.2%	6.2%
1994	41.9%	5.6%
1995	37.1%	4.3%
1996	39.5%	7.8%
1997	41.8%	10.8%
1998	39.7%	9.7%
1999	39.2%	9.4%
2000	40.6%	11.0%
2001	52.2%	11.6%
2002	56.1%	11.5%
2003	62.9%	12.7%
1993-2003	44.7%	9.2%
Period 1993.1 - 2006.1 ln(terms of trade) versus ln(Pcopper) and ln(Poil) R^2 = 0.78		

Source: Authors´ calculations based on information from the Central Bank of Chile.

In addition, the specification reported in equation (2) assumes that NFA/Y, *G/Y* and *TNT* are either constant or have a cyclical component correlated with the price of copper or oil. As shown in Figure (1) this is not a far fetched assumption. Over our sample period *TNT* and *G/Y* are stable, whereas NFA/Y is highly correlated with the price of copper. The reason for this is that in Chile copper production is either owned by the state (that saves abroad or pays back foreign debt in times of high copper prices because of a structural surplus rule) or multinational companies that increase their investment in the country (via retained earnings) in times of high copper prices.

Figure 1
Net Foreign Assets, government spending and price of copper



Source: Authors´ calculations based on Central Bank of Chile and *Bloomberg*.

The model is estimated for the period 1995-2006. We take a cointegration approach where we consider a long-run relationship between the variables. This approach needs non stationary variables. Standard unit root test do not reject the null of unit root for all variables during the analyzed period (test available upon request).

II.2. Short-run dynamics

We take an agnostic approach to the short run dynamics of the exchange rate. On the one hand, we allow for changes in the nominal exchange rate to be driven by changes in the real exchange rate fundamentals discussed above, and by movements towards the equilibrium real exchange rate. We do this by estimating an error correction model, where the lagged error correction term corresponds to the estimated residual of equation (2) – the previous period deviation of the exchange rate from its equilibrium value.

Specifically, the short run model is

$$\Delta ER_t = \alpha + \beta CE_{t-1} + \lambda \Delta \overline{Z}_{t-k} + \varepsilon_t \qquad (4)$$

Where CE_{t-1} is the lagged error correction term, and ΔZ_{t-k} are the first differences of the fundamental variables from the long run model: the *price of copper, price of oil, EMBI, P and P**. We include 5 lags of each variable, but only report significant lags. We also include day-of-week dummies.

On the other hand, we allow the short run dynamics of the exchange rate to be influenced by both financial and policy variables. First, we extend the short run model including foreign and domestic interest rates. Second, we consider the effect of FX interventions. Third, we gauge the implications of the international investments of pension funds on the exchange rate. Finally, we estimate the effect of payments from the government to the Central Bank.[4]

III. Estimation results: Baseline model

We proceed to estimate the long run dynamics of the nominal exchange rate following equation (2) for the period 1993-2006. Our sample selection is driven by data availability. Additional information on the variables and sources is in the appendices. The estimation method is OLS (*ordinary least squares*) using daily data for all variables. Sensitivity analysis using alternative estimation methods such as DOLS (*dynamic ordinary least squares*, Stock and Watson, 1993) do not alter the results but diminish the number of observations. Base on this, we perform all estimations by OLS with robust standard errors.

[4] To ease the presentation of these several estimations we extend the model in one dimension at a time and leave for the appendix the joint estimation.

Table 2
Long-run model
Dependent Variable: ln(ER)
Period: 1993-2006

Variable	[1]	[2]	[3]
Pcopper	-0.137	-0.118	-0.067
	[0.010]***	[0.009]***	[0.011]***
Poil	0.094	0.109	0.158
	[0.006]***	[0.006]***	[0.008]***
P*	-1.015	-0.874	-0.742
	[0.036]***	[0.034]***	[0.044]***
Trend	0.049	0.054	
	[0.001]***	[0.001]***	
EMBI		0.113	0.14
		[0.003]***	[0.004]***
P			1.321
			[0.022]***
Observations	**2828**	**2828**	**2828**
R-squared	**0.9**	**0.92**	**0.89**

Notes:
- *, **, ***, denotes significance at 10, 5, 1%, respectively. Robust standard errors in parenthesis.
- All variables in logs with the exception of EMBI.

Source: Authors` calculations.

Table 2 presents the results for 3 different specifications. The first two include a trend that controls for changes in *P*. The last includes the daily values of the CPI directly. All elasticities have the expected sign and are significant at 1%. In particular, for the copper price, we observe that 100% increase leads to an appreciation of around 12% in the nominal exchange rate in the long run if we take specifications [1] or [2] and 7% under specification [3]. The variable *P**, as expected, has an estimated value close to one, while *P* has a positive and significant estimate.

We also include in the model the EMBI Global as a measure of international liquidity for emerging economies. The coefficient is significant and indicates that an increase of 10% in the EMBI spread leads to a 1% depreciation. This variable merits discussion as it deviates slightly from standard RER determinants. We incorporate the EMBI to capture movements in the NFA position that arise from changing costs of finance in international capital markets.

Table 3 presents the results for the short run dynamics of the model. Only significant variables are shown. Each column corresponds to the respective column in table 2.

Table 3
Short run model
Dependent Variable: Δln(ER)
Period: 2000-2006

Variable	[1]	[2]	[3]
$\Delta PCopper_t$	-0.079	-0.07	-0.07
	[0.011]***	[0.010]***	[0.010]***
$\Delta Poil_{t-3}$	0.013	0.011	0.01
	[0.005]**	[0.005]**	[0.005]**
ΔP^*_t	-0.329	-0.241	-0.241
	[0.050]***	[0.049]***	[0.049]***
ΔP^*_{t-2}	0.119	0.116	0.117
	[0.052]**	[0.051]**	[0.051]**
$\Delta EMBI_t$		0.11	0.11
		[0.011]***	[0.011]***
$\Delta EMBI_{t-1}$		0.031	0.031
		[0.011]***	[0.011]***
$\Delta EMBI_{t-2}$		-0.022	-0.024
		[0.008]***	[0.008]***
$\Delta EMBI_{t-3}$		0.019	0.019
		[0.008]**	[0.008]**
ΔP_{t-4}			-5.65
			[2.223]**
EC_{t-1}	-0.004	-0.005	-0.004
	[0.002]**	[0.002]**	[0.002]**
Observations	**1581**	**1581**	**1581**
R-squared	**0.1**	**0.20**	**0.21**

Notes:
- *, **, ***, denotes significance at 10, 5, 1%, respectively. Robust standard errors in parenthesis.
- All variables are in logs with the exception of EMBI.
- Error Correction term (EC) for each equation comes from the corresponding long-run specification in table 1.

Source: Authors` calculations.

The signs of the estimated coefficients are as expected: rising copper prices, falling oil prices, an increase in EMBI and a decrease in international prices all lead to depreciations of the peso. Furthermore, the negative and significant error correction term indicates convergence towards the long run equilibrium rate. Finally – and in line with the first objective of the paper – we obtain a reasonable in-sample fit with this parsimonious model, explaining approximately 20% of daily peso/usd variability.

Next to allow for the short-run dynamics of the ER to be influenced by financial variables, we incorporate domestic and foreign interest rates. Under *UIP*, an – unexpected- rise in the domestic interest rate should cause a contemporaneous appreciation of the domestic currency. We measure foreign interest rate using the US interbank interest rate (i^{US}), and also include the nominal interest rates in

Brazil (i^{BR}). These variables are obtained from *Bloomberg* and detailed in the appendix.

Clearly the endogeneity of the domestic interest rate is an issue, as the monetary authority could change the monetary policy rate in response to fluctuations in the exchange rate.[5] Despite this, our results tend to reject an effect of domestic interest rates on the exchange rate (table 4).

Table 4
Short run model: foreign and domestic interest rates
Dependent Variable: Δln(ER)
Period: 2000-2006

Variable	[1]	[2]	[3]	[4]	[5]	[6]
i_t^{US}	-0.074	-0.05				
	[0.035]**	[0.044]				
i_t	0.027	0.004				
	[0.015]*	[0.020]				
i_t^{BR}	0.012	0.014				
	[0.006]**	[0.006]**				
EMBI		0.019			0.014	0.014
		[0.013]			[0.007]**	[0.006]**
$i_t - i_t^{US}$			0.035			
			[0.017]**			
$i_t - i_t^{BR}$			-0.011	-0.007		
			[0.006]*	[0.005]		
$i_t - i_t^{US}$ ***- EMBI***				-0.023		
				[0.012]*		
$i_t - E(i_t)$					0.271	-0.284
					[0.404]	[0.659]
Observations	**1066**	**1033**	**1066**	**1033**	**1531**	**1531**
R-squared	**0.23**	**0.24**	**0.22**	**0.24**	**0.22**	**0.22**

Notes:
- *, **, ***, denotes significance at 10, 5, 1%, respectively. Robust standard errors in parenthesis.
- Control variables taken from specification [3] in Table 3.

Source: Authors` calculations.

Columns 1 and 2 in table 4 report the estimated coefficients for interest rates when they enter unrestricted to the model. The coefficients for domestic interest rates, i, and US interest rates, i^{US}, are statistically significant but with the wrong sign.[6] On the other hand, the coefficient for the Brazilian interest (i^{BR}) rate has the expected positive sign, which may point out the presence of *carry trade* between the Brazilian real and the Chilean peso. When the interest rates rises in Brazil

[5] In Chile the Central Bank sets a target for the intra-day interest rate, also known as the inter-bank interest rate.

[6] Given that we obtained the opposite sign for the coefficients for interest rates, we explored to add the interest rates differences to the model. In this fashion we expected to separate the overshooting of the exchange rate with its dynamic to the new equilibrium, but the results did not improve as expected.

agents are more prone to invest in that currency, but they do it borrowing Chilean pesos which is done through the non-delivery forward market. They basically go short on pesos, and therefore, trigger a depreciation of this currency.

In columns 3 and 4 we restrict the coefficients on the foreign and domestic interest rates to be the same. We estimate a negative coefficient -as expected- only for the interest rate differential between Chile and Brazil. The interest rate differential between Chile and the US only turns negative when we restrict the coefficient on the EMBI to have the same value (column 4).

Previous contributions evaluating the effect of interest rates on the Chilean exchange rate suggest that interest rate news would affect parities (Broer and Dominichetti, 2003). Thus, we proceed by estimating the effect of domestic interest rate news on the exchange rate. We employ two series of domestic interest rate news: Larrain (2007) and Meyer (2006). As shown in column 5 and 6, respectively, estimated coefficients are not significant. We claim that previous findings –where interest rates news were significant – come from not considering a long-run relationship between nominal exchange rate and fundamentals.

III.1. Foreign Exchange Rate Intervention

Despite adopting a floating exchange rate regime, the CBCh reserves the right to intervene in the foreign exchange rate market under "exceptional circumstances", either by purchasing o selling foreign currency directly or by providing the market with instruments for exchange rate hedging. These "exceptional circumstances" are broadly defined as large changes in the exchange rate that are not due to changes in the fundamentals discussed above, and are therefore expected to be undone in the short run. The rational for intervention is that these transitory changes in the exchange rate may impact inflation, generate financial instability and distort resource allocation.

Since floating in 1999, the Central Bank Board has believed that the Chilean exchange rate market experienced "exceptional circumstances" in two periods: the 2nd semester of 2001 and the 4th quarter of 2002. The first period starts in August 2001, on the eve of the Argentinean crisis. During the 1st half of 2001 the CHP depreciated close to 20% against the US Dollar. The CBCh announced the intention to intervene until 31 December 2001 using up to 2$billion in spot operations (close to 10% of outstanding reserves) and a similar amount in dollar indexed paper (BDC). Thus intervention was limited in amounts, in time and no target rate was established. Over the following months spot interventions totaled 803mm USD, while BDC intervention totaled 3.0 billion (including pre-scheduled amounts).

The second intervention episode occurred around the time that events surrounding the Enron scandal and political events in Brazil had pushed emerging market risk up considerably. The intervention mode was identical to that of 2001, with a pre-announced date and limit. Unlike the previous episode, however, the CBCh never intervened in the spot market, limiting itself to selling BCDs during October and November.

The theoretical literature argues that there are three mechanisms through which sterilized interventions could affect the exchange rate: the portfolio, signaling and information channels. The first of these channels relies on imperfect substitutability between peso and dollar assets, so that the expected return on these assets need not be identical at all times, and therefore UIP need not hold. The second two channels, on the other hand, rely on UIP and operate by affecting the medium and long term interest rates or the expected depreciation rate.

In the portfolio channel domestic and foreign assets are imperfect substitutes. Private agents hold a portfolio of these assets, which leads to a set of demand curves for each of the individual assets. Changes induced by forex interventions affect the relative supply of domestic and foreign assets, and hence the market clearing relative price – the exchange rate. In the portfolio channel there is therefore a direct link between the size of the interventions relative to the stock of outstanding assets and the impact on the exchange rate. This channel applies to all changes in government portfolios, Central Bank, Central Government and State Owned Companies[7].

In the signaling channel, *forex* intervention affects the exchange rate by altering the expectations of future monetary policy. Accordingly, a sale of foreign currency leads to an appreciation because it "signals" future monetary tightening. Thus, in this channel a sterilized intervention is actually a non-sterilized intervention with a lag, so that it is really changes in the medium and long domestic interest rates that lead to changes in the exchange rate (Tapia and Tokman 2003). In other words, in the signaling channel *forex* intervention is not a independent policy tool for the Central Bank, but a mechanism for conveying information regarding future monetary policy. Unlike the portfolio channel, in economies with independent Central Banks, this mechanism only operates for Central Bank *forex* interventions[8].

In the third channel -- the information channel – intervention alters the exchange rate by changing the market expectation of the future exchange rate, or by acting as a coordination device for informed traders (sees Kilian and Taylor, 2003). This channel is closely linked to exchange rate misalignments. If the Central Bank considers the local currency to be under (over) valued, it can signal this belief by selling (buying) foreign assets. The effectiveness of this channel depends on the credibility of the Central Bank to correctly read, and act upon deviations from these fundamentals. By intervening the Central Bank is enhancing its credibility by exposing its equity to the exchange rate. If, on the other hand, the CB enjoys

[7] Several authors have questioned the relevance of this channel, on the grounds that the size of interventions is dwarfed by the size of the pool of outstanding assets (Hutchinson, 1984), and the rising substitutability of currencies in investor portfolios due to rising international capital mobility (Sarno and Taylor, 2001). Arguably, this concern may be less relevant for a developing country such as Chile.

[8] The empirical work that tests this channel directly is mixed. One the one hand Dominguez and Frankel (1993 a and b) find evidence that interventions do signal future monetary policy, and in the expected direction. This result is contradicted by Kaminsky and Lewis (1996) who find signaling effects in the opposite direction, and Fatum and Hutchinson (1999) who fail to find effects.

high credibility, it may intervene by simply announcing an equilibrium exchange level, or by promising future interventions if the exchange rate does not converge to this equilibrium level.[9]

The main empirical concern in this literature is the simultaneous determination of exchange rates and the intervention decision. Authors usually get around this simultaneity issue by working with high frequency data (see for example Dominguez and Frankel (2003) for US intervention, Fatum and King (2005)) for CAD intervention), by relying on instrumental variables for *forex* interventions (see Fatum and Hutchinson 2003) or (more recently) by using structural models of exchange rate determination (Kearns and Rigobon, 2003).

The second concern is the sporadic nature of interventions, which has lead most recent research to rely on event study methods. Evidence on the effects of interventions on the level and volatility of exchange rates is mixed, for daily data, but tends to be supportive of intervention in intra day and structural studies.

The only existing empirical analysis for Chile is Tapia and Tokman (2003), which analyses the impact of *forex* interventions and the intervention announcements described above, on the level of the peso/dollar exchange rate over the period 1998-2003. To do so they use daily data to estimate a time series model that uses a linear intervention reaction function to instrument for intervention. They find that during the pre-float period spot and bond interventions had a significant impact on the exchange rate. The estimated coefficients imply that sales of 500 million USD would lead to a 1% real appreciation. For the two post-float episodes, on the other hand, they find that individual interventions had no effect, but that the announcements themselves did impact the path of the exchange rate.

A possible rationalization of this result is that pre-99 the size of the interventions relative to the stock of international assets held by Chilean residents was large enough for the portfolio effect to operate. Two things changed after 1999: internationalization increased, and the size of interventions fell. This led to a watering down of the portfolio channel. Absent this channel, credible announcements become perfect substitutes to intervention.

In this section we follow the approach of Tapia and Tokman (2003) closely, but rely on a richer specification of the exchange rate dynamics. To do so we re-estimate equation (4), including three measures of sterilized interventions: spot currency intervention, auctions of central bank paper denominated or indexed to the USD and the two intervention announcements detailed above (incorporated as dummies). In the case of spot and bond auctions we scale CBCH operations by the trend turnover in the spot exchange rate market – to capture the relative scale of the operations. Our measure of spot interventions corresponds to the "sale of dollars" by the Central Bank; therefore successful interventions would lead to a positive coefficient estimate. In turn we expect a negative sign on the auction of CBCH papers. To instrument for spot interventions we use lagged values of intervention, lagged values of reserves and the cumulative depreciation over the previous week.

[9] For a recent (critical) review of the empirical literature on the impact on forex interventions on the level and variance of exchange rates see Hutchinson (2003) and Neely (2005).

Table 5
Short run model: Interventions
Dependent Variable: Δln(ER)
Period: 2000-2006

	OLS	IV
Variable	[1]	[2]
Announcement t-1	-0.017	-0.017
	[0.001]***	[0.001]***
Announcement t-2	0.001	0.002
	[0.004]	[0.003]
Announcement t-3	-0.005	-0.004
	[0.003]	[0.003]
Announcement t-4	-0.001	0.0000
	[0.002]	[0.002]
Spot interventions t	-0.038	-0.925
	[0.023]	[0.958]
Spot interventions t-1	-0.012	0.225
	[0.038]	[0.259]
Spot interventions t-2	-0.009	0.009
	[0.024]	[0.049]
Spot interventions t-3	-0.008	-0.051
	[0.028]	[0.061]
Spot interventions t-4	0.048	0.234
	[0.025]*	[0.237]
Papers CBCH	0.004	-0.015
	[0.005]	[0.022]
Observations	**1275**	**1257**
R-squared	**0.24**	**0.23**

Notes:
- *, **, ***, denotes significance at 10, 5, 1%, respectively. Robust standard errors in parenthesis.
- Control variables taken from specification [3] in table 2.

Source: Authors` calculations.

As reported in table (4) we find significant effects of the two intervention announcements on the exchange rate. The day after the announcement the currency appreciated by 1.7%. The auctions of dollar denominated papers have no effects on the exchange rate. In the OLS estimation, we find that 4-lagged spot interventions have an effect on the exchange rate. We find this lag structure, however, extremely implausible. When we instrument contemporaneous spot interventions we fail to find any effects of these on the exchange rate.

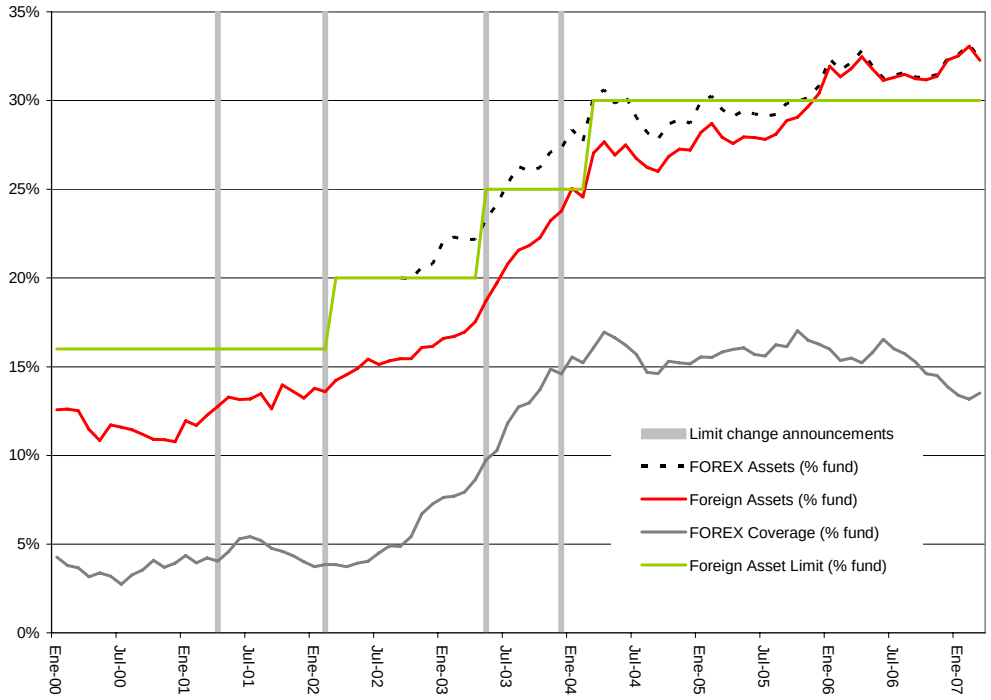
III.2. Pension Funds and the dynamics of the ER.

Pension funds (PFs) are mayor participants in Chilean financial markets. At the end of 2006, total assets under administration where 61 percent of domestic GDP, while their foreign investment was more that a quarter of the total foreign assets of the economy. The sheer sizes of these assets have raised questions regarding the potential impact of pension funds on the prices of financial assets in domestic capital markets.

Since they were created in 1981, private pension funds in Chile have faced a series of quantitative restrictions on their portfolio allocations. One of the restrictions that has received most attention is the limit that puts a cap on the share of total assets that can be invested offshore. This limit has been gradually extended over time, and currently stands at 35% of total assets.

Figure 2 plots the changes in the limit that have taken place since the beginning of 2000, and the share of PF assets invested abroad. In addition, the grey vertical lines indicate dates in which changes in these limits where announced, a point we return to below. Figure 2 also illustrates the gross and net foreign currency positions of the system. The gross position is the share of assets denominated in a foreign currency. This share is higher than foreign assets because a series of domestic instruments – mostly Central Bank bonds – are denominated or indexed to the USD. The net position results from subtracting the PF net currency derivative position (coverage) which measures the net "sell" position of PF in peso/dollar or UF/dollar derivatives.

Figure 2
Pension Fund Investment in Foreign Assets and Limits 2000-2005



Source: Authors` calculations.

This section of the paper explores the impact of the changes in foreign assets, or foreign currency assets of PFs on the exchange rate. We concentrate on realized portfolio changes, and on the effects of changes in the foreign asset limits faced by the funds.

But why should PF asset allocation affect the exchange rate? To answer this question is best to separate long and short run effects. The long run effects will

depend on the extent to which changes in the portfolio of PFs affects the domestic real interest rate. To the extent that the gross capital outflow generated by PF investment abroad pushes up the domestic interest rate – a likely scenario considering that foreign capital must be pulled into Chile to offset the gross outflow induced by the PFs -- then this will reduce the current account deficit, raise net foreign assets and lead to an appreciation of the real exchange rate. Note that this long run appreciation is related to the extent that PFs buy foreign assets and is independent of the currency composition of their portfolio.

Where the currency composition plays an important role is in the short run effects of shifts in the PF assets via portfolio effects. The discussion is analogous to that of the portfolio effects of the sterilized interventions of the Central Bank. If the PFs increase the share of their portfolio in USD, then the peso will depreciate so that the resulting expected appreciation leads other agents to hold larger stocks of peso assets. There are several complications to this argument, however. The first—mentioned above – is that what matters for the portfolio effects is the currency composition of assets not the domestic/foreign mix. The second complication is the role played by derivatives. If spot dollars and "buy" forward positions are close substitutes in portfolios, then only changes in the net currency compositions of PFs will impact the exchange rate. A dollar purchase that is matched with a forward contract to sell this dollar in a month will therefore have no impact. If, on the other hand, substitution is imperfect, even hedged PF operations will impact the exchange rate.

Note also that – as was the case for spot interventions – there is also the potential for a signaling channel that may also drive the exchange rate. If PF managers are considered to have better information on exchange rate movements, then their positions may lead to herding by other market participants.

The concerns addressed in this section are part of an increasing literature that has examined the impact of institutional investors in stock prices, particularly in developed economies. Wei and Kim (1997) find that changes in the positions of large participants in the foreign exchange market exacerbate the volatility of the exchange rate. The closest paper to this one is Restrepo et al (2006), who performs an analysis of the role of Colombian PFs in domestic interest rates and exchange rate market and report a significant effect of its trading volumes on both markets.

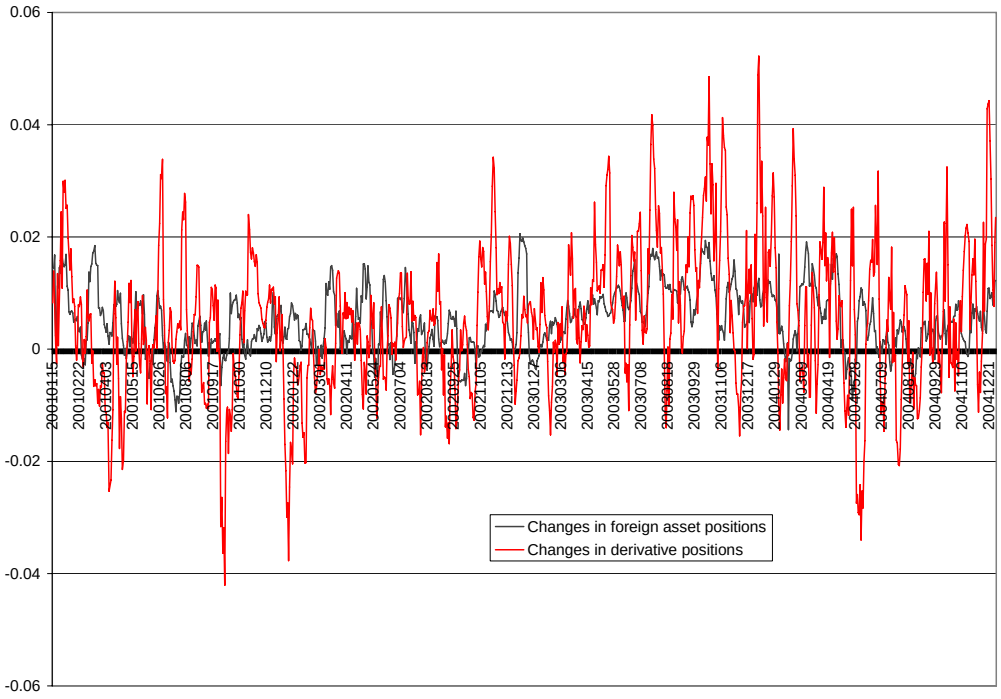
To address these issues empirically we extend the short-run model of the previous section to incorporate variables associated with the cross-border or foreign currency investment of Chilean pension funds. Specifically, we estimate the impact of realized portfolio changes, the impact of the changes in the international investment limits and the impacts of the announcements of changes in these limits, on the exchange rate.

To evaluate the impact of change in portfolios we rely on two sources of information. The first is daily data on the net spot exchange rate purchases of the PFs in the formal exchange rate market. The second is the daily portfolio data on pension fund assets. This data contains the units of each asset and its price. To separate price from quantity changes we build the net changes of foreign assets as

$$\Delta q^*_t = \sum_{i=1}^{n} \left(q_{i,t} - q_{i,t-1} \right) p_{i,t}$$

where $i=1...n$ are the different classes of foreign assets, q_{it} are quantities and p_{it} the prices of these assets. We have this data daily for 2000-2005. In addition to quantitf changes in foreign assets we also build daily changes of net derivate positions (notional value), and foreign currency denominated assets. Figure 3 plots the 5 day moving average for two of these series: foreign assets and net derivative positions. Note that we scale these changes by a trend value of total turnover in the spot currency market.

Figure 3
Net changes in foreign assets and derivatives
(5 day ma, as a share of trend spot transactions)



Source: Authors construction based on data from the SAFP.

Finally, we build a series of changes and announced changes in the foreign investment limits of the PFs. The main events in this series are summarized in table 5. The sample we cover has 3 limit changes: in March 2002, May 2003 and March 2004. In addition we identify 2 separate announcements of limit changes. The first took place on the 19th of April 2001, when a capital market reform law (MKI) was announced and sent to Congress. This law contemplated a gradual widening of the foreign investment limits from 16% to 30% by March 2004. The next announcement we identify took place on December 15th 2003, when the Central Bank announced that it would validate the maximum limit in March 2004. This last point needs clarifying. What the law sent to Congress in April 2001 did

was to set a ceiling for the PF foreign investment limit. It was then up to the Central Bank to set the operational limit below this ceiling. What the Central Bank did in December 2003 was to preannounce that it was going to allow the operational limit to jump to the ceiling in March 2004.

Table 6
Foreign Investment Limit Changes

Announcement	Limit change	Date implemented	Comments
19/04/01(MK1)	16 to 20%	01/03/2002	Establishes ceilings for CBCH: 20%: Feb 02 to Feb 03 25%: Feb 03 to Feb04
29/05/2003	20 to 25%	01/06/2003	Announcement coincides with limit change
15/12/2003	25 to 30%	03/01/2004	Announcement precedes limit change
22/05/2007	30 to 45%		Announcement precedes limit change

Source: Authors` based on CBCH and press review.

To estimate these effects we extend the baseline short run model to incorporate the PF variables discussed above. The results are reported in table 6 and table 7.

In column (1) of table 6, which includes the spot dollar transactions of the PFs in the formal market (scaled by trend turnover) and column (2) which includes the net changes in foreign assets of the PFs, we fail to find a significant effect of PF foreign asset transactions on the exchange rate. However, once we focus on changes in foreign currency assets (column 3) we obtain a small positive effect with two days of lag. Interestingly, the changes in foreign currency assets and coverage operations have opposite signs – as expected (column 4). Furthermore, once we control for coverage operations we find a larger positive effect of foreign currency asset purchases. This result is confirmed in column (5) in which coverage operations are netted from FOREX asset purchases. Defined in this way we find that pension funds have a significant impact on the exchange rate.

The next columns focus on the changes in the foreign investment limits. To do this we build a series for changes and announcements that take on the value of zero in every period that a change (announcement) did not take place, and the value of the effective (announced) change on the day it took place.

Using the series for effective changes, column (6) shows that a 10% increase in the foreign investment limit has a 1% effect on the peso dollar exchange rate, which mostly decays after 4 days. A similar result is reported in column (7), in which the changes in the effective limit are weighted by the size of the PF assets just before the change. The bottom line is that changes in the PF limits on foreign assets have significant, but small and transitory effects on the exchange rate.

Finally, table 7 summarizes the impacts of the changes in the limits and the announcements of the limits. All changes are included simultaneously with four lags of each. As described above these are dummy variables multiplied by the size of the change. Several interesting results emerge. The first is that MKI announcement had a mixed effect on the exchange rate –probably because a series of additional measures where announced simultaneously. The change in March

2002 had a positive, but short lived effect, much smaller that the effect of the change in May 2003. The announcement of December 2003 also had an impact on the exchange rate – although again it was short lived. Finally, the fully expected limit change of March 2004 also depreciated the exchange rate.

Perhaps the last two events are the most useful for gauging the effects of pension fund assets on the exchange rate. December 2003 is a "clean" announcement: nothing else was announced, and an exact date and quantity was set. Note that this in of itself led to a temporary depreciation of the peso. Then – in March 2004 – when this change took place, the peso depreciated again even though no new information was revealed.

Table 7
Short run model: Pension Fund Impact
Dependent Variable: Δln(ER)
Period: 2000-2006

	1	2	3	4	5	6	7
d assets	-0.006	-0.001	-0.011	-0.009	0.002		
	[0.008]	[0.009]	[0.009]	[0.009]	[0.005]		
d assets (-1)	-0.014	0.006	0.007	0.01	0.012		
	[0.008]*	[0.008]	[0.008]	[0.007]	[0.005]***		
d assets (-2)	0.004	-0.004	0.014	0.015	0.001		
	[0.008]	[0.008]	[0.008]*	[0.008]**	[0.004]		
d assets (-3)	0.006	0	0.006	0.006	0.006		
	[0.008]	[0.008]	[0.008]	[0.008]	[0.005]		
d assets (-4)	0.011	-0.004	0.005	0.009	0.015		
	[0.008]	[0.008]	[0.007]	[0.007]	[0.005]***		
d coverage				-0.006			
				[0.005]			
d coverage (-1)				-0.014			
				[0.006]**			
d coverage (-2)				0.006			
				[0.005]			
dcoverage (-3)				-0.006			
				[0.005]			
d coverage (-4)				-0.018			
				[0.006]***			
change in limit (-1)						0.123	0.005
						[0.027]***	[0.001]***
change in limit (-2)						0.053	0.003
						[0.093]	[0.004]
change in limit (-3)						0.01	0
						[0.046]	[0.002]
change in limit (-4)						-0.11	-0.005
						[0.091]	[0.004]

- Notes:
- *, **, ***, denotes significance at 10, 5, 1%, respectively. Robust standard errors in parenthesis.
- Control variables taken from specification [3] in table 2.

Table 8
Short run model: Pension Fund Impact
Dependent Variable: Δln(ER)
Period: 2000-2006

Date	Impact on Δ ln(ER)								
	t+1		t+2		t+3		t+4		cumulative
	Coef	SE	Coef	SE	Coef	SE	Coef	SE	
April 2001	0.028	[0.004]***	-0.057	[0.006]***	-0.003	[0.007]	0.050	[0.006]***	0.018
March 2002	0.002	[0.016]	0.060	[0.018]***	-0.031	[0.018]*	-0.135	[0.017]***	-0.104
May 2003	0.173	[0.014]***	-0.097	[0.014]***	0.074	[0.012]***	0.028	[0.011]***	0.178
December 2003	0.084	[0.008]***	0.019	[0.008]**	-0.017	[0.008]**	-0.151	[0.006]***	-0.065
March 2004	0.100	[0.013]***	0.247	[0.013]***	0.047	[0.014]***	-0.291	[0.013]***	0.103

- Notes:
- This table summarizes the impact on the exchange rate of limit changes and announcements. The specification matches that of column [3] in table 2. However, only the limit change variables are reported.
- *, **, ***, denotes significance at 10, 5, 1%, respectively. Robust standard errors in parenthesis.

III.3. Central Government Payments to the Central Bank

During the crisis of 1982, the Central Government capitalized the Central Bank of Chile through treasury notes under the Law 18.768. These Treasury promissory notes are denominated and payable in US dollars, not tradable in secondary markets and accrue an annual interest rate of Libor plus 0.5 points, of which 2% is payable semiannually and the balance is capitalized. The last installment expires on 15 December 2014. At a later date, there was an agreement to make the payments in pesos (Law 19.774), although the debt was originally denominated and payable in dollars.

In recent years, the Central Bank has received prepayments for significant amounts. In 2004, the Bank received a US$488 million principal payment and interest prepayments of US$12 millions. In 2005, the Bank received principal prepayments of US$1,957 millions, and interest payments of US$43 millions. When the payments are liquidated in pesos, the Central Government may need to sell dollars on the spot market which may eventually trigger an appreciation on the exchange rate. Alternatively, by selling dollars and paying in pesos, the Central Government is altering the currency composition of the consolidated public sector.

We use the ER model to evaluate the effects of these payments on the spot exchange rate. We use daily series of payments obtained from the Annual Report of the Central Bank. The Variable *Fisco-CBCH* corresponds to payments in USD normalized by turnover in the spot ER market; the variable *Fisco-CBCH cumulative 10 days* corresponds to cumulative 10 days payments also normalized by spot turnover. A positive sign for the coefficient would indicate an appreciation of the parity. Results are reported in table 9.

Table 9
Short run model: Fisco-CBCH
Dependent Variable: Δln(ER)
Period: 1995-2006

Variable	[1]	[2]	[3]
Fisco-CBCH cumulative 10 days			0.004
			[0.003]
Fisco-CBCH t-1	-0.009	-0.01	
	[0.008]	[0.008]	
Fisco-CBCH t-2	0.021	0.021	
	[0.011]**	[0.011]*	
Fisco-CBCH t-3	0.01	0.01	
	[0.014]	[0.014]	
Fisco-CBCH t-4	-0.012	-0.014	
	[0.012]	[0.012]	
Fisco-CBCH t-5		0.006	
		[0.007]	
Fisco-CBCH t-6		0.008	
		[0.008]	
Fisco-CBCH t-7		0.007	
		[0.011]	
Fisco-CBCH t-8		0	
		[0.011]	
Fisco-CBCH t-9		0.018	
		[0.011]*	
Observations	**1275**	**1255**	**1310**
R-squared	**0.25**	**0.25**	**0.24**

Notes:
- *, **, ***, denotes significance at 10, 5, 1%, respectively. Robust standard errors in parenthesis.
- Control variables taken from specification [3] in table 3.

Source: Authors` calculations.

In specification [1] we include 4 lags of the variable. In specification [2] we extend the lags structure to capture sluggishness in the trading process by *market-makers*, and in [3] we evaluate the cumulative payments. We do not observe a straightforward effect of the *Fisco* payments on the parity. The second lag is significant in specifications [1] and [2], while the 9th lag shows up significance with a quite similar point estimate. Even though, the variable associated to cumulative payments reported in specification [3] is not significant.

IV. Conclusions

This paper presents a stylized empirical model of the high frequency dynamics of the Chilean nominal exchange rate. The model performs reasonably well tracking the long run dynamics of the parity. Fundamental variables such as copper and oil prices are important determinants of the long and short term dynamics of the exchange rate.

We employ the model to analyze the effect of cross-border investments of pension funds, official foreign exchange rate interventions and the payments *Fisco*-Central Bank. We obtain a small (and in most cases transitory) effect of changes in uncovered foreign currency positions of the pension funds on the exchange rate. On the other hand, our results for official interventions confirm previous findings that verbal interventions have a small but significant effect on parity. Finally, with respect to the payments *Fisco*-Central Bank, our results do not show a clear effect on the exchange rate.

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Appendix A: P* definition

The external price index, P*, is computed as the weighted inflation of Chile's main trade partners in US dollars, according to:

$$P^*_t = \prod_{I=1}^{I_t} \left(\frac{wpi_i}{s_i} \right)^{\omega_i}$$

where wpi_i is the wholesales price index of country i, s_i is the exchange rate for one US dollar in country i, and ω_i is the geometric weight for country i. Weights are calculated yearly according to trade participation of the particular country Wholesale prices are used instead of consumer prices given that the former are more concentrated on tradable goods. Nevertheless, when no information on wholesale prices is available consumer prices are used (Caputo and Dominichetti, 2005).

To obtain a series of daily frequency we decomposed monthly inflations in even amounts in every working day in the respective month. Moreover, given that exchange rate parities enter into the LHS of the previous equation we obtained a series with daily frequency which has more variance than the simple interpolation of the original monthly series.

Table A presents the weights for each main trading partner for the period 1993-1996.

Table A
Trade weights for Chile`s trade partners

	year													
country	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
USA	30.2	33.1	32.3	32.7	34.7	28.8	28.3	29.1	26.4	25.3	25.7	24.6	23.8	21.7
Japan	17.8	15.2	16.1	15.4	13.2	11.2	10.7	10.7	9.4	8.5	8.4	8.2	8.8	8.9
Brazil	10.8	11.2	10.7	10.9	9.7	8.2	7.6	7.2	8.1	8.8	9.1	9.5	9.9	10.5
Germany	9.0	7.5	7.5	6.8	6.5	5.3	5.1	4.4	3.6	4.2	4.4	4.1	3.8	4.1
Argentina	9.1	9.4	9.2	8.4	9.5	8.5	9.6	10.7	9.7	8.1	7.4	7.9	7.7	7.6
France	3.8	3.9	3.6	3.5	4.0	2.8	3.9	2.9	2.9	3.6	3.9	3.5	2.7	2.5
Spain	4.2	3.5	3.7	3.6	4.1	3.7	4.1	3.5	3.1	3.4	3.4	3.4	3.1	3.0
Italy	3.6	3.7	3.7	4.4	4.2	4.0	4.0	3.6	3.0	3.0	2.8	2.8	2.5	2.3
UK	4.0	3.6	3.9	4.1	4.0	3.4	3.5	3.7	3.2	3.3	3.5	3.3	2.9	1.9
Peru	2.2	2.3	2.6	2.9	2.4	1.8	2.0	2.5	2.8	3.0	2.8	2.8	3.3	4.3
Canada	2.1	2.2	2.4	2.3	2.8	2.4	2.8	2.7	2.8	2.5	2.2	2.1	1.8	2.0
Korea	3.2	4.3	4.3	5.0	4.9	4.0	3.1	3.1	3.2	3.2	2.8	3.2	3.6	4.3
Mexico						5.7	5.1	5.2	4.9	5.1	5.6	5.1	5.4	5.0
Taiwan						2.1	1.7	1.9	1.9	1.5	1.7	1.6	1.4	1.2
Colombia						1.9	1.8	1.9	1.9	2.0	2.2	2.0	1.9	1.6
Nethelands						1.9	1.9	2.1	1.9	2.7	2.4	2.9	4.3	4.5
Belgium						1.6	1.9	1.8	1.9	1.4	1.4	1.4	1.2	1.3
Venezuela						1.5	1.6	1.8	1.6	2.0	1.5		1.2	1.2
Ecuador						1.2	1.4	1.2	1.1	1.5	1.5	1.5	1.3	
China									5.3	6.7	7.5	7.7	8.3	9.0
Sweden									1.5			1.1	1.2	1.6
Finland												1.2		1.4

Source: Central Bank of Chile

Appendix B: **Participation of the Central Bank in the exchange market**

In principle, the Central Bank may influence the exchange market both directly and indirectly. On the one hand, by setting the monetary policy rate the Bank can indirectly affect the parity. On the other hand, the Central Bank may carry out interventions directly in the market. There are two ways of intervention; first the Central Bank may negotiate foreign currencies for pesos. Second, it can issue in foreign currency. In general, central banks sell off international reserves to curve the depreciation of their currencies--as was the case in Chile in 2001. Therefore, actions of the Central Bank in the exchange market are usually linked to fluctuations in international reserves. Nonetheless, as we will describe in this appendix, the role of the Central Bank in the market is not limited to the accumulation or depletion of foreign reserves, and movements in international reserves do not always reflect the participation of the CB in the FX market. For instance, we have variations in reserves due to interest and valuation effects.[10] In the former case, for example, international reserves may change when the Central Bank buy foreign currency with a pact of future sale. If the counterpart brings foreign currency to the Central Bank, international reserves will rise given that the CB makes provisions for the future sale. Moreover, the Central Bank has been replacing documents in foreign currency with documents in domestic currency and denominated in foreign currency. This influence exchange operations but does not modify international reserves.

We employ the information of the balance termed exchanges (*intercambios*) or exchange operations (*operaciones de cambio*). Exchanges accounts for variations in balances net of interest payments, non-financial costs, readjustments, and in general any flow that is not accompanied of a corresponding compensatory flow (Central Bank of Chile, 2006). As such, it closely reflects the FX policies implemented by the authority. Exchanges may be influenced by maturity of operations decided in the past, but maturities could be delayed or anticipated through renovations, sales or anticipated rescues. Exchange operations represent the net acquisition of foreign currency and/or documents in foreign currency, with domestic currency and/or documents in domestic currency.

[10] As June of 2006 international reserves of the Central Bank of Chile were invested in US dollars (67.2%), Euros (25.5%) and other currencies (7.3%).

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