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# NON-FUNDAMENTAL FLOWS AND FOREIGN EXCHANGE RATES

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## ABSTRACT

Frequent, yet uninformed, fund flows in Chilean pension plans generate substantial trading in currency markets due to the high allocation to international securities. These non-fundamental flows have a significant impact on the Chilean peso, which is estimated to have a relatively low price elasticity of 0.81. Hedging by the banking sector propagates the price pressure to currency forward markets and results in violations of the covered interest rate parity. Using trading data and bank balance sheet data, we confirm that regulatory requirements and banks' risk bearing constraints create limits of arbitrage.



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# 1 Introduction

According to traditional asset pricing theories, the price of a financial asset should only change when investors revise their expectations on future cash flows or discount rates. The "inelastic market hypothesis," recently proposed by Gabaix and Koijen (2021), however, predicts that asset prices, even at the macro-level, respond to day-to-day investment flows. If funds hold assets denominated in foreign currencies, fund flows may also generate price pressure on currency markets. Taking advantage of several unique features of the Chilean pension system, we aim to quantify the price elasticity of demand in the currency market, and to explore limits of arbitrage by studying how flow shocks influence violations of the covered interest rate parity (CIP).

The Chilean pension system allows investors to allocate their investments across funds with different risk levels (from funds mostly invested in stocks to funds mostly invested in fixed income). A financial advisory firm called Felices y Forrados (FyF, which translates to "Happy and Loaded") was founded in 2011 to cater to the demand of individual investors to time the market. Between 2011 and early 2020, FyF sent out 82 fund reallocation recommendations. As an illustration of the impact of recommendations on flows, Figure 1 shows the FyF recommendations (depicted with vertical lines) during 2018 and the daily flows to pension fund A (the fund with the highest allocation to stocks). The largest spikes in the pension flows almost always coincide with FyF recommendations. Recommendations to buy fund A (depicted with dotted lines) are associated with inflows to fund A and recommendations to sell (depicted with solid lines) are associated with outflows from fund A. Da, Larrain, Sialm, and Tessada (2018) and Bernhardt and Cuevas (2022) show that these recommendations are largely uninformative and generate significant price pressure and increased volatility in the local stock market.

These fund reallocations do not just impact Chilean stock and bond markets, but also the

Chilean foreign exchange market. The most risky fund invests around 75% of its portfolio in international assets while the safest fund mostly holds assets denominated in Chilean pesos, consistent with the "home-currency bias" documented by Maggiori, Neiman, and Schreger (2020) for bond portfolios. Hence, a FyF recommendation to move from the safe to the risky fund results in a need to trade almost US$1 billion worth of Chilean pesos, which corresponds to 0.48% of the money supply (M2). We document that these reallocation trades move the exchange rate of the Chilean peso per US dollar by 0.59%, translating into a relatively low price elasticity of 0.81. For comparison, Da, Larrain, Sialm, and Tessada (2018) also document a low price elasticity of 0.45 in the Chilean stock market. Both estimates support the inelastic market hypothesis of Gabaix and Koijen (2021).

By examining the trading imbalances reported by the Chilean central bank, we confirm that the local banking sector provides liquidity to the pension funds in the spot market. The local banks then hedge their currency exposure by taking offsetting positions against foreigners in the OTC forward market. For instance, after a recommendation to move from the safe to the risky fund, local banks buy forward an amount that represents close to 2% of their equity capital. Thus, local banks propagate the flow-induced shocks from the spot market to the forward market. We find that the forward premium (the difference between the forward and spot prices) moves according to whether local banks need to buy or sell in the forward market. Since the price elasticity is different across these two markets, we find that the flow-induced shocks correlate with CIP deviations. For example, the cross-currency basis, which measures the extent of the CIP violation in the foreign exchange market, falls by close to 25 basis points (from an average of $-36$ bp) after a recommendation to move from the safe to the risky fund.

Given the difficulty for foreign investors to trade in the spot market for Chilean pesos, local banks appear to be in a good position to arbitrage CIP violations. However, consistent with Du, Tepper, and Verdelhan (2018) and Du, Hébert, and Huber (2021), we find that

local banks do not fully eliminate these deviations due to limits of arbitrage. Following the Great Financial Crisis, banks are required to maintain minimum capital ratios against all assets, including those involved in arbitrage. Such capital requirements impose costs for balance-sheet-intensive strategies such as trading against CIP violations.

Consistent with "balance sheet costs," we find that FyF recommendations cause greater price effects in the spot and forward markets around quarter ends. It is more expensive for arbitrageurs to hold positions over quarter ends when bank assets are measured by regulators (Du, Tepper, and Verdelhan, 2018). We also connect our results with banks' risk-bearing constraints. In particular, we find that price effects are stronger when banks recently experienced a negative shock to their equity capital, consistent with He, Kelly, and Manela (2017), Du, Hébert, and Huber (2021), and Cenedese, Della Corte, and Wang (2021).

Our paper contributes to several strands of literature. First, it contributes to a voluminous literature documenting price pressure in various asset classes. Supporting the framework in Hau and Rey (2006), Gabaix and Maggiori (2015), Camanho, Hau, and Rey (2021), and Jiang, Richmond, and Zhang (2022), we also find that the currency demand curve is downward sloping. In this regard, our empirical findings are related to Hau, Massa, and Peress (2010) and Pandolfi and Williams (2019), who document the exchange rate response when a country's stocks or bonds are added to or re-balanced in popular indices. We examine 82 non-fundamental demand shocks that alternate between large inflows and large outflows in the currency market. These repeated, non-fundamental, and quantifiable shocks allow us to estimate the price elasticity in the currency market at the macro level, as emphasized by Gabaix and Koijen (2021).[1] In a contemporaneous paper, Pinto-Avalos, Bowe, and Hyde (2022) also study the impact of FyF recommendations on the Chilean for-

[1]There is a large literature that studies the impact of flows on prices. Papers estimating the micro-elasticities include, for example, Shleifer (1986), Wurgler and Zhuravskaya (2002), and Duffie (2010). A large number of papers study the impact of fund flows, including Warther (1995), Edelen and Warner (2001), Frazzini and Lamont (2008), Chen, Goldstein, and Jiang (2010), Ben-David, Franzoni, and Moussawi (2012), Ben-Rephael, Kandel, and Wohl (2012), Lou (2012), Ben-David, Li, Rossi, and Song (2021), and Dou, Kogan, and Wu (2022). See Gabaix and Koijen (2021) for a more detailed review of the literature.

eign exchange market. They also document significant price pressure in the spot market, although they do not compute an elasticity. In our paper we additionally investigate the role of banks in propagating the shocks towards the forward market and the consequences for CIP violations.

Second, our paper contributes to an equally voluminous literature on exchange rates. The recent paper by Itskhoki and Mukhin (2021) highlights the important role of noise traders, risk averse intermediaries, and limits of arbitrage in the currency market. Our unique setting and detailed data offer a rare opportunity to showcase the interaction between noise traders (pension fund investors acting on FyF recommendations) and financial intermediaries (local banks). According to Du and Schreger (2021), the role of large non-bank investors has received little attention in the literature on currency markets. We find that hedging activities by banks propagate shocks from the spot to the forward market. Limits to arbitrage arising from regulatory costs and banks' risk bearing constraints explain why this activity can result in persistent CIP violations. Our findings complement those in Cenedese, Della Corte, and Wang (2021), Jiang, Krishnamurthy, and Lustig (2021), and Wallen (2022).

The rest of the paper is organized as follows. Section 2 describes the data sources. Section 3 explains the empirical strategy and reports the results on fund flows. Section 4 studies the impact on the spot exchange rate. Section 5 studies the transmission of the recommendations on banking imbalances, and Section 6 investigates the impact of fund flows on deviations from CIP. Section 7 concludes.

# 2 Data

Our analysis combines multiple data sources. We divide the presentation of the data into five subsections: prices and interest rates, the balance sheet of the banking system, trading volume, pension funds, and the advisory firm FyF.

## 2.1 Prices and Interest Rates

We get most of the market data from Bloomberg. The daily spot exchange rate ($S$) is measured in Chilean pesos per U.S. dollars. The one-month forward exchange rate ($F_{1m}$) is measured at closing and corresponds to the mid-point price on over-the-counter forward contracts of Chilean pesos per U.S. dollars. These contracts can be opened on any day. All contracts are non-deliverable forwards, meaning that they have to be settled in dollars and not in Chilean pesos.[2] Interest rates correspond to the 30-day LIBOR rate in U.S. dollars ($R_{us}$) and the local 30-day interbank interest rate in Chilean pesos ($R_{chile}$).[3]

Insert Table 1 here

Table 1 shows the summary statistics for the main variables in our analysis. The average spot exchange rate is approximately 595 pesos per dollar. The average daily change in the spot exchange rate is 0.02%, with a standard deviation of 0.62%. The average 30-day Chilean rate is 4.13% and the average U.S. LIBOR rate is 0.71% over our sample period.[4] The average spread between the U.S. and the Chilean rate is -3.42%, with a standard deviation of 1.92%.

## 2.2 Balance Sheet of the Domestic Banking System

The CMF (Comision para el Mercado Financiero) is the regulator of financial markets in Chile. It regulates banks, insurance companies, exchanges, and issuers of financial securities. At the monthly level, it reports the amount of equity, and the ratio of equity to risk-weighted assets of the aggregate balance sheet of the Chilean banking system.[5]

[2]The Chilean peso was not a deliverable currency during our sample period, however this changed in December 2020: https://www.bcentral.cl/en/content/-/details/the-central-bank-of-chile-authorizes-the-use-of-the-chilean-peso-in-cross-border-transactions.

[3]Bloomberg tickers are as follows: CLP BGN Curncy (spot), CHN1M Curncy (forward), US0001M Index (Libor), and CLTN30DN Index (Chilean interest rate).

[4]All interest rates and spreads are reported in annual terms in our analysis. As is standard practice, monthly rates and spreads are multiplied by 360/30.

[5]The CMF data can be downloaded from www.cmfchile.cl.

## 2.3 Trading Volume and Banking Imbalances

The Central Bank of Chile reports trading volumes in the spot and forward markets in several ways. At the monthly level, it reports the total amount bought and sold of foreign currencies between banks (and other authorized participants of the exchange market) and various counterparties: pension plans, insurance companies, mutual funds, foreigners, firms, and others. All foreign currencies are aggregated into a single amount, but U.S. dollars represent the lion's share of the volume. The trading volume in the forward market is between 1.5 and 2 times larger than the trading volume in the spot market. Foreigners account for most of the trading in the forward market. Many foreigners trade solely on the forward market since forward contracts are settled exclusively in U.S. dollars. Trading on the spot market requires opening accounts in Chilean pesos at a local bank.

At the daily level, the Central Bank of Chile reports the total amount bought and sold of foreign currencies between the banking sector and third parties. The daily data is not split by type of counterparty like the monthly data. We define the daily imbalances of the banking sector as the difference between the amount bought and the amount sold in each market. As seen in Table 1, the average imbalances are 0.01% of the equity of the banking sector in the spot market and -0.23% in the forward market. The average net imbalance is obtained by simply adding the imbalances in the spot and forward markets.

The Central Bank also reports data for the net positions of the banking system at a daily frequency. These are accounting measures of the stock of foreign currency spot and forward contracts in the banking sector. A negative net spot position implies that banks are borrowing foreign currency to sell in the local spot market. Changes in the net position correspond basically to the amount bought minus the amount sold by banks in each market. The net position in the forward market encompasses the notional value of all open contracts at each point in time. Hence, the net forward position also varies with the expiration or

closing of previous contracts, and not just with the origination of buy and sell contracts.[6]

## 2.4 Pension Funds

Private pension fund administrators (AFPs, from their acronym in Spanish) are regulated and supervised by the Superintendencia de Pensiones (SP). There are between six and seven AFPs operating throughout the sample period that we study. Each AFP has to offer five types of funds, labeled A through E, with different risk profiles set by regulation. Risk is defined in terms of the maximum investment that is allowed in equity, for example, 80% of the portfolio in fund A, 40% in fund C, or 5% in fund E. Equity investments above those thresholds are only permitted under special circumstances. There is also a limit on foreign asset holdings for the aggregate portfolio of all funds managed by each AFP, and which stood at 80% at the beginning of our sample period in 2011. The SP makes available a wealth of information about AFPs on its website (www.spensiones.cl). At the monthly level, we obtain for each type of fund (i.e., A to E) the portfolio composition, in terms of broad assets classes and the split between foreign and domestic investments, and some demographic information about investors.

Table 2 shows the average size of the five funds offered in the pension system. The total assets under management, amounting to approximately US$175 billion, represent close to 65% of Chilean GDP. Fund C, which started earlier than the other other funds, is the largest with US$65 billion assets under management. There are close to 11 million individual fund investments in the pension fund system. On average, 84.5% of individuals between 20 and 65 years old are investors in the pension fund system throughout our sample.[7]

At the system level, close to 42% of the assets under management are invested in foreign

[6]Most forward contracts expire instead of being closed out. Rather than settling an open contract, banks trade contracts in the opposite direction in order to effectively close out their positions.

[7]Investors can decide to split their investment into multiple funds, so 11 million fund investments corresponds to fewer than 11 million investors. The 84.5% proportion reported above adjusts for this double counting as some people are invested in multiple funds.

assets. The proportion of foreign investments equals 75% for fund A and decreases monotonically to only 6% of fund E. Thus, switches between funds A and E generate large flows in currency markets. Around two-thirds of foreign currency investments are held in equity securities (i.e., 28%/42%) and around 70% of all equity investments are invested in foreign equities (i.e., 28%/39%).

Insert Table 2 here

At the daily level ($t$), we get the fund share price ($P_{ikt}$) and assets under management ($AUM_{ikt}$) for each fund type $i$ (A-E) offered by each AFP $k$. From there we define the daily flow as:

$$Flow_{ikt} = \frac{AUM_{ikt}}{AUM_{ikt-1}} - \frac{P_{ikt}}{P_{ikt-1}}. \tag{1}$$

According to Chilean regulations, investors are free to request their AFP to transfer their savings between funds.[8] These requests are typically filed online. The AFP has up to day *t+4* after the request to move the amount between funds, although the transfer is executed at share prices of day *t+2*. For example, an investor with $N^A$ shares of fund A and who requests a transfer to fund E will be able to buy $N^A \times \frac{P^A_{t+2}}{P^E_{t+2}}$ shares of fund E. The AFP has to delay switches between funds when the volume of transfer requests is especially large. In particular, the excess flow above 5% of the $AUM_{ikt}$ has to be postponed until the next day. For example, an outflow of 20% of the $AUM_{ikt}$ takes four additional days to be fully implemented. Transfers are organized on a first-come-first-served basis.

[8]Beyond voluntary transfers, there are transfers between funds that are triggered by the age of the investor if the investor has always taken the default option defined by regulation. For example, fund B is the default option for men and women up to 35 years old. Both are moved to fund C when they turn 36. Funds A and E are not default options under the Chilean regulation, hence flows to and from these funds need to be initiated by the investor.

## 2.5 Felices y Forrados

The advisory firm FyF gave asset allocation recommendations to their on-line subscribers. Subscribers received an email telling them to sign into the FyF website when a new recommendation was issued.[9] After seeing the recommendation investors could request their AFP to implement the switch. The request had to be filed on the platform of each AFP and not on a centralized FyF platform. FyF recommended types of funds (A through E, or combinations of them) instead of particular AFPs. Table 3 shows the 82 recommendations that FyF issued between July 2011 and the end of February 2020. There was a new recommendation approximately every six weeks between 2011 and 2017. Then, in 2018, the frequency increased to approximately one recommendation every two weeks. Most recommendations (69) involve moving towards or away from fund A. The rest (13) recommend moves between funds C, D, or E. Fund B has never been recommended.

Insert Table 3 here

Figure 1 shows the flows to the aggregate fund A of the Chilean pension system in 2018. The aggregate fund is an AUM-weighted fund of the individual funds. The vertical lines mark dates of FyF recommendations. Dotted vertical lines mark days where FyF recommends a move towards fund A and solid lines correspond to dates where FyF recommends a move away from fund A. Most spikes in flows are preceded by FyF recommendations with the correct sign: recommendations to move towards fund A precede large inflows and conversely for recommendations away from fund A. We can also discern a small time gap between the recommendations and the extreme flows, which corresponds to the four days that the AFPs have to transfer the funds between the two investment options.

Insert Figure 1 here

[9] Their website, which is now mostly inactive, is www.felicesyforrados.cl.

Figure 2 shows flows for all the years in our sample. Again, most extreme flows, either positive or negative, are preceded by FyF recommendations. Daily flows after FyF recommendations can be as high as 3% (e.g., after November 11, 2019), while on non-recommendation dates the average flow is close to zero. This illustrates the high popularity of FyF, most of which was achieved using effective social media campaigns. Bernhardt, Cuevas, and Sanclemente (2020) use survey and administrative data and find that the followers of FyF are relatively wealthy, well-educated, and financially sophisticated.

Insert Figure 2 here

The service offered by FyF started in July 2011 and closed in June 2021 after Chilean regulators imposed restrictions and capital requirements for firms offering this type of financial advise. We only study FyF recommendations and their potential market impact up to the end of February 2020. The more recent period is excluded for two reasons that change the nature of the experiment. First, although the regulator advised against frequent changes in pension funds as early as 2013, the tension between FyF and the authorities escalated during 2020, both in terms of tone and public notoriety. This likely undermined FyF's reputation. Second, and more importantly, the Chilean pension system faced three big withdrawals (in July 2020, December 2020, and April 2021) permitted by regulators to smooth the financial consequences of the Covid crisis. These withdrawals amounted to more than US$50 billion. Pension funds started selling foreign assets in advance to prepare for these massive withdrawals.

FyF never disclosed the model – statistical or conceptual – behind their recommendations. Their marketing material only argued that the recommendations were tailored to avoid losses such as those during the Great Financial Crisis. In Table 4 we report a regression model to estimate the likelihood of switches towards fund A in FyF recommendations. The dependent variable takes values between 1 (i.e., move from fund E to fund A) and -1 (i.e., move from

fund A to fund E). Partial moves are represented by fractional changes. For example, suppose FyF switched from recommending an allocation of 50% in fund A and 50% in fund E to an allocation of 100% in fund A. In this case, the dependent variable takes a value of 0.5. We use as explanatory variables the past returns in funds A and E, together with previous changes in the foreign exchange rate, the price of copper, and macroeconomic variables such as the interest rate and the rate of inflation. We find that FyF follows a one-week momentum strategy and a two-to-three week reversal strategy based on the returns for fund A. Besides the importance of past returns, there is little explanatory power of the other variables included in Table 4, as evident by the very small regression R-squares, which range between 0.00 and 0.02.

Insert Table 4 here

The regulator questioned the ability of FyF to deliver superior returns almost from FyF's inception. FyF responded that the cumulative performance from their first recommendation was superior to buy-and-hold strategies of any of the other funds. However, their response did not address the statistical significance of the return differences and the fact that most subscribers started following FyF significantly later than its first recommendations. Table 5 reports annual returns for investors who followed FyF recommendations in comparison to funds A, C, and E. We assume investors request a switch of their pension fund the same day that the FyF recommendation is issued, and that the switch is implemented at the prices on day *t+2* as defined by the regulations. In 2011 and 2012, investors who followed FyF exhibited superior performance than investors who passively invested in funds A, C, or E. The outperformance of FyF was especially pronounced in 2011, when the return of following FyF was 27.72% higher than the return on fund A. The advantage between FyF and fund E was smaller, showing that fixed income delivered superior returns in 2011. This high initial performance contributed to the subsequent popularity of FyF. The performance

differences are, however, far from statistically significant, as reported by the $t$-statistics in parentheses. Additionally, the experience of subscribers who started following FyF in later years is frequently negative. For example, six of the eight years after 2012 exhibited an underperformance of the FyF portfolio relative to holding fund A, although the return differences are typically not statistically significant. Overall, it is hard to argue that FyF had access to superior information or a superior predictive model.

Insert Table 5 here

# 3 Pension Fund Flows

We investigate in this section the impact of FyF recommendations on fund flows. We run the following time-series regression for each type of fund $i$ (A-E) at the aggregate level:

$$Flow_{it} = \sum_{\tau=1}^{10} \beta_\tau Day_\tau + \sum_{j=1}^{5} \gamma_j Flow_{it-j} + \sum_{j=1}^{5} \delta_j Return_{it-j} + \epsilon_{it} \tag{2}$$

The variable $Day_\tau$ captures the direction and the magnitude of FyF recommendations that have been issued $\tau \in [1, 10]$ days ago.[10] $Day_\tau$ corresponds to the change in the FyF recommendation ($\Delta\omega_i^{FyF}$) times the investment in foreign assets in each aggregate pension fund with a 90-day lag ($\lambda_{i,t-90}$):

$$Day_\tau = \begin{cases} \sum_{i=A}^{E} \lambda_{i,t-90} \Delta\omega_i^{FyF} & \text{for days } \tau \in [1, 10] \text{ after a recommendation of FyF} \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

For example, suppose that fund A invested 75% in foreign securities at the end of the prior

[10] In a few cases there is an overlap in the post-recommendation window for two consecutive FyF emails. In terms of the variable for post-recommendation days, the second email takes precedence. For example, a recommendation might be issued on day 8 after a previous recommendation. Under our definition, the next day is labeled as day 1 instead of day 9.

quarter, while fund E invested only 6% in foreign securities (see Table 2). If FyF recommends a switch from a portfolio that is 50% in fund A and 50% in fund E to a portfolio that is 100% in fund A, then $Day_\tau = \lambda_{A,t-90} \times 0.5 - \lambda_{E,t-90} \times 0.5 = 0.75 \times 0.5 - 0.06 \times 0.5 = 0.345$. The measure is positive for switches toward fund A and increases in absolute magnitude for more extreme switches. The definition of $Day_\tau$ takes into account all recommendations, and not only those that involve fund A.

Insert Table 6 here

The results for regression (2) are summarized in Table 6. We show the impact on the recommendations towards the flows of funds A, C, and E aggregated across AFPs. The coefficients for $Day_\tau$ over the first three days are small, which is consistent with the delay of four days that regulations give AFPs to accommodate switching requests. On day 4 we find a positive and significant coefficient of 3.58 for fund A (column (1)), and a negative and significant coefficient of $-6.19$ for fund E (column (3)). The impact on fund C is smaller in magnitude (column (2)). These coefficients imply that a recommendation of FyF to switch from 100% fund E (with international holdings of 6%) to 100% fund A (with international holdings of 75%) produces an inflow toward fund A of 2.47% ($=3.58 \times (0.75 - 0.06)$) and an outflow from fund E of 4.27% ($=-6.19 \times (0.75 - 0.06)$). Given the average sizes of funds A and E, the flows amount to close to US$700 and $-$US$1,500 million, respectively. Columns (4)-(6) repeat the analyses in columns (1)-(3) adding five lags of flows and returns as control variables. Controlling for past flows and returns reduces the persistence of the recommendation shocks, but leaves the immediate impact of FyF recommendations mostly unaffected.

Significant flows toward fund A and away from fund E continue for several days, which can be expected if investors react slowly to FyF recommendations. The bottom panel of Table 6 shows the cumulative coefficient for the first five days ($CUM[1-5]$) and the subsequent five

days ($CUM[6-10]$]). In column (1), the cumulative effect on fund A over the first five days is 6.46, while it is 3.41 over the next five days. In columns (4)-(6), we see that the cumulative effect on the next five days is reduced when we control for the persistence associated with lagged flows and returns. Overall, unusual flows at the system level are observed over the first week following a recommendation from FyF.

Insert Table 7 here

In Table 7 we show the effects of FyF recommendations for the funds of Modelo, a small AFP that started in 2007. Modelo has a relatively young investor base because it was awarded the first government auction for the portfolios of workers who entered the labor market. By having young and internet-savvy investors this AFP is more likely to be affected by FyF recommendations. As seen in columns (1)-(3), the coefficients on $Day_\tau$ are twice as large as in the regressions with aggregate flows in columns (4)-(6) of Table 6. In the last three columns of Table 7 we use as the dependent variable an indicator variable equal to one for flows of 5%, which is the upper bound on daily flows allowed by the regulation.[11] This constraint is likely to bind only for small AFPs like Modelo. As seen in column (4), 5%-flows to fund A are 3.3% more likely on the fourth day after a recommendation that requires an increase in foreign holdings of 10%, while there is little effect on the rest of the days. As seen in column (6), 5%-flows away from fund E are 7.1% more likely on the fourth day after such a recommendation.

Overall, large flows are related to FyF recommendations and reflect the direction implied by those recommendations. Flows are exceptionally large in comparison to the average flow on any given day. The 5% upper bound is frequently hit in small AFPs after a recommendation issued by FyF. Excess flows are observed during a relatively narrow window, which fits well with the constraints derived from the Chilean pension fund regulations.

[11] We allow for a difference of $\pm 0.1\%$ around the 5% threshold since we can only measure flows ex-post and not in real time like the pension funds.

# 4 Foreign Exchange Rates

In this section, we study the impact of FyF's recommendations on foreign exchange rates.

## 4.1 Event study

Foreign investments represent an increasing fraction of the portfolios of pension funds as we move from fund E to fund A. Thus, a recommendation to move towards fund A implies that pension funds have to buy a significant amount of foreign currency. In Figure 3 we report the results from an event study for the effect on the foreign exchange rate of the 82 recommendations issued by FyF. Day 0 in the figure is the day that FyF sends an email to subscribers with the new recommendation. We plot the subsequent cumulative depreciation of the foreign exchange rate. The event study is shown from the perspective of emails that recommend a reallocation toward foreign assets, and hence imply buying pressure of foreign currency (see last column of Table 3). We multiply the cumulative change in the foreign exchange rate by minus one when we consider FyF emails that recommend a reallocation away from foreign assets (e.g., from funds C to E). Then, we average across all events for each day.[12]

Insert Figure 3 here

We find that the exchange rate depreciates quickly and significantly after a recommendation. Thus, the purchases of foreign currency after recommendations to shift assets to the risky funds lead to a depreciation of the Chilean peso. By the second day after a recommendation the depreciation is approximately 0.4% and increases to 0.6% over the first ten days. The reversal is relatively slow in terms of point estimates, although the statistical significance of the effect disappears after ten days.

[12]We show up to 30 event days in Figure 3, which can imply overlapping event windows in the case of frequent recommendations. The time-series regressions in Table 8 do not use overlapping data.

## 4.2 Time-Series Regressions

To study the relation between exchange rate changes and FyF recommendations more closely, we run the following times-series regression:

$$\Delta FX_t = \sum_{\tau=1}^{10} \beta_\tau Day_\tau + \sum_{j=1}^{5} \alpha_j \Delta FX_{t-j} + \Gamma' X_t + \xi_t \tag{4}$$

The dependent variable is the daily percentage change in the foreign exchange rate. Our main interest is in the coefficients for $Day_\tau$ as defined in equation (3). In some regressions we also include five lags of the dependent variable and a vector $X_t$ with several control variables: 30-day lags of the domestic and U.S. inflation rates, domestic and U.S. three-month interest rates, the size of the balance of the Chilean Central Bank, indicator variables for Mondays and Fridays, and the daily percentage change in the international price of copper. Copper represents approximately 40% of Chilean exports and hence changes in the price of copper are closely associated with the foreign exchange rate.

Insert Table 8 here

In column (1) of Table 8 we run the regression without controls and find a strong foreign exchange depreciation on the first two days after a recommendation. Interestingly, while the pension flows in Table 6 are delayed by four days, the foreign exchange rate reacts immediately. The immediate reaction of prices is not surprising despite the delay in flows seen in Table 6. Pension funds can start trading immediately after a recommendation to accommodate the imminent flows. Smart investors can also anticipate and front-run pension funds' trading, consistent with the stock market evidence in Da, Larrain, Sialm, and Tessada (2018), or prices can change with little abnormal trading after FyF emails, as suggested by Bernhardt and Cuevas (2022) in their study of total trading volume in the stock market.

The effects are hardly sensitive to adding different controls (column (2)) or restricting

the sample to when the forward price is available (column (3)), which for the most part excludes days where the U.S. market is closed because of holidays. The cumulative effect over the first five days increases to 0.99 (column (4)), which implies that a recommendation to move from fund E to fund A is associated with a depreciation of the foreign exchange rate of 0.68% ($= 0.99 \times (0.75 - 0.06)$). The effect over the first five days is statistically significant regardless of the specification. The cumulative effect on the next five days (days 6-10) is positive, but smaller, and is not statistically significant. Hence, we do not find a reversal over our ten-day window.

In Table 9 we explore several sample splits to better understand the effects of FyF recommendations. First, we compare the effects after buy and sell emails, where buy (sell) refers to FyF recommendations to increase (decrease) foreign investment and therefore to buy (sell) foreign currency. The variable $Day_\tau$ takes into account the direction of the recommendations and therefore the coefficients can be compared across columns, although recommendations go in opposite directions. In columns (1) and (2) we find that the five-day effect on the foreign exchange rate is similar after buy and sell recommendations. The effect after sell emails is delayed by one day from the first day to the second day following the recommendations.

Insert Table 9 here

Second, we split the sample into the early years of FyF (2011-2015) and the later years (2016-2020). FyF was more active (higher email frequency) and more popular (more followers) in the later years. Not surprisingly, the effects on the exchange rate are stronger in the later part of the sample. For example, the five-day effect is 0.48 in the early sample and 1.70 in the latter sample.

Third, we focus on FyF recommendations that are sent near the end of a quarter, specifically, between the 24th and the last day of March, June, September, and December. The end of the quarter can be relevant if constraints on the balance sheets of banks are more

binding during these days (Du, Tepper, and Verdelhan, 2018). Since many Chilean public holidays also happen around quarter ends, limited attention on the part of arbitrageurs and uncertainty around holidays may also contribute to these effects. The five-day depreciation of the foreign exchange rate is indeed substantially stronger at the end of the quarter than on other days (6.36 vs. 0.80). The difference is statistically significant at the 1% level.

Finally, in column (7) we exclude periods when the Central Bank of Chile officially intervened in the foreign exchange market. The foreign exchange rate is typically free to float, but during the year 2011 and between November 29, 2019 and the end of our sample the central bank intervened. The motives for the two interventions were different. During 2011 the objective was to increase the exchange rate and alleviate the pressure from exporters, while the objective in 2019 was to reduce the exchange rate after a period of unusually high uncertainty from social unrest. Excluding both of these periods does not change our conclusions.

## 4.3 Price Elasticity of the Demand for Money

The large and frequent trading in Chilean pesos arising from uninformed pension flows provides a unique setting to estimate the price elasticity of the demand for the Chilean peso. For concreteness, we focus on the effect of a portfolio switch from fund E to fund A ($Day_\tau = 0.69$). We estimate the average foreign currency trade associated with this portfolio switch to be US$847 million, which can be obtained by multiplying: (a) Fund A's average AUM of US$27,587 million (Table 2 Panel A), (b) 4.45% ($= 6.46\% \times 0.69$) flow towards fund A (from CUM[1-5] in column (1) of Table 6), and (c) 69% extra foreign investment in fund A compared to fund E (Table 2 Panel B). The trade size represents 0.48% of the Chilean M2 aggregate money supply (average M2 is US$175,000 million during 2011-2020).

The resulting depreciation of the Chilean peso, according to column (1) of Table 8 (CUM[1-5]), is 0.59% ($= 0.86\% \times 0.69$). Therefore, the price elasticity of the Chilean peso is

estimated at $-0.81$ ($= -0.48\%/0.59\%$). The estimate implies an inelastic demand curve for foreign currency. For comparison, Da, Larrain, Sialm, and Tessada (2018) document a price elasticity of -0.45 in the Chilean stock market. Both estimates support the inelastic market hypothesis proposed by Gabaix and Koijen (2021). Currency markets are among the largest and most liquid markets in the world, so it is perhaps not surprising that currency demand, although still inelastic, is more elastic than the demand in the local stock market.

# 5 Banking Imbalances

This section investigates how FyF's recommendations affect the positions of banks in forward and spot currency markets. Figure 4 shows the outstanding net positions of the banking system in the spot and forward markets. The net position in the spot market is always negative, which shows that local banks are short dollars (i.e., dollar deposits in local banks are scarce). The net position in the forward market is always positive and almost a mirror image of the spot position. This shows that banks hedge their spot positions in the forward market, and vice versa. Hedging follows from risk management practices and is required by regulation. The overall net exposure (spot plus forward) is close to zero, although it is consistently negative in the second half of our sample.

Insert Figure 4 here

The behavior of banks implied by Figure 4 suggests that the effects of FyF recommendations can be transmitted through local banks from the spot market to the forward market. In Figure 5 we show the monthly amount bought minus the amount sold of foreign currency by various counterparties (i.e., pension funds, foreign entities, brokers, insurance companies, mutual funds, firms, others) from the local banks. Given that the data is only reported at the end of each month, we focus on the net change in FyF's recommendations for fund A

during each month. Dark blue (light red) bars correspond to months with recommendations to decrease (increase) allocations to fund A. We subtract from each bar the average banking imbalance with each counterparty during months without changes in FyF recommendations.

Insert Figure 5 here

In Panel A of Figure 5 we see that pension funds are selling (buying) approximately US$600 (US$750) million to banks in the spot market in months with a net decrease (increase) in fund A. The imbalances with other counterparties are small. Thus, the months with FyF recommendations are not months with broad-based buying or selling in the spot market. Also, the other counterparties are not providing much liquidity to accommodate FyF flows. In Panel B we see the mirror image in the forward market, where foreign entities are buying (selling) approximately US$700 (US$1,300) million from local banks in months with a net decrease (increase) in fund A. One interpretation is that foreigners provide liquidity to local banks. However, there is more volume in the forward market than the volume directly implied by the hedging needs of banks from the spot market. In addition, there can be foreign arbitrageurs who lean against the purchases and sales of pension funds. They do this in the forward market since they may not have access to the spot market. It is worth noting that pension funds are not very active in the forward market after FyF recommendations.

Insert Figure 6 here

Figure 6 shows in stylized form the flows that FyF emails induce. A recommendation to move away from fund A increases the supply of foreign currency by pension funds in the spot market. Local banks absorb that supply by buying foreign currency in the spot market. In order to hedge their positions, banks turn to the derivatives market where they sell foreign currency forwards to foreign entities. At the end of the day, foreigners absorb the excess of foreign currency from the pension funds, but this is done indirectly through the local

banks. Most foreigners do not provide liquidity directly to pension funds since they do not participate in the spot market.

Insert Figure 7 here

Although the volume data by counterparty is informative, it only comes at a monthly frequency. At a daily frequency we can compute the total imbalance of the banking sector and link the effects more directly to the timing of FyF recommendations. In Figure 7 we show the cumulative daily imbalance (i.e., buys minus sells) of the banking sector in the spot and forward markets after FyF recommendations. In the top panel we show the effects in millions of U.S. dollars, while in the lower panel we show the effects in terms of the equity of the banking sector. We find that banks sell foreign currency in the spot market by approximately US$600 million (1.8% of their equity) in the ten days that follow a recommendation to increase investment in foreign assets. At the same time, banks buy approximately US$700 million (2% of equity) in the forward market.

Insert Figure 8 here

Although we do not know the exact counterparty at the daily level, we can find traces of the role of local banks in absorbing pension fund currency flows. An indication of the correlation between pension fund movements and the banking imbalances is given by Figure 8. We first compute the implied daily foreign exchange flow of pension funds as the multiplication of the daily flow to or from each fund times the fraction invested in foreign assets in each fund. We add this up over the ten days that follow a recommendation from FyF. We then correlate this implied foreign exchange flow with the net sales of banks over the same ten days. The estimated slope in Figure 8 is 0.57, showing that the relation is strong and positive. The figure confirms that the local banking system serves as the intermediary to pension funds in the spot market.

Insert Table 10 here

Table 10 shows the time-series regressions with daily banking imbalances as dependent variables. The spot imbalance decreases significantly on days 3 and 4 after a recommendation, implying that banks are selling foreign currency in the spot market. The cumulative five-day effect is -2.29% of bank equity. The forward imbalance increases strongly over the same days, and the cumulative five-day effect is 2.42% of bank equity, which is slightly stronger than the spot market. The total imbalance (spot plus forward) in the first five days is, however, small and not significantly different from zero (column (3)). Therefore, banks are almost fully hedged. The change in the net positions in column (4) incorporates in addition the expiration of previous forward contracts. The cumulative five-day effect or the change in net positions is 1.37% of banking equity, and it is statistically significant. This suggests that banks let forward selling contracts expire so the net position increases more than the net origination of forward contracts.

# 6 Covered Interest Parity Violations

In this section we study whether the FyF recommendations have an impact on CIP deviations.

## 6.1 Cross-Currency Basis

Using the spot foreign exchange rate $S$, forward exchange rate $F$, and the interest rates $R_{US}$ and $R_{Chile}$ we can define the one-month cross-currency basis ($CCB_{1m}$) as:

$$CCB_{1m} = (1 + R_{US}) - (1 + R_{Chile})\frac{S}{F_{1m}} \tag{5}$$

We define CCBs at other horizons analogously.[13] In a world with frictionless arbitrage the CCBs should be zero at all times. This is not the case in practice, as shown in Figure 9. The CCB is often negative over our sample period, which implies that it is potentially more beneficial for an investor with U.S. dollars to exchange the dollars into Chilean pesos, take a deposit in Chilean pesos, and hedge them back to U.S. dollars than to take a U.S. dollar deposit directly at the LIBOR rate. As seen in Table 1, the average (median) one-month CCB is -0.36% (-0.29%). A similar behavior of the CCB across different currencies, particularly after the subprime crisis of 2008, has been documented by Du, Tepper, and Verdelhan (2018).

Insert Figure 9 here

The *Forward Premium* can be defined as:

$$Forward\,Premium = \frac{F_{1m} - S}{S} \tag{6}$$

The forward premium is the safe return associated with carrying dollars for one month (Koijen, Moskowitz, Pedersen, and Vrugt, 2018). As seen in Table 1, the average forward premium in our sample is 3.06%, with a standard deviation of 2.17%.

The forward premium is one element of the CCB, which can be more easily seen if the CCB is defined in logarithms:

$$ccb_{1m} = (r_{US} - r_{Chile}) + (f_{1m} - s) \tag{7}$$

[13]We construct the one-month CCB using Bloomberg data. We get the CCB at the three and six month horizons from the Central Bank of Chile. All Central Bank data can be downloaded from https://si3.bcentral.cl/siete. We are able to match the three-month CCB reported by the Central Bank with Bloomberg data, but there is no data available in Bloomberg to compute the six-month CCB. The Central Bank does not report the one-month CCB. Most of our tests deal with the one-month CCB since this is the most liquid forward contract available.

The log-CCB can be expressed in terms of two spreads: the log-interest rate spread between the foreign and the domestic rate and the log-forward premium.

## 6.2 Event study

We have shown that local banks trade with pension funds in the spot market and then hedge their exposures in the forward market. To the extent that the price elasticity is different across these two markets, and spot and forward trading are not perfectly synchronized, a violation of the CIP could arise. In Figure 10 we report the results of an event study of cumulative changes in the CCB at different horizons. We find that the one-month CCB falls by approximately 0.25% by day 10, which is statistically significant. The effects on the three-month and six-month CCBs are smaller, but still statistically significant. There is little evidence of a reversal of the CCBs at the horizon of the event study. Thus, the depreciation of the spot Chilean peso exchange rate associated with FyF recommendations is not fully offset by changes in the forward premium or interest rate spreads.

Insert Figure 10 here

In Figure 10 we multiply by -1 the changes that occur after recommendations to move away from foreign assets. This implies that the CCB is decreasing after a recommendation to move toward foreign assets and increasing after a recommendation to move away from foreign assets. If the CCB is negative before the FyF recommendation, then the CIP violation becomes worse after a recommendation to move towards foreign assets, but it improves after a recommendation to move away from foreign assets. In other words, the flows induced by FyF do not always aggravate frictions in the foreign exchange market. Some flows seem to alleviate price dislocations in the market.

## 6.3 Time-Series Regressions

In Table 11 we show similar regressions to Table 8 using the change in the one-month CCB as the dependent variable. The CCB effect is more spread out over the first few days after the announcement, as also shown in Figure 10. The cumulative effect is -0.44% over the first five trading days and -0.30% over the next five trading days if we include controls (column (2)). The effect is statistically significant only during the first five days.

Insert Table 11 here

In columns (3)-(6) we split the change in the CCB into two parts: the change in the forward premium and the change in the interest rate spread. We find that most of the effect is seen in the forward premium and not in interest rates. The five-day cumulative effect for the forward premium is -0.51% (column (4)), while it is a mere 0.03% for interest rate differentials (column (6)). Hence, the market for forward currency contracts, and not the market for deposits, is most affected by FyF recommendations. As investors move toward foreign assets, banks sell spot dollars and buy forward dollars. Hence, when banks borrow dollars in the forward market, the forward premium goes down. Simply put, the forward premium moves in favor of banks depending on whether they need to borrow or carry dollars. This is consistent with the idea that local banks charge an intermediation fee for being the bridge between the spot and forward markets (see Du and Schreger 2021, and Wallen 2022).

Insert Table 12 here

In Table 12 we perform sample splits to study the heterogeneity of the CCB results. The five-day cumulative effect on the CCB is stronger after buy recommendations (-0.85%) than after sell recommendations (-0.03%). The effect after sell emails is delayed, as seen in the large effect after sell emails for days 6-10 (-0.73%). Quick changes in the CCB after buy emails could be due to the fact that the banking system is systematically short of dollars,

as implied by Figure 4. The CCB effect is also stronger at the end of the quarter (-1.16% in column (5) vs. -0.40% in column (6)), which points towards balance-sheet constraints of banks as one driver of the results (Du, Tepper, and Verdelhan, 2018). Although economically large, the difference between the end of the quarter and other periods is not statistically significant. Finally, column (7) shows that the results are robust to excluding periods when the Central Bank of Chile intervened in the foreign exchange market.

## 6.4 Intermediary Capital

In Table 13 we explore the heterogeneity of our results to the risk-bearing capacity of the banking system. We identify periods when there is a decrease in the risk-weighted equity ratio of the banking system. As pointed out by He, Kelly, and Manela (2017) and Cenedese, Della Corte, and Wang (2021), this indicates a weakening ability and willingness of banks to absorb shocks. We can expect price effects to be larger when banks have less capital to intermediate.

Insert Table 13 here

We run a more compact version of our regression by combining the cumulative effect of the $Day_\tau$ variables into a single variable *DAYS[1-10]*. We then interact this cumulative variable with an indicator for decreases in banking capital, which is lagged by 30 days. We find that the interaction of *DAYS[1-10]* and the indicator for decreases in banking capital is negative for all CCBs and larger in magnitude than the coefficient for *DAYS[1-10]*. The magnitude of the interaction coefficient is decreasing with the CCB horizon. The interaction is statistically significant for the one-month and three-month CCBs (columns (1) and (2)), showing that the effects are stronger when banks recently experienced a decrease in their equity cushion.

Our results are consistent with the idea that CCB movements are related to the limited capital of the local banking system. Price movements in the forward market are compensation for banks to be intermediaries, which is more challenging when they have less capital.

# 7 Conclusions

Taking advantage of large and frequent trading arising from uninformed fund flows in the Chilean pension system, we are able to quantify the impact of noise trading in the foreign exchange market. First, our setting allows us to estimate the price elasticity in foreign exchange markets. Our relatively low price elasticity estimate of 0.81 for the Chilean peso supports the inelastic market hypothesis of Gabaix and Koijen (2021). Second, our unique bank trading and imbalance data shed new insights on the origin of covered interest rate parity violations. Local banks in Chile who trade against pension funds in the spot market subsequently hedge their exposures by taking offsetting positions in the forward market. Differential price elasticity across the two markets result in deviations from the covered interest rate parity. Supporting the findings in Du, Tepper, and Verdelhan (2018), Du, Hébert, and Huber (2021) and Cenedese, Della Corte, and Wang (2021), we show that limits to arbitrage can arise from "balance sheet costs" and banks' risk bearing constraints. Overall, our unique setting and detailed data offer a rare opportunity to showcase the interaction between noise traders and financial intermediaries in the foreign exchange market.

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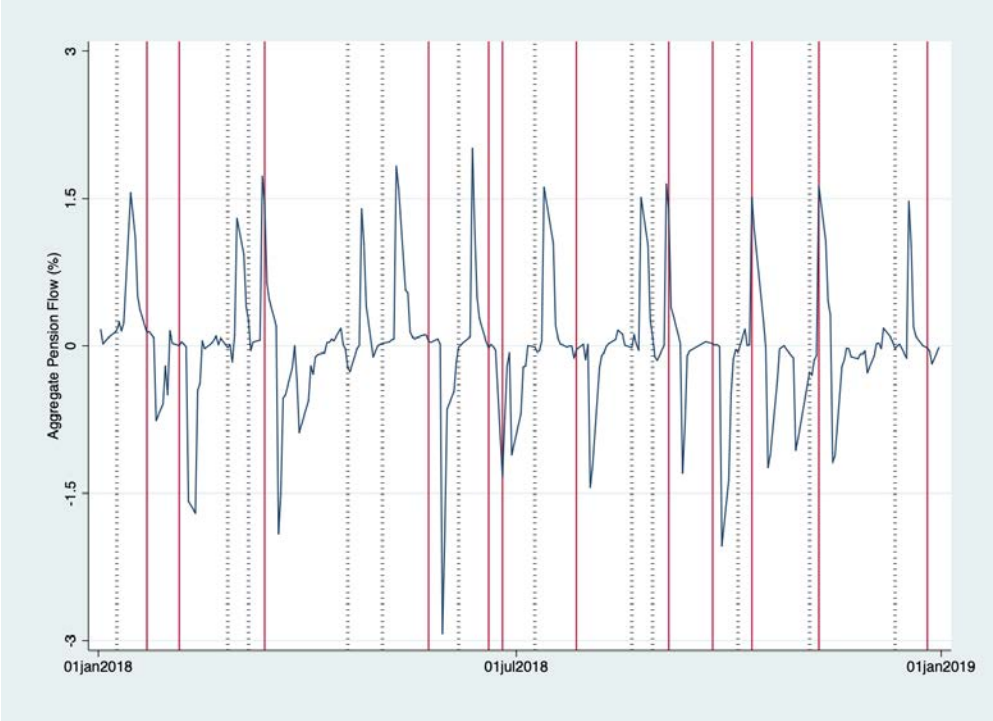
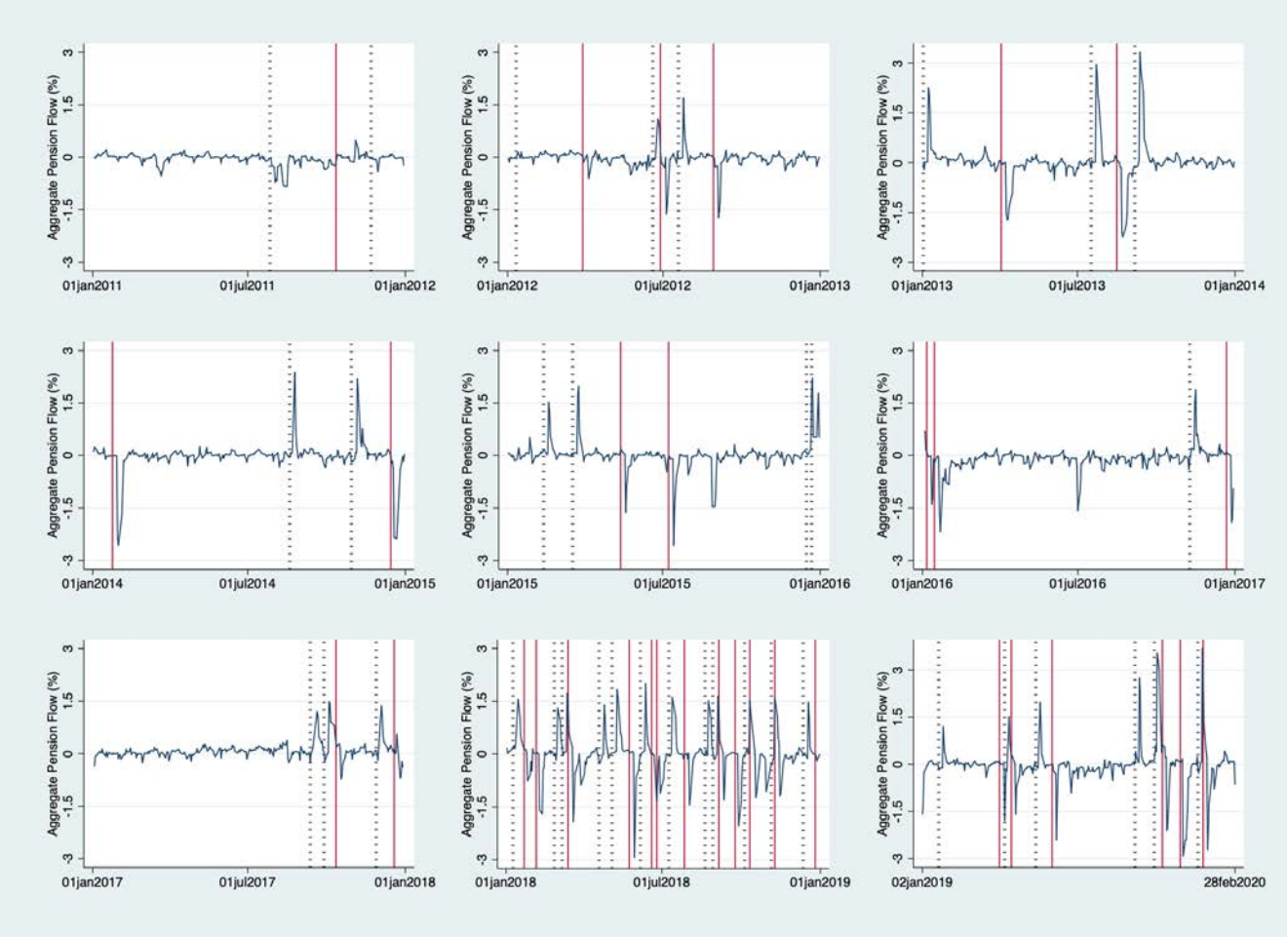
Figure 1: Daily Flows to Pension Fund A (2018)



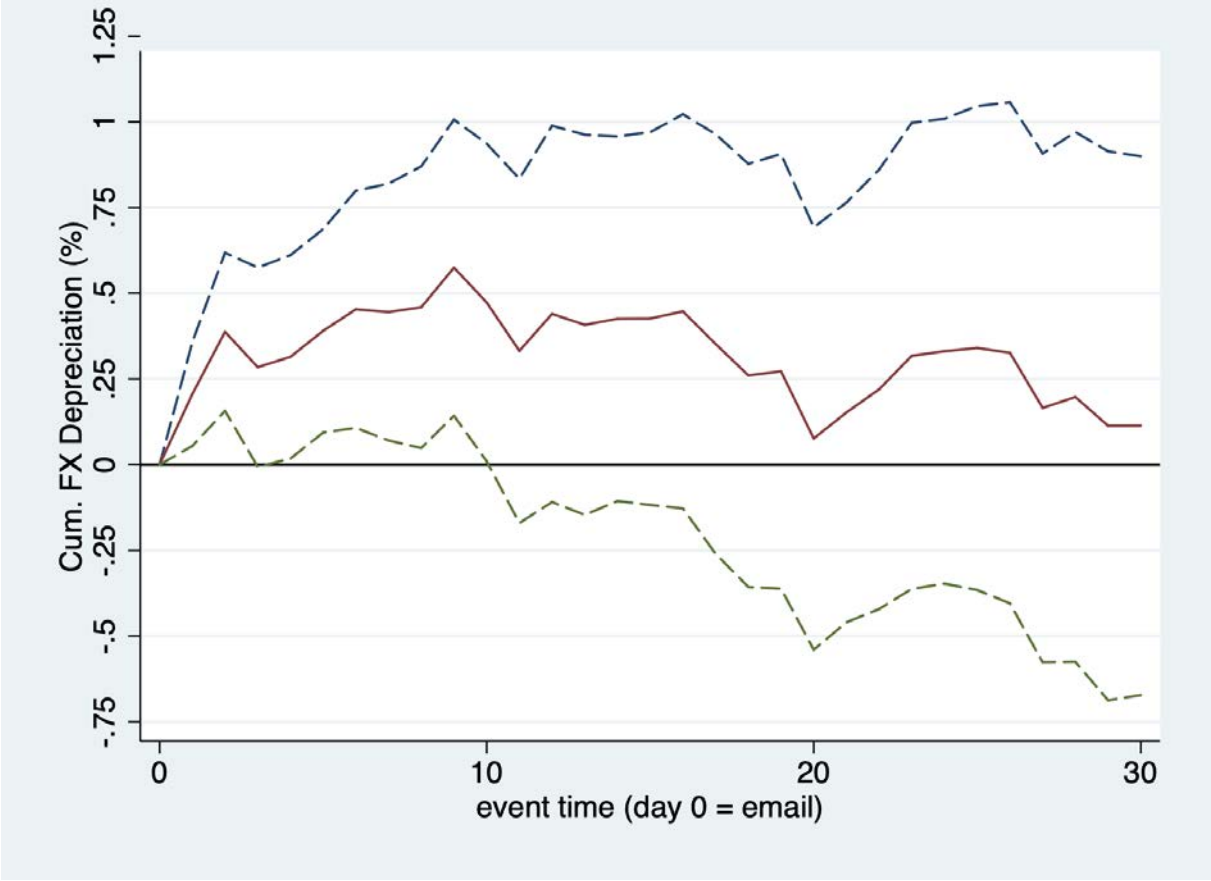

**Notes**: Daily flows (in percentage of AUM) for the aggregate pension fund A in Chile. Dotted (solid) vertical lines mark days of FyF emails that recommend a move toward (away from) fund A. Daily data for 2018.

Figure 2: Daily Flows to Pension Fund A (2011-2020)



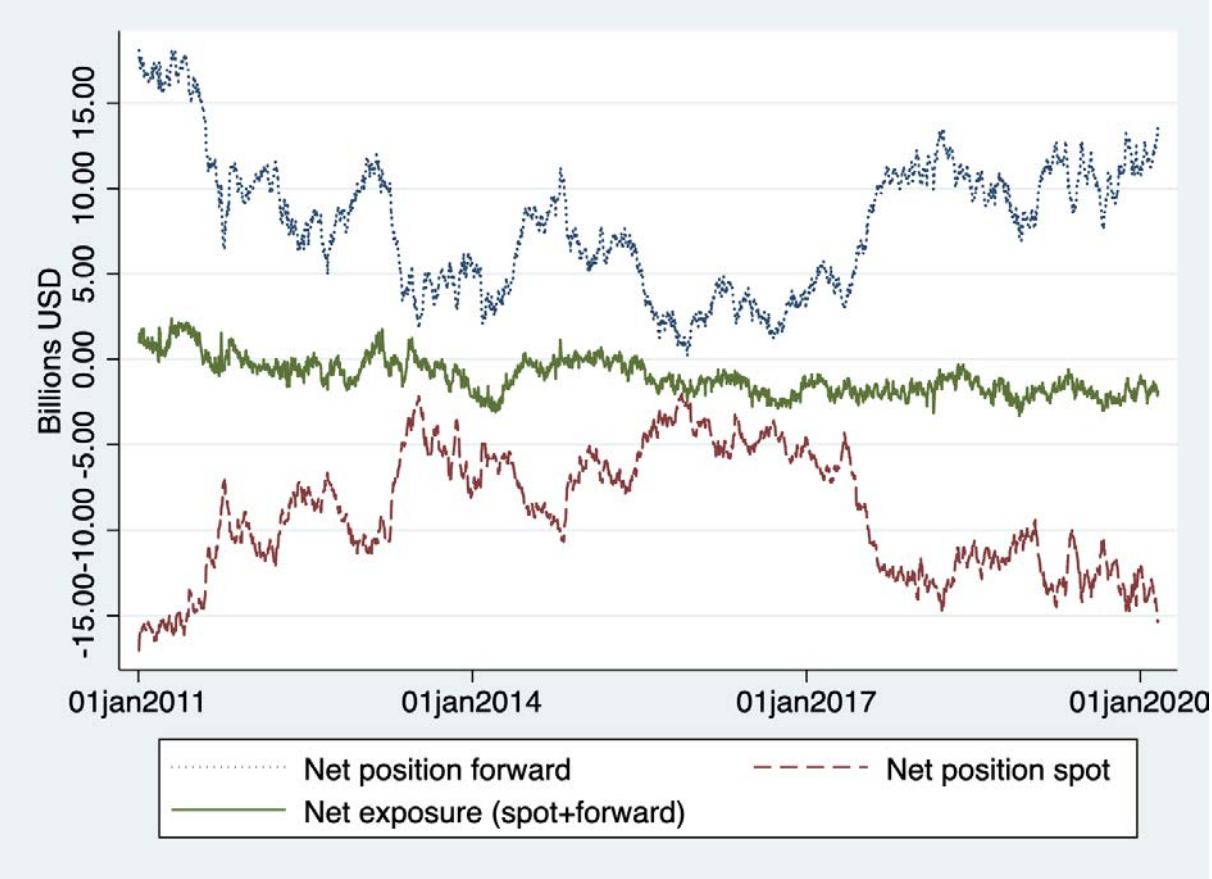

**Notes**: Daily flows (in percentage of AUM) for the aggregate pension fund A in Chile. Dotted (solid) vertical lines mark days of FyF emails that recommend a move toward (away from) fund A. Daily data for the sample that covers the period from January 3, 2011 to February 29, 2020.

Figure 3: The Foreign Exchange Rate after FyF Recommendations




**Notes**: The event study uses all 82 emails from 2011 to Feb 2020. The perspective is of FyF emails that recommend a move toward foreign assets (following the last column in Table 3). Thus, the effects after an email with a recommendation to move away from foreign assets are multiplied by -1. Foreign exchange data is from Bloomberg. The figure does not adjust for overlapping events. Confidence bands based on robust standard errors are at the 95% level.

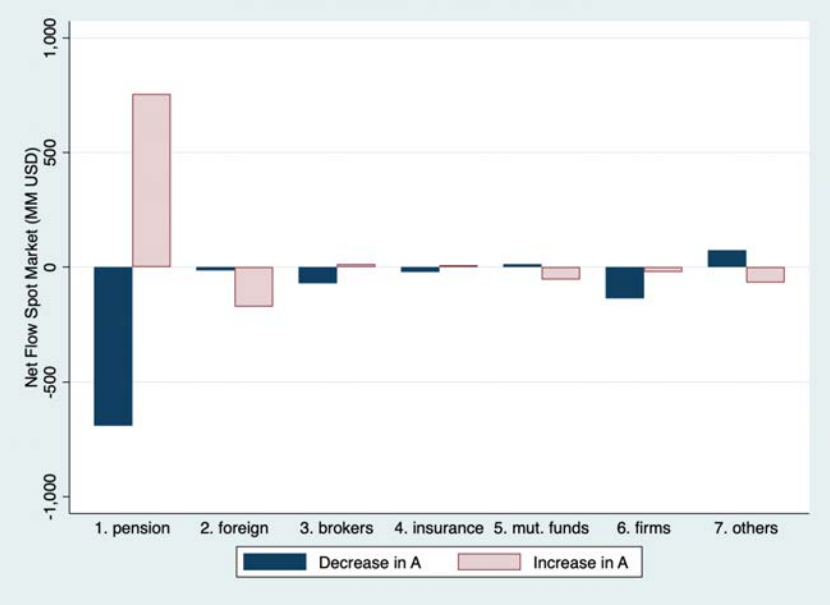
Figure 4: Banks' Net Position in Forward and Spot Markets



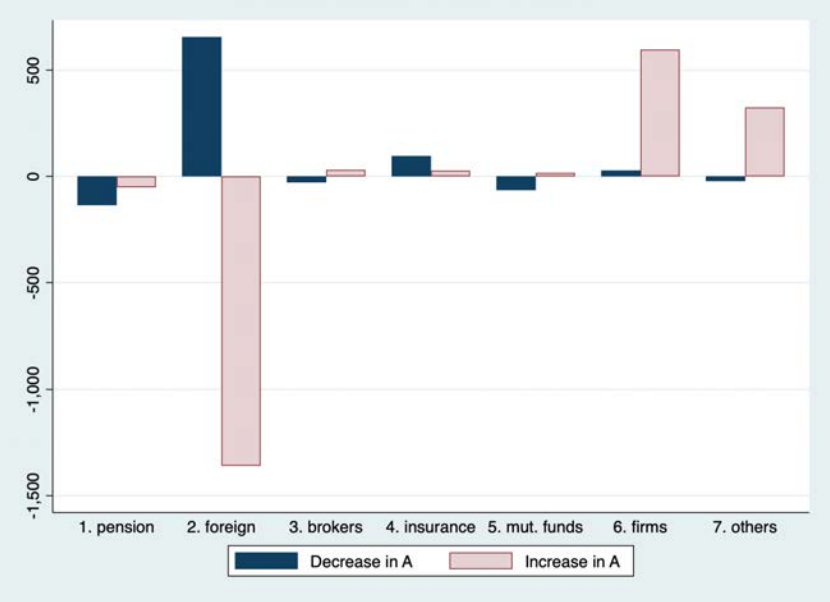

**Notes**: The figure presents the banks' net position in spot and forward markets as reported by the Central Bank of Chile.

Figure 5: Monthly Traded Volume in the Spot and Forward Markets by Counterparty

(a) Spot Market




(b) Forward Market




**Notes**: The figures show the monthly average of the net flow (buy - sell) of different counterparties with the formal exchange market (mainly banks) for months with FyF recommendations to increase or decrease the portfolio allocation to fund A. Panel (a) shows net flows for the spot market and panel (b) for the forward market. We subtract the monthly average of the net flow for each counterparty in months with no change in the FyF recommendation about fund A. All values are in millions of US dollars. A positive number represents an increase in the purchases of foreign currency by each counterparty from banks. Blue (dark-coloured) bars are for months with FyF emails that result in a net decrease in fund A and red bars (light-coloured) are for months with FyF emails that result in a net increase in fund A. The others category includes households, the government, the central bank, and financial institutions not included in the previous categories. The sample covers the period from January 2011 to February 2020.

Figure 6: Flows in the Spot and Forward Markets in Response to FyF Recommendation

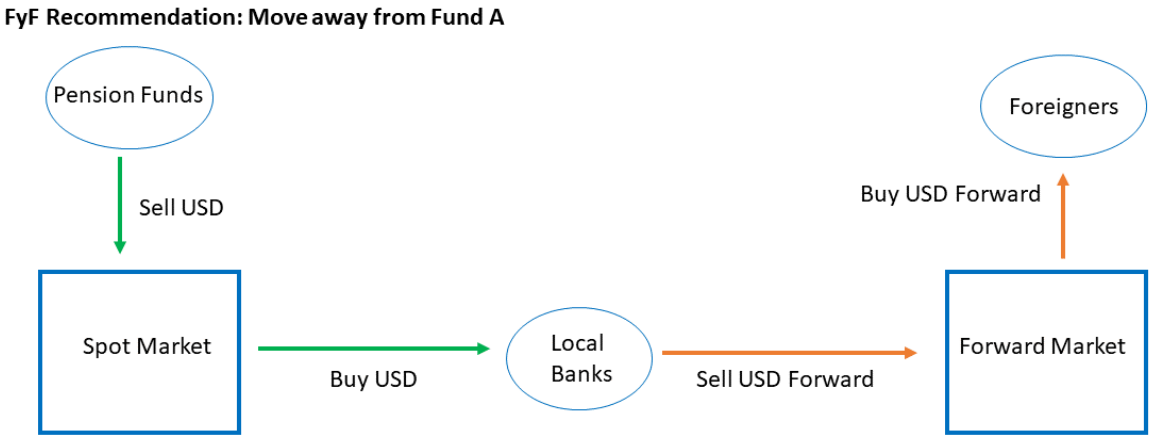
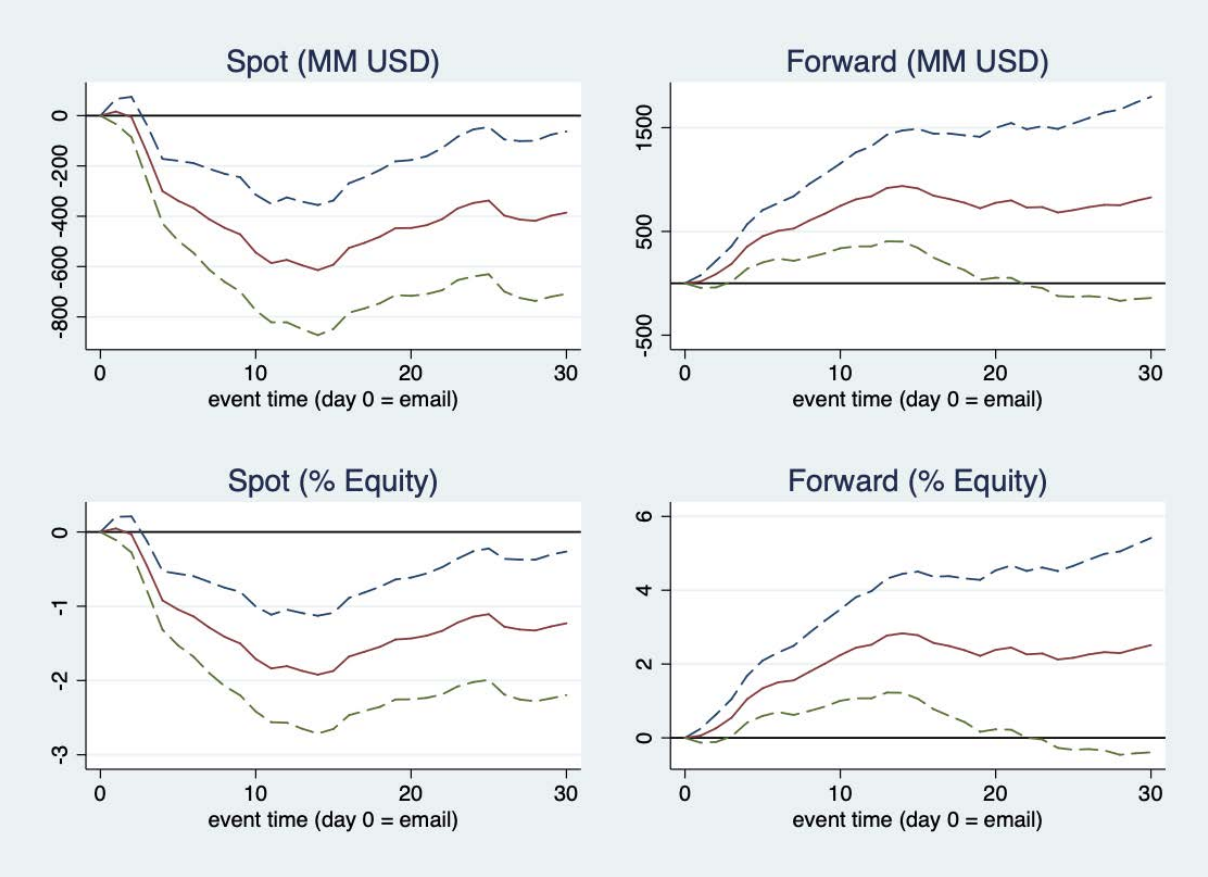
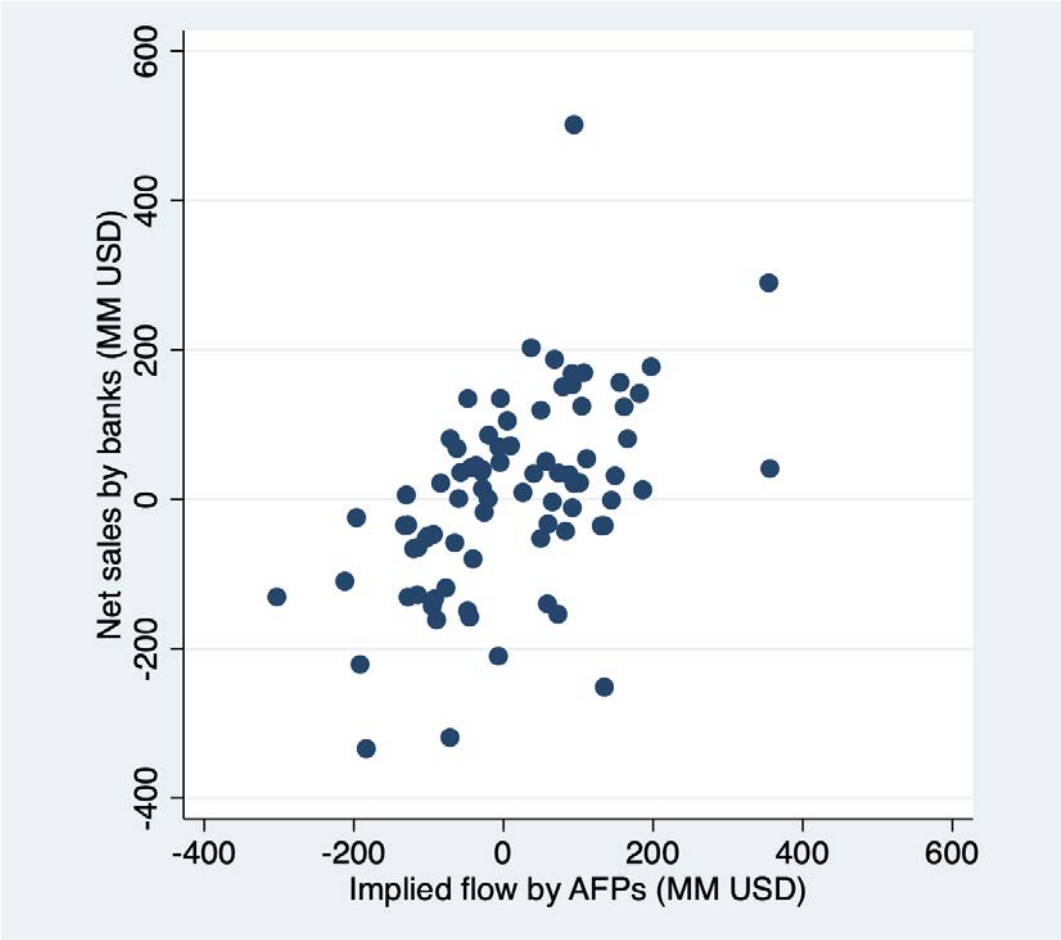


Figure 7: Banking Sector Imbalances after FyF Recommendations



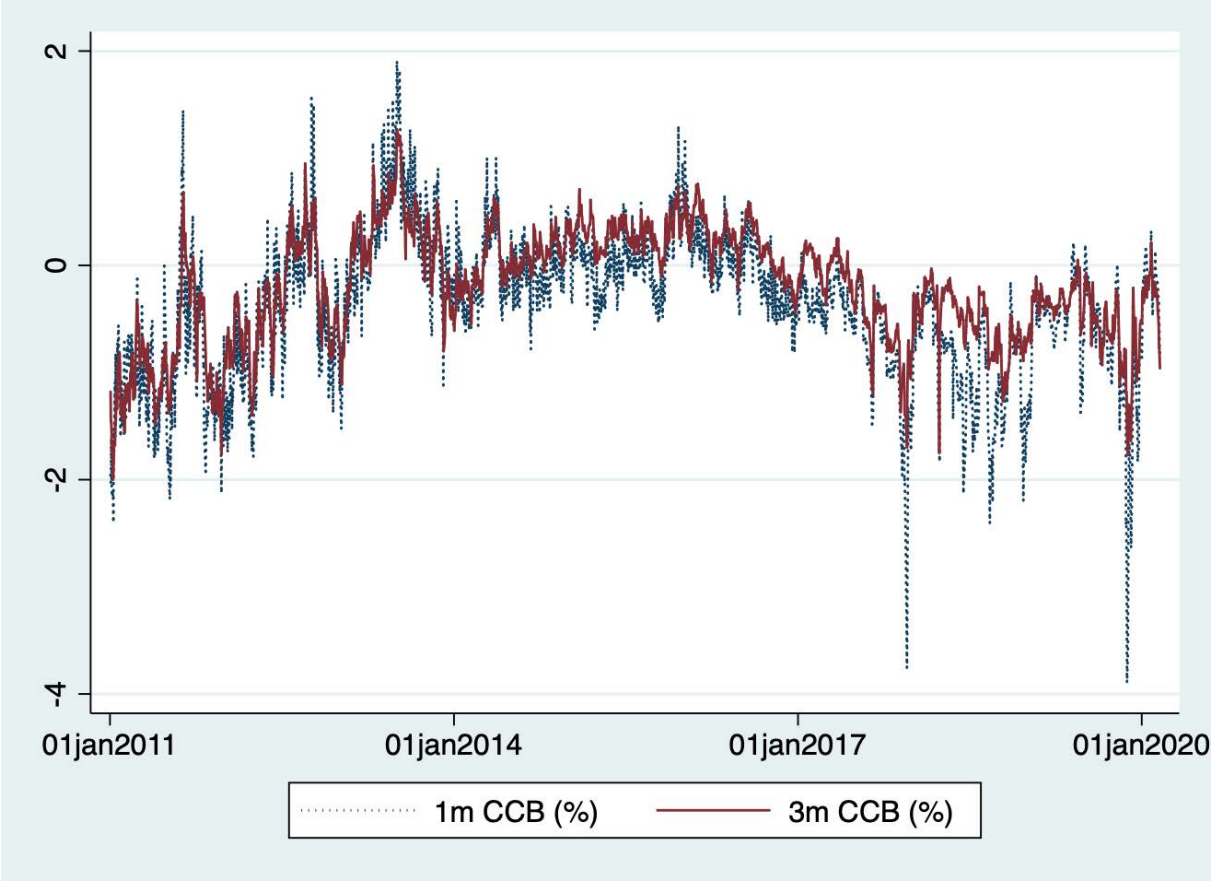

**Notes**: The event study uses all 82 emails from 2011 to Feb 2020. The perspective is of FyF emails that recommend a move toward foreign assets (following the last column in Table 3). Thus, the effects after an email with a recommendation to move away from foreign assets are multiplied by -1. The banking imbalance is defined as buys minus sells by the Chilean banking sector in the daily spot market or the forward market. The top row shows results in millions of US dollars, while the bottom row normalizes by the total equity of the Chilean banking system, which is lagged by 30 days. The data is from the Central Bank of Chile. Confidence bands based on robust standard errors are at the 95% level.

Figure 8: Daily spot trading by the banking sector and implied flows by AFPs



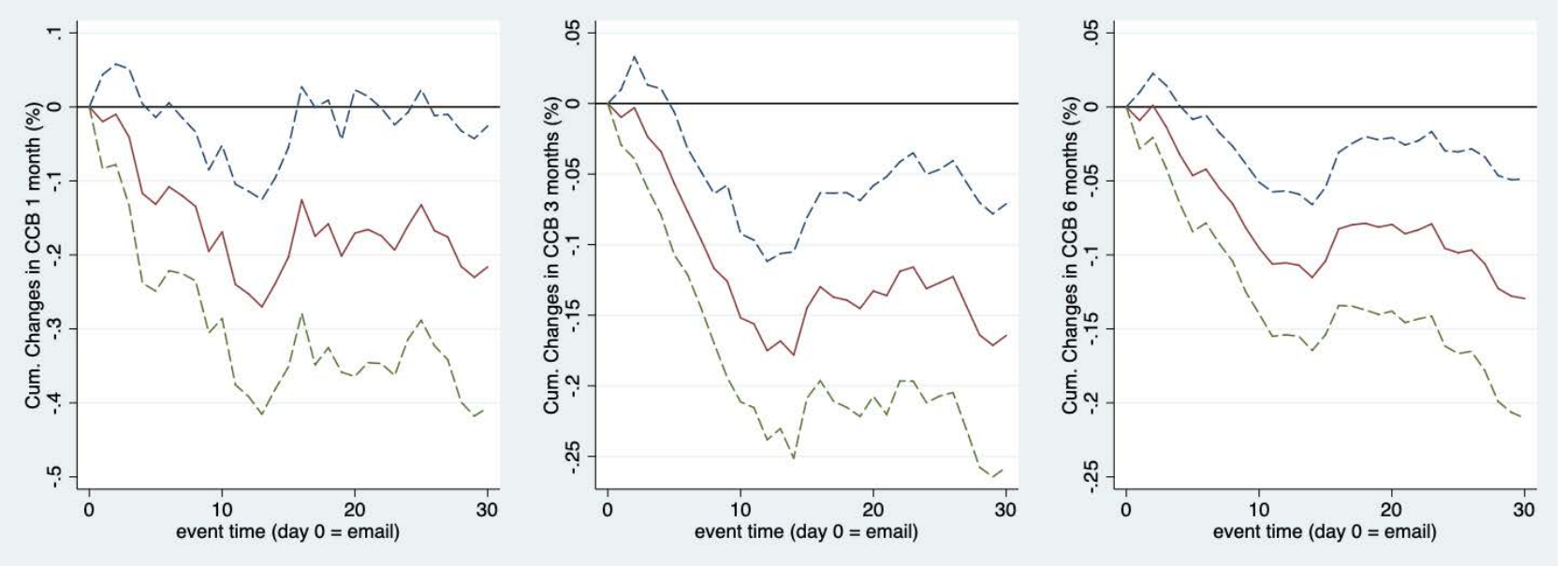

**Notes**: The figure uses all 82 emails 2011-Feb 2020. Each variable corresponds to the sum over the first ten days after an email from FyF. The implied flow is computed as the sum over all funds (A-E) of the daily flows times the fraction of foreign investment in that fund. A positive number implies that the amount invested by AFPs in foreign assets increased that day. The net sales of the banking sector are computed as the difference between the selling and buying of foreign currency. A positive number implies that banking sector is selling more foreign currency than what it is buying. Data is from the Central Bank of Chile and the Chilean regulator of AFP (SAFP).

Figure 9: Cross-Currency Basis




**Notes**: Data comes from Bloomberg (1-month CCB) and the Central Bank of Chile (3-month CCB).

Figure 10: Cross Currency Basis after FyF Recommendations




**Notes**: The event study uses all 82 emails from 2011 to Feb 2020. The perspective is of FyF emails that recommend a move toward foreign assets (following the last column in Table 3). Thus, the effects after an email with a recommendation to move away from foreign assets are multiplied by -1. CCB data is from Bloomberg for the one-month CCB and from the Central Bank of Chile for the 3-month and 6-month CCBs. The figure does not adjust for overlapping events. Confidence bands based on robust standard errors are at the 95% level.

Table 1: Summary Statistics

This table shows summary statistics for the main variables used in the analysis. All rates, spreads, flows, and variable changes are reported as percentage points. The sample covers the period from January 3, 2011 to February 29, 2020.

| | N. of Obs. | Mean | Std. Dev. | p10 | Median | p90 |
|---|---|---|---|---|---|---|
| *Panel A: Prices and rates (daily)* | | | | | | |
| Spot foreign exchange rate (CLP/USD) | 2,041 | 595.27 | 90.76 | 474.05 | 612.90 | 700.40 |
| Daily change of the spot foreign exchange | 2,041 | 0.02 | 0.62 | -0.69 | 0.01 | 0.75 |
| 1-month Chilean interest rate | 2,041 | 4.13 | 1.29 | 2.62 | 3.85 | 6.04 |
| 1-month U.S. LIBOR interest rate | 2,041 | 0.71 | 0.76 | 0.16 | 0.25 | 2.09 |
| Spread between the 1-month LIBOR and local rates | 2,041 | -3.42 | 1.92 | -5.82 | -3.55 | -0.53 |
| Daily change of the spread between LIBOR and local rates | 2,041 | 0.00 | 0.05 | -0.05 | 0.00 | 0.05 |
| Forward premium | 2,041 | 3.06 | 2.17 | -0.23 | 3.54 | 5.58 |
| Daily change of the forward premium | 2,041 | 0.00 | 0.27 | -0.29 | -0.02 | 0.33 |
| 1-month cross-currency-basis (CCB) | 2,041 | -0.36 | 0.67 | -1.26 | -0.29 | 0.36 |
| Daily change of the 1-month CCB | 2,041 | 0.00 | 0.28 | -0.30 | -0.02 | 0.34 |
| Daily change in the price of copper | 2,041 | -0.02 | 1.24 | -1.48 | -0.04 | 1.43 |
| *Panel B: Quantities (daily)* | | | | | | |
| Spot imbalance of banking sector (% bank equity) | 2,034 | 0.01 | 0.74 | -0.81 | -0.02 | 0.89 |
| Forward imbalance of banking sector (% bank equity) | 2,034 | -0.23 | 1.09 | -1.46 | -0.19 | 0.96 |
| Net imbalance (spot + forward imbalances) | 2,034 | -0.22 | 1.02 | -1.34 | -0.22 | 0.88 |
| Daily Flow Aggregate Fund A | 2,286 | -0.01 | 0.48 | -0.24 | 0.00 | 0.17 |
| Daily Flow Aggregate Fund C | 2,286 | 0.00 | 0.13 | -0.07 | 0.00 | 0.08 |
| Daily Flow Aggregate Fund E | 2,286 | 0.09 | 0.88 | -0.33 | 0.01 | 0.58 |
| *Panel C: Monthly variables* | | | | | | |
| Chilean inflation | 101 | 0.26 | 0.28 | 0.00 | 0.20 | 0.60 |
| U.S. inflation | 101 | 0.14 | 0.20 | -0.11 | 0.18 | 0.38 |
| Banking sector capital (% total assets) | 101 | 13.31 | 0.38 | 12.81 | 13.30 | 13.77 |
| Monthly change in bank capital | 100 | -0.00 | 0.19 | -0.24 | -0.01 | 0.24 |
| Chilean central bank balance sheet (% GDP) | 101 | 16.41 | 1.74 | 14.03 | 16.55 | 18.00 |

Table 2: Characteristics of Chilean Pension Funds

This table reports averages for total assets under management (AUM), investors, and portfolio characteristics by type of fund (A-E) offered by the Chilean pension system. Individual funds of each type are value-weighted into a single aggregate fund. Averages are computed for each aggregate fund over all months in our sample. Foreign investment refers to non-Chilean assets. The data are collected from administrative records published by the central Bank of Chile and the pension fund regulator (SAFP).

| | Fund A | Fund B | Fund C | Fund D | Fund E | Total |
|---|---|---|---|---|---|---|
| *Panel A: Pension system characteristics* | | | | | | |
| AUM average (million US$) | 27,587 | 29,099 | 65,187 | 28,289 | 24,783 | 174,945 |
| AUM as % of GDP | 10.33 | 10.88 | 24.38 | 10.56 | 9.22 | 65.38 |
| AUM as % of total AUM in all funds | 15.97 | 16.74 | 37.45 | 16.05 | 13.79 | 100 |
| Investors total (thousands) | 1,320 | 4,111 | 3,776 | 1,232 | 554 | 10,992 |
| Investors as % total investors in all funds | 12.08 | 37.4 | 34.43 | 11.16 | 4.92 | 100 |
| *Panel B: Portfolio characteristics* | | | | | | |
| **Foreign investment (% of total AUM)** | | | | | | |
| Mean | 75.17 | 56.29 | 40.62 | 25.98 | 6.19 | 41.58 |
| Median | 76.49 | 58.2 | 42.26 | 26.89 | 6.58 | 41.69 |
| Min | 64.99 | 44.85 | 30.3 | 17.38 | 1.08 | 35.39 |
| Max | 84.71 | 67.94 | 50.49 | 30.94 | 11.14 | 47.79 |
| **Foreign equity investment (% of total AUM)** | | | | | | |
| Mean | 61.19 | 41.18 | 24.57 | 12.1 | 2.29 | 28.05 |
| Median | 61.62 | 42.38 | 25.81 | 13.14 | 2.38 | 28.64 |
| Min | 54.71 | 32.92 | 16.26 | 5.98 | 0.23 | 23.45 |
| Max | 66.33 | 48.09 | 31.77 | 16.83 | 4.36 | 32.78 |
| **Total equity investment (% of total AUM)** | | | | | | |
| Mean | 78.36 | 58.21 | 37.93 | 17.81 | 3.63 | 39.83 |
| Median | 78.47 | 58.58 | 38.55 | 18.45 | 3.99 | 40.29 |
| Min | 74.59 | 53.75 | 32.93 | 13.8 | 0.96 | 32.92 |
| Max | 80.73 | 60.08 | 40.53 | 20.86 | 5.05 | 47.79 |

Table 3: FyF Recommendations

This table shows the list of the 82 portfolio recommendations sent out by FyF since their start in July of 2011 up to the end of February 2020. Fund A is the riskier fund with a higher percentage invested in foreign assets (mostly denominated in USD). Fund E is the safer fund with a higher percentage invested in local fixed income (denominated in Chilean Pesos, CLP). Funds B, C, and D gradually reduce risk and the percentage of USD denominated assets. The column labeled "buying pressure" indicates whether the flows induced by the recommendation result in an increased demand for USD or CLP.

| **Date** | **Recommendation** | **Buying pressure** | **Date** | **Recommendation** | **Buying pressure** |
|---|---|---|---|---|---|
| 27-Jul-11 | 100% E | CLP | 12-Oct-17 | 50% A / 50% E | CLP |
| 12-Oct-11 | 100% A | USD | 28-Nov-17 | 100% A | USD |
| 22-Nov-11 | 100% E | CLP | 19-Dec-17 | 50% A / 50% E | CLP |
| 11-Jan-12 | 100% A | USD | 9-Jan-18 | 100% A | USD |
| 29-Mar-12 | 100% E | CLP | 22-Jan-18 | 50% A / 50% E | CLP |
| 19-Jun-12 | 100% A | USD | 5-Feb-18 | 100% E | CLP |
| 28-Jun-12 | 100% E | CLP | 26-Feb-18 | 50% A / 50% E | USD |
| 19-Jul-12 | 100% A | USD | 7-Mar-18 | 100% A | USD |
| 29-Aug-12 | 100% E | CLP | 14-Mar-18 | 50% C / 50% E | CLP |
| 2-Jan-13 | 100% A | USD | 23-Mar-18 | 15% D / 85% E | CLP |
| 3-Apr-13 | 100% E | CLP | 19-Apr-18 | 50% A / 50% E | USD |
| 17-Jul-13 | 100% A | USD | 4-May-18 | 100% A | USD |
| 16-Aug-13 | 100% E | CLP | 24-May-18 | 50% C / 50% E | CLP |
| 6-Sep-13 | 100% A | USD | 6-Jun-18 | 60% A / 40% E | USD |
| 24-Jan-14 | 100% E | CLP | 19-Jun-18 | 20% A / 80% E | CLP |
| 6-Mar-14 | 50% C / 50% E | USD | 25-Jun-18 | 100% E | CLP |
| 1-Aug-14 | 100% E | CLP | 9-Jul-18 | 50% A / 50% E | USD |
| 19-Aug-14 | 50% A / 50% E | USD | 27-Jul-18 | 100% E | CLP |
| 30-Oct-14 | 100% A | USD | 20-Aug-18 | 50% A / 50% E | USD |
| 15-Dec-14 | 100% E | CLP | 29-Aug-18 | 100% A | USD |
| 12-Feb-15 | 50% A / 50% E | USD | 5-Sep-18 | 50% A / 50% E | CLP |
| 18-Mar-15 | 100% A | USD | 24-Sep-18 | 100% E | CLP |
| 13-May-15 | 50% A / 50% E | CLP | 5-Oct-18 | 50% A / 50% E | USD |
| 8-Jul-15 | 40% C / 60% E | CLP | 11-Oct-18 | 100% E | CLP |
| 24-Aug-15 | 100% E | CLP | 5-Nov-18 | 50% A / 50% E | USD |
| 13-Oct-15 | 50% C / 50% E | USD | 9-Nov-18 | 100% E | CLP |
| 26-Oct-15 | 100% E | CLP | 12-Dec-18 | 50% A / 50% E | USD |
| 16-Dec-15 | 50% A / 50% E | USD | 26-Dec-18 | 40% C / 60% E | CLP |
| 22-Dec-15 | 100% A | USD | 18-Jan-19 | 100% E | CLP |
| 6-Jan-16 | 50% A / 50% E | CLP | 24-Jan-19 | 50% A / 50% E | USD |
| 15-Jan-16 | 100% E | CLP | 16-Apr-19 | 100% E | CLP |
| 22-Feb-16 | 50% C / 50% E | USD | 23-Apr-19 | 50% A / 50% E | USD |
| 29-Apr-16 | 100% E | CLP | 2-May-19 | 100% E | CLP |
| 6-Sep-16 | 50% C / 50% E | USD | 4-Jun-19 | 50% A / 50% E | USD |
| 13-Sep-16 | 100% E | CLP | 26-Jun-19 | 100% E | CLP |
| 9-Nov-16 | 50% A / 50% E | USD | 16-Oct-19 | 50% A / 50% E | USD |
| 22-Dec-16 | 100% E | CLP | 11-Nov-19 | 100% A | USD |
| 13-Jul-17 | 50% C / 50% E | USD | 22-Nov-19 | 50% A / 50% E | CLP |
| 10-Aug-17 | 100% E | CLP | 16-Dec-19 | 100% E | CLP |
| 12-Sep-17 | 50% A / 50% E | USD | 9-Jan-20 | 50% A / 50% E | USD |
| 28-Sep-17 | 100% A | USD | 16-Jan-20 | 100% E | CLP |

Table 4: Drivers of FyF recommendations

This table shows regressions examining the factors driving FyF's recommendations. The independent variable in all columns is the change in the fraction of the portfolio that FyF recommends to invest in fund A. This variable takes values between 1 and -1 on days when there was an email and zero on all other days. For example, if the previous FyF email recommended 50% to be invested in fund A and 50% in fund E, and the current email recommends to invest is 100% in fund A, then this variable takes a value of 0.5. The explanatory variables include the system-wide past weekly returns of fund A and fund E, past weekly changes in the exchange rate and copper prices, the one-month Chilean interest rate, the one-month U.S. LIBOR interest rate, and Chilean inflation in the previous month. The sample covers the period from July 27, 2011 (first FyF recommendation) to February 29, 2020. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| VARIABLES | Change Fund A | Change Fund A | Change Fund A | Change Fund A | Change Fund A |
| Fund A return week -1 | 0.60*** | | | | 0.52** |
| | (0.22) | | | | (0.24) |
| Fund A return week -2 | -0.32* | | | | -0.25 |
| | (0.19) | | | | (0.20) |
| Fund A return week -3 | -0.54** | | | | -0.54** |
| | (0.25) | | | | (0.25) |
| Fund A return week -4 | -0.25 | | | | -0.29 |
| | (0.21) | | | | (0.21) |
| Fund E return week -1 | -0.99 | | | | -1.14 |
| | (0.80) | | | | (0.83) |
| Fund E return week -2 | 0.94 | | | | 0.94 |
| | (0.89) | | | | (0.93) |
| Fund E return week -3 | -0.39 | | | | -0.55 |
| | (0.67) | | | | (0.73) |
| Fund E return week -4 | 0.10 | | | | -0.08 |
| | (0.72) | | | | (0.76) |
| FX rate change week -1 | | -0.28 | | | -0.07 |
| | | (0.24) | | | (0.27) |
| FX rate change week -2 | | -0.18 | | | -0.34 |
| | | (0.22) | | | (0.24) |
| FX rate change week -3 | | -0.38** | | | -0.39* |
| | | (0.19) | | | (0.23) |
| FX rate change week -4 | | 0.31 | | | 0.31 |
| | | (0.21) | | | (0.28) |
| Copper price change week -1 | | | 0.17 | | 0.05 |
| | | | (0.12) | | (0.13) |
| Copper price change week -2 | | | -0.10 | | -0.20* |
| | | | (0.11) | | (0.12) |
| Copper price change week -3 | | | 0.07 | | 0.03 |
| | | | (0.12) | | (0.14) |
| Copper price change week -4 | | | -0.10 | | 0.04 |
| | | | (0.13) | | (0.14) |
| 1-month Chilean interest rate | | | | -0.00 | -0.00 |
| | | | | (0.00) | (0.00) |
| 1-month Libor interest rate | | | | -0.00 | -0.00 |
| | | | | (0.00) | (0.01) |
| Chilean inflation previous month | | | | -0.00 | -0.00 |
| | | | | (0.01) | (0.01) |
| Constant | 0.00 | 0.00 | -0.00 | 0.00 | 0.02 |
| | (0.00) | (0.00) | (0.00) | (0.02) | (0.02) |
| Observations | 1904 | 1904 | 1753 | 1904 | 1753 |
| $R^2$ | 0.01 | 0.01 | 0.00 | 0.00 | 0.02 |

Table 5: FyF Performance

This table shows the average difference in annualized daily returns between following FyF recommendations and passive strategies. The passive strategies correspond to buy-and-hold returns for funds A, C, or E. Each row considers returns for different years. The last row shows the difference in annualized daily returns for an investor who followed FyF recommendations for the whole period. We assume investors request a switch in their pension fund portfolio the same day that the recommendation is issued and that the switch is implemented at day *t+2* prices according to Chilean regulations. Return differentials are reported as percentage points. The sample covers the period from August 1, 2011 (2 business days after first FyF recommendation) to February 29, 2020. We report the $t$-statistic for the difference in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| | Mean Annualized Return | | | | | | |
|---|---|---|---|---|---|---|---|
| | FyF-A | t-stat | FyF-C | t-stat | FyF-E | t-stat | N trading days |
| 2011 | 27.72 | (1.10) | 15.06 | (1.10) | 1.92 | (0.14) | 104 |
| 2012 | 2.60 | (0.47) | 4.11 | (1.13) | 5.32 | (1.13) | 248 |
| 2013 | -0.73 | (-0.14) | 1.52 | (0.44) | 1.43 | (0.34) | 249 |
| 2014 | -6.48 | (-1.57) | -6.51*** | (-2.97) | -4.54 | (-1.31) | 250 |
| 2015 | -2.17 | (-0.33) | -0.59 | (-0.19) | 1.45 | (0.37) | 250 |
| 2016 | 0.60 | (0.09) | -1.77 | (-0.60) | -3.62 | (-1.61) | 251 |
| 2017 | -11.47** | (-2.30) | -4.32* | (-1.75) | 2.05 | (0.84) | 247 |
| 2018 | 7.03 | (1.16) | 2.16 | (0.72) | -1.82 | (-0.54) | 246 |
| 2019 | -0.55 | (-0.10) | 1.34 | (0.32) | 6.35 | (0.86) | 249 |
| 2020 | -10.13 | (-0.37) | -5.07 | (-0.42) | 0.10 | (0.02) | 42 |
| All years | -0.15 | (-0.07) | 0.16 | (0.12) | 0.86 | (0.56) | 2136 |

Table 6: Aggregate Daily Pension Fund Flows and FyF Recommendations

This table shows time-series regressions of daily pension fund flows at the system level. The main independent variables (Day 1 - Day 10) are explained in equation (3) of the main text. Results for funds A, C, and E are reported separately. Controls include five lags of daily flows and fund returns. In the bottom panel, CUM[1-5] and CUM[6-10] report the cumulative effects over the first five trading days and the next five trading days respectively. The sample covers the period from January 3, 2011 to February 29, 2020. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| VARIABLES | Flow to Fund: | | | | | |
|---|---|---|---|---|---|---|
| | A | C | E | A | C | E |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Day 1 | -0.11 | -0.05** | 0.29* | 0.08* | 0.00 | -0.13** |
| | (0.10) | (0.02) | (0.15) | (0.05) | (0.01) | (0.07) |
| Day 2 | 0.03 | 0.01 | 0.05 | 0.05 | 0.03 | -0.13* |
| | (0.05) | (0.02) | (0.09) | (0.04) | (0.02) | (0.07) |
| Day 3 | 0.10** | 0.00 | -0.05 | 0.01 | -0.01 | -0.07 |
| | (0.05) | (0.02) | (0.10) | (0.04) | (0.02) | (0.07) |
| Day 4 | 3.58*** | 0.22*** | -6.19*** | 3.45*** | 0.21*** | -6.14*** |
| | (0.29) | (0.07) | (0.42) | (0.28) | (0.07) | (0.40) |
| Day 5 | 2.95*** | 0.18*** | -5.36*** | 0.62*** | 0.05** | -0.90*** |
| | (0.24) | (0.05) | (0.37) | (0.14) | (0.02) | (0.30) |
| Day 6 | 1.54*** | 0.10*** | -2.90*** | 0.04 | 0.02 | 0.34 |
| | (0.18) | (0.03) | (0.37) | (0.13) | (0.02) | (0.30) |
| Day 7 | 0.94*** | 0.07*** | -1.73*** | 0.04 | 0.02 | 0.29 |
| | (0.16) | (0.02) | (0.32) | (0.10) | (0.02) | (0.22) |
| Day 8 | 0.43*** | 0.03 | -0.89*** | -0.05 | -0.01 | 0.17 |
| | (0.12) | (0.02) | (0.26) | (0.08) | (0.02) | (0.15) |
| Day 9 | 0.20*** | 0.02 | -0.47** | -0.07 | 0.02 | 0.30* |
| | (0.07) | (0.02) | (0.19) | (0.10) | (0.02) | (0.16) |
| Day 10 | 0.12** | 0.01 | -0.37** | -0.07 | 0.01 | 0.13 |
| | (0.06) | (0.03) | (0.16) | (0.07) | (0.03) | (0.14) |
| Controls | no | no | no | yes | yes | yes |
| Observations | 2277 | 2277 | 2277 | 2272 | 2272 | 2272 |
| R-squared | 0.631 | 0.041 | 0.597 | 0.786 | 0.320 | 0.810 |
| *Cumulative evidence* | | | | | | |
| CUM [1-5] | 6.46*** | 0.36*** | -11.06*** | 4.32*** | 0.28*** | -7.74*** |
| | (0.57) | (0.09) | (1.01) | (0.50) | (0.08) | (0.88) |
| CUM [6-10] | 3.41*** | 0.24*** | -6.62*** | -0.27 | 0.05 | 1.52*** |
| | (0.36) | (0.05) | (0.72) | (0.33) | (0.05) | (0.53) |

Table 7: Daily Flows for a Small Pension Plan and FyF Recommendations

This table shows regressions in the style of Table 6 for the case of a small pension fund administrator (AFP) called Modelo. Flows that are larger than 10% are dropped to exclude events related to government auctions of new clients. Columns (4)-(6) use a dummy for days with flows that are equal to 5% (±0.1%) as dependent variable. The sample covers the period from January 3, 2011 to February 29, 2020. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| VARIABLES | Flow to Fund: | | | 5% Flow to Fund: | | |
|---|---|---|---|---|---|---|
| | A | C | E | A | C | E |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Day 1 | 0.05 | 0.19 | 0.66** | 0.00 | -0.00 | 0.01 |
| | (0.24) | (0.26) | (0.33) | (0.00) | (0.00) | (0.01) |
| Day 2 | -0.42 | -0.09 | -0.73* | -0.00 | -0.00 | 0.01 |
| | (0.33) | (0.31) | (0.40) | (0.00) | (0.00) | (0.01) |
| Day 3 | 0.12 | -0.01 | -0.32 | 0.00 | -0.00 | -0.04 |
| | (0.30) | (0.24) | (0.39) | (0.00) | (0.00) | (0.05) |
| Day 4 | 7.83*** | 0.29 | -8.72*** | 0.33*** | 0.01 | -0.71*** |
| | (0.62) | (0.40) | (0.73) | (0.09) | (0.01) | (0.13) |
| Day 5 | 3.47*** | -0.17 | -5.56*** | 0.02 | -0.00 | -0.03 |
| | (0.50) | (0.26) | (0.53) | (0.02) | (0.00) | (0.03) |
| Day 6 | 1.87*** | 0.70* | -3.17*** | 0.04 | 0.00 | -0.10 |
| | (0.40) | (0.36) | (0.55) | (0.05) | (0.00) | (0.07) |
| Day 7 | 1.28*** | -0.06 | -2.43*** | 0.00 | 0.00 | -0.07** |
| | (0.39) | (0.38) | (0.62) | (0.01) | (0.00) | (0.03) |
| Day 8 | 0.72* | 0.01 | -1.05** | 0.00 | 0.00 | -0.03 |
| | (0.39) | (0.23) | (0.45) | (0.01) | (0.00) | (0.03) |
| Day 9 | 0.35 | 0.47 | -0.00 | 0.00 | -0.00 | -0.08** |
| | (0.33) | (0.39) | (0.68) | (0.01) | (0.00) | (0.03) |
| Day 10 | 0.12 | 0.10 | -0.10 | 0.00 | 0.00 | -0.06** |
| | (0.28) | (0.17) | (0.33) | (0.01) | (0.00) | (0.02) |
| AFP | SMALL | SMALL | SMALL | SMALL | SMALL | SMALL |
| Controls | yes | yes | yes | yes | yes | yes |
| Observations | 2248 | 2239 | 2164 | 2248 | 2239 | 2164 |
| R-squared | 0.566 | 0.061 | 0.528 | 0.101 | 0.008 | 0.253 |
| *Cumulative evidence* | | | | | | |
| CUM [1-5] | 10.44*** | 0.21 | -13.25*** | 0.35*** | 0.01 | -0.77*** |
| | (1.21) | (0.69) | (1.36) | (0.10) | (0.02) | (0.16) |
| CUM [6-10] | 3.91*** | 1.24* | -5.16*** | 0.07 | 0.00 | -0.34** |
| | (0.98) | (0.75) | (1.55) | (0.06) | (0.01) | (0.15) |

Table 8: Foreign Exchange Rates and FyF Recommendations

This table shows time-series regressions for the daily depreciation of the spot foreign exchange rate. The main independent variables (Day 1 - Day 10) are explained in equation (3) of the main text. We report the coefficients for the first five days, but we omit the individual coefficients for days 6–10. CUM[1-5] and CUM[6-10] report the cumulative effects over the first five trading days and the next five trading days respectively. The dependent variable is expressed in percentage points. Macroeconomic controls include the daily change in the price of copper and 30-day lags of Chilean and U.S. inflation, three-month Chilean and LIBOR interest rates, the size of the Chilean central bank balance sheet as a fraction of GDP, and dummies for Mondays and Fridays. The lagged dependent variable (DV) includes five lags of the foreign exchange rate depreciation. The sample covers the period from January 3, 2011 to February 29, 2020 and in columns (3)–(6) is restricted by the availability of a one-month futures price in Bloomberg. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| VARIABLES | $\Delta FX$ | $\Delta FX$ | $\Delta FX$ | $\Delta FX$ | $\Delta FX$ | $\Delta FX$ |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Day 1 | 0.45** | 0.49*** | 0.45** | 0.49*** | 0.48** | 0.50*** |
| | (0.21) | (0.18) | (0.21) | (0.19) | (0.21) | (0.19) |
| Day 2 | 0.54*** | 0.50*** | 0.52*** | 0.48*** | 0.49*** | 0.47*** |
| | (0.17) | (0.17) | (0.18) | (0.17) | (0.18) | (0.17) |
| Day 3 | -0.29 | -0.28 | -0.22 | -0.20 | -0.28 | -0.24 |
| | (0.17) | (0.17) | (0.18) | (0.17) | (0.19) | (0.18) |
| Day 4 | 0.09 | 0.07 | 0.06 | 0.05 | 0.05 | 0.03 |
| | (0.18) | (0.16) | (0.20) | (0.17) | (0.19) | (0.17) |
| Day 5 | 0.06 | 0.17 | 0.05 | 0.14 | 0.08 | 0.18 |
| | (0.19) | (0.18) | (0.20) | (0.20) | (0.20) | (0.19) |
| Sample | All | All | F1m available | F1m available | F1m available | F1m available |
| Macro Controls | no | yes | no | yes | no | yes |
| Lagged DV | no | yes | no | no | yes | yes |
| Observations | 2277 | 2181 | 2041 | 2041 | 2041 | 2041 |
| R-squared | 0.020 | 0.145 | 0.020 | 0.138 | 0.031 | 0.142 |
| *Cumulative evidence* | | | | | | |
| CUM [1-5] | 0.86** | 0.97** | 0.89** | 0.99** | 0.84* | 0.96** |
| | (0.42) | (0.39) | (0.44) | (0.41) | (0.44) | (0.41) |
| CUM [6-10] | 0.30 | 0.40 | 0.41 | 0.43 | 0.40 | 0.45 |
| | (0.42) | (0.40) | (0.45) | (0.41) | (0.45) | (0.41) |

Table 9: Foreign Exchange Regressions in Sub-Samples

This table follows the style of Table 8. The sample is restricted by the availability of a one-month futures price in Bloomberg. Buy (sell) emails refer to emails that recommend increasing (decreasing) the allocation to foreign assets. The sample in the case of the buy (sell) column includes the post-recommendation days that follow buy (sell) emails plus days that do not immediately follow any recommendation. The end-of-quarter sample includes trading days between the 24th and the last day of March, June, September, and December. The free float sample excludes periods of central bank intervention in the foreign exchange market (the year 2011 and from November 29, 2019 up to the end of our sample on February 29, 2020). Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| Sample | Buy Emails | Sell Emails | 2011-15 | 2016-20 | Q-end | Not Q-end | Free Float |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Day 1 | 0.84*** | 0.16 | 0.26 | 0.87** | 1.34** | 0.43** | 0.50** |
| | (0.30) | (0.22) | (0.20) | (0.34) | (0.62) | (0.20) | (0.20) |
| Day 2 | 0.27 | 0.64*** | 0.37* | 0.64* | 1.78** | 0.45** | 0.56*** |
| | (0.28) | (0.20) | (0.20) | (0.34) | (0.86) | (0.18) | (0.18) |
| Day 3 | -0.18 | -0.32 | -0.25 | -0.22 | 0.71 | -0.25 | -0.27 |
| | (0.28) | (0.23) | (0.17) | (0.38) | (1.14) | (0.18) | (0.20) |
| Day 4 | -0.03 | 0.05 | 0.17 | -0.25 | 2.05*** | -0.03 | -0.05 |
| | (0.31) | (0.15) | (0.15) | (0.36) | (0.62) | (0.16) | (0.18) |
| Day 5 | -0.06 | 0.35 | -0.06 | 0.63 | 0.57 | 0.20 | 0.13 |
| | (0.27) | (0.29) | (0.20) | (0.39) | (0.64) | (0.21) | (0.20) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1715 | 1741 | 1189 | 852 | 118 | 1923 | 1749 |
| R-squared | 0.145 | 0.149 | 0.199 | 0.107 | 0.336 | 0.145 | 0.125 |
| *Cumulative evidence* | | | | | | | |
| CUM [1-5] | 0.88 | 0.89* | 0.48 | 1.70** | 6.36*** | 0.80* | 0.90** |
| | (0.67) | (0.53) | (0.43) | (0.81) | (1.82) | (0.42) | (0.44) |
| CUM [6-10] | 0.62 | 0.19 | 0.17 | 1.21 | 3.68** | 0.32 | 0.50 |
| | (0.61) | (0.59) | (0.47) | (0.81) | (1.73) | (0.42) | (0.41) |

Table 10: Daily Banking Imbalances and FyF Recommendations

This table shows time-series regressions for daily banking sector imbalances. Net imbalance in the spot and forward markets in columns (1) and (2) are defined as the amount bought minus the amount sold by banks to third parties, divided by the 30-day lagged equity of the banking sector. Spot+Forward in column (3) corresponds to the the sum of the net imbalances in the spot and forward markets. In column (4) we use the daily change in the banks net exposure (spot position + forward position). The rest of the table follows the style of Table 8. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| VARIABLES | Spot | Forward | Spot+Forward | $\Delta$ Net Position |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Day 1 | 0.31 | 0.09 | 0.39* | 0.50** |
| | (0.24) | (0.26) | (0.22) | (0.23) |
| Day 2 | -0.36* | 0.37 | 0.10 | 0.11 |
| | (0.20) | (0.39) | (0.40) | (0.23) |
| Day 3 | -0.88*** | 0.54* | -0.31 | 0.41 |
| | (0.27) | (0.30) | (0.32) | (0.25) |
| Day 4 | -1.13*** | 1.06*** | -0.16 | 0.19 |
| | (0.25) | (0.38) | (0.30) | (0.27) |
| Day 5 | -0.26 | 0.37 | 0.00 | 0.14 |
| | (0.30) | (0.35) | (0.33) | (0.26) |
| Controls | Yes | Yes | Yes | Yes |
| Observations | 2029 | 2029 | 2029 | 2028 |
| R-squared | 0.117 | 0.082 | 0.057 | 0.143 |
| *Cumulative evidence* | | | | |
| CUM [1-5] | -2.29*** | 2.42*** | 0.04 | 1.37** |
| | (0.59) | (0.76) | (0.71) | (0.56) |
| CUM [6-10] | -1.39*** | 1.31 | 0.13 | -0.13 |
| | (0.52) | (0.85) | (0.78) | (0.69) |

Table 11: Cross Currency Basis and FyF Recommendations

This table shows regressions for the change of the one-month cross-currency basis ($\Delta CCB1m$), the change of the forward premium ($\Delta FwdPremium$), and the change of the spread between the one-month LIBOR rate and the local rate ($\Delta Rates$). The rest of the table follows the style of Table 8. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| VARIABLES | $\Delta CCB1m$ | $\Delta CCB1m$ | $\Delta FwdPremium$ | $\Delta FwdPremium$ | $\Delta Rates$ | $\Delta Rates$ |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Day 1 | -0.05 | -0.07 | -0.07 | -0.10 | 0.02** | 0.02** |
| | (0.09) | (0.08) | (0.09) | (0.08) | (0.01) | (0.01) |
| Day 2 | 0.04 | -0.02 | 0.02 | -0.05 | 0.02 | 0.02 |
| | (0.06) | (0.06) | (0.07) | (0.06) | (0.01) | (0.01) |
| Day 3 | -0.03 | -0.04 | -0.02 | -0.03 | -0.02 | -0.01 |
| | (0.07) | (0.08) | (0.07) | (0.08) | (0.01) | (0.02) |
| Day 4 | -0.18** | -0.18** | -0.18** | -0.19** | 0.01 | 0.01 |
| | (0.08) | (0.09) | (0.08) | (0.08) | (0.02) | (0.02) |
| Day 5 | -0.12** | -0.14** | -0.12** | -0.14** | -0.00 | -0.01 |
| | (0.06) | (0.06) | (0.06) | (0.06) | (0.02) | (0.02) |
| Sample | F 1m available | F 1m available | F 1m available | F 1m available | F 1m available | F 1m available |
| Controls | No | Yes | No | Yes | No | Yes |
| Observations | 2041 | 2041 | 2041 | 2041 | 2041 | 2041 |
| R-squared | 0.056 | 0.131 | 0.057 | 0.146 | 0.009 | 0.024 |
| *Cumulative evidence* | | | | | | |
| CUM [1-5] | -0.33* | -0.44*** | -0.37** | -0.51*** | 0.04 | 0.03 |
| | (0.17) | (0.17) | (0.17) | (0.16) | (0.03) | (0.04) |
| CUM [6-10] | -0.19 | -0.30 | -0.16 | -0.26 | -0.03 | -0.03 |
| | (0.20) | (0.19) | (0.19) | (0.18) | (0.04) | (0.04) |

Table 12: Cross Currency Basis Regressions in Sub-Samples

This table follows the style of Table 9 for changes of the one-month cross-currency basis as the dependent variable. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| Sample | Buy Emails | Sell Emails | 2011-15 | 2016-20 | Q-end | Not Q-end | Free Float |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Day 1 | -0.09 | -0.04 | 0.08 | -0.28** | -0.20 | -0.07 | -0.07 |
| | (0.15) | (0.08) | (0.09) | (0.14) | (0.15) | (0.09) | (0.09) |
| Day 2 | -0.16* | 0.12 | -0.03 | 0.04 | -0.77 | -0.00 | -0.01 |
| | (0.09) | (0.08) | (0.09) | (0.08) | (0.56) | (0.06) | (0.07) |
| Day 3 | -0.10 | 0.05 | -0.02 | -0.07 | 0.87 | -0.05 | -0.10 |
| | (0.13) | (0.09) | (0.11) | (0.12) | (0.53) | (0.08) | (0.08) |
| Day 4 | -0.27* | -0.07 | -0.06 | -0.38** | -0.47 | -0.15* | -0.20** |
| | (0.15) | (0.09) | (0.09) | (0.15) | (0.36) | (0.09) | (0.09) |
| Day 5 | -0.22** | -0.08 | -0.20*** | -0.01 | -0.14 | -0.14** | -0.16** |
| | (0.11) | (0.05) | (0.07) | (0.10) | (0.31) | (0.06) | (0.07) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1715 | 1741 | 1189 | 852 | 118 | 1923 | 1749 |
| R-squared | 0.141 | 0.155 | 0.206 | 0.077 | 0.280 | 0.132 | 0.157 |
| *Cumulative evidence* | | | | | | | |
| CUM [1-5] | -0.85*** | -0.03 | -0.22 | -0.73*** | -1.16** | -0.40** | -0.54*** |
| | (0.30) | (0.19) | (0.20) | (0.28) | (0.58) | (0.17) | (0.18) |
| CUM [6-10] | 0.26 | -0.73*** | -0.26 | -0.32 | -0.01 | -0.29 | -0.14 |
| | (0.30) | (0.26) | (0.23) | (0.32) | (0.72) | (0.20) | (0.20) |

Table 13: Cross Currency Basis Regressions with Banking Interactions

This table shows regressions in the style of Table 11 for changes of the cross-currency basis at one, three, and six months. The main independent variable (DAYS [1-10]) corresponds to the aggregation of $Day_\tau$ (see equation (3)) for the first ten days that follow an email from FyF. We divide this variable by 10, so the coefficient is the cumulative effect over the ten days. This variable is interacted with indicators for days when banking equity as a fraction of total assets decreased in the previous month ($Decrease\,in\,Bank\,Capital$). Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| VARIABLES | $\Delta CCB1m$ | $\Delta CCB3m$ | $\Delta CCB6m$ |
|---|---|---|---|
| | (1) | (2) | (3) |
| DAYS [1-10] | -0.10 | -0.19 | -0.15 |
| | (0.30) | (0.15) | (0.12) |
| DAYS [1-10] * Decrease in Bank Capital | -1.19** | -0.49** | -0.24 |
| | (0.50) | (0.20) | (0.17) |
| Decrease in Bank Capital | 0.01 | 0.00 | 0.00 |
| | (0.01) | (0.00) | (0.00) |
| Controls | Yes | Yes | Yes |
| Observations | 2004 | 2004 | 2004 |
| R-squared | 0.131 | 0.038 | 0.038 |