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Francisco Pinto-Avalos
Michael Bowe
Stuart Hyde

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Financial advisory firms, asset reallocation and price pressure in the FOREX market*

Francisco Pinto-Avalos†
Central Bank of Chile and
Cardiff Business School

Michael Bowe‡
University of Manchester
and University of Vaasa

Stuart Hyde§
University of Manchester

Abstract

Pension fund asset allocation in many countries has become increasingly influenced by financial advisory firms, whose recommendations often elicit a large, coordinated portfolio reallocation of pension fund holdings across asset classes. Using a proprietary database, we analyse if portfolio asset reallocations in the Chilean pension fund industry act as a mechanism for exerting price pressures in the Chilean peso FOREX market. We document significant price pressure and enhanced volatility in the nominal exchange rate surrounding pension fund transactions initiated by pension fund investors following financial advisory firm recommendations. We provide evidence that certain institutions participating in the FOREX market may seek to exploit the anticipated portfolio adjustments following such recommendations by front-running pension fund trades. The potential for financial asset market volatility and market instability this activity creates has regulatory and policy implications.

*This study was conducted prior to the introduction of the Chilean Law Number 21.314, which established the legal framework regulating pension advisory firms. The law in its original Spanish reads: Ley 21.314, Establece nuevas exigencias de transparencia y refuerza las responsabilidades de los agentes de los mercados, regula la asesoría previsional y otras materias que indica. The authors are grateful for the insightful comments from: Ralf Becker, Soteria Charalambous, Pablo Filippi, Diego Gianelli, Stefan Petry, Claudia Sotz, Ian Tonks, participants of the Research and Policy Seminars at the Central Bank of Chile (May 2021, Santiago), and the 2022 annual meetings of the EFMA (Rome, Italy), IFABS (Napoli, Italy), the Future Finance and Economics Association (Napoli, Italy), and the British Academy of Management (Manchester, UK). All errors remain the authors' responsibility. The content, results, and conclusions presented in this study are solely those of the authors and do not reflect the views of the Central Bank of Chile.

†Corresponding author. Cardiff Business School, Cardiff University, PintoF2@cardiff.ac.uk, and Central Bank of Chile.

‡Alliance Manchester Business School, University of Manchester, and School of Accounting and Finance, University of Vaasa, michael.bowe@manchester.ac.uk.

§Alliance Manchester Business School, University of Manchester, stuart.hyde@manchester.ac.uk

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Resumen

En varios países, la asignación de activos de los fondos de pensiones se ha visto cada vez más influenciada por empresas de asesoría financiera, cuyas recomendaciones suelen dar lugar a una gran reasignación coordinada de portafolio de los fondos de pensiones afectando distintas clases de activos. Utilizando una base de datos propia, analizamos si las reasignaciones de portafolio en la industria de fondos de pensiones chilena actúan como un mecanismo para ejercer presiones sobre los precios en el mercado cambiario chileno. Documentamos una presión cambiaria significativa y una mayor volatilidad en el tipo de cambio nominal en torno a las transacciones de fondos de pensiones iniciadas por trabajadores que siguen las recomendaciones de empresas de asesoría financiera. Proporcionamos evidencia de que ciertos agentes que participan en el mercado cambiario chileno pueden intentar explotar los ajustes de portafolio previstos tras dichas recomendaciones, adelantando las transacciones de los fondos de pensiones. La potencial volatilidad que esta actividad genera en el mercado de activos financieros tiene implicancias regulatorias y de política.

1 Introduction

The pension fund industry in Chile has undergone significant development since the turn of the millennium, and in 2020 pension fund companies (PFCs) managed around USD 200 billion dollars of savings, equivalent to around 80% of Chilean GDP. The ensuing PFC investment has become increasingly important in fostering real economic growth and enhancing the development of domestic financial market activity (Corbo & Schmidt-Hebbel 2003). These market developments are not inconsequential. Da et al. (2018) and Ceballos & Romero (2020) analyse the effect of pension fund investors' portfolio reallocations, who follows the recommendation of advisory firms, on PFC portfolio adjustments and the concomitant effects on the Chilean equity and government bond markets, respectively. Aldunate et al. (2022) investigate the impact of PFCs asset reallocation on the hedging strategies of the Chilean banking sector in the currency forward market, examining the factors contributing to measured violations of covered interest arbitrage conditions.

Our contribution is to analyse the impact of PFC portfolio reallocations, which are initiated by pension fund investors' decisions following the recommendations of financial advisory firms, on trading activity and price movements in the Chilean peso foreign exchange (FOREX) market. The fact foreign assets constitute around 50 per cent of PFCs balance sheets, positions them among the most relevant agents in Chilean peso FOREX trading. Indeed, as a result of the counter-cyclical nature of their investment decisions, PFC trading activity has been ascribed with an active role in dampening excessive volatility in the Chilean peso exchange rate. Historically, during episodes of global financial distress (prosperity), PFCs exhibit a tendency to invest in safe (risky) assets, corresponding mainly to domestic fixed income securities (foreign equities). By so doing, PFCs trigger a sale (purchase) of FOREX denominated assets and a purchase (sale) of domestic currency securities during periods of economic downturns (expansions). This pattern generates USD dollar inflows (outflows), which acts to partially offset the domestic currency depreciation (appreciation) that usually characterises this stage of the economic cycle.

More recent evidence points to a weakening of the inherent counter-cyclical nature of PFC investment decisions which follows enhanced PFC FOREX market activity. This coincides with a pattern of more pronounced and frequent PFC asset reallocations accompanying revisions to short-term investment strategies (Zahler 2005, Opazo et al. 2014). Indeed, pension fund investment policies searching for enhanced short-term profitability may even contribute to more pro-cyclically aligned portfolio readjustments, in the process exacerbating asset price volatility (Levy & Zuniga 2016, OECD 2020). In particular, in comparison to previous years, since 2011 PFC FOREX trading volume displays an elevated level of volatility. These episodes

of enhanced PFC trading in the FOREX market coincide with the emergence and increasingly important profile of several unregulated financial advisory firms in the pension fund industry. One such advisory firm, *Felices y Forrados* (F&F), becomes particularly influential over the ensuing decade. F&F recommendations are purportedly underpinned by short-term investment strategies informed by economic and financial macro-enviromental factors, and encourage pension fund investors to actively trade and reallocate their savings.[1] F&F justifies their advice on the (unsubstantiated) claim that such investment behaviour increases returns in comparison to more passive investment strategies, such as buy-and-hold. Since F&F began publishing recommendations, pension fund investors indeed trade more frequently, actively reallocating their assets across PFC investment portfolios. Concomitantly, the FOREX market experiences an increase in both the magnitude and amplitude of PFC trading activity, thereby potentially exacerbating rather than mitigating exchange rate volatility.

This study's contribution is to analyse whether investors' portfolio reallocations following F&F recommendations influence either the nature or magnitude of PFC FOREX trading activity, and to ascertain any subsequent effects on the pricing dynamics evident in the Chilean peso FOREX market. Such an analysis is revealing not only because of the specific characteristics of the Chilean pension fund industry, but also from a wider international perspective. In the Chilean context, subsequent to F&F starting to issue recommendations, pension fund companies rank among the biggest institutional investors in Chile, undertaking large, coordinated trades in the Chilean FOREX market. As we later document, these PFC FOREX transactions generate significant price pressure on the Chilean peso exchange rate, and increase its volatility. Moreover, current pension fund industry regulations incorporate legally binding procedures which serve to delay the effective date when PFCs can execute asset sales/purchases in the market following receipt of mandates to readjust investor portfolios. Using a proprietary database of daily FOREX market trading volume, disaggregated by type of agent, we find this delay in trade execution generates strategic trading complementarities where other FOREX market participants can benefit from front-running the anticipated PFC portfolio realignment trades. We provide evidence for this claim later in the paper.

Examining the potential effect of financial advisors on FOREX trading is of significant interest from both an economic policy and financial stability perspective. Previous studies highlight the relationship between the pension fund industry and the Chilean FOREX market, noting that large pension fund flows may pose a threat to market stability (Marcel 2020). Zahler (2005) argues the herding behaviour characteristic of PFCs asset reallocation decisions generates significant portfolio flows that may affect the exchange rate, albeit with-

[1] *Felices y Forrados* translates from Spanish to English as Happy and Loaded. Section 3 documents the evidence identifying the influence of F&F recommendations upon investor decision-making.

out quantifying the flows' impact. The Central Bank of Chile (2020) discusses how pension fund reallocations impact asset trading volumes in the Chilean fixed income market.

In an international context, OECD (2020) highlights how large, coordinated pension fund portfolio readjustments may have consequences for asset price movements and exacerbate FOREX market volatility. The relevant studies mirror Raffnsøe et al. (2016) who find that the investment decisions of Danish pension fund companies exhibit a significant impact on the Danish krone, and discuss the consequences of their findings for the exchange rate policies implemented by the Central Bank of Denmark. In this holistic setting, our study aims to offer policy-relevant insights which can be used by Central Banks and national regulatory authorities to examine the role played by unregulated financial advisors in triggering asset price movements beyond those mandated by macro fundamentals, thereby further exacerbating asset price volatility. This may possibly inform the design of policies which more efficiently formalise and regulate their financial market activity. In comparative terms, financial advisor regulation and associated policy considerations often occur earlier in more developed economies (Hung et al. 2008, Inderst & Ottaviani 2012). In emerging economies, however, a formal quantification of the potential impact of financial advisors in FOREX markets is often lacking, and in this respect our study aims to provide important insights. Our results are of relevance not only for the Chilean economy, but also for many other countries adopting similar pension fund systems.[2]

Our findings complement studies highlighting the mechanism through which large, coordinated institutional investment decisions generate sustained price pressure in financial markets. For instance, recent analyses discern herding behaviour by institutional investors and documents the resulting pricing dynamics in: the U.S. corporate bond market (Ellul et al. 2011, Goldstein et al. 2017, Cai et al. 2019); U.S. equities (Gompers & Metrick 2001, Khan et al. 2012), as well as the Israel stock market (Ben-Rephael et al. 2011). Greenwood & Vayanos (2010) document price pressure in both UK and US government bonds, attributing the phenomenon to the preferred habitat trading preferences of pension funds. From a theoretical perspective, Basak & Pavlova (2013) show that institutional investors' trading decisions exert pricing pressure on their benchmark equity indices, generate excessive correlation among stocks and increase equity market volatility. Similarly, Froot & Ramadorai (2005) find that institutional investors play a key role in explaining short-term exchange rate movements for their sample of eighteen currencies.

While the majority of extant research covers mature financial markets, a few recent stud-

[2]Several other countries adopt a defined-contribution pension fund scheme in which pension investors can freely choose the level of risk associated with different portfolio allocations, including: Colombia, Costa Rica, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Mexico, Peru, Poland and Romania.

ies investigate whether F&F recommendations influence domestic asset price movements in Chile. Da et al. (2018), Ceballos & Romero (2020), find that the large, coordinated sales and purchases subsequent to F&F recommendations generate significant price pressure within the stock and government bond markets, respectively. In a contemporaneous paper, Aldunate et al. (2022) investigate the role of local banks' currency hedging strategies on pricing relationships in the Chilean peso forward market, surrounding PFCs' asset reallocations triggered by pension fund investors following F&F recommendations. They find that limits to arbitrage originating from both regulatory capital requirements and the risk-bearing constraints local banks face contribute to explaining detected violations of covered interest parity. While both Aldunate et al. (2022) and our study investigate the sources of price pressure on the FOREX market following F&F recommendations, there are key differences in focus and scope. Aldunate et al. (2022) utilise a subset of F&F recommendations involving a specific risk class portfolio (portfolio A) to analyse Chilean banks' trading patterns in the currency forward market. Our study employs a proprietary dataset from the Central Bank of Chile containing the daily trading volume of several categories of FOREX market institutional investors, and utilises the complete set of F&F recommendations made during the sample period (March 2012 to October 2020). Our purpose is to capture the impact of F&F-induced pension fund investors' decisions on the trading patterns of these institutional market participants, quantifying the subsequent exchange rate pricing dynamics and volatility impacts. This enables us to focus upon issues of price stability of particular relevance to policy-makers.

We show that F&F announcements induce exchange rate fluctuations beyond those suggested by economic fundamentals, thereby exacerbating exchange rate volatility. The recommendations also influence the trading behaviour of certain classes of FOREX market participants. Collectively, these elements may lead to exchange rate overreaction, which may be inconsistent with financial stability mandates. Indeed, Garcia (2022) and Jara & Piña (2023) point out that episodes of enhanced exchange rate volatility are responsible for triggering FOREX interventions made by Central Bank of Chile. In this respect, our study contributes by analysing relevant factors which may underpin official foreign exchange interventions.

2 The Chilean Pension Industry: Institutional Context

The Chilean pension system is a defined-contribution scheme which compels employees, henceforth (pension fund) investors, to allocate 10% of their wages to designated individual pension saving accounts. Pension fund companies (PFCs), private institutions created by law in 1980 and regulated by the *Superintendencia de Pensiones de Chile* (regulatory body

of the Chilean pension fund industry) are legally authorised to manage these investor pension fund accounts. Figure 1 shows that following their creation, aggregate savings managed by the PCFs exhibit steady growth, totalling around USD 200 billion by 2020, approximately 80% of Chilean GDP.

[Figure 1 in here]

Seven PFCs currently operate in the pension fund market in Chile, charging a management fee equivalent to a percentage of an investor's monthly income. Investors can switch from one company to another with no exit fees. A 2002 regulation requires each PFC to offer five classes of pension fund portfolios, and investors may allocate their pension savings across no more than two portfolios offered by the same PFC. This regulation aims to provide investors with some investment flexibility by enabling them to select portfolios according to their risk preferences. Table 1 provides details of the five portfolios, labelled A to E, with risk declining monotonically from portfolio A (highest risk) to E (lowest risk). The total USD value of savings invested in each portfolio in 2020 is given in Panel A, revealing portfolio C the medium risk portfolio is the largest. Panel B presents each portfolio's asset composition, considering both the class of investment assets (equity and fixed income) and their location (domestic or overseas). Portfolio A is characterised as the riskiest portfolio, since its investments are weighted towards equities and the majority of its asset allocation (84%) is in overseas markets. In contrast, portfolio E provides the safest investments, allocating most of its pension assets (88%) into domestic, fixed income markets.

[Table 1 in here]

Current regulations mandate certain legally binding requirements restricting the asset composition of each PFC portfolio. First, they enforce specific limits upon equity allocation within each portfolio. Panel C in table 1 reveals that the riskiest portfolio A may invest no more than 80% and no less than 40% of the total portfolio value in equities, while the least risky portfolio E may allocate no more than 5% to equities. Portfolios B, C, and D designate intermediate equity risk exposure alternatives lying between funds A and E. These legal limits attempt to ensure that portfolios are differentiated from each other based on their asset composition and resulting risk exposure. Second, current regulations also penalise PFC portfolio underperformance in comparison to the average returns of the remaining family of PFCs. On the basis of these legal requirements, it is perhaps unsurprising to discover that the asset composition of corresponding risk class portfolios across PFCs is similar, as they attempt to avoid their returns departing significantly from the average PFC investment performance. Some commentators maintain these regulations generate a pattern of herd-type

behaviour in PFC investment decisions (Raddatz & Schmukler 2008). Third, existing regulations also make it compulsory for PFCs to hedge their currency exposures. In particular, after purchasing any FOREX in the spot market, PFCs must hedge the resulting currency risk by selling FX forward contracts. Fourth, in terms of enacting investor-mandated portfolio reallocation, PFCs can only begin to execute any required portfolio rebalancing from the fourth working day following receipt of the investors' instructions.[3] Fifth, PFCs are prohibited from processing requests to switch portfolio investment allocations which account for more than 5% of total portfolio value on the same day. Any reallocation exceeding 5% of the total portfolio value occurs on the following working day, with requests processed on a first-come, first-served basis.[4] Despite the rationale underpinning these trading delays, we believe they are not unproblematic. Specifically, given the similarities in the composition of fund's portfolios, we conjecture they generate incentives for FOREX market participants to front-run any significant coordinated PFC asset sales/purchases anticipated in the aftermath of financial advisory firms' recommendations. Further, these restrictions also incentivise pension investors to act quickly when requesting changes to their portfolio in an attempt to obtain more favourable prices.

A major consideration in the FOREX-focused context of this study is indicated in figure 2, namely that over our sample period, overseas assets constitute a significant and fairly constant proportion of the PFCs balance sheet, around 40%. This feature, in combination with the magnitude of PFC savings and resulting investment order flow, positions PFCs as among the most important institutional participants in the Chilean FOREX market.

[Figure 2 in here]

These considerations raise the issue of the extent to which PFC trades exert pricing pressure on the peso exchange rate. For example, when a pension investor chooses to enhance their risk exposure, she instructs her PFC via a switching request to reallocate savings into a portfolio which by definition contains a greater proportion of foreign assets. Subsequent to this request, the PFC sells domestic, peso-denominated assets, using the sale proceeds to purchase foreign currency, typically USD, in the spot FOREX market. This is invested in foreign currency denominated risky assets, generating capital outflows from the domestic economy. If this hypothetical portfolio reallocation scenario to riskier asset portfolios is

[3]This delay is justified on the basis that such requests may contain clerical errors, enabling PFCs to use this window of time to evaluate the accuracy and feasibility of investor instructions.

[4]The 5% rule applies to both the initial and target portfolio. This measure was introduced in response to the notion that given the value of funds under management, significant PFC reallocations may have the potential to unwittingly destabilise certain financial market sectors (Zahler 2005).

replicated on a large, coordinated scale across several PFCs, it will generate a noteworthy increase in PFCs aggregate demand for foreign currency, With sufficient ensuing order flow, this may translate into depreciation pressure on the Chilean peso in the spot market.

However, the precise impact of PFCs' trading on the exchange rate depends on the nature of the transaction, a feature arising due to the binding regulatory requirements on PFCs to hedge currency risk exposures. In the context of the above transaction, these regulations require PFCs to offset their USD spot market purchases by selling USD forward, thereby generating appreciation pressure on the value of the domestic currency, acting to partially mitigate the original tendency towards peso depreciation. These FOREX hedging requirements also create a potential asymmetry, in that subsequent to coordinated PFC investor requests to switch to less risky portfolios, PFCs will use the FOREX proceeds obtained from selling overseas assets to purchase domestic currency in the spot market and invest in domestic fixed income assets. This process generates FOREX (mainly USD) inflows to the Chilean economy, which, if sufficient, will induce an appreciation of the domestic currency. There are no requirements to hedge such transactions, meaning any appreciation pressure induced by spot FOREX sales can be fully transmitted into the domestic currency exchange rate. Later, we document and attempt to quantify the importance of these effects, but initially we provide context, describing the role of financial advisory firm recommendations as a catalyst for PFC portfolio readjustments.

3 Pension Advisory Companies: Felices & Forrados

The period since 2010 witnesses the emergence and sustained growth of several unregulated pension advisory companies operating in the Chilean pension market. One such firm, Felices & Forrados (F&F), operates actively in this market from July 2011 to June 2021. For an annual subscription fee (USD 30 USD in 2020) F&F sent email recommendations to investor clients advising them into which PFC portfolio they should allocate their pension fund investments. We note this advice contains a paucity of market analysis and additional commentary to justify the particular strategy recommended. Providing pension investment advice constitutes F&F's main subscriber service, as the firm never managed investor pensions. Based upon its astute promotional and media marketing strategies, F&F gains remarkable prominence and popularity in the 2010s, claiming that investors could enhance their wealth by following their recommendations in comparison to alternative investment strategies, for example passively buying and holding a specific PFC portfolio.[5]

[5]In addition to F&F, three other unregulated financial advisory firms offer pension investment advisory services, namely (the year recommendations commence in parentheses): *Fondo Alerta* (2008), *Tiempo para*

Two striking features emerge subsequent to F&F initiating its investment recommendations in July 2011. First, the frequency of readjustments in PFC investor portfolios dramatically increases relative to previous years. Figure 3 displays the net portfolio flows through time, at the aggregate pension fund industry level. Panel (a) shows a notable increase in portfolio reallocations after F&F begins advising investors (represented by the vertical line). This increase in activity is noteworthy even when compared to previous episodes of severe financial distress, such as the 2008 global financial crisis, and intensifies during an episode of civil unrest in Chile in late 2019.

[Figure 3 in here]

Second, the greatest magnitude of portfolio switches coincides with F&F recommendation dates. In panel (b) we depict net portfolio switches during 2011-2020,clearly indicating both an increase on days when F&F announces their recommendations (represented by the vertical dotted lines) and a tendency to remain relatively high for the few days thereafter. Since 2019, when the frequency of F&F recommendations increases, the average 5-day cumulative value of portfolio switches following recommendations sums to between 15 and 20% of the average value of portfolio E, the least risky portfolio.[6] The observed persistence in portfolio switches subsequent to recommendations is a consequence of the regulatory-imposed delay necessitated by the rules PFCs must follow when processing portfolio switch requests, which we discussed earlier. In addition, any investment reallocations following dispersal of recommendation information from F&F subscribers to non-subscribers reinforces this effect. F&F popularity increases over time, despite the Chilean pension fund regulatory body providing explicit evidence demonstrating that pension investors would secure enhanced financial returns by not following F&F advice.[7] However, claims of outstanding initial performance along with successful media and web-based marketing campaigns kept its somewhat younger and

ganar (2012) and *Previsionarte* (2013). These companies are significantly less prominent in the media, and have considerably fewer followers than F&F. Figure A.1 in the appendix presents Google Trends data reporting investor interest over time, which indicates F&F is by some distance the most popular advisory firm.

[6]While portfolio E is not the largest portfolio, it invests the highest proportion of its assets in the Chilean economy than any other. This provides some perspective on the size of the portfolio switches triggered following F&F recommendations.

[7]Since 2013, the *Evidence from Superintendencia de Pensiones de Chile* (the regulator of the pension fund market in Chile) reveals that returns to PFC investors following F&F recommendations are below those from adopting passive investment strategies, such as buy-and-hold. (Superintendencia de Pensiones de Chile 2013, 2020, 2021). The popularity of F&F may be grounded in claims of the ability of its recommendations during the initial year of operations to outperform alternative investment strategies. Investigations reveal this claim appears to be spurious, as no statistically significant superior performance is evident (Da et al. 2018).

wealthier investor clientele engaged and keen to implement F&F recommendations.[8] This evidence is consistent with studies documenting that investors choose to hire financial advisors based on elements such as persuasive advertising, familiarity and so-called 'schmoozing', (Gennaioli et al. 2015), and remain loyal, even after evidence reveals the ensuing investment advice underperforms the market (Foerster et al. 2017). The next section briefly discusses relevant aspects of the Chilean Peso FOREX market and describes the mechanism whereby F&F recommendations elicit PFC FOREX trading activity.

4 The Chilean peso FOREX market, F&F recommendations and PFC trading

In 2019 transaction volume on the Chilean peso FOREX market totals around USD 1,400 billion, approximately seven times Chilean GDP, a market depth which is about 250% higher than the average of other Latin American emerging market economies. Liquidity in the Chilean FOREX market remains stable after the early 2000s and is comparable in magnitude to other regional economies.[9] Trading activity in the Chilean FOREX market activity focuses upon the spot, forward and interbank swap/repo markets, with a small residual in derivatives (futures and options). Spot trading volumes are around USD 460 billion, while currency forward and FX swaps comprise 95% of the remaining USD 940 billion of trading activity in 2019.[10] Panel (a) in figure 4 presents the trading volume in the Chilean FOREX spot market disaggregated by type of agent, revealing the main market participants both prior to and during our sample period correspond to retail and exporting companies linked to international trade, together with wealth management firms and mutual funds involved with private investment flows.

[Figure 4 in here]

Since 2011 PFC participation in the FOREX market has actively increased, largely reflecting USD transaction in response to investor portfolio reallocation requests. Figure 5 highlights the subsequent increase in PFC trading volume following the start of F&F recommendations, and by 2019 PFC trading volume constitutes 25% of total FOREX spot market

[8] Table A.1 in the appendix reveals the social demographic of F&F investor clients as compared to the average non-follower.

[9] See Villena & Hynes (2020) who follow BIS quarterly reporting standards when defining FOREX market depth as transaction value as a proportion of GDP and market liquidity as the average bid-ask spread.

[10] Based on 2019 valuations, the USD accounts for between 90% to 95% of FOREX trades, depending on the market segment, with transactions in euros representing around 7% and 1% in the spot and other markets, respectively. The remaining currency trades (less than 3%) are denominated in other global currencies.

trading activity, closely behind the 28% accounted for by retail and export companies. Panel (b) in figure 4 indicates the two main institutional agents active in the forward and FX swap sector of the FOREX market correspond to non-residents and pension fund companies, with average participation around 50% and 25% since 2019, respectively. The non-resident trading volume relates mainly to foreign banks engaging in interbank swaps, and also includes foreign investors undertaking speculative carry trade strategies using FX derivatives. The pension funds trading volume captures the mandatory currency hedging obligations imposed upon PFCs in accordance with the regulations discussed earlier.

[Figure 5 in here]

This raises one important issue that we address subsequently, namely whether PFC portfolio reallocations following F&F recommendations exacerbate exchange rate volatility. Table 2 presents a preliminary comparison of the standard deviation of changes in both the exchange rate and the PFC net trading volume in the FOREX market during different time periods. The first column in table 2 reveals that relative to its earlier levels, exchange rate volatility increases during the 2008 global financial crisis (GFC) and remains elevated after F&F starts issuing recommendations, although slightly below its crisis level. Columns two and three indicate that the volatility of PFC net trading volume in the FOREX spot and forward markets increases during the period of F&F recommendations to a level which exceeds its amplitude during the financial crisis.

[Table 2 in here]

In section 5.2, we systematically explore this relationship, controlling for additional risk factors that may influence the documented relationship. Overall, these preliminary observations suggest F&F recommendations influence investors' portfolio reallocation decisions and may act as a potential catalyst initiating large, coordinated PFC transactions in the Chilean FOREX market. Importantly, the enhanced volatility evident in PFC trading volumes since 2019 raises financial stability questions in relation to the counter-cyclical role of PFC USD trades in this market, as they may generate significant price pressures on the Chilean exchange rate and also incentivise other FOREX market participants to front-run these coordinated PFC transactions. This FOREX evidence, which we investigate later, is consistent with two related papers analysing the effect of F&F in other asset markets. Da et al. (2018) and Ceballos & Romero (2020) find F&F recommendations generate price pressure in the Chilean equity and bond markets, respectively. In addition, the former study provides evidence indicating other market participants front-run PFC equity market trades.

5 Empirical Methodology: the impact of F&F recommendations on the Chilean peso FOREX market

The prima facie evidence we document earlier suggests an association between F&F recommendations, increases in PFC portfolio switch requests, and enhanced trading volume in the Chilean peso FOREX market. In an attempt to uncover the systematic nature of the impact of F&F recommendations on FOREX transactions, we identify the news component of F&F announcements to uncover any ensuing price pressures or enhanced volatility levels in the market. We undertake four strands of analysis. First, we use an ordered logit model to establish which, if any, economic factors trigger F&F recommendations, a relevant part of our identification strategy, as it allows us to capture the specific shock component of F&F announcements. Second, having identified the news component, we adopt the local projection method to explore the nature of any resulting price pressures on the Chilean nominal exchange rate. Third, utilising the same methodological framework, we analyse the impact of F&F news on exchange rate volatility. Finally, we investigate whether other FOREX market participants initiate trading activity following F&F recommendations, possibly in an attempt to front-run trades arising from the anticipated PFC portfolio readjustments.

The data consist of both proprietary and publicly available information obtained from the Central Bank of Chile at a daily frequency. Chilean pension fund industry data denoting pension fund industry valuations and composition of the pension investment portfolios are available on the website of the Chilean pension fund regulatory body.[11] We source macroeconomic and financial data on nominal exchange rates, interest rates, VIX, S&P 500 returns, Chilean government bond returns, domestic activity and inflation expectations, and terms of trade from Bloomberg. We use a proprietary dataset from the Central Bank of Chile to obtain the daily trading volume (by agent) in the Chilean peso FOREX market. Our sample spans the period from 01 March 2012 to 22 October 2020.[12]

5.1 Identifying the news in F&F recommendations

Understanding any impact of F&F recommendations on the FOREX market requires an ability to identify the news (unanticipated shock component) the announcements contain, so the effect is not mistakenly attributed to other alternative factors which influence both

[11] Information available on the *Superintendencia de Pensiones de Chile* website (www.spensiones.cl)

[12] F&F recommendations start in July 2011, but domestic economic uncertainty index data is only available from February 2012. Further, Da et al. (2018) note that F&F does not gain popularity until early 2012 and Cuevas et al. (2016) document the number of F&F subscribers in 2011 is significantly lower than in 2012. Hence, omitting the first four F&F outlier recommendations will have negligible impact on our findings.

the exchange rate and the recommendations. This section investigates the factors triggering F&F recommendations, which are subsequently used as inputs for estimating an empirical exchange rate model. This model includes exchange rate fundamentals as well as variables influencing the probability of F&F making a recommendation, which could potentially induce exchange rate movements. The essence of F&F recommendations is to advocate investors reallocate their pension savings following a review of the appropriateness of the existing PFC portfolio risk exposure in the context of the current macroeconomic and financial environment. The principles F&F follows in delivering recommendations originate from its claims of short-run market timing ability. However, F&F's market timing claim is riddled with dynamic inconsistencies, its definition iterating between "maximising pension fund profitability" and "reducing the loss in value of pension funds", two objectives that are not necessarily compatible, and generally require different investment strategies. As a result, the typically brief explanations F&F provides to underpin their announcements accommodate a variety of circumstances, making it challenging to identify their supporting rationale.

Specifically, F&F do not disclose details of any risk assessment model it employs to gauge the overall state of the macroeconomic and financial environment. Instead, F&F releases recommendations to subscribers, providing some limited reasoning to contextualise its advice. Textual analysis reveals the most common factors F&F mentions include: (i) recent economic/financial risks, and (ii) recent developments in global equity markets, and (iii) recent developments in Chilean fixed income markets. In particular, F&F often alludes to the recent performance of both the $S\&P500$ and the Chile government bond market as key elements underpinning its market analysis. Indeed, figure A.2 in the appendix shows that $S\&P500$ returns (panel a) and domestic government bond returns (panel b) are highly correlated with returns of the riskiest and the safest PFC portfolio, respectively. Therefore, a priori, the performance of these markets appears to represent a central component of F&F's risk assessment, constituting a critical element in understanding any decision to publicise a recommendation.

5.1.1 Predicting the content of F&F recommendation announcements

These aforementioned elements underpin our decision to consider the outcome of a F&F risk assessment exercise as equivalent to an unobservable latent variable, which emanates from F&F's true model as follows:

$$\Delta Y^* = X\beta + \varepsilon \tag{1}$$

where the vector ΔY^*, the unobservable latent variable, represents changes in F&F's risk

assessment. X is a vector of variables corresponding to the factors included in F&F's risk assessment, β is a vector of coefficients to be estimated, and the vector ε is a zero mean, random disturbance term which follows a standard logistic distribution. While ΔY^* is an unobservable variable, we observe F&F recommendations. We assume F&F recommendations are a function of the latent variable (i.e. variations in F&F risk assessment) as follows:

$$Y = \begin{cases} \text{strong} & \text{if } \kappa_2 \leq \Delta Y^* \\ \text{moderate} & \text{if } \kappa_1 \leq \Delta Y^* < \kappa_2 \\ \text{no recommendation} & \text{if } \Delta Y^* < \kappa_1 \end{cases} \tag{2}$$

where Y is a vector containing the observed F&F recommendations and the κ_j's, $(j = 1, 2)$, are scalars representing the threshold points of the latent variable. According to equation 2, changes in F&F risk assessment determine the intensity and the direction of its recommendations. Specifically, a substantial (slight) increase in F&F's economic environmental risk assessment initiates a recommendation suggesting a strong (moderate) change in investment risk exposure towards less risky portfolios. with the corresponding decrease in risk triggering commensurate enhancement of portfolio investment risk. Marginal variations in F&F risk assessment outcomes effectively lead to no risk realignment recommendation.

Recall investors may only direct pension investments to a maximum of 2 portfolios. On this basis, we categorise F&F recommendations as follows, according to the suggested change in risk exposure. A strong change in risk exposure ($y_t = 2$) occurs when a recommendation advises changing to one extreme portfolio, conditional on the existing recommendation allocating investments within the opposite extreme portfolio. For instance, a strong change in risk exposure occurs when F&F recommends allocating either 100% or a fraction of pension savings into portfolio A (E), the riskiest (least risky) portfolio, given the current recommendation is to allocate either 100% or some fraction of the savings into portfolio E (A), the least risky (riskiest) portfolio. We define moderate changes in risk exposure ($y_t = 1$) as those recommendations which advise increasing investment allocations to intermediate portfolios (i.e.: portfolios B, C or D), conditional on existing recommendations mandating 100% exposure in an extreme portfolio. For example, a moderate change in risk exposure occurs when F&F recommends allocating 50% of pension funds into portfolio C and 50% into portfolio E, when the current recommendation is 100% into portfolio E. No change in risk exposure ($y_t = 0$) corresponds to a day with no recommendations.

Using our full sample of daily observations, we estimate an ordered logit model to test whether the factors F&F customarily cites as underpinning its pension advice actually serve as drivers of the probability of F&F delivering a specific recommendation. The ordered logit

model is as follows:

$$P\left(Y_i > j\right) = \frac{\exp\left(X\beta_i - \kappa_{i,j}\right)}{1 + \exp\left(X\beta_i - \kappa_{i,j}\right)} \tag{3}$$

with $i = [more\ risk,\ less\ risk]$ and $j = [1, 2]$. Y_i corresponds to a time-series, ordered categorical variable capturing both the direction and the intensity of F&F recommendations. We follow Da et al. (2018) and separately estimate the ordered logit model in equation 3 for sets of recommendations advocating taking more and less risk exposure ($i = more\ risk, less\ risk$). The intensity of F&F recommendations determines whether the ordered dependent categorical variable takes a value of 1 or 2, corresponding to situations when F&F recommends moderate or strong changes in risk exposure, respectively, and zero otherwise.

In this respect, our classification differs from Da et al. (2018), given the majority of their equity market analysis focuses on the first fifteen F&F recommendations, each of which advises a strong switch reallocation from portfolio A to E or the reverse. However, from their sixteenth recommendation in March 2014, F&F starts advocating that investors allocate funds to the intermediate risk class portfolios B, C, and D, and split pension savings across more than one PFC portfolio. Unlike Da et al. (2018), who exclude intermediate risk recommendations, our estimates include the full sample of 92 F&F recommendation announcements between 01 March 2012 and 22 October 2020, with our proposed classification capturing variations in their inherent risk exposure.[13]

The vector X represents the set of explanatory variables consisting of the economic factors F&F customarily invokes when making its recommendations. To capture any short-term monthly or weekly trends in these variables, we mirror Da et al. (2018) and include four lags of the cumulative weekly returns of the Chilean nominal exchange rate ($\Delta usdclp$), S&P 500 ($\Delta S\&P500$) and Chilean government bonds ($\Delta Bond$) and five lags of daily changes in domestic inflation expectations ($\Delta\pi$), domestic economic uncertainty (ΔDEU) and the VIX index (ΔVIX). We capture Chilean domestic economic uncertainty using the economic uncertainty index measure proposed by Becerra & Sagner (2020), which tracks economic-related uncertainty based on daily media news coverage. An increase in the index indicates enhanced economic uncertainty. Domestic inflation expectations are measured by the level of break-even inflation, computed as the yield difference between nominal and inflation-linked 2-year government bonds. This daily frequency measure is widely used by Central Banks to track high frequency inflation expectations. β_i is a vector of coefficients and $\kappa_{ij},\ (j = 1, 2)$ are

[13]Data availability necessitates exclusion of the first four F&F recommendations (see footnote 12). Table A.2 in the appendix displays the dates and advice associated with F&F portfolio recommendations, along with the designated ordered classification we use in this section in column 'Ologit'.

scalars representing the thresholds of the latent variable. The model estimates are generated using maximum likelihood specifications.

5.1.2 Results

Table 3 displays the results of the ordered logit model estimation. The dependent variable in the column 'more risk' ('less risk') corresponds to the ordered categorical variable capturing the intensity of the F&F recommendation to reallocate investment funds to more (less) risky portfolios.

[Table 3 in here]

Our main findings are as follows. Neither lagged exchange rate returns nor Chilean government bond returns exhibit any statistically significant explanatory power in relation to the probability that F&F makes a recommendation to reallocate risk. Positive S&P 500 returns in the prior week significantly reduce the probability that F&F will recommend an asset redistribution to less risky pension portfolios. This result provides some support to the belief that F&F follows short-term trends in equity markets when issuing pronouncements. Some statistical support for the position that factors capturing short-term economic and financial risks contribute to explaining the probability that F&F recommends a portfolio risk-adjustment is also evident. An increase in expected inflation significantly reduces (increases) the probability of F&F recommending riskier (safer) portfolios, a finding consistent with the view that inflation-linked bonds become more attractive with rising inflation expectations, leading to a rebalancing strategy towards portfolios allocating a majority of assets into fixed income securities.[14] Finally, both enhanced domestic economic uncertainty and increases in global risk aversion significantly reduce the probability of F&F advising a fund transfer to riskier portfolios. The fact that the estimated latent variable thresholds ($\kappa_j,\ j = 1, 2$) exhibit high significance confirms our choice of the ordered categorical variable (Y) definition given in equation 2. Moreover, the statistically insignificant χ^2 statistic when testing the parallel regression assumption in both the 'more risk' and 'less risk' models indicates that this assumption is not violated.[15] This enhances our confidence that in categorising the F&F recommendations, the risk exposure classification we implement not only captures their economic underpinnings, but is statistically validated.

[14]The less risky PFC portfolios, particularly portfolio E, mainly allocate investment funds into nominal and inflation-linked bonds.

[15]The null hypothesis in the parallel regression assumption test states there is no statistical difference in the coefficients between models using an alternative binary definition of the dependent variable, such as a model where the dependent variable takes the value of one in the highest category and zero otherwise, in comparison to a model where it takes the value of one in the second-highest category and zero otherwise.

These results lead to the following conclusions. First, the probability of F&F making recommendations is not influenced by lagged exchange rate returns, which is important for our purposes, as this evidence helps alleviate endogeneity concerns relating to possible reverse causality when we model price pressures in the Chilean Peso FOREX market in section 5.2. Second, our findings suggest that short-term changes in economic and financial risk perceptions exert some influence over F&F decision making. In particular, short-run equity returns (S&P 500) and factors capturing daily economic and financial market risk perceptions (VIX, inflation expectations and economic uncertainty) play a primary role. Third, despite the statistical evidence, the relatively low explanatory power of the predictive logit regression, as evidenced in the pseudo R2 in table 3, indicates there remains a large unexplained component to F&F recommendation announcements. This suggests that the decision-making process of F&F is also governed by non-fundamental elements incorporated into the stochastic disturbance term (ε) in equation 1. Consequently, F&F recommendations may be less informative about important economic fundamentals, with their somewhat arbitrary nature conveying noisy information to investors. This conclusion is corroborated by Da et al. (2018) who also document that fundamental factors tend to display weak explanatory power for F&F recommendations. Indeed, evidence indicates this lack of informativeness in F&F recommendations negatively impacts the pension saving of F&F followers, whose fund valuations consistently underperform those of investors who do not adhere to F&F advice(Superintendencia de Pensiones de Chile 2013, 2020, 2021).[16]

Two other important implications emerge from the previous analysis. First, as panel (b) of figure 3 depicts, the noisy process generating F&F recommendations together with its short-term investment strategy appears to exacerbate the frequency and volatility of portfolio switches. As we demonstrate later, this observed volatility of portfolio switches triggered by F&F recommendations is associated with both enhanced peso price pressures in the FOREX market and increases in exchange rate volatility. Second, the evidence suggesting that fundamental drivers only tangentially influence the F&F decision-making process permits us to interpret F&F recommendation news as an exogenous shock. This helps to (statistically) mitigate endogeneity concerns, as such news is less likely to be correlated with the error term of the exchange rate model we introduce in section 5.2.

[16]This evidence sparks a debate about the benefits of following noisy F&F recommendations which utilise short-term investment strategies, as opposed to strategies focused upon generating longer-term profitability.

5.2 Exchange rate price pressure

This section uses a time-series framework to analyse how the magnitude and temporal persistence of F&F recommendation announcements affect the Chilean peso exchange rate. We employ the local projection method (LPM) proposed by Jordà (2005) which employs impulse response functions that allow the effect of F&F recommendations to be tracked over time. This is especially useful given that the regulatory time delays which govern PFCs' processing of portfolio switch requests mean the trading and asset pricing impacts of F&F recommendations will persist for several days after their actual issuance. The dissemination of information in recommendation announcements from F&F subscribers to non-subscribers will likely reinforce this inherent tendency to persistence.

5.2.1 Local projection model

Our benchmark empirical model extends Contreras et al. (2013) who analyse the 2011 Central Bank of Chile FOREX market intervention. We supplement their explanatory variables by including F&F recommendation announcements, and project its news component's impact on the Chilean nominal exchange rate through time as follows:

$$\Delta s_{t+h} = \alpha^h + \beta^h F\&F_t + \sum_{i=1}^{2} \gamma_i^h \Delta s_{t-i} + \sum_{i=0}^{2} \delta_{k,i}^h x_{k,t-i} + \sum_{i=0}^{2} \theta_{m,i}^h z_{m,t-i} + \varepsilon_t^h \tag{4}$$

where Δs_{t+h} corresponds to the nominal exchange rate return between $t-1$ and $t+h$, with $h = 0, \ldots, 30$, and t being the day on which F&F issues a recommendation announcement. $F\&F_t$ is the variable capturing this recommendation's impact. Table A.2 in appendix displays details of F&F recommendations along with the value taken by $F\&F_t$. We define $F\&F_t$ as the first difference of $finv_t$, where $finv_t = \sum_{i=1}^{5} w_{it} p_{it}$, with $i = 1, 2, 3, 4, 5$ (the five PFC portfolios), w_{it} represents the allocation F&F recommends in portfolio i at time t, and p_{it} represents the percentage of foreign assets invested in portfolio i at time t. $F\&F_t = 0$ during days with no recommendations. By definition, the $F\&F_t$ variable captures the direction and magnitude of the F&F recommendation announcements on the nominal exchange rate. This variable's construction serves to quantify the pressure PFCs generate in the FOREX spot market, as it captures the proportion of foreign assets in the portfolios into which F&F suggests allocating savings. The $x_{k,t}$ correspond to the k exchange rate fundamental variables, based on Contreras et al. (2013), which consist of returns on the trade-weighted U.S. dollar index (ΔUSD), Chilean terms of trade (ΔToT), and the change in the interest rate differential between the short-run domestic and U.S. interest rates ($\Delta(i - i^*)$).

Following section 5.1's discussion of F&F recommendation determinants, the vector $z_{m,t}$

contains the m variables that F&F customarily cites when motivating its recommendations, namely: the change in the VIX index (ΔVIX), the change in domestic economic uncertainty (ΔDEU), the change in domestic expected inflation ($\Delta\pi$), and returns on both Chilean government bonds ($\Delta Bond$) and the S&P500 index ($\Delta SP500$). On the basis of section 5.1's results, we interpret F&F recommendation announcements as an exogenous shock uncorrelated to the error term of the exchange rate model in equation 4. The variables in x_t and z_t are included both contemporaneously and with two lags, and the model also includes two lags of the dependant variable to control for the persistence of exchange rate returns. α^h, β^h, γ_i^h, δ_i^h and θ_i^h are coefficients we estimate using ordinary least squares.

Table 4 displays the results from estimating equation 4 using daily observations over the full sample period and setting $h = 1$. The results indicate that on the day following a F&F recommendation announcement, the Chilean peso exhibits a significant average depreciation of around 0.86%. The remaining coefficients, corresponding to exchange rate fundamentals, all exhibit the expected sign, a plausible magnitude and, with the exception of the change in the interest rate differential, are statistically significant. Remaining control variables also display the expected sign, albeit not all are significant.

[Table 4 in here]

To analyse the persistence of F&F recommendations on nominal exchange rate returns we project the effect h days ahead in figure 6, here, the solid (blue) line depicts the cumulative response of the nominal exchange rate to F&F announcement news (i.e., the β^h coefficient in equation 4) with the grey area corresponding to 95% confidence interval bands. As documented previously, the exchange rate exhibits an average 0.86% cumulative depreciation the first day after F&F recommendations, which increases to a 1.6% and 1.8% cumulative depreciation by the fifth and tenth day, respectively. The statistical effect fully dissipates around eighteen days. This shock persistence over time is consistent with the PFC's mandate to delay portfolio switches to meet regulatory requirements. This evidence indicates that F&F announcement news, while noisy by its nature, generates significant pressure on the Chilean peso nominal exchange rate.[17]

[Figure 6 in here]

[17] As a robustness check, we re-estimate equation 4 again using the Da et al. (2018) F&F shock definition. Figure A.3 in the appendix reveals the impact on the nominal exchange rate is 0.5%, 1% and 1.2%, after 1, 5 and 10 days, similar in terms of significance but lower in magnitude as compared to our F&F announcement news definition.

To control for any effect of overlapping recommendations, we drop any announcements that occur within a twenty-day window of the previous recommendation, displaying the results in Figure 7. After excluding overlapping recommendations, the impact of F&F news on the exchange rate is similar in magnitude, still evidencing a depreciation close to 1% on the first day after the recommendation. However, in line with expectations, the effect now dissipates sooner (since any overlapping recommendations augment the prior shock and induce a prolonged exchange rate response), becoming insignificant ten day following the initial recommendation.

[Figure 7 in here]

5.2.2 Comparing the effect of F&F news with other FOREX market shocks

To further contextualise our results, we compare the effect of F&F announcements on the nominal exchange rate to the findings in Aldunate et al. (2022). Table 5 summarises this comparison, indicating that Aldunate et al. (2022) estimate a cumulative exchange rate depreciation of 0.25% and 0.44% one and five days after F&F recommendations, with the duration of their estimated impact also lasting 10 days. Although their results are somewhat lower in magnitude than the present findings, the estimated exchange rate impact is similar. This suggests that the intermediate portfolio switches recommended by F&F (portfolios B, C and D) we include in our analysis provide additional depreciation impulses to the peso. Furthermore, we also compare our results to the impact of historical FOREX market interventions by the Central Bank of Chile (CBCL), by definition events designed to influence spot exchange rate dynamics. Contreras et al. (2013) find the 2011 FOREX market intervention serves to depreciate the exchange rate by 4.6% and 12% one and five days after the intervention announcement, with a discernible statistical announcement evident between fifteen and eighteen days later. To date, no study quantifies the effect of the most recent CBCL interventions, so as a guide, we use the observed percentage exchange rate changes, which correspond to -3% (-5.5%) and 1.4% (1.2%) one (five) day(s) after the 2019 and 2021 CBCL interventions, respectively. The comparison in table 5 indicates that the effect of F&F announcement news on the exchange rate, while somewhat lower in absolute magnitude and less persistent than the CBCL FOREX market intervention announcements, is certainly comparable in magnitude to those at the lower end of the spectrum.

[Table 5 in here]

5.2.3 FOREX trading volume and the peso exchange rate

This section analyses if trading volume patterns accompanying PFC portfolio reallocations exert a discernible influence on the peso exchange rate. These results provide additional corroborating evidence to clarify the market mechanisms and dynamics underlying our previous findings that the peso exchange rate is subject to pricing pressure following F&F announcement news. Our approach follows Evans & Lyons (2002) who include order flow (signed, net transaction volume) as a fundamental driver explaining exchange rate returns, allowing us to quantify the effect of PFC transactions on the peso FOREX market without the need to directly consider the effect of F&F recommendation news.

Our model specification, utilising PFC trading volume in the Chilean peso FOREX market is given by:

$$Y = NetTrdVol\,\theta + X\beta + \varepsilon \tag{5}$$

where Y is a vector of nominal exchange rate returns. $NetTrdVol$ is a vector of changes in PFC net trading volume in both the FOREX spot and forward markets. X is a vector of first differences of exchange rate-relevant fundamental variables based on Contreras et al. (2013). ε is a vector representing the error term. β and $\theta = [\theta_{spot}, \theta_{forward}]$ are the coefficients we estimate using ordinary least squares using daily observations over the full sample period.

[Table 6 in here]

The results are presented in table 6, revealing that the change in PFC net trading volume in both the spot and forward markets are statistically significant and exhibit the expected sign. For each additional USD billion of PFC purchases (sales) in the spot (forward) market the Chilean peso depreciates (appreciates) 0.32% (0.20%).[18] Since 2011, the average two-day cumulative change in PFC net trading volume in the FOREX spot market following a F&F recommendation is around USD 2 billion, leading us to infer the exchange rate depreciates 0.65% (=0.323x2) due to the cumulative direct effect of PFC activity in the FOREX spot market two days after F&F announcements. Although slightly lower in magnitude, these findings are consistent with the exchange rate pressures estimated using the LPM in equation 4, supporting the idea that F&F recommendations trigger PFC FOREX market order flow which ultimately impacts the nominal exchange rate. The significant coefficient estimates on PFC trading volume in the FOREX market (θ) reveal that $\theta_{forward} < 0 < \theta_{spot}$ and

[18] The change in PFC net trading volume in FOREX spot and forward markets is measured in USD billion. A positive value in Δ PFC net trading volume in the Peso FOREX spot (forward) market represents net purchases (sales) of USD.

$|\theta_{forward}| < \theta_{spot}$. These results provide empirical support for the view that the hedging strategy PFCs are mandated to undertake in the FOREX forward market acts to partially offset the ensuing exchange rate depreciation pressures arising from spot market purchases of USD.

5.2.4 Asymmetric impact of F&F recommendations

Now we undertake an analysis of potential asymmetries that F&F recommendations induce, by considering separately the effect of those announcements advocating investors reallocate funds to PFC portfolios with more and less risky exposures. Initially, we estimate the LPM in equation 4 only for recommendations which suggest investors enhance their risk exposure, with the F&F variable, $F\&F$, taking the relevant positive ordered value given in Table A.2, and zero otherwise. Subsequently, we re-estimate equation 4 this time for announcements proposing investors reduce risk exposure, with the relevant negative value on the relevant ordered F&F variable in Table A.2 multiplied by -1 to ensure positivity of $F\&F$, the dependant variable (its value is zero for non risk-reducing recommendations).

[Figure 8 in here]

The cumulative impact of the two sets of F&F recommendations are given in panels (a) and (b) in figure 8, respectively. Risk enhancing (mitigating) recommendations both generate a cumulative depreciation (appreciation) of around 0.8% the day following the recommendations, with the former (latter) dissipating six (twenty) days after the recommendation announcement. The asymmetric duration of the cumulative impact is illustrated in Figure 8 panel (c), in which we multiply the cumulative effect of taking less risk by -1 to facilitate comparisons. This evidence is consistent with the mandatory requirement that PFCs must hedge any currency risk exposure by selling currency forward in the FOREX market after purchasing spot USD, a strategy they initiate only when increasing portfolio risk exposure. These results provide evidence that compulsory forward sales of USD partially compensate for the depreciation pressures of PFC purchases of USD in the FOREX spot market and are fully consistent with the evidence considered in section 5.2.3.

5.3 Exchange rate volatility

We proceed by investigating if the documented pressure that F&F announcement news exerts on exchange rate returns translates into enhanced exchange rate volatility. Related studies argue that trading by pension fund investors focusing on short-term horizon strategies, embodied by F&F clients, tends to exacerbate asset price volatility (Levy & Zuniga 2016, OECD

2020). Following Diebold & Yilmaz (2009) we estimate a range-based measure of nominal exchange rate realised volatility using intraday observations as follows:[19]

$$\begin{aligned}\hat{\sigma}_t^2 = 0.511\,(H_t - L_t)^2 - 0.019\,[(C_t - O_t)\,(H_t + L_t - 2O_t) \\ -2\,(H_t - O_t)\,(L_t - O_t)] - 0.383\,(C_t - O_t)^2\end{aligned} \tag{6}$$

where H_t, L_t, O_t, C_t represent the intraday high, low, open, and close price on day t.

[Figure 9 in here]

Preliminary evidence shown in figure 9 reveals that our measure displays volatility clusters after mid-2011, and realised volatility in the exchange rate tends to spike during F&F recommendation days (vertical dotted lines). In similar fashion to section 5.2, the exchange rate volatility effects of F&F recommendations are estimated using a modification of the LPM in equation 4, in which our dependent variable measures the cumulative change in the natural logarithm of the square root of exchange rate volatility. The explanatory variables and the F&F definition of news remain unaltered.

[Figure 10 in here]

Figure 10 panel (a) illustrates the effect of F&F announcement news on the cumulative change in exchange rate volatility. It reveals a sharp increase in volatility of around 100% on the initial day following F&F recommendations. This effect on exchange rate volatility is short-lived, with the statistical significance of the cumulative volatility impact quickly dissipating over subsequent days. This robust but short-lived effect on exchange rate volatility is consistent with section 5.2's findings, indicating the majority of the exchange rate impact occurs during the first day after F&F recommendations and diffuse thereafter (figure 6). [20]

To validate the robustness of our findings, we analyse the effect of F&F recommendations on the conditional volatility of exchange rate returns using a GARCH model which includes F&F announcement news as an additional explanatory variable in the variance equation of

[19]This range-based implied volatility measure is very similar to a simpler volatility measure estimated as the square of exchange rate returns. A comparative time-series plot of both volatility measures is available upon request.

[20]Comparing our results to related studies quantifying the impact of comparable exchange rate volatility shocks, Fuentes et al. (2014) document that the 2011 CBCL intervention in the Chilean FOREX spot market increases exchange rate volatility by 36%, although the magnitude becomes less significant once they control for additional factors. The comparative lower volatility impact of CBCL interventions in the FOREX market may relate to the Central Bank's financial stability promotion, suggesting the intent of such interventions is to reduce rather than to enhance exchange rate fluctuations. Neely (2008) provides a detailed analysis of the literature discussing Central Bank interventions, revealing the lack of consensus in this area.

the model.[21] The mean equation in our GARCH formulation corresponds to equation 4, excluding the F&F news from the set of explanatory variables, with the conditional variance of cumulative exchange rate returns specified as follows:

$$\sigma^2_{t,h} = \omega^h + \alpha^h \varepsilon^2_{t-1,h} + \beta^h \sigma^2_{t-1,h} + \gamma^h FF_t \tag{7}$$

where $\sigma^2_{t,h}$ represents the conditional variance of cumulative exchange rate returns. $\varepsilon_{t,h}$ are the residuals of the mean equation. FF_t corresponds to the F&F recommendation news defined as in section 5.2. ω, α, β and γ are the coefficients estimated using maximum likelihood. As in the previous analysis, we formulate h days ahead projections of the effect of F&F recommendation news on the conditional variance of cumulative exchange rate returns. Figure 10 panel (b) illustrates the results. The solid line represents the cumulative response of nominal exchange rate volatility to F&F recommendation news (i.e., the γ^h coefficient projected h days ahead) we obtain from equation 7. The results are consistent with the earlier exercise, with the increase in exchange rate volatility being short-lived, the majority of the effect arising during the initial days following the F&F recommendations.

Viewed collectively, this section's evidence suggests that F&F recommendations enhance exchange rate volatility, albeit this impact is of short duration. Our results are consistent with related studies arguing that the trading decisions of investors focusing on short-term horizons tend to exacerbate asset price volatility (Levy & Zuniga 2016, OECD 2020).

5.4 FOREX market trading volume

Our findings to this point suggest trading subsequent to F&F recommendations generates enhanced pressure on the Chilean peso nominal exchange rate and exacerbate its volatility. We proceed by analysing the impact of these recommendations on the peso spot market trading patterns of different classes of investors, employing a proprietary dataset from the CBCL which contains information of the daily FOREX trading volume of six important classes of market participants: Pension fund companies (PFCs), non-residents, retail companies, insurance companies, stock brokers, and mutual funds. Our hypothesis is informed by how regulations governing the timing of PFC portfolio readjustments raise the possibility that other market participants may benefit by anticipating the direction of coordinated

[21] Other studies also implement this GARCH methodology to estimate the effect of shocks to the FOREX market on exchange rate volatility. Doroodian & Caporale (2001) find that Central Bank interventions in the FOREX market generate a significant increase in volatility (measured as conditional variance of exchange rate returns) in the yen/dollar and mark/dollar sectors, while Domac & Mendoza (2004) find that Central Bank interventions reduces exchange rate volatility in Mexican and Turkish FOREX markets.

PFC-initiated trading volume in the FOREX market following F&F recommendations and front-running the trades. We provide evidence supporting this conjecture later in this section.

To calculate the impact of F&F recommendations on the trading behaviour of the six classes of market participant, we estimate the regression model in equation 8 over the full sample period:

$$TrdVol_{p,t} = DFF_t\theta_p + X_{t-1}\beta_{p,1} + X_{t-2}\beta_{p,2} + \varepsilon_{p,t} \tag{8}$$

where $TrdVol_{p,t}$ is a vector containing the time-series of the natural logarithm of trading volume in the Chilean peso FOREX spot market of investor class p. Each subscript $p = 1, \ldots, 6$ denotes one of the six classes of FOREX spot market participants to which we refer above. DFF_t is a vector which contains h categorical variables taking a value of one h days (with $h = 1, \ldots, 10$), following an F&F recommendation and zero otherwise. X_{t-1} and X_{t-2} represent vectors of control variables lagged one and two periods, respectively. ε_p is a vector representing the residual term of investor class p. The control variables in X_{t-1} and X_{t-2} are those we include in equation 4. The vectors of coefficients, $\theta_p, \beta_{p,1}$ and $\beta_{p,2}$, are estimated using ordinary least squares.

[Table 7 in here]

Table 7 displays the estimation results from equation 8, with the main findings as follows. First, on the day following a F&F recommendation announcement, PFC trading volume increases significantly, reaching its peak after four days, then gradually diminishes over time. This pronounced hump-shaped pattern is consistent with the manner in which the regulations discussed in section 2 mandate PFCs to implement portfolio switches, stating that PFCs must wait until the fourth day following receipt of a switching request to reallocate fund assets. Consequently, when viewed in isolation, these regulations lead to an expected increase in PFC FOREX spot market trades on the fourth day following F&F recommendation announcements. Interestingly, PFC trading volume actually starts to increase from $t+1$, the day following an F&F recommendation, This suggests that PFCs anticipate a large number of portfolio switching requests following F&F recommendations and immediately begin to accommodate their FOREX needs. Second, on average we observe a significant average increase of 25% and a 35% in non-resident and mutual fund companies spot market trades, respectively, after F&F recommendations. When we consider that PFCs and non-residents together constitute more than 50% of the total FOREX market trading, this significant increase in their transactions after F&F recommendations likely translates to enhanced pressure on the nominal exchange rate. This evidence is consistent with the results documented in figure 6, namely the impact on the nominal exchange rate is manifest from the day immediately

following F&F recommendations, even though PFCs can only process switching portfolio requests four days after receipt. Third, no persistent changes are evident in the volume of FOREX trading volume by either retail, insurance, or stock brokering companies following F&F announcement days.

Overall, this set of results raises the possibility that F&F recommendation news not only significantly increases PFC trading volume, but that it may also induce certain other classes of FOREX market participants, such as non-resident investors and mutual fund companies, to anticipate such massive and coordinated PFC transactions in the peso FOREX spot market. Our evidence closely relates to the findings in Corsetti et al. (2002) showing that transactions by large, sophisticated investors in the FOREX market exert other market participants to trade in this market more aggressively. Our findings are also consistent with the findings in Da et al. (2018) who document that F&F recommendations generate significant changes in investors' trading patterns in the Chilean stock market. While we do not test the proposition directly, it is conceivable that the regulatory trading restrictions which mandate a delay to PFC portfolio switches, provide both an incentive and an opportunity enabling other market participants to attempt to profit by front-running these anticipated PFC trades.

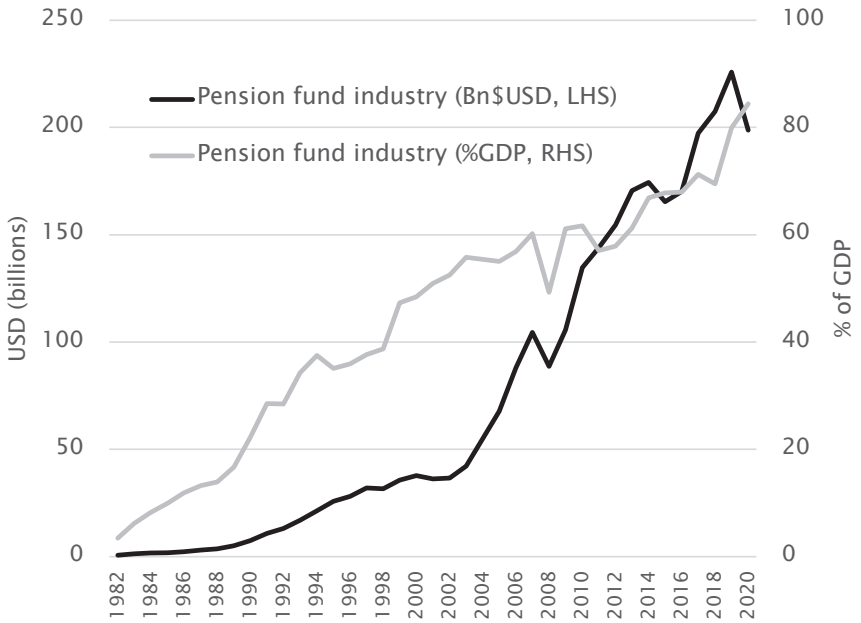
6 Conclusion

The increasing prominence of Felices & Forrados (F&F), a financial advisory firm in the Chilean pension fund industry, positioned the company as the most relevant firm in the growing market providing pension investment recommendations to investors. Focusing on short-term horizon investment strategies, F&F recommendations trigger large asset reallocations within the pension fund system. This asset reallocation translates into massive, coordinated transactions by pension fund companies in the Chilean peso sector of the FOREX market. In this study, we show that F&F recommendations, although noisy in their nature in the sense they cannot be predicted accurately by macroeconomic or financial market developments, generate a considerable pricing impact on the Chilean peso FOREX market. Among the main results, we show that the Chilean peso depreciates by 0.86% on average after F&F recommendations and the impact persists for ten days. We also find that F&F recommendations exert a substantial increase in exchange rate volatility, although the effect is short-lived and dissipates quickly over time. Collectively, our evidence suggests F&F recommendation announcements generate significant price pressures in the Chilean peso FOREX market. Our findings are consistent with related studies arguing that substantially large, coordinated asset reallocations based on short-term investment strategies tend to impact asset prices, pushing them beyond fundamentals and exacerbating price volatility. Further highlighting our find-

ings which provide evidence that F&F recommendations exert considerable exchange rate pressures, we document that certain other classes of markets participants may anticipate the ensuing large, coordinated transactions of PFCs in the FOREX market, and attempt to profit by front-running these trades, although we leave detailed analysis of this issue to future research. Our results suggest F&F recommendations generate a meaningful impact on the Chilean peso FOREX market that may not be consistent with financial stability objectives. The findings contained in this study contribute to the ongoing policy discussions concerning the appropriate regulation of financial advisory companies operating in the pension fund industry in Chile. Moreover, our analysis also has implications for multiple other jurisdictions which harbour similar pension fund systems, particularly for countries whose regulation allows investors to actively choose investment portfolios based on recommendations of unregulated financial advisory firms.

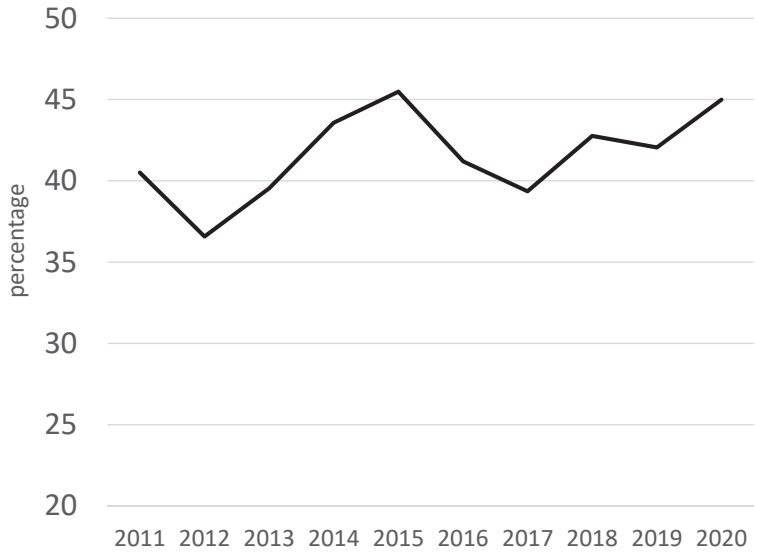
Figures

Figure 1: Pension fund industry value



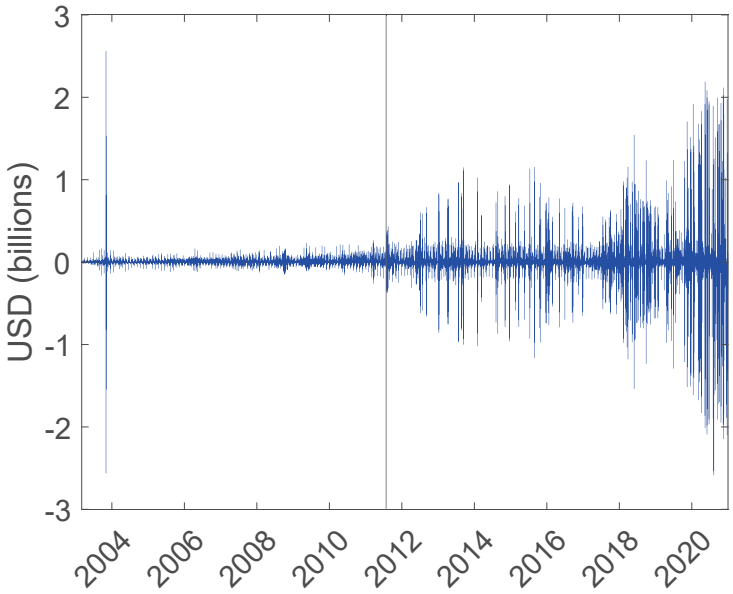
Value of the pension industry in Chile, annual observations, 1982 to 2020. Black line corresponds to the value in billion USD (left-hand side axis). Grey line corresponds to values as a percentage of the Chilean GDP (right-hand side axis). Source: Chilean regulatory body of the pension fund industry.

Figure 2: Percentage of assets invested in foreign markets, aggregate industry

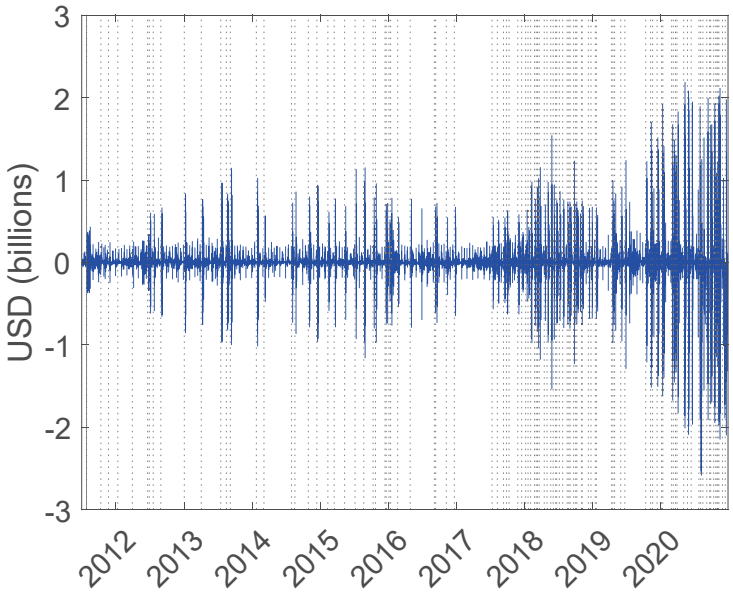


Percentage of assets invested in foreign markets at aggregate industry level (aggregate assets of the PFCs). Annual observations, 2011-2020. Source: Chilean regulatory body of the pension fund industry.

Figure 3: Net pension saving flows



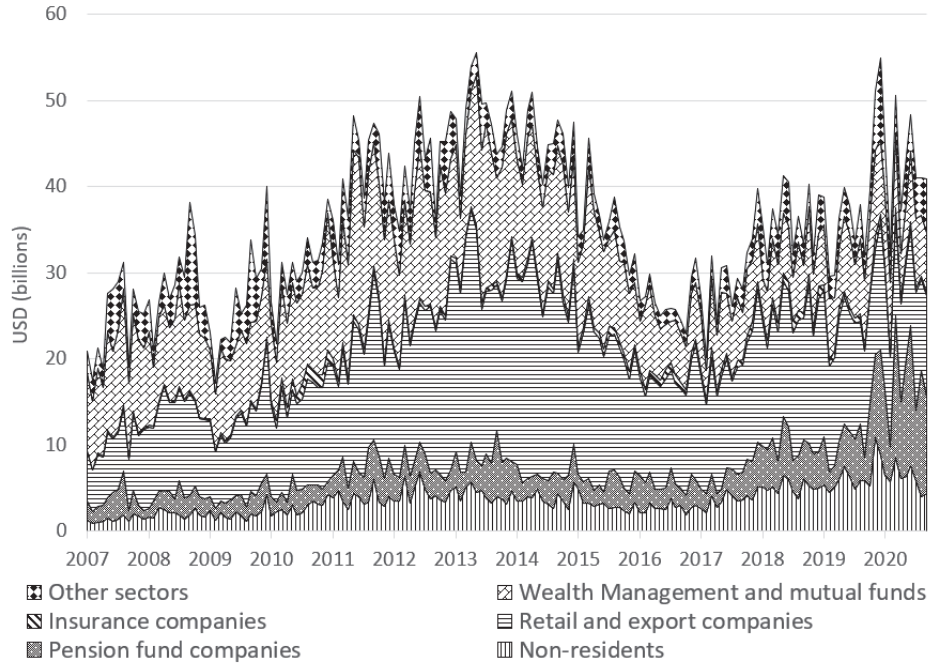
(a) 2003-2020



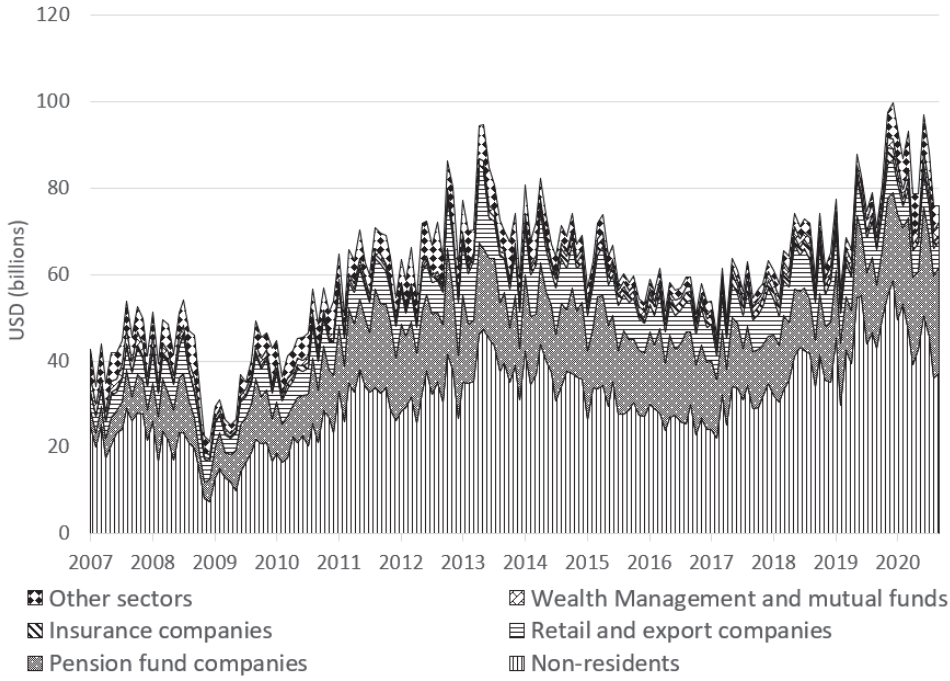
(b) 2011-2020

Net portfolio flows in USD (billions). Portfolio flows correspond to the aggregate daily observations at the industry level, all funds included (A, B, C, D, and E). Vertical line in panel (a) indicates the day F&F recommendations commence (July 2011). Vertical lines in panel (b) indicate the dates F&F issues recommendations. Source: Superintendencia de Pensiones de Chile.

Figure 4: Trading volume in the Chilean FOREX market by agent



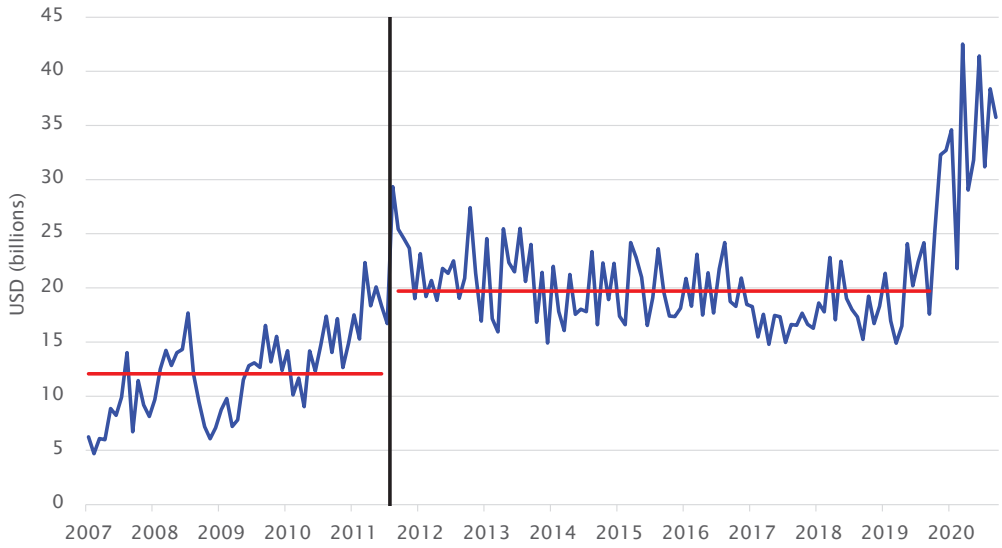
(a) FX spot market



(b) FX derivative market

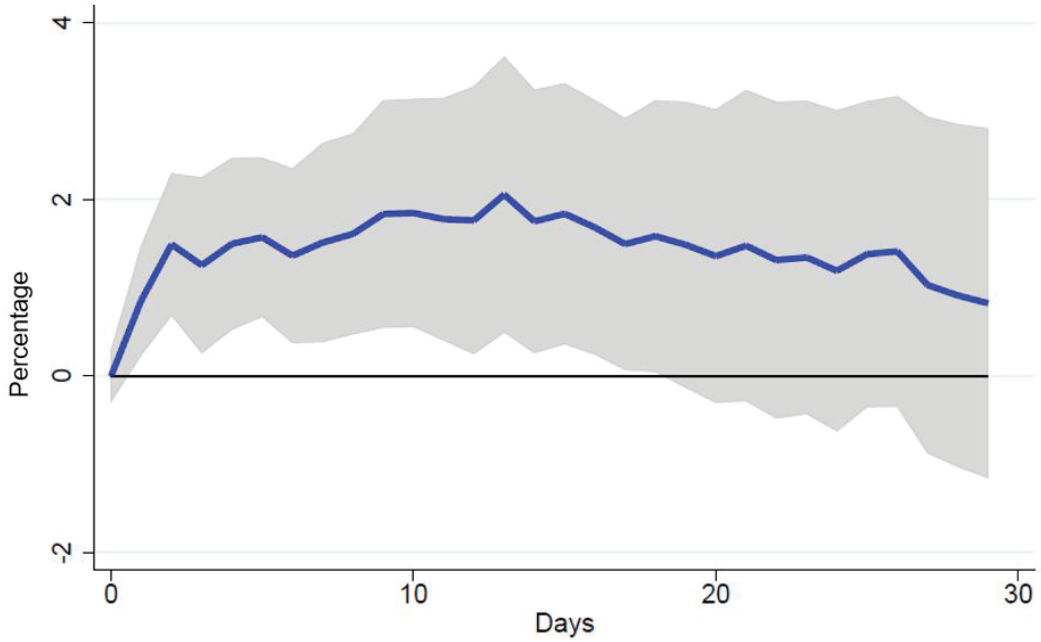
Trading volume in the Chilean FOREX markets by agent. Values in USD (billions). Monthly observations, 2007 to 2020. Source: Central Bank of Chile.

Figure 5: PFC trading volume in the FOREX market



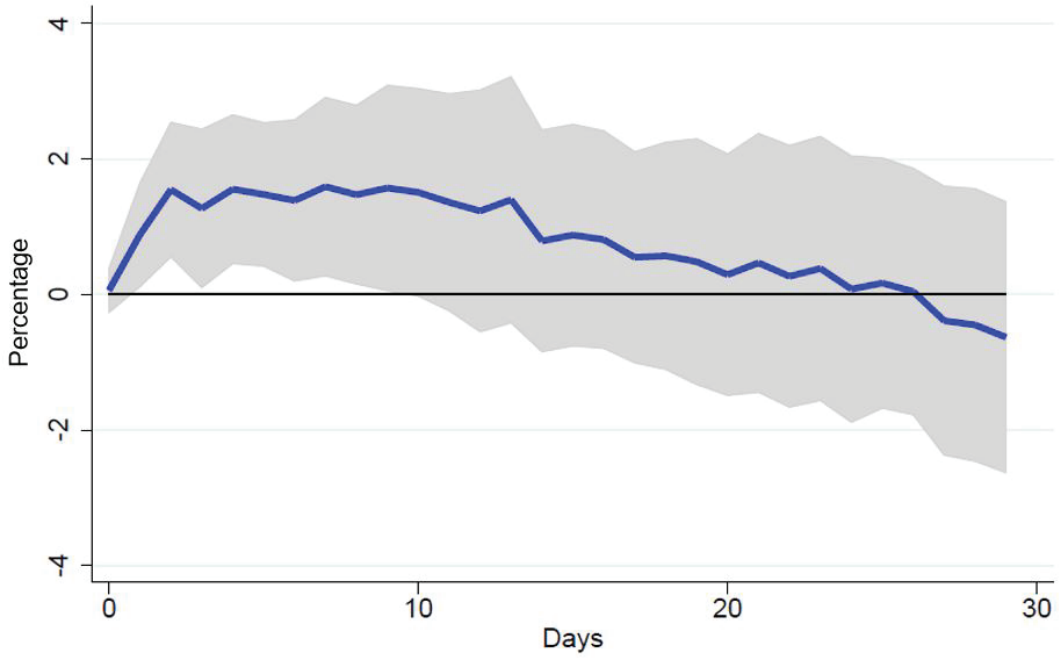
Trading volume of pension fund companies (PFCs) at aggregate industry level in the Chilean FOREX market (spot and derivative), in USD (billions). Monthly observations, 2007-2020. The vertical black line represents the date F&F commences recommendations. Horizontal red lines denote the average PFC trading volume before and after F&F recommendations. The average PFC trading volume before F&F recommendations corresponds to $12 billions dollars. The average PFC trading volume after F&F recommendations (excluding the period from 2020 onwards) corresponds to $20 billions dollars. Source: Central Bank of Chile.

Figure 6: Cumulative response of nominal exchange rate to F&F news



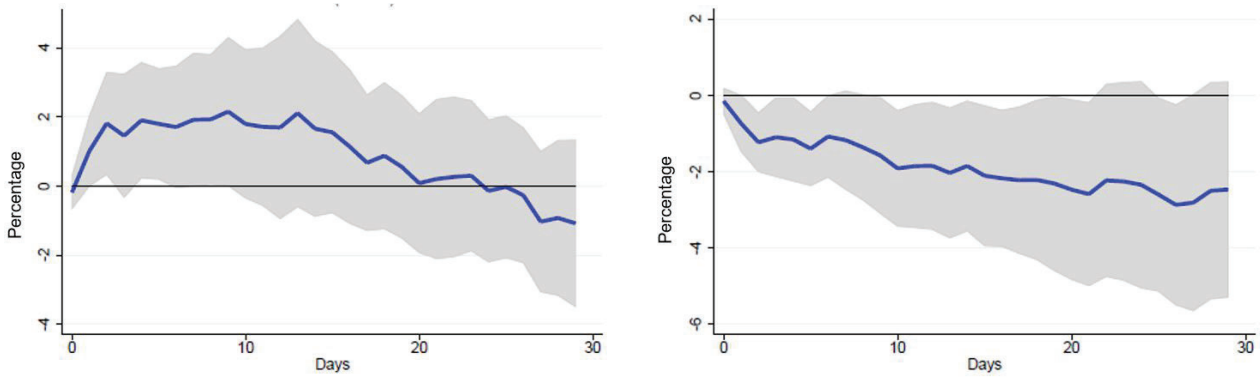
The blue line represents the cumulative response of the $\Delta usdclp$, in percentage change, to F&F news at horizon h (days). An increase indicates a Chilean peso depreciation. The cumulative response of the $\Delta usdclp$ corresponds to the estimated β^h coefficient of equation 4, with $h = 0, ..., 30$. The grey area represents 95% confidence bands. Daily observations, 01 March 2012 - 22 October 2020. The impact of F&F news is statistically significant when the confidence bands exclude zero. Source: Authors' calculations.

Figure 7: Cumulative response of nominal exchange rate to F&F news, excluding overlapped recommendations

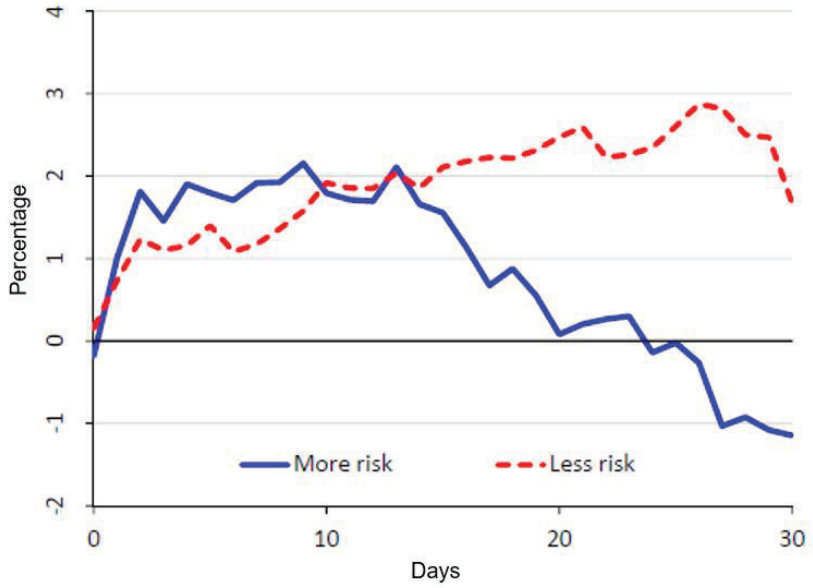


The blue line represents the cumulative response of the $\Delta usdclp$, in percentage change, to FF news at horizon h (days). An increase indicates a Chilean peso depreciation. The cumulative response of the $\Delta usdclp$ corresponds to the estimated β^h coefficient of equation 4, with $h = 0, ..., 30$. The grey area represents 95% confidence bands. This estimation excludes overlapped recommendations. See table A.2 in appendix for details of those overlapped dates, marked with an star (*). Daily observations, 01 March 2012 - 22 October 2020. The impact of F&F news is statistically significant when the confidence bands exclude zero. Source: Authors' calculations.

Figure 8: Asymmetric impact of F&F recommendations



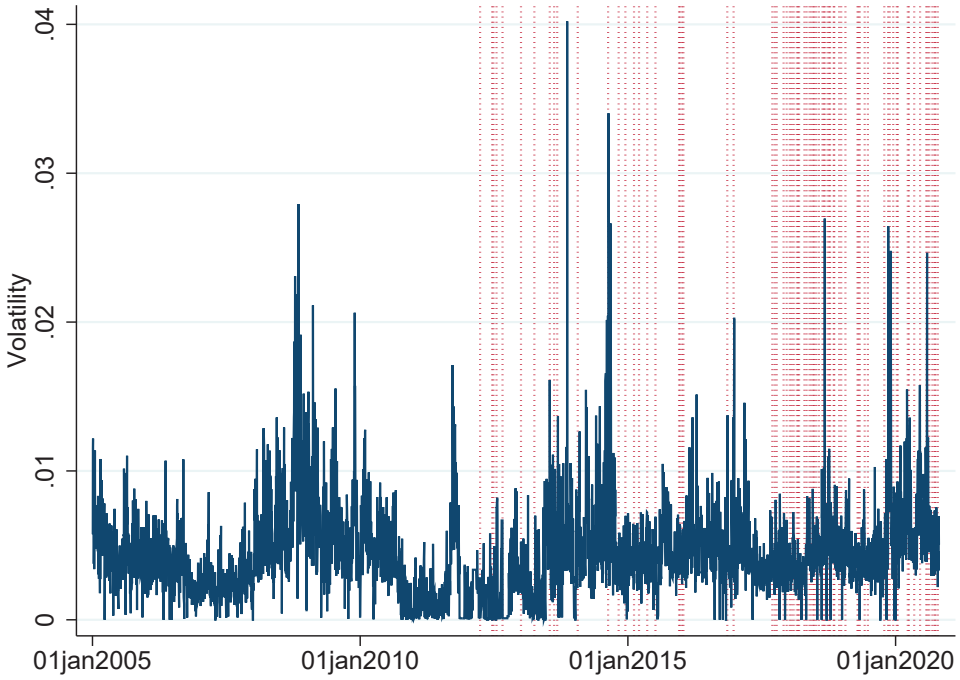
(a) More risk (b) Less risk



(c) Asymmetric impact point estimate

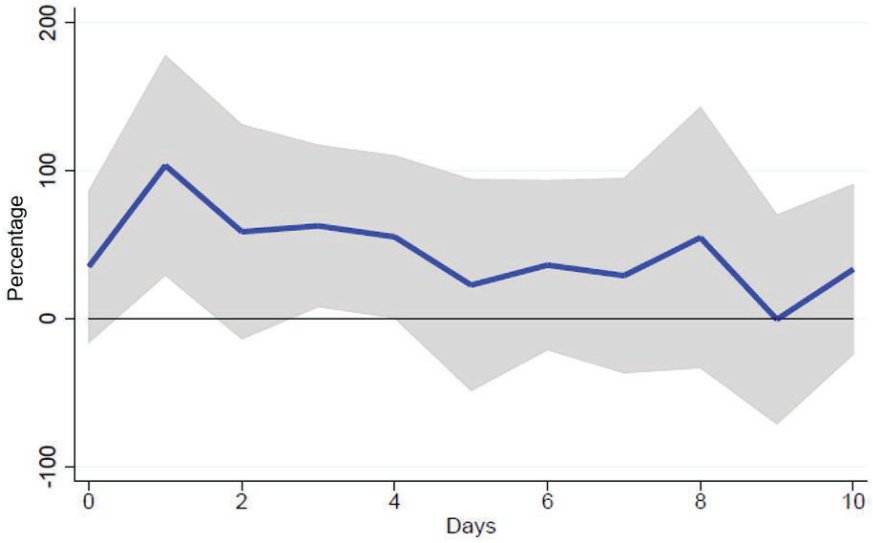
The blue line in panels (a) and (b) represents the cumulative response of the $\Delta usdclp$, in percentage change, to FF news at horizon h (days) suggesting to take more and less risk, respectively. An increase (decrease) indicates a domestic currency depreciation (appreciation). The cumulative response of the $\Delta usdclp$ corresponds to the estimated β^h coefficient of equation 4, with $h = 0, ..., 30$. The grey area represents 95% confidence bands. The blue line in panel (c) represents the point estimate of panel (a), while the red dashed line represents the point estimate of panel (b), which is multiplied by minus one for illustration purposes only. Daily observations, 01 March 2012 - 22 October 2020. The impact of F&F news is statistically significant when the confidence bands exclude zero. Source: Authors' calculations.

Figure 9: Nominal exchange rate volatility

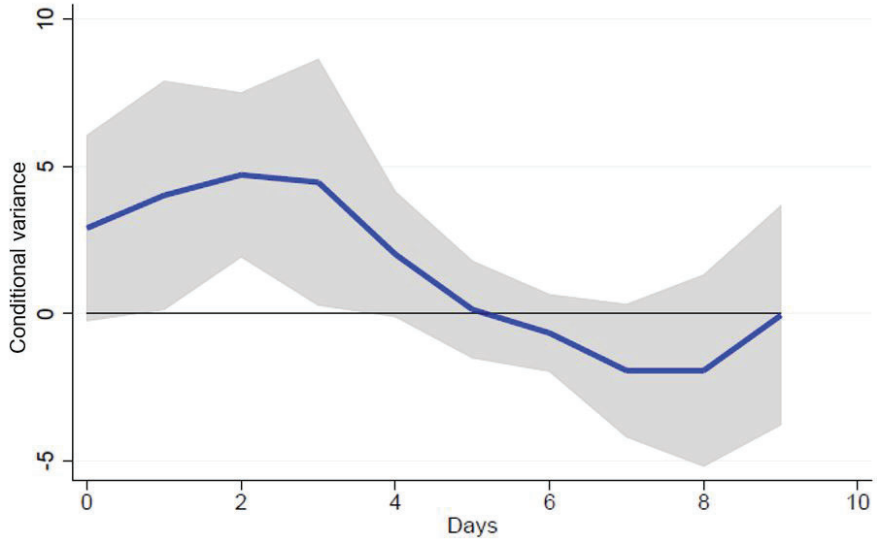


The blue solid line corresponds to the square root of the exchange rate volatility introduced in equation 6. Vertical dotted lines denote the days when F&F issues recommendations. Source: Authors' calculations.

Figure 10: Cumulative response of exchange rate volatility to F&F news



(a) Exchange rate return volatility



(b) Conditional variance exchange rate returns

The blue line in panel (a) represents the cumulative response of the exchange rate volatility, in percentage change, to F&F news at horizon h. The cumulative response of the exchange rate volatility corresponds to the estimated β^h coefficient of equation 4, with $h = 0, ..., 10$, where the dependent variable corresponds to the cumulative change in the natural logarithm of the square root of exchange rate volatility. The blue line in panel (b) represents the cumulative response of the conditional variance of nominal exchange rate returns to FF news at horizon h. The cumulative response of the conditional variance of nominal exchange rate returns corresponds to the estimated γ^h coefficient of equation 7, with $h = 0, ..., 10$. The grey areas represent 95% confidence bands. Daily observations, 01 March 2012 - 22 October 2020. The impact of F&F news is statistically significant when the confidence bands exclude zero. Source: Authors' calculations.

Tables

Table 1: Pension fund company portfolio composition

	Portfolio					
	A	**B**	**C**	**D**	**E**	**Total**
Panel A: Value (US$ Bn)						
Value	22.3	26.7	66.0	36.0	48.4	199.4
Panel B: Composition (% of the portfolio)						
Domestic	16	32	51	71	88	55
Equity	13	11	7	3	2	6
Fixed income	4	22	44	68	87	49
Foreign	84	68	49	29	12	45
Equity	66	48	31	15	3	29
Fixed income	18	20	18	14	9	16
Panel C: Equity investment limits (% of the portfolio)						
min.	40	25	15	5	0	–
max.	80	60	40	20	5	–

Panel A displays the value in USD (billion) of each portfolio at an aggregate pension fund industry level in 2020. Panel B exhibits the composition of each portfolio considering the location of the invested assets (domestic or foreign markets) and its type (equity or fixed income). Panel C shows the equity investment limits as a percentage of the total portfolio. Source: Superintendencia de Pensiones de Chile (Chilean regulatory body of the pension fund industry).

Table 2: Preliminary facts

Episodes	σ usdclp	PFC net trading vol FOREX	
		σ spot	σ forward
Pre GFC	0.55	29.3	59.3
GFC	0.90	91.9	164.7
Since F&F	0.63	174.1	174.7

σ usdclp represents the standard deviation of daily Chilean exchange rate returns. σ spot and σ forward represent the standard deviation of the daily change in the pension fund company trading volume in the Chilean FOREX Spot and Derivative markets, respectively. Dates pre global financial crisis (Pre GFC): January 2003 - July 2007. Global financial crisis (GFC): July 2007 - August 2009. Since F&F: July 2011 - September 2020. Source: Authors' calculation based on Central Bank of Chile.

Table 3: Ordered logit model of F&F recommendation determinants

		More risk	Less risk
$\Delta usdclp$	$t-1$	0.180	-0.189
		(0.140)	(0.140)
	$t-2$	-0.194	0.170
		(0.140)	(0.160)
	$t-3$	-0.097	-0.176
		(0.210)	(0.150)
	$t-4$	-0.194	-0.068
		(0.140)	(0.150)
$\Delta SP500$	$t-1$	0.123	-0.255***
		(0.120)	(0.100)
	$t-2$	-0.043	0.178*
		(0.090)	(0.090)
	$t-3$	-0.105	0.013
		(0.120)	(0.090)
	$t-4$	-0.022	0.005
		(0.110)	(0.050)
$\Delta Bond$	$t-1$	-0.237	0.171
		(0.170)	(0.220)
	$t-2$	-0.153	-0.364*
		(0.230)	(0.200)
	$t-3$	0.008	0.264
		(0.270)	(0.250)
	$t-4$	-0.272	-0.001
		(0.240)	(0.340)
$\Delta\pi$	$t-1$	-7.032**	1.168
		(3.450)	(4.160)
	$t-2$	-5.638	-0.636
		(3.760)	(4.080)
	$t-3$	-6.130	11.946**
		(4.290)	(4.780)
	$t-4$	3.865	0.462
		(7.820)	(4.400)
	$t-5$	0.156	-4.120

		(4.290)	(5.420)
ΔDEU	$t-1$	-0.072	-0.024
		(0.060)	(0.040)
	$t-2$	0.058	-0.002
		(0.050)	(0.030)
	$t-3$	-0.110**	-0.020
		(0.050)	(0.040)
	$t-4$	0.022	-0.016
		(0.020)	(0.050)
	$t-5$	-0.015	0.066
		(0.040)	(0.050)
ΔVIX	$t-1$	-0.314**	0.086
		(0.150)	(0.070)
	$t-2$	-0.352***	-0.037
		(0.110)	(0.090)
	$t-3$	0.053	0.019
		(0.080)	(0.060)
	$t-4$	-0.039	-0.081
		(0.090)	(0.080)
	$t-5$	-0.114	0.037
		(0.100)	(0.080)
Latent variable thresholds			
κ_1		4.670***	4.184***
		(0.320)	(0.240)
κ_2		5.089***	4.549***
		(0.380)	(0.280)
Parallel assumption test			
χ^2		22.590	19.120
p-value		[0.707]	[0.866]
N Obs		1511	1511
Pseudo R2		0.15	0.09

Estimation of the ordered logit model of equation 3 using daily observations from 01 March 2012 to 22 October 2020. The dependent variable of the model in column 'more risk' ('less risk') corresponds to an ordered categorical variable capturing the intensity of F&F recommendation to take more (less) risk. The ordered dependent variable takes values of 1 and 2 when F&F recommends a moderate and strong change in risk exposure, respectively, and zero otherwise. A strong change in risk exposure occurs when a recommendation suggests changing to one extreme portfolio conditional on the existing recommendation allocating investments within the opposite extreme portfolio. We define moderate changes in risk exposure as those recommendations which suggest an increased allocation to intermediate portfolios (i.e.: portfolios B, C or D), when existing recommendations involve an extreme portfolio allocation. The last column of table A.2 in the appendix displays this classification. The set of explanatory variables consists on four lags of the cumulative weekly returns of the Chilean nominal exchange rate ($\Delta usdclp$), S&P 500 ($\Delta S\&P500$) and Chilean government bonds ($\Delta Bond$). In addition, we also include five lags of daily changes of domestic inflation expectations ($\Delta\pi$), domestic economic uncertainty (ΔDEU) and VIX index (ΔVIX). We estimate the models using maximum likelihood. Standard errors in parentheses. P-values of the parallel regression assumption test in square brackets. (*), (**), (***) indicates statistical significance at 10, 5, and 1% level, respectively. Source: Authors' calculations.

Table 4: Effect of F&F news on Chilean exchange rate

		$\Delta usdclp_{t+h}$
F&F	t	0.857***
		(0.314)
ΔUSD	t	1.085***
		(0.074)
	$t-1$	0.125
		(0.093)
	$t-2$	-0.038
		(0.088)
ΔToT	t	-0.045***
		(0.007)
	$t-1$	-0.018**
		(0.007)
	$t-2$	-0.008
		(0.007)
$\Delta(i-i^*)$	t	-0.813
		(0.759)
	$t-1$	0.050
		(0.557)
	$t-2$	-0.847
		(0.631)
ΔVIX	t	0.037
		(0.023)
	$t-1$	0.058**
		(0.023)
	$t-2$	0.034
		(0.021)
ΔDEU	t	0.001
		(0.005)
	$t-1$	0.001
		(0.004)
	$t-2$	-0.006
		(0.004)
$\Delta\pi$	t	0.396

		(0.620)
	$t-1$	-0.873
		(0.557)
	$t-2$	0.403
		(0.608)
$\Delta Bond$	t	0.106
		(0.117)
	$t-1$	0.060
		(0.120)
	$t-2$	0.162
		(0.114)
$\Delta SP500$	t	-0.057
		(0.034)
	$t-1$	0.123***
		(0.042)
	$t-2$	0.057
		(0.036)
$\Delta usdclp$	$t-1$	0.036
		(0.049)
	$t-2$	-0.028
		(0.047)
Constant		0.016
		(0.020)
N Obs		1725
Adj. R2		0.24

Estimation of the local projection model of equation 4 via OLS, using daily observations, 01 March 2012 - 22 October 2020. The dependent variable corresponds to a time-series of cumulative exchange rate returns at $h = 1$, measured in percentage change. An increase indicates a Chilean peso depreciation. The set of explanatory variables contains F&F news, contemporaneous and lagged observations of the of returns on the trade-weighted U.S. dollar index (ΔUSD) and Chilean terms of trades (ΔToT), the change in the interest rate differential between the short-run domestic and the U.S. interest rates ($\Delta(i - i^*)$), the change in the VIX index (ΔVIX), the change in domestic economic uncertainty (ΔDEU), the change in domestic expected inflation ($\Delta\pi$), and returns on Chilean government bonds ($\Delta Bond$) and the S&P500 index ($\Delta SP500$). Robust standard error in parentheses. (*), (**), (***) indicates statistical significance at 10, 5, and 1% level, respectively. Source: Authors' calculations.

Table 5: Comparison of shocks on the Chilean FOREX market

	$t+1$	$t+5$	Length[(1)]
F&F recommendation news	0.86%	1.57%	10-18
Aldunate et al. (2022)	0.25%	0.44%	10
Central Bank of Chile FX market interventions			
2011[(2)] (US dollars purchase)	4.6%	12%	15-20
2019[(3)] (US dollars sales)	-3.0%	-5.5%	–
2021[(3)] (US dollars purchase)	1.4%	1.2%	–
Net FX_{PFC} trading volume model	0.65%[(4)]	–	–

Impact of shocks on the Chilean peso exchange rate at one and five days after the events defined in rows. (1) Length corresponds to the number of days the shock displays statistical significant impact on exchange rate returns. (2) Based on Contreras et al. (2013). (3) Nominal exchange rate variation after the Central Bank intervention announcement. (4) Cumulative effect on exchange rate two days after F&F recommendations. Source: Authors' calculations.

Table 6: Exchange rate model based on PFCs FOREX trading volume

	$\Delta usdclp_t$
ΔPFC net trading volume	
$Spot_t$	0.323***
	(0.098)
$Forward_t$	-0.200**
	(0.082)
$\Delta(i_t - i_t^*)$	0.384
	(0.562)
ΔToT_t	-0.039***
	(0.004)
ΔUSD_t	1.045***
	(0.042)
Constant	0.009
	(0.011)
N obs	1940
Adj R2	0.35

Results of the estimation of the model in equation 5 via OLS using a sample of daily observations, 01 March 2012 - 22 October 2020. The dependent variable corresponds to a time-series of exchange rate returns. An increase indicates a Chilean peso depreciation. The set of explanatory variables contains the change in the FOREX net trading volume of PFCs (ΔPFC net trading volume) in both the spot and forward markets, the change in the interest rate differential between the short-run domestic and the U.S. interest rates ($\Delta(i - i^*)$), the of returns on both Chilean terms of trades (ΔToT) and trade-weighted U.S. dollar index (ΔUSD). Δ PFC net trading volume in Chilean FOREX spot and forward markets are measured in billion U.S. dollars. A positive value in Δ PFC net trading volume in Chilean FOREX spot (forward) market represents net purchases (sales) of U.S. dollars. Robust standard error in parentheses. In order to avoid endogeneity issues, we use a measure of PFC net trading volume in the peso FOREX spot and forward markets which is orthogonal to other risk factors that may affect the Chilean exchange rate. Section "Auxiliary PFC FOREX trading volume regressions" on page 59 provides more details about the orthogonalisation of PFC trading volume in the FOREX market. Source: Authors' calculations.

Table 7: F&F and FOREX trading volume by agent

	PFC	Non-residents	Retail	Insurance	Brokers	M. Funds
DFF						
$t+1$	0.760***	0.233***	0.070	0.144	-0.017	0.332***
	(0.165)	(0.078)	(0.046)	(0.151)	(0.079)	(0.097)
$t+2$	0.939***	0.240**	0.031	0.021	-0.124*	0.198
	(0.155)	(0.104)	(0.051)	(0.165)	(0.075)	(0.125)
$t+3$	1.264***	0.259***	-0.081	0.220	-0.117	0.363***
	(0.153)	(0.081)	(0.065)	(0.165)	(0.073)	(0.120)
$t+4$	1.457***	0.218***	0.000	0.173	-0.086	0.458***
	(0.166)	(0.077)	(0.054)	(0.119)	(0.088)	(0.105)
$t+5$	1.422***	0.140*	0.023	0.128	0.017	0.372***
	(0.139)	(0.079)	(0.066)	(0.154)	(0.070)	(0.119)
$t+6$	0.961***	0.160	-0.031	-0.089	-0.166*	0.345***
	(0.318)	(0.149)	(0.065)	(0.204)	(0.091)	(0.134)
$t+7$	1.154***	0.161*	0.045	0.154	-0.113	0.244*
	(0.106)	(0.085)	(0.067)	(0.142)	(0.078)	(0.128)
$t+8$	0.892***	0.201*	-0.037	-0.120	-0.205*	0.272**
	(0.179)	(0.116)	(0.066)	(0.211)	(0.109)	(0.115)
$t+9$	1.019***	0.251***	0.064	0.055	-0.048	0.362***
	(0.140)	(0.093)	(0.098)	(0.154)	(0.099)	(0.123)
$t+10$	0.561***	0.066	0.012	-0.005	-0.016	0.060
	(0.215)	(0.113)	(0.071)	(0.148)	(0.090)	(0.129)
ΔDEU						
$t-1$	0.009	0.008**	0.002	0.003	0.002	0.002
	(0.006)	(0.003)	(0.002)	(0.005)	(0.003)	(0.004)
$t-2$	0.015**	0.014***	0.002	0.002	-0.002	0.001
	(0.007)	(0.003)	(0.002)	(0.005)	(0.003)	(0.004)
$\Delta\pi$						
$t-1$	-0.192	-0.458	-0.220	0.275	-0.280	0.587
	(0.940)	(0.385)	(0.253)	(0.621)	(0.354)	(0.526)
$t-2$	-0.061	-0.262	-0.201	-0.424	-0.203	-0.340
	(1.021)	(0.372)	(0.258)	(0.612)	(0.336)	(0.532)
$\Delta(i-i^*)$						
$t-1$	-0.568	0.389	-0.064	0.164	0.225	-0.517

	(0.664)	(0.439)	(0.239)	(0.588)	(0.282)	(0.439)
$t-2$	0.584	0.203	-0.129	0.820	-0.058	0.531
	(0.781)	(0.361)	(0.225)	(0.516)	(0.257)	(0.480)
ΔVIX						
$t-1$	0.009	0.008	-0.003	-0.015	-0.001	0.008
	(0.016)	(0.009)	(0.006)	(0.013)	(0.007)	(0.010)
$t-2$	-0.011	-0.006	-0.007	0.004	0.000	0.004
	(0.016)	(0.008)	(0.006)	(0.011)	(0.006)	(0.011)
$\Delta SP500$						
$t-1$	-2.548*	-0.859	-0.399	-3.104***	-0.894	-2.490***
	(1.523)	(0.758)	(0.503)	(1.129)	(0.680)	(0.914)
$t-2$	0.107	0.569	0.144	-2.177**	-0.777	-0.605
	(1.386)	(0.651)	(0.446)	(1.002)	(0.586)	(0.824)
$\Delta Bond$						
$t-1$	-0.794	2.579	2.632**	1.926	-0.687	1.234
	(4.158)	(2.450)	(1.210)	(3.317)	(1.354)	(2.145)
$t-2$	3.839	-1.654	1.585	0.895	0.183	-3.438
	(4.850)	(2.258)	(1.402)	(3.522)	(1.648)	(2.236)
$\Delta usdclp$						
$t-1$	0.699	-1.909*	-0.574	2.508	0.545	-0.965
	(1.953)	(1.145)	(0.653)	(1.724)	(0.771)	(1.248)
$t-2$	0.976	1.449	0.894	2.404	2.108***	2.240*
	(2.645)	(1.046)	(0.669)	(1.671)	(0.816)	(1.240)
Constant	4.600***	5.135***	6.549***	3.150***	5.970***	3.307***
	(0.039)	(0.016)	(0.011)	(0.026)	(0.014)	(0.020)
N Obs	1762	1770	1771	1771	1771	1771
Adj R2	0.10	0.04	0.00	0.01	0.01	0.03

Results of the estimation of model in equation 8 via OLS using daily observations, 01 March 2012 - 22 October 2020. The dependent variable in each column represents the natural logarithm of the trading volume in the peso FOREX spot market by agent. FF_{t+h}, $h = 1, \ldots, 10$, is a categorical variable taking the value of one h days after F&F issues a recommendation, and zero otherwise. Additional control variables correspond to lagged observations of the change in domestic economic uncertainty (ΔDEU), the change in domestic expected inflation ($\Delta\pi$), the change in the interest rate differential between the short-run domestic and the U.S. interest rates ($\Delta(i - i^*)$), the change in the VIX index (ΔVIX), returns on the S&P500 index ($\Delta SP500$), returns on Chilean government bonds ($\Delta Bond$), and returns on the Chilean exchange rate. Robust standard errors in parentheses. (*), (**), (***) indicates statistical significance at 10, 5, and 1% level, respectively. Source: Authors' calculations.

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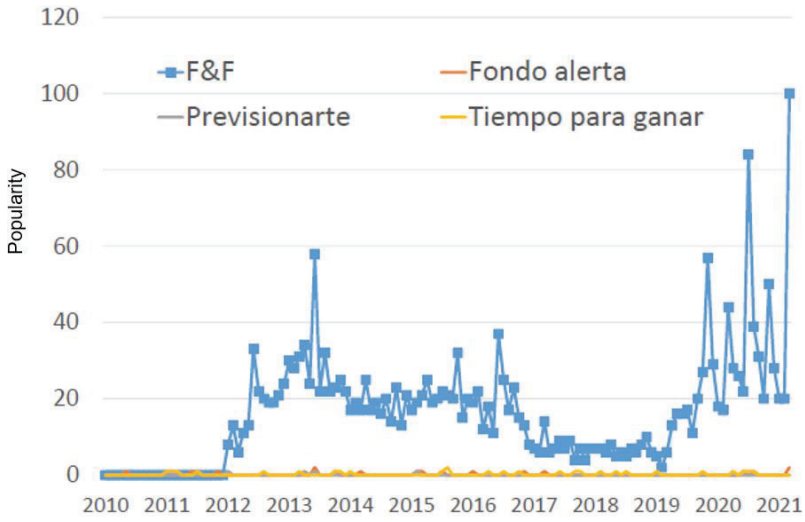
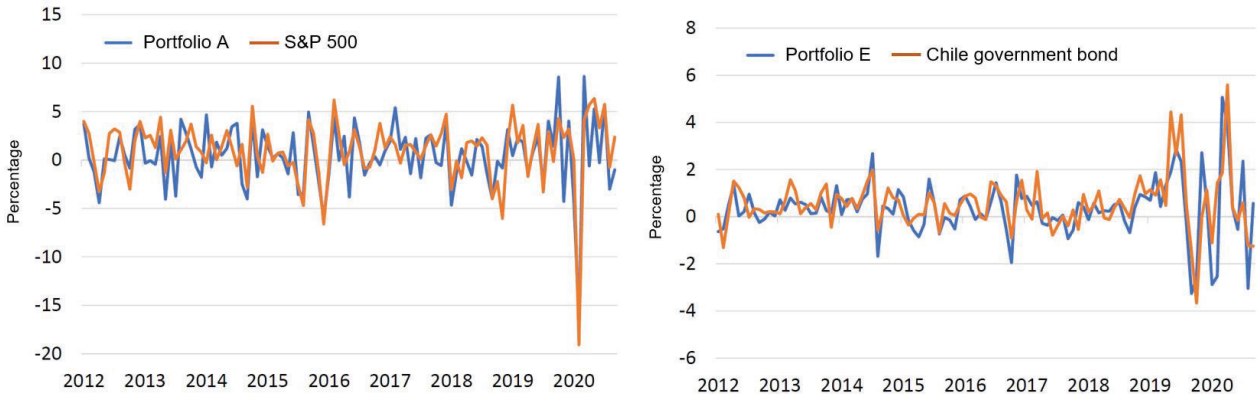
Appendix

Figure A.1: Popularity of financial advisory firms in the pension fund market in Chile



Popularity based on Google trend index. Values in the y-axis capture the relative search interest. A value of 100, 50, and 0, represents the most popular search, half of the most popular, and no popular at all. Source: Google trends.

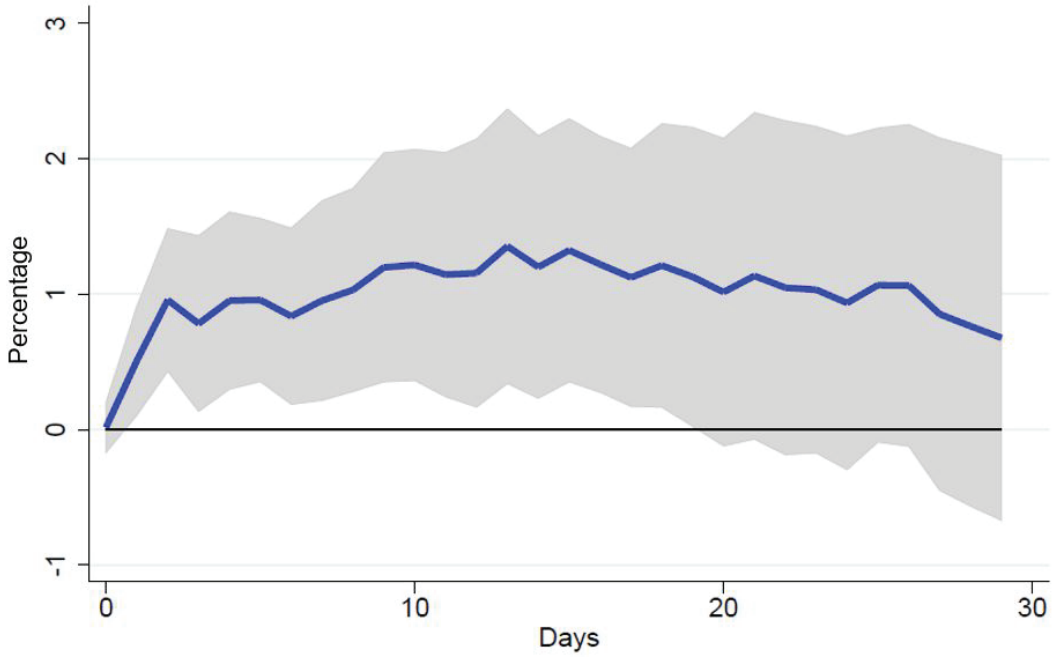
Figure A.2: PFC portfolio returns



(a) Portfolio A and S&P 500 returns (b) Portfolio E and Chilean gov. bond returns

Time-series of monthly returns from March 2012 to October 2020. Source: Authors' calculations based on Bloomberg and Superintendencia de Pensiones de Chile.

Figure A.3: Impact of F&F recommendations on exchange rate based on Da et al. (2018)



The blue line represents the cumulative response of the $\Delta usdclp$, in percentage change, to FF news at horizon h (days). In this case, F&F news follows the Da et al. (2018) definition. An increase indicates a Chilean peso depreciation. The cumulative response of the $\Delta usdclp$ corresponds to the estimated β^h coefficient of equation 4, with $h = 0, ..., 30$. The grey area represents 95% confidence bands. Daily observations, 01 March 2012 - 22 October 2020. The impact of F&F news is statistically significant when the confidence bands exclude zero. Source: Authors' calculations.

Table A.1: F&F followers statistics

	F&F followers	Non-F&F followers	Difference
Age	38	41	-3***
Savings	50,989	14,896	36,093***
Male	58	52	6**

Table displays average statistics by groups: F&F followers and Non-F&F followers. The last column reports the difference of averages between groups and its statistical significance. Age measured in years. Saving measured in U.S. dollars. Male corresponds to the percentage of males in each group. (*), (**), (***) indicates statistical significance at 10, 5, and 1% level, respectively. Source: Authors' calculations based on *Superintendencia de Pensiones de Chile* (regulator authority of the pension fund market in Chile).

Table A.2: F&F recommendations

#	**Date**	**FF recom.**	**F&F**	**Ologit**
1	27/07/2011	100% E	–	–
2	12/10/2011	100% A	0.627	2
3	22/11/2011	100% E	-0.644	-2
4	11/01/2012	100% A	0.652	2
5	29/03/2012	100% E	-0.645	-2
6	19/06/2012	100% A	0.641	2
7	28/06/2012*	100% E	-0.648	-2
8	19/07/2012	100% A	0.642	2
9	29/08/2012	100% E	-0.640	-2
10	02/01/2013	100% A	0.677	2
11	03/04/2013	100% E	-0.667	-2
12	17/07/2013	100% A	0.688	2
13	16/08/2013	100% E	-0.673	-2
14	06/09/2013	100% A	0.665	2
15	24/01/2014	100% E	-0.654	-2
16	06/03/2014	50% C / 50% E	0.177	1
17	01/08/2014	100% E	-0.134	-1
18	19/08/2014*	50% A / 50% E	0.343	2
19	30/10/2014	100% A	0.353	2
20	15/12/2014	100% E	-0.716	-2
21	12/02/2015	50% A / 50% E	0.363	2
22	18/03/2015	100% A	0.350	2
23	13/05/2015	50% A / 50% E	-0.352	-2
24	08/07/2015	40% C / 60% E	-0.211	-1
25	24/08/2015	100% E	-0.150	-1
26	13/10/2015*	50% C / 50% E	0.184	1
27	26/10/2015	100% E	-0.181	-2
28	16/12/2015	50% A / 50% E	0.349	2
29	22/12/2015*	100% A	0.354	2
30	06/01/2016*	50% A / 50% E	-0.340	-2
31	15/01/2016*	100% E	-0.363	-2
32	22/02/2016	50% C / 50% E	0.179	1
33	29/04/2016	100% E	-0.155	-2
34	06/09/2016*	50% C / 50% E	0.158	1
35	13/09/2016	100% E	-0.155	-2
36	09/11/2016	50% A / 50% E	0.335	2
37	22/12/2016	100% E	-0.346	-2
38	13/07/2017	50% C / 50% E	0.173	1
39	10/08/2017	100% E	-0.168	-2
40	12/09/2017*	50% A / 50% E	0.325	2
41	28/09/2017	100% A	0.326	2

42	12/10/2017*	50% A / 50% E	-0.324	-2
43	28/11/2017	100% A	0.352	2
44	19/12/2017	50% A / 50% E	-0.351	-2
45	09/01/2018	100% A	0.343	2
46	22/01/2018*	50% A / 50% E	-0.339	-2
47	05/02/2018	100% E	-0.348	-2
48	26/02/2018*	50% A / 50% E	0.339	2
49	07/03/2018	100% A	0.350	2
50	14/03/2018*	50% C / 50% E	-0.515	-2
51	23/03/2018*	15% D / 85% E	-0.145	-1
52	19/04/2018*	50% A / 50% E	0.311	2
53	04/05/2018	100% A	0.358	2
54	24/05/2018*	50% C / 50% E	-0.521	-2
55	06/06/2018	60% A / 40% E	0.242	2
56	19/06/2018*	20% A / 80% E	-0.285	-1
57	25/06/2018	100% E	-0.142	-1
58	09/07/2018*	50% A / 50% E	0.355	2
59	27/07/2018	100% E	-0.356	-2
60	20/08/2018*	50% A / 50% E	0.357	2
61	29/08/2018	100% A	0.355	2
62	05/09/2018*	50% A / 50% E	-0.359	-2
63	24/09/2018	100% E	-0.353	-2
64	05/10/2018*	50% A / 50% E	0.354	2
65	11/10/2018*	100% E	-0.360	-2
66	05/11/2018	50% A / 50% E	0.349	2
67	09/11/2018*	100% E	-0.360	-2
68	12/12/2018	50% A / 50% E	0.355	2
69	26/12/2018*	40% C / 60% E	-0.207	-1
70	18/01/2019	100% E	-0.149	-1
71	24/01/2019*	50% A / 50% E	0.351	2
72	16/04/2019	100% E	-0.343	-2
73	23/04/2019*	50% A / 50% E	0.361	2
74	02/05/2019*	100% E	-0.369	-2
75	04/06/2019	50% A / 50% E	0.366	2
76	26/06/2019	100% E	-0.367	-2
77	16/10/2019	50% A / 50% E	0.373	2
78	11/11/2019	100% A	0.402	2
79	22/11/2019*	50% A / 50% E	-0.384	-2
80	16/12/2019	100% E	-0.377	-2
81	09/01/2020	50% A / 50% E	0.399	2
82	16/01/2020*	100% E	-0.374	-2
83	03/03/2020	50% C / 50% E	0.203	1
84	12/03/2020*	100% E	-0.190	-2

85	24/03/2020	40% A / 60% E	0.297	2
86	01/04/2020*	80% A / 20% C	0.356	1
87	07/05/2020	50% C / 50% E	-0.474	-2
88	27/05/2020	100% E	-0.193	-1
89	16/06/2020	50% A / 50% E	0.389	2
90	28/07/2020	25% A / 75% E	-0.187	-1
91	06/08/2020*	50% A / 50% E	0.194	1
92	18/08/2020	25% A / 75% E	-0.181	-1
93	08/09/2020	100% E	-0.172	-1
94	23/09/2020*	30% A / 70% E	0.209	1
95	29/09/2020	60% A / 40% E	0.209	1
96	15/10/2020*	20% A / 80% E	-0.294	-1
97	26/10/2020	10% A / 90% E	-0.074	-1

Column 'Date' corresponds to the date F&F issues a recommendation. A star (*) indicates a overlapping recommendation as there is less than twenty days after the previous recommendation. 'FF recom.' column corresponds to the portfolio allocation F&F suggests in its recommendation. 'F&F' column corresponds to the definition of the recommendation news we introduce in section 5.2 and it is computed as the first difference of $finv_t$, where $finv_t = \sum_{i=1}^{5} w_{it} p_{it}$, with $i = 1, 2, 3, 4, 5$ (the five PFC portfolios), w_{it} represents the portfolio allocation recommended by F&F in portfolio i at time t, and p_{it} represents the percentage of foreign investment in portfolio i at time t. 'Ologit' column corresponds to an ordered categorical variable taking the value of 1 and 2 when F&F recommends a moderate and strong change in risk exposure, respectively, and zero otherwise. A strong change in risk exposure occurs when a recommendation suggests changing to one extreme portfolio conditional on the existing recommendation allocating investments within the opposite extreme portfolio. We define moderate changes in risk exposure as those recommendations which suggest an increased allocation to intermediate portfolios (i.e.: portfolios B, C or D), when existing recommendations involve an extreme portfolio allocation. Source: Authors' calculations.

Auxiliary PFC FOREX trading volume regressions

Exchange rate models based on trading volume in FOREX market, as the one we propose in equation 5, may potentially suffer endogeneity issues due to simultaneity bias. In order to mitigate endogeneity concerns we use a measure of PFC net trading volume in the FOREX market which is orthogonal to risk factors that may also relate to Chilean exchange rate movements. In particular, the measure of PFC net trading volume orthogonal to risk factors corresponds to the error term ε_i of the following equation:

$$Trd\ Vol_i^{PFC} = X\beta_i + \varepsilon_i \tag{A.1}$$

Where $Trd\ Vol_i^{PFC}$ corresponds to the PFC net trading volume in FOREX market i, with i = [Spot, Forward]. X is a vector containing three categories of explanatory variables: global and domestic risks, economic surprises, and terms of trades. ε_i, the residual term, corresponds to the variable we use as a measure of orthogonal PFC net trading volume in the model of equation 5.

Table A.3 displays the results of the auxiliary models of PFC net trading volume in the FOREX spot market of equation A.1. As explanatory variable we include a set of variables tracking domestic economic uncertainty (ΔDEU), domestic inflation ($\Delta\pi$) and external risk factors (ΔVIX). We also include indices tracking domestic and world economic activity surprises along the Chilean terms of trades (ΔToT). The model includes all variables in first difference, excluding ΔToT which corresponds to percentage change. The results show that only external risk factors, captured by the VIX, statistically influence PFC net trading volume in the Peso FOREX market, while the rest of the variables controlling for domestic risk elements, surprises and terms of trades display no statistical significance. Moreover, the adjusted R2 of the models depicts low for all models suggesting the omission of this endogeneity analysis may not generate severe issues in the exchange rate model based on PFC net trading volume in the Peso FOREX market. The orthogonal measure of PFC net trading volume in the FOREX market we include in the model of equation 5 corresponds to the residual of model (1) in table A.3. Same procedure and conclusions apply for the case of orthogonal PFC net trading volume in the peso FOREX derivative market (results available upon request).

Table A.3: Auxiliary PFC FOREX trading volume regressions

		Δ *PFC net FOREX trading volume*			
		(1)	(2)	(3)	(4)
Risk	ΔVIX_t	0.005**	0.005**	0.005**	0.005**
		(0.002)	(0.002)	(0.002)	(0.002)
	ΔDEU_t	0.0008	0.0008	0.0008	0.0008
		(0.001)	(0.001)	(0.001)	(0.001)
	$\Delta\pi_t$	-0.044	-0.044	-0.044	-0.046
		(0.097)	(0.097)	(0.097)	(0.097)
Surprises	Δ Global Economy		-0.00001		
			(0.000)		
	Δ G10 Economy			-0.00001	
				(0.000)	
	Δ Emerging market Ec.			0.00001	
				(0.000)	
ToT	Δ *Terms of Trades*				-0.0015
					(0.001)
	Constant	-0.0005	-0.0005	-0.0004	-0.0004
		(0.004)	(0.004)	(0.004)	(0.004)
	N obs	1994	1994	1994	1994
	Adj. R2	0.002	0.001	0.001	0.002

Results of the estimation of model in equation A.1 via OLS using daily observations, 01 March 2012 - 22 October 2020. The dependent variable corresponds to the change of PFC net trading volume in the Chilean FOREX spot market. The set of explanatory variables corresponds to external risk factors, proxied by the VIX index (ΔVIX), domestic economic uncertainty (ΔDEU), and domestic inflation ($\Delta\pi$). We also include indices tracking domestic and world economic activity surprises along the Chilean terms of trades (ΔToT). The model includes all variables in first difference, excluding ΔToT which corresponds to percentage change. Robust standard errors in parentheses. (*), (**), (***) indicates statistical significance at 10, 5, and 1% level, respectively. Source: Authors' calculations.

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