Capital Inflow Shocks and Convenience Yields*

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Abstract

We show how shocks to capital inflows from foreign financial institutions (FFIs) fundamentally alter convenience yields, asset pricing, and monetary transmission. Exploiting novel granular data on daily transactions in Israeli sovereign bonds, we identify exogenous capital inflow shocks from large FFIs' idiosyncratic investment activity. These shocks create persistent increases in convenience yields as measured by wedges between central bank monetary stance and market interest rates, explaining 39.6% of their divergence and generating substantial spillovers across assets: corporate bond yield spreads narrow by up to 31.6 basis points while equity prices rise by 5.7%. Our findings reveal a significant channel through which global capital flows affect monetary transmission and asset pricing in integrated markets, with important implications for monetary policy effectiveness.

JEL classification: E0,F0,F3,G2

Keywords: Convenience Yield; Monetary Policy Transmission; Covered Interest Parity Arbitrage; Capital Inflow Shock; Foreign Financial Institutions; Policy Interest Rates; Market Interest Rates; Portfolio Rebalancing; Granular Instrumental Variable; Slow-Moving Capital

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1 Introduction

Foreign financial institutions (FFIs) are now dominant players in sovereign bond markets, exerting significant influence over bond pricing and liquidity premia. Recent evidence suggests that their inelastic demand for sovereign bonds can generate persistent price distortions, weakening the link between policy rates and market rates (Koijen and Yogo (2020) and Doerr et al. (2023)). While prior research links convenience yields—the return foregone to hold highly safe and liquid assets—to both monetary policy conditions and market stress (Krishnamurthy and Vissing-Jorgensen (2012), Nagel (2016), and Diamond and Van Tassel (2024)), we show that capital inflows themselves can endogenously create and sustain convenience yields, independently of significant market stress or monetary policy changes.

To motivate our investigation, we first document in Figure 1 a pattern in cross-country data from 10 of the G11 currencies that reveals a strong and highly significant relationship between foreign holding shares of local government bonds and local convenience yields—an effect that persists even after controlling for the local government bond yield (exhibiting a t-stat of 2.1 compared to 2.5). This pattern suggests that existing models that stress the well-established relation between safe asset yields and convenience yields (e.g., Nagel (2016) and Diamond and Van Tassel (2024)) may need to be extended to capture a key additional determinant of bond market liquidity premia: foreign capital flows as an independent driver of convenience yields.

Is the strong correlation between foreign ownership and convenience yields merely a reflection of other driving forces, or do capital inflows actively create these safe asset liquidity premia? To answer this fundamental question, we turn to high-frequency transaction-level data on FFIs'capital inflows into Israel's short-term sovereign bond market (MAKAM).

Between 2020 and 2022, FFIs actively pursued covered interest parity (CIP) arbitrage, accumulating 50% of outstanding MAKAM securities. Unlike domestic investors, FFIs entered the market not in response to local macroeconomic fundamentals but due to global-wide persistent deviations from CIP that also affected Israel, borrowing in dollars and investing in short-term sovereign bonds. This provides an ideal empirical setting to study how exogenous capital inflow shocks affect monetary policy transmission, bond pricing, and spillovers into other asset classes.

A non-zero convenience yield is tantamount to monetary policy transmission imperfection because the convenience yield defines the wedge between policy rates—which are both convenience- and risk-free—and risk-free market rates which may nonetheless contain a convenience yield. As such, the convenience yield measures monetary transmission imperfection. Our empirical setting offers a rare opportunity to examine how capital flows influence the transmission of monetary policy as measured by the convenience yield. To measure the convenience yield, we leverage the Israeli interbank rate (TELBOR), which we rigorously demonstrate—through its effectively perfect correlation with central bank rates for its shortest (overnight) maturity and through its unique underlying institutional setting for its longer maturities' rates which purges them of any potentially meaningful risk premia—to be an ideal measure of the monetary policy stance (see Section 4.6), and accordingly define the convenience yield as the MAKAM-TELBOR spread. This clean setting allows us to precisely identify deviations from intended policy: any wedge between TELBOR and MAKAM market rates serves as a direct measure of transmission imperfections, uncontaminated by risk premia or evolving market expectations about future policy.

To obtain identification and address potential endogeneity between FFIs' capital flows and market conditions, we employ a Granular Instrumental Variable (GIV) approach (Gabaix and Koijen (2024)) to isolate FFI-driven serially uncorrelated shocks and measure their causal impact on convenience yields, monetary transmission, and broader financial markets. The GIV approach has been extensively used in recent literature to address endogeneity concerns and identify causal effects in various economic contexts (see Gabaix and Koijen (2024)—the developers of this method—and the exhaustive references within as well as Ben Zeev and Nathan (2024a,b)). Our findings reveal that a 10pp increase in FFIs' accumulated net inflows (as share of total outstanding MAKAM) leads to an 8.7 bps decline in the MAKAM-TELBOR spread over two years. The persistence of this effect accords with FFIs gradually building positions over time, generating lasting price distortions that weaken the pass-through of policy rates to market rates, and is consistent with theories of slow-moving capital where there are institutional constraints on market entrance such as search costs and time to raise capital (see, e.g., Mitchell et al. (2007) and Duffie (2010)).

Beyond monetary transmission, we document significant spillovers into broader financial markets due to the capital inflow shock. Government bond spreads narrow by up to 8.3 basis points, with the strongest effects at the short end of the yield curve. The impact is even larger in corporate bond markets, where spreads decline by as much as 31.6 basis points. The effects extend to equity markets, where the local stock index rises by 5.7%. These spillover results suggest that FFI-driven changes in the benchmark safe asset rate lead to a broad repricing of other assets.

These distortions propagate through financial markets via a portfolio rebalancing mechanism. Using novel daily sectoral secondary market data, we show that mutual funds act as key counterparties to FFIs' MAKAM purchases, reallocating proceeds to corporate bond and equity investments. This provides direct evidence that capital inflow shocks trigger local portfolio adjustments, amplifying their impact beyond the sovereign bond market.

While previous research has highlighted the role of interest rates and market stress in shaping convenience yields, our findings emphasize a distinct, complementary mechanism: capital flows as a persistent driver of liquidity premia in sovereign bonds. Supplementing the well-established mechanisms linked to monetary policy and market conditions (Nagel (2016) and Diamond and Van Tassel (2024)), our results suggest that foreign demand for local government bonds can independently create and sustain convenience yields. As such, our paper nicely fits the promising direction of the safe asset convenience yield literature which has traditionally mostly focused on the U.S. but has recently extended its focus to other countries as well (Jiang, Lustig, Van Nieuwerburgh and Xiaolan (2021), Du, Im and Schreger (2018), and Diamond and Van Tassel (2024)).

Our findings have important implications for both policymakers and market participants. For central banks, the results underscore how capital flows can impair monetary transmission by creating persistent wedges between policy rates and market rates. This suggests central banks may need to develop new frameworks for managing domestic monetary conditions in the presence of large, foreign flows. For investors, our findings demonstrate that sovereign bond yields can deviate persistently from levels implied by risk-adjusted return expectations, driven instead by institutional demand imbalances. This insight is crucial for understanding price formation in sovereign bond markets and suggests traditional yield curve models need to incorporate the growing influence of foreign capital flows on convenience yields and liquidity premia.

Literature Review. Our paper connects to five strands of literature. The first is the literature on convenience yields of safe assets, which has predominantly centered on the U.S. (Krishnamurthy and Vissing-Jorgensen (2012), Nagel (2016), Lenel et al. (2019), Koijen and Yogo (2020), van Binsbergen et al. (2022), Doerr et al. (2023), and D'avernas and Vandeweyer (2024)), with recent papers focusing also on other developed economies' convenience yields (Du, Im and Schreger (2018), Jiang, Lustig, Van Nieuwerburgh and Xiaolan (2021), and Diamond and Van Tassel (2024)). While this literature has mostly focused on monetary policy and market stress as drivers of convenience yields, we put forward a new convenience yield channel based on foreign demand for local safe assets.

The second literature examines how foreign investors affect domestic asset prices and market functioning. Jotikasthira et al. (2012) document how foreign fund flows create significant price pressure in emerging market stocks, while Pandolfi and Williams (2019) show substantial effects on emerging market sovereign yields. These price effects often extend beyond the directly affected markets—Fratzscher et al. (2018) demonstrate how U.S. monetary policy drives foreign flows that create substantial cross-market spillovers. We contribute to this literature by providing new evidence on the role of FFIs as price-makers in sovereign bond markets.

The third literature studies covered interest parity (CIP) deviations, which Du, Tepper and Verdelhan (2018) show to be persistent post-GFC. These deviations affect financial markets through multiple channels: Ivashina et al. (2015) demonstrate impacts on global banks' cross-currency lending, Avdjiev et al. (2019) link them to bank leverage decisions, and Anderson et al. (2024) show how they reshape banks' business models toward arbitrage-driven liquid asset investment. While pre-GFC FX swap supply was perfectly elastic with CIP-determined pricing, post-GFC regulatory constraints create persistent arbitrage opportunities (Du and Schreger (2022)). We extend this literature by showing how FFIs arbitrage activities affect monetary policy transmission through sustained distortions in market rates.

The fourth literature our paper connects to is the extant literature investigating the many ways in which intermediaries affect financial markets (Greenwood and Vayanos (2010), Ellul et al. (2011), He and Krishnamurthy (2013), He et al. (2017), O' Hara et al. (2018), He and Krishnamurthy (2018), Klingler and Sundaresan (2019), Hendershott et al. (2020), Jiang, Krishnamurthy and Lustig (2021), Koijen and Yogo (2022), Greenwood et al. (2023), Pinter (2023), and Ben Zeev and Nathan (2024a,b) among others). We add to this literature by showing how large net capital inflows from FFIs'—driven by their demand for short-term risk-free bonds—affect monetary policy transmission impairment as measured by the disconnect between interbank and market rates.

The fifth literature studies monetary policy autonomy and the associated "trilemma" theory (Shambaugh (2004), Obstfeld et al. (2005), and Klein and Shambaugh (2015)). This literature empirically defines monetary policy autonomy as the coefficient obtained from regressing countries' short-term interest rates on corresponding base rates, with smaller such coefficient values indicating more monetary policy autonomy. The evidence from this literature has supported the traditional "trilemma" view in international macroeconomics that floaters with free capital mobility enjoy full monetary policy autonomy. However, recent work by Rey (2013) and Miranda-Agrippino and Rey (2020) has challenged this view by providing compelling evidence of a 'global financial cycle' that is meaningfully determined by U.S. monetary policy, transmits its effects through international financial markets, and significantly constrains national monetary policies regardless of the exchange rate regime in place. We contribute to this research on monetary policy transmission in globally integrated markets by showing that capital flows can weaken the link between policy rates and sovereign yields.[1]

Outline. The remainder of the paper is organized as follows. The next section provides a brief summary of the institutional background of FFIs' activity in the MAKAM market, deferring a detailed presentation to Appendix A of the online appendix to this paper. Section 3 provides a

[1] Recently, Kalemli-Ozcan (2019) and De Leo et al. (2022) have highlighted in the context of emerging economies that the literature's standard use of short-term money market rates to measure monetary policy rates masks an important dimension of monetary policy autonomy imperfection: a disconnect between these monetary policy rates (or their proxies - interbank rates) and short-term market rates from the government bond market resulting from countercyclical risk premia moving market rates the opposite direction from procyclical policy rates. Our paper contributes to the literature by further stressing this important transmission impairment dimension in the context of developed economies with open capital markets. Our focus on capital inflow shocks as the impulse driving this impairment is much in line with the international macroeconomics literature's focus on the capital flows variable, which also plays a central role in transmitting the 'global financial cycle' from the related above-cited works. And our focus on a developed economy like Israel allows us to isolate a short rate disconnect mechanism that stems solely from monetary autonomy imperfection as opposed to one that is additionally driven by a risk-premia-based mechanism.

description of the data and methodology used in this paper. Section 4 presents the baseline results, briefly discusses additional robustness checks (the results of which are shown in Appendix D of the online appendix to this paper), and reinforces the validity of our TELBOR and IRS rates as measures of the risk-free yield curve. The final section concludes.

2 Institutional Background

Appendix A of the online appendix to this paper provides a detailed overview of the MAKAM market in Israel and the role of FFIs—global financial intermediaries, including commercial banks, investment banks, hedge funds, and asset managers, that pool funds from various investors and invest in financial assets—in this market. The appendix details the structure and purpose of MAKAM—short-term securities issued by the Bank of Israel (BOI) to large primary dealers as 3- or 12-month maturity bonds, with monthly issuances resulting in 12 series traded concurrently, each with a term up to 1 year—stressing its highly liquid and safe nature which make it very appealing to FFIs' CIP arbitrage activity. FFIs access MAKAM through a trading structure that enables direct participation without requiring local banking subsidiaries. This direct access, combined with its superior liquidity compared to government bonds (3.3x higher volume and 40% tighter bid-ask spreads) and MAKAM's preferential regulatory treatment under Basel III, made these securities particularly attractive for cross-border flows. By the end of our sample, FFIs had accumulated a 50% share of outstanding MAKAM, with trading highly concentrated among a small number of institutions (Herfindahl–Hirschman index of 0.47).

A natural question arises: why isn't the supply of risk-free bonds perfectly elastic? Appendix C of the online appendix to this paper presents a simple model with broad external validity beyond our empirical setting of central bank securities, where constraints on security issuance by a sovereign (be it a government or a central bank) result in an imperfectly elastic supply curve and the emergence of increased convenience yield in the presence of large capital inflow shocks. This convenience yield mechanism—as we argue in this paper—is the main driver behind the fact that from early 2021 the MAKAM-TELBOR spread averaged -25.3 basis points compared to effectively zero before.

3 Methodology

This section elucidates the methodology used in the empirical analysis undertaken in this paper. We first describe the data used in the estimation after which we turn to present the estimation.

3.1 Data

Our data is daily and covers the period 1/1/2017-8/31/2022. The specific starting and ending points of this 5.75-year period are dictated by the availability of the Bank of Israel (BOI) proprietary data we have on FFIs' MAKAM flows. We begin our data description by providing details on IIs' data after which we turn to discuss the other variables we utilize in our empirical analysis.

3.1.1 MAKAM-TELBOR Spread and FFIs' MAKAM-Related Net Capital Inflows

MAKAM-TELBOR Spread. Our object of interest is the convenience yield which we define as the spread between the daily MAKAM and TELBOR yields. Both yields are computed as averages over the 1-12 monthly maturity yields. As discussed in the previous section, the MAKAM market operates in a centralized and highly liquid exchange and serves as the preferred investment vehicle for FFIs' CIP arbitrage trading. TELBOR rates are the local interbank rates measured from interest rate quotes by a number of commercial banks in the Israeli inter-bank market. The 1-, 3-, 6-, 9- , and 12-month TELBOR rates are directly observed by the BOI; the other rates are interpolated from the observed ones. See Section 4.6 for both data- and institutional-setting-based evidence that demonstrates a lack of any meaningful risk premia in TELBOR rates and validates their use as sound measures of the risk-free yield curve.

FFI-Level Makam-Related Net Capital Inflows. We have proprietary granular, transaction-level daily data for FFIs' net capital inflows from MAKAM-related activity. We observe all MAKAM-related FFIs' ILS flows settled at their ILS checking accounts with local banks.[2,3] Hence, an FFI's gross capital inflow (outflow) is defined as the debiting (crediting) of its account with a local bank resulting from MAKAM activity (purchase for the debiting case and sale or redemption for the crediting case) and its net capital inflows are the difference between its gross inflows and outflows. MAKAM gross capital inflows include purchases in both the secondary as well as non-secondary, primary market as these capture an important share of their capital inflows into the MAKAM market with (this point is further discussed in Section 4.5).[4] We have a total of 18 FFIs, which correspond to the universe of FFIs active in the MAKAM market. The aggregate FFIs' daily net capital inflows variable is simply the sum of the individual 18 FFIs' daily net capital net inflows.

Our GIV-based identification comes from our ability to observe FFI-level daily net capital inflows and its merit is rooted in the very highly concentrated structure of FFIs' activity in the MAKAM market, as reflected by an average Herfindahl-Hirschman Index of 0.47 for FFIs' net capital inflow volumes. It reasonable to expect only modest correlation among our 18 FFIs' net capital inflows given the high-frequency (daily) nature of our data. This expectation is borne out by the data with an average absolute pairwise correlation among the 18 FFIs of 10.9% and a corresponding standard deviation of 12.2%. Importantly, by removing the effects on these flows of various common drivers, our estimation procedure is capable of meaningfully reducing these numbers to 5.8% and 6.9%, respectively. I.e., the high-frequency nature of our data along with the suitability of our estimation procedure facilitate the extraction of daily idiosyncratic II-level capital inflow shocks where the difference between the size-weighted- and inverse-variance-weighted-average of these shocks (i.e., GIV shock) in turn provides a valid aggregate capital inflow shock for the testing and quantification of the convenience yield channel explored in this paper.

[2]We can also observe such non-ILS (reported in USD) flows but in practice essentially all FFIs' MAKAM flows are settled only in ILS.

[3]Some of FFIs' activity is done through a foreign custodian bank, which is not an investor in MAKAM but rather only serves as a vehicle for transaction settlement. Hence, we can not observe such custody-based flows as the these flows' settlement is not done directly by our FFIs but rather by the said foreign custodian through its checking account with local banks. In Appendix D.4 of the online appendix to this paper we confirm that our baseline results are unaffected by this unobserved custody-based activity by directly controlling for this foreign custodian's flows in our FFI-level regressions.

[4]FFIs' generate a major part of their demand through the placement of direct purchase orders with local banks prior to MAKAM auctions, with primary-market-related purchases constituting 49.8% of FFIs' total purchases. Our net capital inflow data captures these important demand flows.

3.2 Additional Local Interest Rates

Local Government Bond Yields and Swaps Rates. To show our convenience yield mechanism also spills over to the local government bond market, we examine the responses of spreads of yields in this market for the 1- through 5-year and 10-year maturities, which are available from the BOI, with respect to corresponding current and future monetary policy stance measures from the interbank market. Since TELBOR rates are not available for maturities longer than one year, while being very illiquid for the one-year maturity, we use interest rate swap (IRS) rates for the 1- through 5-year maturities and 7- and 10-year maturities as such measures, subtracting them from the corresponding government bond yields to control for maturity-comparable money market rates and their associated local and future monetary policy stance effects.[5] IRS rates, which are taken from Reuters, are the fixed interest rates from IRS contracts—i.e., agreements exchanging fixed-rate interest payments with floating-rate ones—traded by local commercial banks who in turn serve as market makers in the local IRS market.

Since IRS rates are only available for the 1- through 5-year maturities and 7- and 10-year maturities, and due to government bond illiquidity for the 6- through 9-year maturities which in turn produces many missing observations for these maturities, we show results for the government bond spreads data for the 1- through 5-year maturities and the 10-year maturity (without the 7-year maturity).

Local Corporate Bond Yields. To asses whether our convenience yield mechanism also carries over to the corporate bond market, we examine the responses of spreads of nominal investment-grade corporate bond yields for the 1- through 5-year and 7- and 10-year maturities with respect to corresponding IRS rates.

[5]The segmentation between the IRS and government bond market, as measured by the spread between IRS rates and comparable government bond yields ('swap spread'), has long been recognized and studied by the literature (see, e.g., Duffie and Singleton (1997) and Klingler and Sundaresan (2019)). Klingler and Sundaresan (2019)) focus on the 30-year swap spread and argue it became negative since September 2008 because of increased demand for duration from underfunded pension funds. This long-duration, underfunded-pension-fund-based mechanism is not a concern for our setting because we consider much shorter-term maturities and the pension fund system in Israel consists primarily of defined contribution plans. The considered swap spreads in our data have generally been slightly positive with exceptions only at the 5- and 10-year maturities with very mildly negative values; in particular, the average 1- through 5-year and 7- and 10-year spreads standi at 8.8, 6.3, 4, 0.7, -1.4, 2.7, and -6.5 basis points, respectively.

3.2.1 Additional Macro-Financial Data

We use several aggregate daily frequency macro-financial variables in our analysis, all of which cover the FFIs' MAKAM net capital inflows' sample (1/1/2017-8/31/2022). All of these variables, except for those underlying the global financial shocks segment of the data, are taken from Bloomberg and their values are end-of-day quotes.

Global Financial Shocks. To control for shocks to global equity, corporate credit, wholesale funding, and safe asset markets, we include in our FFI-level regressions the first-differences of the corresponding 4 financial stress indices developed by the Office of Financial Research (OFR) (Monin (2019)). These indices are sub-indices of OFR's broader financial stress index and are computed as weighted averages of various regional (U.S., Europe, Japan, and emerging markets) indicators of equity market performance, corporate credit spreads, wholesale funding spreads (spreads between interbank rates and risk-free rates as well as 2-year USD/EUR and USD/JPY cross currency bases), and safe asset market performance (10-year U.S. and German government bond yields, U.S. dollar broad exchange rate as well as its exchange rate with respect to the Swiss franc and Japanese yen, and the gold spot dollar price). The weights are estimated with a dynamic factor model in the spirit of Bai and Ng (2008) and Stock and Watson (2011).[6]

Local Financial Shocks. To control for local equity and risk shocks in our FFI-level regressions, we use current and lagged values of the log-first-difference of the TA-35 index - which lists the largest 35 companies in the TASE - as well as the current and lagged values of the first-difference of the CDS price of 5-year Israeli government dollar bonds.

Interest Rates. To control for foreign risk-free interest rates in our FFI-level regressions, we use the current and lagged values of changes in the U.S. 3-month treasury t-bill rate. Correspondingly, we use the current and lagged value of changes in the BOI's declared monetary policy interest rate to control for local risk-free rates. The latter rate is effectively the interest rate earned by local banks on short-term deposits they hold with the BOI.

[6] For the OFR data and more details regarding it, the reader is referred to https://www.financialresearch.gov/financial-stress-index/.

USD/ILS Cross-Currency Basis. We construct the USD/ILS cross-currency basis in the standard way, i.e., as the difference between the cash market risk-free dollar interest rate and the CIP-implied dollar interest rate (i.e., the inverse of the forward premium multiplied by gross local risk-free rate). We compute this basis for the 1-, 3-, 6-, and 12-month maturities. The dollar risk-free interest rate is measured by LIBOR. To construct the CIP-implied dollar rate, we use the 1-, 3-, 6-, and 12-month MAKAM rates as our measures of the Israeli cash market risk-free interest rates as the MAKAM market serves as the investment vehicle for FFIs' USD/ILS CIP arbitrage.

3.2.2 Sectoral Rebalancing Flows

To investigate whether a meaningful portfolio-rebalancing-induced mechanism is driving our results, we use the Smart Money database from the TASE which includes daily and historical (starting from 2018) aggregate buying and selling flows of institutional investors (pension/insurance/provident funds), mutual funds (excluding exchange traded funds (ETFs)), ETFs, portfolio managers, local banks, TASE members, and foreign residents in all traded securities. Note that this database only pertains to secondary market flows and hence covers only a limited portion of FFIs' MAKAM trading. (This issue is discussed further in Section 4.5.)

3.2.3 Summary Statistics

Table 1 presents summary statistics for the main variables used in our analysis. For completeness, this table also shows summary statistics for monthly sectoral MAKAM holding shares for the FFI, local banks, and mutual fund sectors as well as corporate bond and equity holding shares for the mutual funds sector.

3.3 Estimation

We estimate a daily frequency econometric model that consists of two estimation steps. The first estimates FFI-level regressions for our 18 FFIs' net capital inflows. The second step constructs a GIV capital inflow shock from the latter regressions' residuals and estimates this shock's dynamic effects on FFIs' aggregate accumulated net capital inflows and the MAKAM-TELBOR spread. Our granular econometric approach to studying convenience yields and associated monetary policy transmission impairment is premised on the notion that the our granular FFI-level residuals and resultant GIV construction would generate FFIs' net capital inflows' variation that is not coming from macro forces but rather from idiosyncratic large FFIs' capital inflow shocks.

3.3.1 Econometric Model

FFI-Level Specification. We estimate (via OLS) 18 FFI-level regressions given by

$$net\_inflows_{i,t} = \mathbb{C}_t' \gamma_i + v_{i,t}, \tag{1}$$

where $net\_inflows_{i,t}$ is the net capital inflow of FFI i; $\mathbb{C}_t$ is a vector of observable controls that includes the fixed effect, day-dummies for Monday through Thursday, lagged values of $net\_inflows_{i,t}$, lagged values of the 1-month USD/ILS cross-currency basis which represents their effective net (arbitrage) profit from their MAKAM investments (specifically, since FFIs tend to use short-term FX swaps in their CIP arbitrage activity and roll over these swap positions, this basis can be thought of as the effective price of FFIs' FX-swap-funded MAKAM investments), and current and lagged values of the following exogenous controls:[7] first-differences of 3-month U.S. t-bill rate and BOI monetary policy rate to control for shocks to U.S. and local monetary policy stances; first-differences of OFR's global equity, corporate credit, wholesale funding, and safe asset markets to control for global financial shocks; log-first-difference of the TA-35 index to control for local equity market shocks; and first-difference of the 5-year CDS price of Israeli government dollar bonds to control for local risk shock. $v_{i,t}$ is the regression's residual where $v_{i,t} = \eta_t + \epsilon_{i,t}$ with η_t and $\epsilon_{i,t}$ representing an unobserved common shock and the FFI i's idiosyncratic capital inflow shock, respectively. Regression (1) does a fairly good job of explaining the variation in FFI-level net capital inflows, with mean and standard deviation of R^2s across the 18 FFI-level regressions of 37.1% and 23.5%, respectively.

Our sought-after shocks are the $\epsilon_{i,t}$s as we wish to use these exogenous, idiosyncratic shocks to construct our GIV shock. The GIV shock construction from the estimated $\hat{v}_{i,t}$ removes the variation coming from the unobserved common component η_t and is thus able to remove potential

[7] The number of lags for FFI-level net capital inflows, 1-month USD/ILS cross-currency basis, and exogenous controls in $\mathbb{C}$ is common and determined as the average of the chosen lag specifications from the AIC, corrected AIC, BIC, and HQIC lag length criteria tests for each FFI-level regression. The mean and standard deviation of lags across the 18 regressions are 15.9 and 3.4, respectively.

estimation bias from unobserved common shocks. The identifying assumption for the GIV shock is that it captures daily idiosyncratic shifts in FFIs' preferences for MAKAM investment orthogonal to aggregate global and local shocks. We now turn to a description of our second estimation step which deals with the construction of the GIV shock and estimation of its effects.

Estimation of GIV Shock's Effects. Following Gabaix and Koijen (2024), we define the GIV shock (denoted by $\varrho_{GIV,t}$) as the difference between the size-weighted- and inverse-variance-weighted-average of the estimated idiosyncratic shocks, i.e., $\varrho_{GIV,t} = \sum_{i=1}^{18} \hat{v}_{i,t} w_i - \sum_{i=1}^{18} \hat{v}_{i,t} u_i$ (normalized to have unit standard deviation), where the weights w_i are calculated from the share of net capital inflows average volume of each FFI in total FFIs' average volume and u_i is the share of $\hat{v}_{i,t}$'s inverse variance in the sum of estimated residuals' inverse variances.

As shown in Gabaix and Koijen (2024), this inverse-variance-weights-based GIV construction is optimal in the sense that the resulting estimation possesses the highest precision. Even if there still remains an unobserved common component in the estimated $v_{i,t}$s ($\hat{v}_{i,t}$s), the GIV shock construction removes this common component and ensures that the GIV shock is still valid in that it represents exogenous idiosyncratic variation coming from the $\epsilon_{i,t}$s since the common shock gets cancelled out in the subtraction of the inverse-variance-weighted-average from the size-weighted-average. Specifically, recall from above that η_t (some common composite of unobserved white noise MAKAM demand and supply shocks) is driving some of the variation in $\hat{\epsilon}_{i,t}$s such that for all is $\hat{v}_{i,t} = \epsilon_{i,t} + \eta_t$. In this setting the GIV shock $\varrho_{GIV,t} = \sum_{i=1}^{18}(\epsilon_{i,t} + \eta_t)w_i - \sum_{i=1}^{18}(\epsilon_{i,t} + \eta_t)u_i = \sum_{i=1}^{18} \epsilon_{i,t}(w_i - v_i)$ represents exogenous variation coming from the true idiosyncratic net capital inflow shocks ($\epsilon_{i,t}$) of large FFIs since the common shock gets cancelled out in the subtraction of the inverse-variance-weighted-average from the size-weighted-average.

Since the MAKAM bond market is rather concentrated, bearing an average Herfindahl-Hirschman Index of 0.47 for FFIs' net capital inflow volumes, it can deliver sufficient exogenous variation from large FFIs' idiosyncratic capital inflow shocks to properly identify monetary policy transmission impairment with this variation not being susceptible to a bias from any remaining unobserved common shocks. Our $\hat{v}_{i,t}$s do not appear to contain a material such unobserved common component, possessing an average absolute pairwise correlation of 5.9% and a corresponding standard deviation of 6.8%. But this common component is also non-negligible, thus highlighting the importance of the GIV construction's nature of the removal of this component. In sum, the concentrated structure of the bond market under study and the GIV shock approach's ability to remove even moderate biasing variation coming from unobserved common shocks both validate the suitability of the GIV shock approach used in this paper for the estimation of the our convenience yield channel.

Specifically, our second estimation step deals with estimating the local projection regressions given by

$$(accum\_net\_inflows_{t+h} - accum\_net\_inflows_{t-1})/outstanding_{t-1} = \alpha_h + \Omega_h \varrho_{GIV,t} + u_t, \tag{2}$$

$$conv\_yield_{t+h} - conv\_yield_{t-1} = \beta_h + \Xi_h \varrho_{GIV,t} + z_t, \tag{3}$$

where $h = 0, 1, ..., 500$ is the local projection horizon; $accum\_net\_inflows_t = \sum_{i=0}^{t} net\_inflows_i$ is FFIs' aggregate accumulated net capital inflows ($i = 0$ represents the beginning of our sample), where for economic scaling we normalize the cumulative difference in $accum\_net\_inflows_t$ by the previous day's value of total outstanding bonds ($outstanding_{t-1}$); and $conv\_yield_t$ is the convenience yield which is defined as the MAKAM-TELBOR spread. (In our analysis's extensions we also consider as outcome variables the spreads between government bond yields and maturity-comparable IRS rates as well as spreads between corporate bond yields and maturity-comparable IRS rates.) Ω_h and Ξ_h represent the impulse responses of the FFIs' accumulated net capital inflows (as share of total outstanding MAKAM) and convenience yield variable, respectively. In appendix C of the online appendix to this paper we describe the estimation of the contributions of the GIV capital inflow shocks to the forecast error variance (FEV) of our considered outcome variables. FEV shares are analogous to dynamic R^2s.

3.4 Estimation of Bond Supply Elasticity

A special case of interest for Equations (2) and (3) lies in the impact horizon ($h = 0$) case where the convenience yield variable is replaced by the MAKAM rate. This case, which allows us to estimate the elasticity of supply in the MAKAM market,[8] is of interest for us for two motivational reasons. The first is related to the economic motivation dimension of this case while the second is related to fact that this case naturally begs the question of whether our identification design choice of looking at the MAKAM-TELBOR spread as the outcome variable - rather than its two components as separate outcome variables - is warranted.

Economic Motivation Dimension. Considering that Equations (2) and (3) for $h = 0$ can be viewed as the first stage regression and reduced form regression, respectively, corresponding to the structural supply curve equation of the MAKAM market given by

$$\begin{aligned} & makam\_rate_t - makam\_rate_{t-1} = \delta + \\ & \theta(accum\_net\_inflows_{t+h} - accum\_net\_inflows_{t-1})/oustanding_{t-1} + e_t, \end{aligned} \tag{4}$$

the special case considered in this section allows us to estimate the slope of the supply curve in the MAKAM market (given by θ which can be estimated via 2SLS). A significant negative estimate of θ is necessary for establishing an upward-sloping bond supply curve (in the bond price-quantity plane). Such result serves as motivation for this paper's dynamic analysis of the convenience yield because a natural starting point for such analysis is to confirm that the bond supply curve is not perfectly elastic in which case there would be no economic underpinning for expecting a meaningful convenience yield of any nature (both static and dynamic).

Identification Motivation Dimension. This paper's objective is to estimate the dynamic meaningfulness of monetary transmission imperfection as measured by the convenience yield. Toward this end, we use an identification design choice that considers as its central outcome variable the MAKAM-TELBOR spread variable rather than separately considering this spread's two components as outcome variables (and then looking at the difference of the corresponding responses). However, the above-discussed estimation of the supply curve slope with the MAKAM rate used as the outcome variable begs the following question: why not estimate the transmission

[8] Note that this slope can only be reliably estimated for the impact case as the capital inflow shock is likely to induce additional changes to the supply curve as time advances after the shock where various market participants may opt to shift their supply of bonds in response to the observed price behavior following the shock.

imperfection by separately estimating the dynamic effects on the MAKAM and TELBOR rates and then simply look at the difference between the two?

To establish the crucialness of our spread-based outcome variable specification for the validity of our identification design and the ruling out of the alternative (separation-based) one, we present in Figure 2 the h-step-ahead correlation between the cumulative differences in the MAKAM and TELBOR rates. In particular, the figure shows the correlation between $makam\_rate_{t+h} - makam\_rate_{t-1}$ and $telbor\_rate_{t+h} - telbor\_rate_{t-1}$ for $h = 0, 1, ..., 500$.

Figure 2 presents correlations that are not only very significant from the impact horizon onwards (standing at 29.6% on impact) but, crucially, are increasing with h very rapidly, reaching 74.7% already at the 10th horizon and 97.1% at the 100th horizon (peaking at 97.4% at the 146th horizon and standing at 96.5% after 500 horizons). These remarkable correlations stress that, in order to identify the dynamic importance of the transmission imperfection with sufficient precision, one must use the spread variable itself as the outcome variable as this removes all of the (clearly dominant) effects of unobserved shocks to the current and future stance (up to horizon h) of local monetary policy on the MAKAM rate. The separation-based alternative to our identification design choice is thus unreliable in a finite sample as it would attempt to estimate an effect—be it on the MAKAM rate or the TELBOR rate—which is dwarfed by the effects of the unobserved shocks to current and future local monetary policy stance.[9]

4 Empirical Evidence

This section presents the main results of the paper. We start with the motivational results from the estimation of the bond supply curve in the MAKAM market, as described in Section 3.4. We then show the dynamic results for the MAKAM-TELBOR spread and FFIs' aggregate accumulated net capital inflows after which we focus on the convenience yield's spillover into the government

[9] In accordance with the message from Figure 2 about the unreliability of the separation-based identification design alternative, our estimation of Equation (3) while replacing the MAKAM-TELBOR spread with the MAKAM rate in the LHS of the equation yielded a significantly negative effect for only the first 5 horizons (from impact (0th horizon) to 4th horizon), losing significance from there onwards. The corresponding estimated effects from TELBOR-rate-based local projections are significant (with a positive point estimate) at only the 13th horizon through the first 392 horizons, and then again for 33 horizons until the 500th (last) horizon.

and corporate bond markets as well as the equity market. (Note that our considered 501 horizons (0th through 500th horizon) reflect roughly two calendar years given that there are about 250 MAKAM trading days during a calendar year.) We also briefly discuss an array of robustness checks, fully showing them in Appendix D of the online appendix to this paper, followed by a sectoral flow analysis using supplementary data from the TASE that highlights an intriguing local portfolio rebalancing mechanism. We end the section with both data- and institutional-setting-based evidence supporting our assumption that TELBOR and IRS rates capture well the risk-free yield curve.

4.1 Estimation Results for Bond Supply Elasticity

Table 2 shows the results from the estimation described in Section 3.4: 2SLS-estimated first stage effect of the GIV capital inflow shock on FFIs' aggregate net capital inflows as a share of total outstanding bonds (second column); the reduced form effect on the MAKAM rate (fourth column); and the 2SLS-estimated second stage estimate of the bond supply elasticity (third column) conditional on the GIV capital inflow shock. For completeness, we also report in the first column the OLS-estimated effect from structural Equation (4). The net capital inflows variable is multiplied by 100 prior to entering the regressions for comparability purposes and hence its response is in terms of one-percentage-point (as share of outstanding MAKAM) changes; the resultant estimated supply slope is thus in terms of a 1-percentage-point increase in FFIs' aggregate net capital inflows (as share of outstanding MAKAM). The reduced form and 2SLS first stage estimates are with respect to a GIV capital inflow shock that generates a peak 10-percentage-point increase in FFIs' aggregate net capital inflows (as share of outstanding MAKAM). This normalization—whose reasoning is elaborated on in the historical decomposition analysis from Appendix B of the online appendix to this paper—is also done in the subsequent dynamic analysis and implies a 3.4-standard-deviation GIV capital inflow shock.

The results from Table 2, which provide valuable motivation for the subsequent dynamic analysis of the monetary transmission imperfection, establish an upward-sloping bond supply curve in the bond price-quantity plane: a GIV-capital-inflow-shock-induced 1-percentage-point increase in FFIs' aggregate net capital inflows (as share of outstanding MAKAM) generates a 0.62 basis point decline in the MAKAM rate. While this constitutes a somewhat modest supply elasticity, what matters to us is the highly significant nature of this estimated slope which clearly rejects the hypothesis of a perfectly elastic supply curve.[10] In what follows next, we turn to a dynamic analysis of the monetary transmission imperfection which we demonstrate to be very rich in the sense of providing persistent and gradually-increasing effects of the capital inflow shock on the MAKAM-TELBOR spread and FFIs' aggregate net capital inflows variables.

4.2 MAKAM-TELBOR Spread and FFIs' Accumulated Net Capital Inflows

Impulse Responses. Figure 3 shows impulse responses to the GIV capital inflow shock of the MAKAM-TELBOR spread and FFIs' accumulated net capital inflows (as share of total outstanding MAKAM). We normalize the two variables responses such that the response of the accumulated net capital inflow variable reaches a peak of 10 percentage points, i.e., FFIs accumulate a 10-percentage-point net capital inflow increase as share of outstanding MAKAM. This peak response takes place after 363 trading days, which demonstrates the very persistent nature of FFIs' bond purchasing following the capital inflow shock.

Note that the latter 10-percentage-point normalization implies that the responses from Figure 3 are with respect to a 3.4-standard-deviation GIV capital inflow shock. While this is a large shock, we view our normalization as reasonable given the high-frequency (daily) nature of our shock series and that over our sample the actual realizations of our GIV capital inflow shocks have accounted for above and beyond of the run-up in FFIs' net capital inflows as share of MAKAM outstanding from early 2020 to the later part of our sample—as confirmed by the historical decomposition results presented in Appendix B of the online appendix to this paper. These historical decomposition results point to a dominating presence of favorable such shocks during the run-up period that far exceeds the 3.4-standard-deviation shock normalization for our impulse responses results exposition. Importantly, when we move to examine the importance of our capital inflow

[10]While not shown here, we have confirmed that the capital inflow shock has an insignificant effect on the TELBOR rate (with a positive point estimate) as expected given that this variable reflects the current and future local monetary policy stance which in turn should not be related to our identified high-frequency GIV capital inflow shock.

shock in driving the variation in the convenience yield variable in the FEV estimation, we consider a one-standard-deviation demand shock.

The MAKAM-TELBOR spread declines significantly for the bulk of the considered horizons, doing so in a persistent and gradual manner. The response on impact is -1.2 basis points (with a t-stat of -3.5), while the trough response—which takes place after 480 trading days—is -8.7 basis points (with a t-stat of -2.2). The response is significant at the 95% and 90% levels for a total of 414 and 492 trading days, respectively.

What can explain the persistent convenience yield response just discussed? The right panel of Figure 3 shows that FFIs buy bonds following the capital inflow shock in a very persistent and gradual manner as well, increasing their accumulated net capital inflows as share of outstanding MAKAM by 1.4 percentage points on impact while gradually building up this increased share to a peak of 10-percentage-point share increase after 363 trading days. The response is significant at the 95% and 90% levels for a total of 471 and 501 (i.e., for all considered horizons) trading days, respectively. The gradual and persistent nature of the accumulated net capital inflows variable is consistent with theories of slow-moving capital where there are institutional constraints on market entrance such as search and portfolio adjustment costs and time to raise capital where these constraints are slowly and gradually alleviated (see, e.g., Mitchell et al. (2007), Duffie (2010), and Jiang and Sun (2024)). It is noteworthy that our capital inflow shock is a white noise shock, i.e., possessing no autocorrelation, as indicated from the Ljung-Box Q-test for residual autocorrelation. Hence, the persistence of our estimated responses is not coming from shock autocorrelation but rather from the persistent propagation of the shock's effect.

FEVs. Figure B.1 from the online appendix to this paper shows the contributions of a one-standard-deviation GIV capital demand shock to the variation over our considered horizons in the convenience yield variable (MAKAM-TELBOR spread) and FFIs' accumulated net capital inflows (as share of outstanding MAKAM). For the former variable, the peak FEV share is attained after 500 horizons with an estimated 39.6% share. That our capital inflow shock explains such a meaningful share after roughly two calendar years is a testament to the added value of the *dynamic* dimension of our econometric analysis and the associated gradual and persistent nature of our shock.

The above-mentioned 39.6% peak FEV share for the MAKAM-TELBOR spread is consistent with the very high FEV share of the variation in FFIs' accumulated net capital flows variable accounted for by our shock. Already on impact, our shock explains an important 31.5% share of the variation in this variable. And after 149 trading days this share reaches its peak of 69.6%, remaining very high persistently throughout the remaining horizons with an estimated share of 51.9% at the last (500th) horizon.

4.3 Additional Analysis: Government Bond, Corporate Bond, and Equity Markets

Government Bond Spreads: Impulse Responses. Figure 4 shows the responses of the spreads between the 1- through 5-year and 10-year government bond yields and the corresponding IRS rates. Clearly, the convenience yield dynamics from Figure 3 meaningfully spill over to the government bond market, with the six government bond spreads significantly falling at the 95% (90%) confidence level for 270 (416), 465 (483), 335 (410), 279 (324), 276 (324), and 82 (133) trading days (by increasing order of bond maturity) with corresponding trough responses of -8.1 basis points (491st horizon), -7.5 basis points (365th horizon), -6.6 basis points (386th horizon), -5.6 basis points (402nd horizon), -5.1 basis points (402nd horizon), and -3.9 basis points (386th horizon).

As the bond maturity increases, the responses quantitatively weaken and largely in accordance with the expectations hypothesis. Nevertheless, it is clear that there is in effect a convenience yield also in the government bond market with respect to interbank rates as results for the 1-year government bond yield spread are quantitatively similar to the baseline MAKAM-TELBOR spread results. And this spillover at the short end of the yield curve also transmits significantly into the intermediate and long ends of the curve.

Government Bond Spreads: FEVs. Figure B.2 from the online appendix to this paper shows the contributions of a one-standard-deviation GIV capital inflow shock to the variation over our considered horizons in the six government bond yield spread variables. Our capital inflow shock accounts for peak FEV shares of the variation in these variables of 42% (499th horizon), 48% (346th horizon), 57.2% (321st horizon), 52.6% (432nd horizon), 50.8% (415th horizon), and 37.3% (500th horizon). Similar to the baseline convenience yield variable, our capital inflow shock accounts for important shares of the variation in the government bond yield spread variables.

Corporate Bond Spreads: Impulse Responses. Figure 5 shows the responses of the spreads between the 1- through 5-year and 7- and 10-year investment-grade corporate bond yields and the corresponding IRS rates. A opposed to the government bond spread case, we also consider the 7-year spread because corporate bond yields - unlike government bond yields - do not suffer from illiquidity-related missing observations at the 7-year maturity.

These spreads posses significant responses at the 95% (90%) confidence level for 147 (229), 435 (477), 249 (329), 247 (294), 249 (314), 312 (393), and 89 (174) trading days (in increasing maturity order) with corresponding trough responses of -27 basis points (365th horizon), -31.6 basis points (380th horizon), -22.4 basis points (237th horizon), -17.3 basis points (365th horizon), -24.7 basis points (385th horizon), -23 basis points (331st horizon), and -16.8 basis points (382nd horizon). Overall, we observe a significant spillover effect of the convenience yield mechanism into the corporate bond market at both the short and long ends of maturities.

Corporate Bond Spreads: FEVs. Figure B.3 from the online appendix to this paper shows the contributions of a one-standard-deviation GIV capital inflow shock to the variation over our considered horizons in the seven corporate bond yield spread variables. Our capital inflow shock accounts for peak FEV shares of the variation in these variables of 53.6% (402nd horizon), 50.9% (321st horizon), 52% (320th horizon), 36.8% (396th horizon), 44.9% (348th horizon), 37.2% (345th horizon), and 37.1% (500th horizon). These estimated FEV shares indicate that our capital inflow shock accounts for an meaningful share of the variation in the corporate bond yield spread variables.

Equity Market: Impulse Responses. Figure 6 shows the response of the TA-35 stock price index. The response is significant at the 95% (90%) confidence level for 267 (348) horizons and peaks at 5.7% after 388 horizons. Overall, we observe a significant spillover effect of the convenience yield mechanism into the equity market.

Equity Market: FEVs. Figure B.4 from the online appendix to this paper shows the contributions of a one-standard-deviation GIV capital inflow shock to the variation over our considered horizons in the TA-35 stock price index. Our capital inflow shock accounts for a peak FEV share of the variation in this variable of 42.1% at the 405th horizon. This estimated FEV share indicates that our capital inflow shock accounts for a meaningful share of the variation in the equity index variable.

4.4 Robustness Checks

Appendix D of the online appendix to this paper examines and confirms the robustness of the baseline impulse response and FEV results presented in the previous section along four dimensions. The first considers alternative lag specifications for the FFI-level regressions. The second truncates the baseline sample at 4/11/2022 so as to confirm that the baseline results are robust to omission of the monetary tightening period part of our sample. The third replaces the inverse-variance-weighted-average shock component in the GIV construction with the equally-weighted-average one. And the fourth adds the flows of the foreign custodian bank discussed in Footnote 3 as a control in the FFI-level regressions to confirm that the baseline results are robust to unobserved custody-based flows.

4.5 Local Portfolio Rebalancing Effects

The results shown above for corporate bonds and equities demonstrate a relatively high corporate bond spread and equity price response magnitude relative to the MAKAM-TELBOR spread. This section aims to explore if this is driven by a local portfolio rebalancing mechanism, where a particular sector which sells MAKAM bonds to FFIs uses the proceeds to purchase corporate bonds and equities thus generating a rebalancing-induced rise in their prices. Toward this end, this section makes use of supplementary TASE-owned (also known as the 'Smart Money' database - see Section 3.2.2 for more details) data on secondary market activity by sector in the MAKAM, government and corporate bond, and equity markets. (In accordance with the government and corporate bond spread analysis, we restrict attention to nominal government and investment-grade corporate bonds with maturities of up to 10 years.)

The secondary MAKAM flow data's shortcoming is that it does not include either bond redemption flows or primary-market-related purchases, with the latter being important in FFIs' MAKAM flow activity due to the placement of direct orders by FFIs with local banks prior to MAKAM auctions. Specifically, FFIs' MAKAM purchases in the primary market are nearly equal to those from the secondary market, with these two purchase categories making up 49.8% and 50.2% of total purchases, respectively. And the baseline net capital inflow series and secondary market flow series have a fairly modest correlation of 44.6%, additionally pointing to the importance of redemptions and primary-market-related purchases. Nevertheless, the added value from this data outweighes this shortcoming as it allows us to shed light on important local rebalancing effects from MAKAM to government bond, corporate bond, and equity markets.

In what follows, for ease of exposition, we focus our analysis solely on the local mutual fund (MF) sector. The reason for this expositional choice is that our experimentations with all of the sectors available in the supplementary secondary market data revealed that MFs appear to be the effectively sole counterparty against which FFIs conduct their demand-driven secondary market MAKAM purchases. This indicates that, while local banks serve as the sole counterparties against FFIs' primary-market-related demand, they play no such counterparty role in the secondary market.

MFs' and FFIs' Secondary Market MAKAM Flows: Impulse Responses. Figure 7 shows impulse responses to the GIV capital inflow shock of MFs' and FFIs' accumulated MAKAM flows (as share of outstanding MAKAM bonds) from the secondary MAKAM market. Echoing the previous discussion about the important role of primary-market-related purchases by FFIs in driving their demand, we can see that the peak response of the secondary market accumulated flow variable of FFIs is 3 percentage points after 475 horizons (with a t-stat of 2), or only 30% of the 10-percentage-point peak baseline response from the baseline data. (The response is significant at the 95% (90%) confidence level for 232 (415) horizons.) This tells us that accounting for primary-market-related demand flows is crucial for identification. But, as noted above, the added value from using the supplementary TASE-owned secondary market data still outweighes the lacking of the primary-market-related demand component.

The answer to who mainly serves as the counterparty to FFIs' secondary market demand is borne out by MFs' accumulated flows response, which is to a good approximation the mirror image of that of FFIs. (The response is significant at the 95% confidence level for all (501) considered horizons and troughs at -2.1 percentage points after 475 horizons.) The correlation between the first-differences (slopes) of the two impulse response functions is -89.3%, in accordance with the quantitative and qualitative similarity between the these functions. This important result begs the following intriguing question: do MFs allocate a meaningful share of the proceeds from their secondary market MAKAM trading with FFIs to corporate bond and equity investment? After briefly discussing the FEV results for the MAKAM flows, we shall answer this question in the affirmative by looking at the corresponding corporate bond and equity flows.

MFs' and FFIs' Secondary Market MAKAM Flows: FEVs. Figure B.5 from the online appendix to this paper shows the contributions of a one-standard-deviation GIV capital inflow shock to the variation over our considered horizons in MFs' and FFIs' accumulated MAKAM flows (as share of outstanding MAKAM bonds) from the secondary MAKAM market. It is apparent that our shock is a leading driver of the variation in these two variables, reaching peak FEV shares of 70.8% (473th horizon) and 67.5% (309th horizon), respectively.

MFs' Rebalancing Flows: Impulse Responses. Figure 8 shows impulse responses to the GIV capital inflow shock of MFs' accumulated government bond, corporate bond, and equity flows from their corresponding secondary markets (all flows are normalized as shares of outstanding MAKAM bonds for comparability purposes with respect to Figure 7).

MFs' accumulated government bond, corporate bond, and equity flows responses peak at 0.75, 0.67, and 0.83 percentage points after 324, 379, and 363 horizons (with t-stats of 2.1, 2.9, and 2.5), respectively, which indicates a meaningful portfolio rebalancing by MFs from MAKAM to government and corporate bond investment as well as equity investment. (The responses are significant at the 95% (90%) confidence level for 125 (163), 162 (259), and 108 (210) horizons, respectively.) Specifically, considering that MFs' accumulated MAKAM flows response is -1.8, -1.8, and -2.1 percentage points after 324, 378, and 363 horizons, respectively, the just-mentioned peak responses of 0.75, 0.67, and 0.83 percentage points imply that MFs allocate at these peak-implied horizons 41.7%, 37.2%, and 39.5% of their proceeds from MAKAM trading with FFIs to investment in government bond, corporate bond, and equity markets, respectively. The meaningful rebalancing from mutual funds evident from Figure 8 is valuable in explaining the relatively large magnitude of corporate bond spread and equity price responses from Figures 5 and 6, respectively, as it highlights an important local portfolio rebalancing from MAKAM bonds to corporate bonds and equities. Given that these markets trade significantly riskier assets than both the MAKAM and government bond markets, it is sensible to expect significant rebalancing flows into these markets to induce meaningful prices changes in them. And the specific and unique role we find for mutual funds in this rebalancing echoes the similar role found for these institutions in propagating the effects of quantitative easing in the U.S. (Selgrad (2023)).

MFs' Rebalancing Flows: FEVs. Figure B.6 from the online appendix to this paper shows the contributions of a one-standard-deviation GIV capital inflow shock to the variation over our considered horizons in MFs' accumulated government bond, corporate bond, and equity flows (as shares of outstanding MAKAM bonds) from their corresponding secondary markets. Our shock accounts for peak FEV shares of 65.2% (500th horizon), 61.9% (417th horizon), and 62.2% (500th horizon) for these three variables, respectively. These significant shares indicates that our shock is the main driver of the variation in MFs' accumulated rebalancing flows across all three considered markets, i.e., the rebalancing mechanism we uncover is responsible for the bulk of the variation in MFs' government bond, corporate bond and equity investment activity. Given that MFs are the largest position holder in the corporate bond market, holding an average market share of 31.9% over our sample period, our FEV result implies that our shock is likely to generate a considerable rebalancing-induced price effect in the corporate bond market. Although the corresponding average market share for stocks is much more modest at 6.1%, taken together with the remarkable FEV share of MFs' equity investment accounted for by our shock this 6.1% share is still meaningful enough to imply a significant rebalancing-induced equity price increase.

4.6 Do TELBOR and IRS Rates Capture Well the Risk-Free Yield Curve?

The underlying assumption of this paper's analysis is that TEBOR and IRS rates, which are used to construct our short- and longer-term convenience yield measures, respectively, are sound measures of monetary policy stance and thus proxy well for the risk-free yield curve.[11] This assumption is crucial for our analysis because to accurately measure convenience yields one must subtract the risk-free yield curve from the maturity-comparable yields of the liquid and safe assets as the latter possess both the convenience yields and the risk-free yield curve. This section provides both data- and institutional-setting-based evidence supporting the validity of this assumption, beginning with TELBOR rates and then ending the section with IRS rates.

TELBOR Rates. One concern about using the TELBOR (interbank) market as a proxy for the monetary policy stance when measuring the convenience yield is that TELBOR rates capture not only the monetary policy stance but also risk-premia-based factors related to local banks' riskiness. Such factors would undermine our analysis as they would sully our convenience yield measure with non-monetary-transmission-imperfection factors, confounding increased local banks' riskiness with the convenience yield.

To remove this concern and validate TELBOR as a clean measure of monetary policy stance, we turn to a direct measure of the BOI's current monetary policy stance—the overnight rate from the BOI's daily deposit auctions—and compare it to the overnight TELBOR rate.[12] A perfect alignment between the two objects would imply that the shortest-term TELBOR rate precisely captures

[11] van Binsbergen et al. (2022) and Diamond and Van Tassel (2024) put forward the novel way measuring risk-free rates as the implicit risk-free rates—called box rates—from prices of stock market index options. However, due to the illiquid and short-term nature of the TA-35 options market, this measuring approach turned out to be invalid for our setting after implementing the methodology from van Binsbergen et al. (2022) and Diamond and Van Tassel (2024). Specifically, since options' maturities for this market are all under three months, even small changes in option prices result in large changes in implied box rates. The standard deviation of our estimated daily box rate series—obtained as medians of maturity-specific estimates from minute-by-minute regressions—was 178 basis points (for a mean of 7 basis points), i.e., our estimated box rate series had an insensible coefficient of variation of over 25. This insensibility is the result of both the short-term nature of the options—which makes the implied box rate highly sensitive to price changes—as well as their illiquid nature as characterized by an average of a mere 8.7 price quotes (observations) for each regression (with a low standard deviation of 5.9).

[12] Note that our convenience yield measure does not make use of the overnight TEBLOR rate because there is essentially no trading in MAKAM with maturities of one day.

the true monetary policy stance which will in turn imply that the longer TELBOR rates we use from the 1- through the 12-month maturity precisely measure the true current and future stance. The overnight deposit rate represents the purest form of risk-free rate as it measures the rate earned by local banks from depositing money overnight with the most risk-free institution there is, i.e., the central bank.

Figure 9 shows the BOI's overnight deposit rate alongside the overnight TELBOR rate. The results are staggering: the two rates are one of the same, possessing a correlation of effectively 1 (precisely, 0.999989 in levels and 0.999032 in first-differences). This equivalence between the two rates completely removes the concern described above, ensuring the suitability of our use of TELBOR rates as measures of the monetary policy stance. Notably, the agents (local banks) governing future monetary policy stance expectations as reflected in our TELBOR rates have free access to the MAKAM market and hence our convenience yield measure is not only purged of the current monetary policy stance but also of future stance expectations. (Over our sample period, local banks have held a meaningful average MAKAM market share of 25.1%.)

One may still argue that inferring that longer-than-overnight TELBOR rates are risk-free from the equivalence between the overnight TELBOR and BOI's deposit rates is somewhat of a stretch considering that risk premia can become more of an issue at longer-than-overnight maturities. To alleviate this concern, we turn to the institutional setting underlying the TEBLOR quotes provided by the Israeli banks. Unlike LIBOR, quote-providing banks in the TELBOR market are obligated by the BOI to execute transactions based on their quotes as follows (Stein (2017)): loans and deposits for an overnight maturity; overnight index swaps (OISs) for the 1- and 3-month maturities; forward rate agreements (FRAs) for the 3- to 12-month maturities; and IRSs for the 12-month maturity. OIS, FRA, and IRS transactions entail no exchange of principal while including both initial and variational margin arrangements, thus being purged of any meaningful risk premia. This fact, taken together with the equivalence between the overnight TELBOR and BOI's deposit rates from Figure 9, indicates that TELBOR rates are not only insusceptible to manipulation but also devoid of risk premia and thus accurately reflect the risk-free yield curve.

IRS Rates. IRS rates are effectively the weighted averages of current and future (expected) TEBLOR rates, where zero-coupon present values of the interest payments are used to determine the weights; as such, IRS rates provide a good measure of longer-term interbank market rates and their associated current and future monetary policy stance effects when longer maturities—for which TELBOR rates are unavailable—are considered. Hence, the spread between government bond yields and IRS rates is sound measure of the convenience yield of government bonds.

To further drive this point home, we present in Figure 10 the h-step-ahead correlation between the cumulative differences in the 1-year IRS and TELBOR rates (the only maturity for which the two rates are available). In particular, the figure shows the correlation between $irs\_rate_{t+h} - irs\_rate_{t-1}$ and $telbor\_rate_{t+h} - telbor\_rate_{t-1}$ for $h = 0, 1, ..., 500$. The impact correlation is highly significant at 69.5% and increases very fast, reaching 92.5% after 10 horizons and 98.8% after 20 horizons. This rather fast convergence to an effectively perfect correlation, coupled with the similar result from Figure 2 for MAKAM and TELBOR rates, implies that over longer horizons monetary policy stance is the effectively sole driver of variation in MAKAM, TELBOR, and IRS rates. Hence, analogously to the MAKAM-TELBOR spread case, subtracting IRS rates from government bond yields in our local projection regressions reliably serves the purpose of removing this monetary policy stance component and thus isolating the dynamic effect on convenience yields in government bond yields.

5 Conclusion

This paper documents a significant and persistent negative response of the spread between Israeli short-term market rates and interbank rates following a capital inflow shock that increases FFIs' demand for local risk-free short-term bonds. The latter capital inflow shock also leads to significant and persistent narrowing of the spreads between both government and corporate bond yields with respect to maturity-comparable interbank rates as well as a corresponding increase in equity prices. We uncover an intriguing local-portfolio-rebalancing-induced rise in corporate bond and equity prices as our capital inflow shock leads to MFs (FFIs' counterparty in the MAKAM secondary market) allocating their MAKAM proceeds to corporate bond and equity investments.

Our set of findings, obtained from a granular econometric approach, can be viewed as representing evidence in favor of a meaningful convenience yield channel that points to a meaningful monetary policy transmission impairment in the presence of capital inflow shocks.

This paper's results shed light on the difficulty facing central banks of enforcing their target rate in the short-term risk-free bond market when hit by large capital inflow shocks. This difficulty speaks to the costly task of maintaining the level of commercial reserves consistent with the targeted rate in the interbank market when large such shocks force the central bank to generate large swings in reserves to keep the market rate from steering away from the latter target/interbank rate. As a negligible convenience yield is a necessary condition for the proper transmission from the monetary policy rate into the real economy, the novel and meaningful convenience yield channel we find represents an important impediment to monetary transmission mechanism.

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Table 1: Summary Statistics of Main Variables.

Variable	Mean	Std.	Min	Max	N
Panel A: Main Variables					
MAKAM-TELBOR Spread (bps)	-7.38	18.69	-124.14	30.90	15274
MAKAM (bps)	18.37	28.71	-62.71	229.45	15274
TELBOR (bps)	25.75	42.53	5.00	313.20	15274
Aggregate Daily FFIs' Net Capital Inflows[a]	0.09	0.46	-4.67	3.80	1394
USD/ILS Cross-Currency Basis (bps)	-33.70	23.37	-297.67	7.70	1394
Panel B: Government Bond Market					
1Y Gov Bond-IRS Spread (bps)	-8.70	19.15	-104.50	17.19	1394
2Y Gov Bond-IRS Spread (bps)	-6.16	16.38	-72.14	28.84	1394
5Y Gov Bond-IRS Spread (bps)	1.70	12.40	-34.30	25.00	1394
10Y Gov Bond-IRS Spread (bps)	6.66	9.59	-27.89	26.10	1394
Panel C: Corporate Bond Market					
1Y Corp Bond-IRS Spread (bps)	135.88	43.00	17.68	286.82	1394
2Y Corp Bond-IRS Spread (bps)	164.04	45.29	51.14	313.89	1394
5Y Corp Bond-IRS Spread (bps)	167.34	36.84	68.83	318.26	1394
10Y Corp Bond-IRS Spread (bps)	121.69	34.79	59.77	290.18	1394
Panel D: Other Financial Variables					
Banks MAKAM Holdings[b]	25.08	17.04	1.88	50.64	68
FFIs MAKAM Holdings[b]	18.33	14.78	0.68	50.35	68
MF MAKAM Holdings[b]	2.87	8.49	12.36	40.02	68
MF Corp Bond Holdings[c]	31.89	3.30	24.99	37.05	68
MF Equity Holdings[c]	6.07	1.66	3.34	8.19	68
MFs' Daily Government Bond Flows[d]	0.2	6.81	-64.60	45.62	1149
MFs' Daily Corporate Bond Flows[d]	1.44	2.68	-22.23	20.96	1149
MFs' Daily Equity Flows[d]	-0.17	3.27	-39.04	22.27	1149
Total MAKAM Outstanding[e]	105.50	13.09	86.97	139.92	1394

[a] Expressed as percentage of outstanding MAKAM.
[b] Expressed as percentage of total outstanding MAKAM. Based on monthly observations.
[c] Expressed as percentage of respective market capitalization.
[d] Expressed in basis points relative to outstanding MAKAM.
[e] In ILS billions.

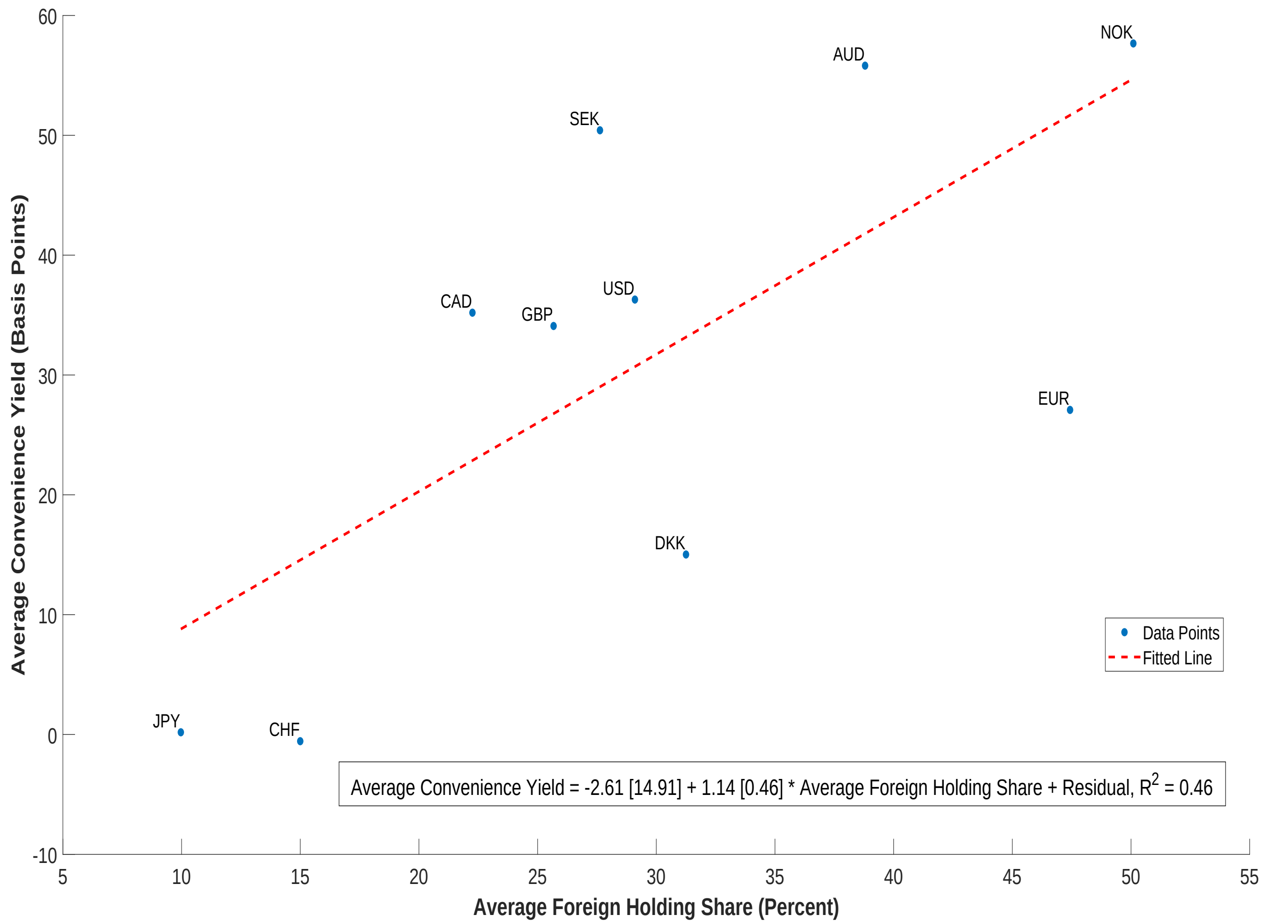
Notes: This table presents summary statistics for the main variables used in our analysis over the period January 2017 to August 2022. Panel A reports statistics for the primary variables including the MAKAM-TELBOR spread (the difference between MAKAM and TELBOR rates, both averaged across 1-12 month maturities). Panel B presents spreads between government bond yields and maturity-matched interest rate swaps (IRS). Panel C shows analogous spreads for corporate bonds. Panel D reports various holdings and flow measures for different market participants. These daily flows represent secondary market transactions only. All spreads and interest rates are expressed in basis points (bps) unless otherwise noted. FFIs refers to foreign financial institutions, MF to mutual funds, and IRS to interest rate swaps.

Table 2: **Estimation of Bond Supply Curve Elasticity.**

Response	OLS	2SLS 1^{st} Stage	2SLS 2^{nd} Stage	Reduced Form
MAKAM Rate	-0.55***		-0.62***	-0.84***
	(0.07)		(0.07)	(0.32)
Net Capital Inflows		1.37***		
		(0.06)		
F-Stat		499.67		
R^2	1.15%	75.64%	1.09%	1.09%
Obs	1,366	1,366	1,366	1,366

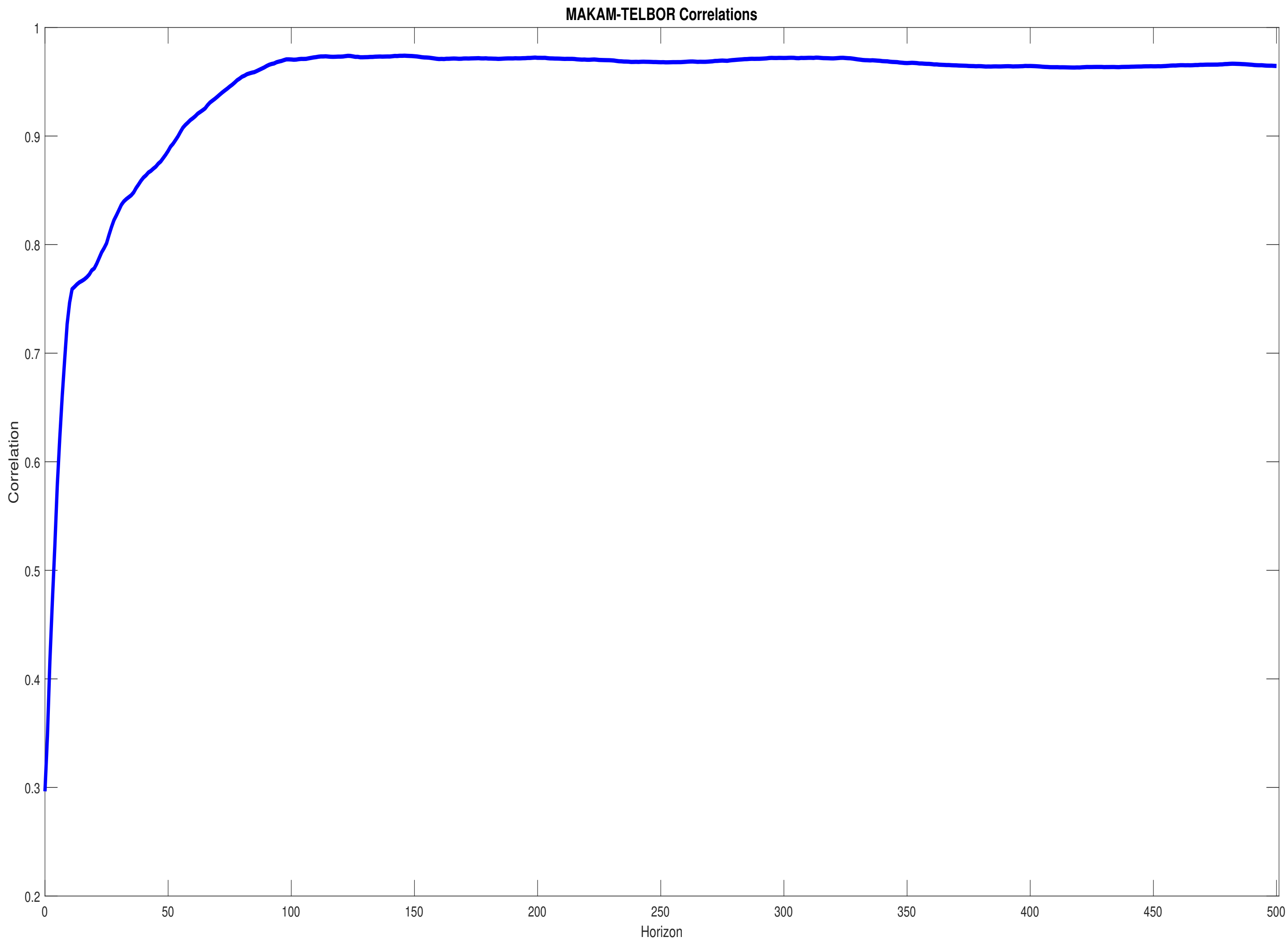
Notes: This table shows the results from the estimation described in Section 3.4: 2SLS-estimated first stage effect of the GIV capital inflow shock on FFIs' aggregate MAKAM net capital inflows as share of outstanding MAKAM (second column; in percentage point terms); the reduced form effect on the MAKAM rate (fourth column; in basis point terms); and the 2SLS-estimated second stage estimate of the bond supply curve elasticity (third column; in basis point terms) conditional on the GIV capital inflow shock. For completeness, we also report in the first column the OLS-estimated effect from structural Equation (4). The MAKAM net capital inflow variable is multiplied by 100 prior to entering the regressions for comparability purposes and hence the resultant estimated supply slope is in terms of a 1-percentage-point increase in FFIs' net capital inflows (as share of outstanding MAKAM). MAKAM rate response and associated numbers in parentheses represent standard errors computed from the heteroskedasticity- and autocorrelation-consistent procedure of Newey and West (1987) with the truncation lag equal to one. *, **, and *** represent significance levels at the 10%, 5%, and 1% levels.

Figure 1: **Cross-Sectional Regression of Local Convenience Yields on Foreign Holding Shares in Local Government Bond Markets.**



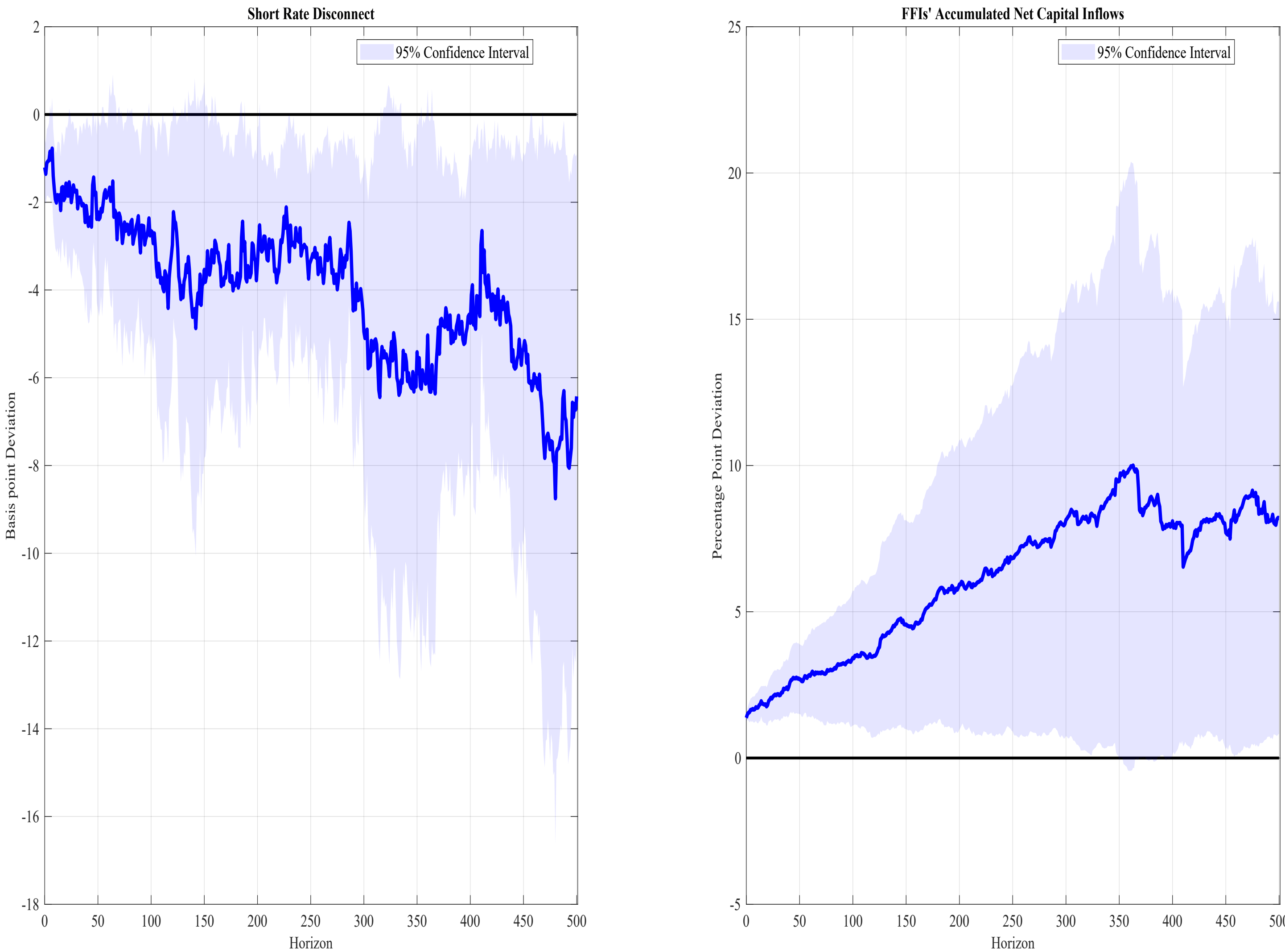
Notes: This figure presents the data points versus fitted line from a cross-sectional regression of local convenience yields on foreign holding shares in local government bond markets from 10 of the G11 currencies. The sample is dictated by the convenience yield data from Diamond and Van Tassel (2024)), which runs from January 2005-July 2020. The foreign holding shares data, which measure the share in total government bond debt held by foreigners at quarterly frequency, is taken from Arslanalp and Tsuda (2014). The monthly convenience yield series are converted into quarterly frequency by taking averages of monthly observations. Robust standard errors appear in squared brackets in the displayed regression equation.

Figure 2: **Dynamic Correlations Between MAKAM and TELBOR Rates.**



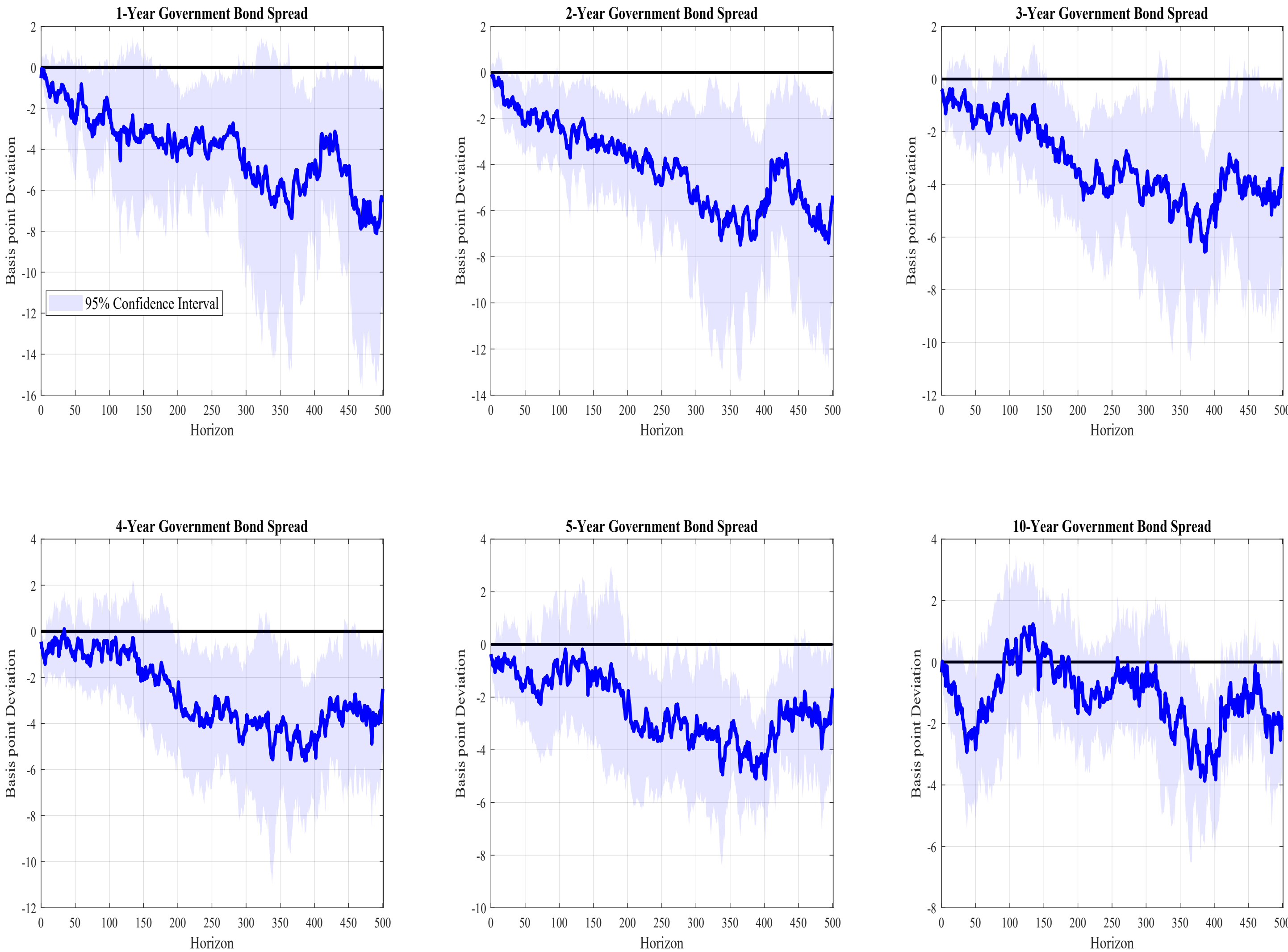
Notes: This figure presents the h-step-ahead correlation between the cumulative differences in the MAKAM and TELBOR rates. In particular, the figure shows the correlation between $makam\_rate_{t+h} - makam\_rate_{t-1}$ and $telbor\_rate_{t+h} - telbor\_rate_{t-1}$ for $h = 0, 1, ..., 500$. Horizon ($h = 0, 1, ..., 500$) is on the x-axis. Values are in fractional terms.

Figure 3: **Impulse Responses to GIV Capital Inflow Shock: MAKAM-TELBOR Spread and FFIs' Accumulated Net Capital Inflows.**



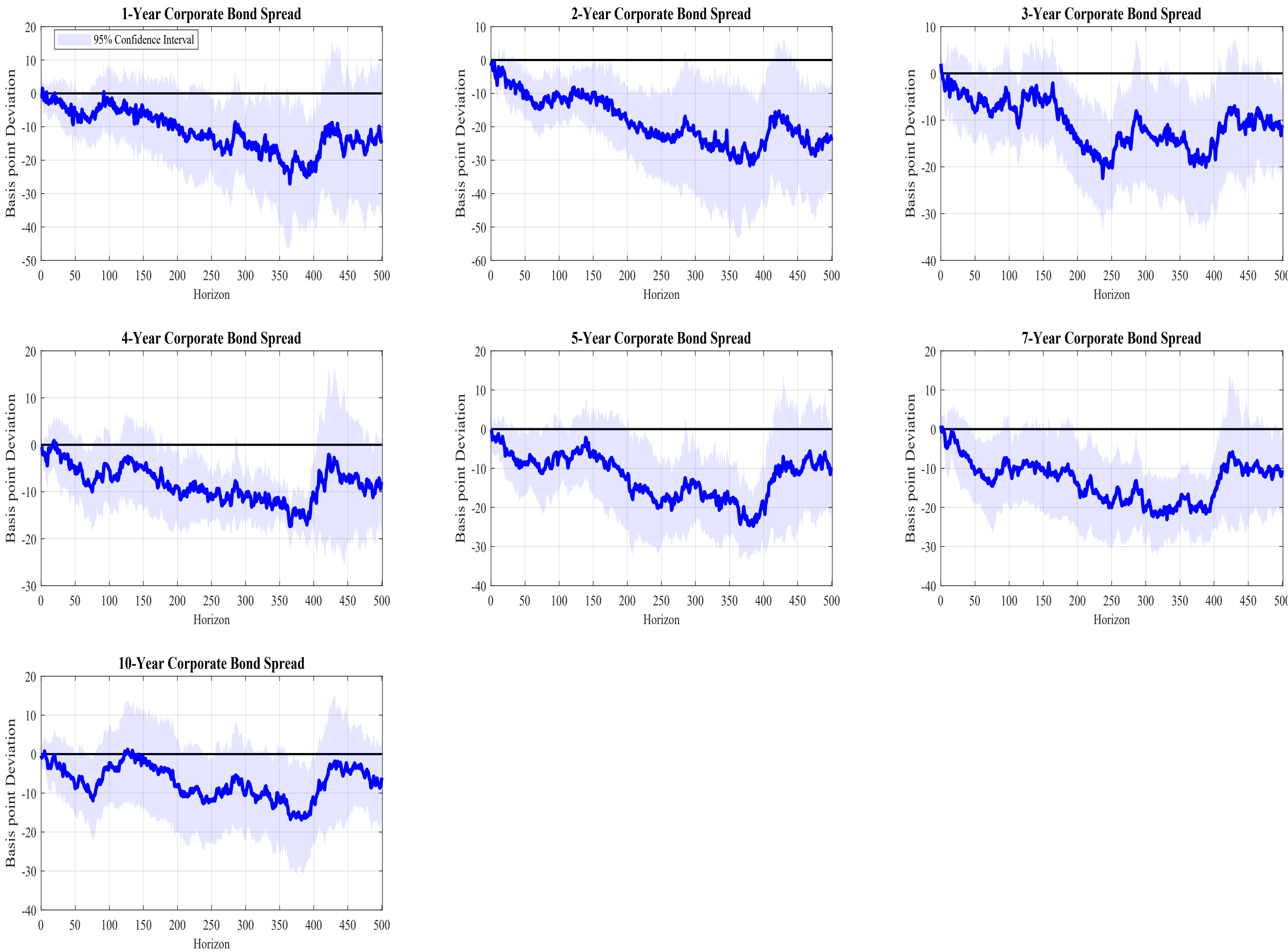
Notes: This figure presents the impulse responses (solid lines) to a GIV capital inflow shock of the convenience yield variable (MAKAM-TELBOR spread) and FFIs' accumulated net capital inflows as share of outstanding MAKAM. Responses are normalized such that the peak response of the latter variable is 10 (i.e., 10-percentage-point share increase), implying a 3.4-standard-deviation GIV capital inflow shock size. 95% confidence bands (shaded areas) are based on standard errors computed from the heteroskedasticity- and autocorrelation-consistent procedure of Newey and West (1987) with the truncation lag equal to $h+1$ (where $h = 0, 1, ..., 500$ is the local projection horizon). Horizons are on the x-axis (impact horizon (0) to 500th horizon). Values for MAKAM-TELBOR spread variable are in basis point change units relative to the pre-shock value of the spread; those for FFIs' accumulated net capital inflows (as share of outstanding MAKAM) are in percentage-point change units relative to the pre-shock value of FFIs' accumulated net capital inflows (as share of outstanding MAKAM).

Figure 4: **Impulse Responses to GIV Capital Inflow Shock: Government Bond Yield Spreads.**



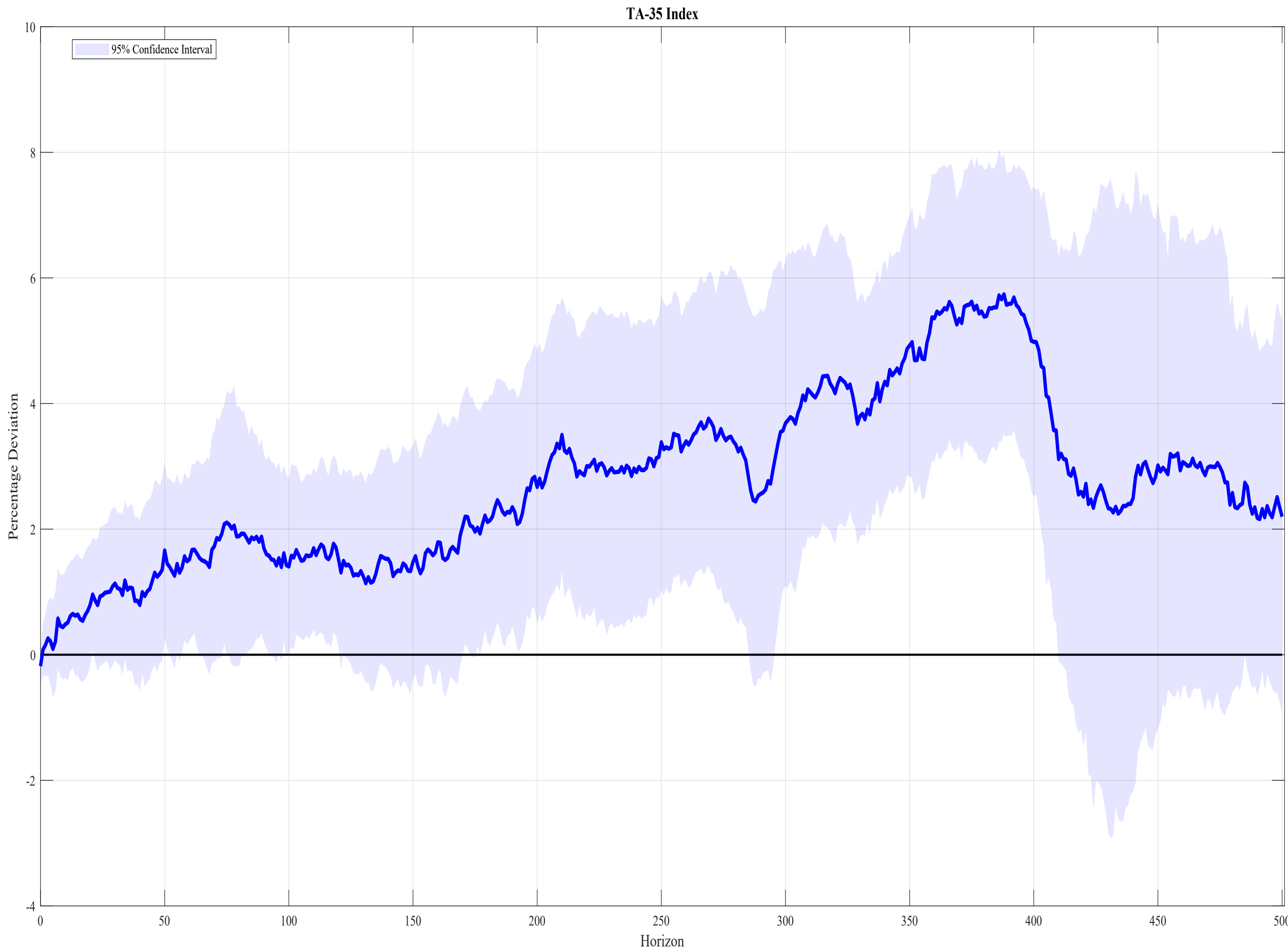
Notes: This figure presents the impulse responses (solid lines) to a GIV capital inflow shock of the 1- through 5-year and 10-year government bond yield spreads (with respect to maturity-comparable IRS rates). Responses are normalized such that the peak response of FFIs' accumulated net capital inflows variable is 10 (i.e., 10-percentage-point increase as share of outstanding MAKAM), implying a 3.4-standard-deviation GIV capital inflow shock size. 95% confidence bands (shaded areas) are based on standard errors computed from the heteroskedasticity- and autocorrelation-consistent procedure of Newey and West (1987) with the truncation lag equal to $h + 1$ (where $h = 0, 1, ..., 500$ is the local projection horizon). Horizons are on the x-axis (impact horizon (0) to 500th horizon). Values are in basis point change units relative to the pre-shock value of the spread variable.

Figure 5: **Impulse Responses to GIV Capital Inflow Shock: Corporate Bond Yield Spreads.**



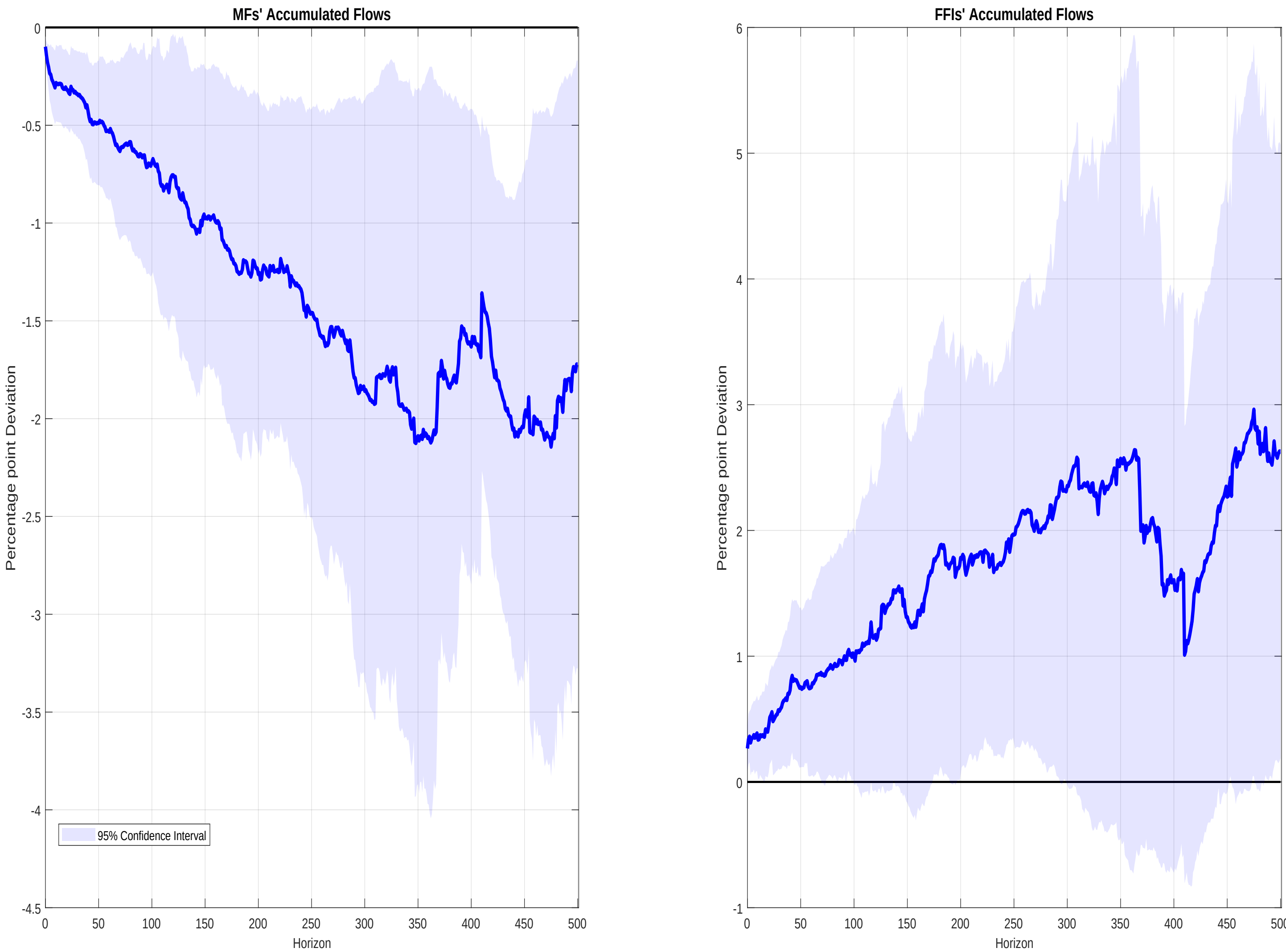
Notes: This figure presents the impulse responses (solid lines) to a GIV capital inflow shock of the 1- through 5-year and 7- and 10-year investment-grade corporate bond yield spreads (with respect to maturity-comparable IRS rates). Responses are normalized such that the peak response of FFIs' accumulated net capital inflows variable is 10 (i.e., 10-percentage-point increase as share of outstanding MAKAM), implying a 3.4-standard-deviation GIV capital inflow shock size. 95% confidence bands (shaded areas) are based on standard errors computed from the heteroskedasticity- and autocorrelation-consistent procedure of Newey and West (1987) with the truncation lag equal to $h+1$ (where $h = 0, 1, ..., 500$ is the local projection horizon). Horizons are on the x-axis (impact horizon (0) to 500th horizon). Values are in basis point change units relative to the pre-shock value of the spread variable.

Figure 6: **Impulse Responses to GIV Capital Inflow Shock: TA-35 Index.**



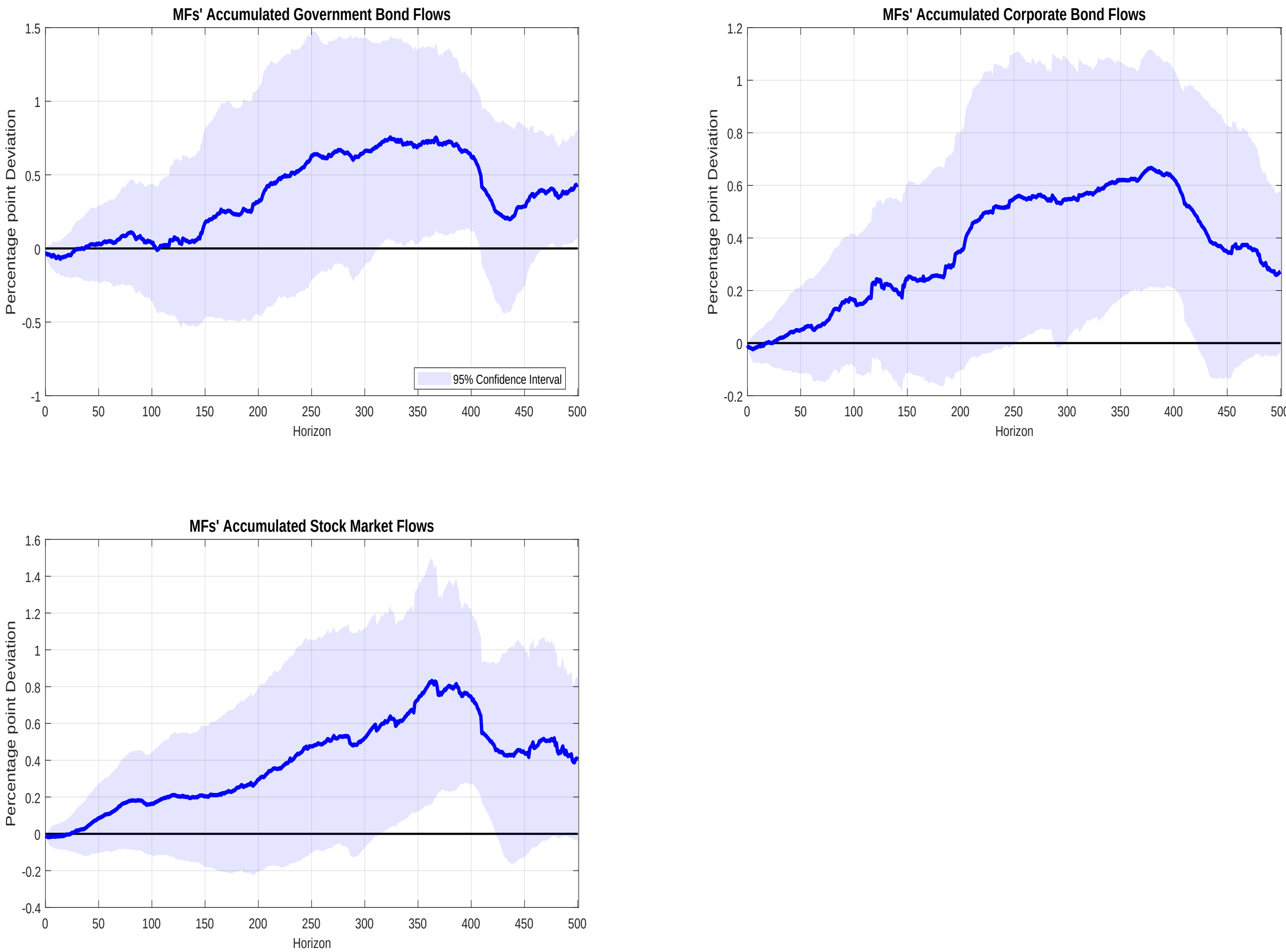
Notes: This figure presents the impulse responses (solid line) to a GIV capital inflow shock of the TA-35 stock price index. Responses are normalized such that the peak response of FFIs' accumulated net capital inflows variable is 10 (i.e., 10-percentage-point increase as share of outstanding MAKAM), implying a 3.4-standard-deviation GIV capital inflow shock size. 95% confidence bands (shaded area) are based on standard errors computed from the heteroskedasticity- and autocorrelation-consistent procedure of Newey and West (1987) with the truncation lag equal to $h + 1$ (where $h = 0, 1, ..., 500$ is the local projection horizon). Horizons are on the x-axis (impact horizon (0) to 500th horizon). Values are in percentage point change units relative to the pre-shock value of the stock price index variable.

Figure 7: **Impulse Responses to GIV Capital Inflow Shock: MFs' and FFIs' Accumulated Secondary Market MAKAM Flows.**



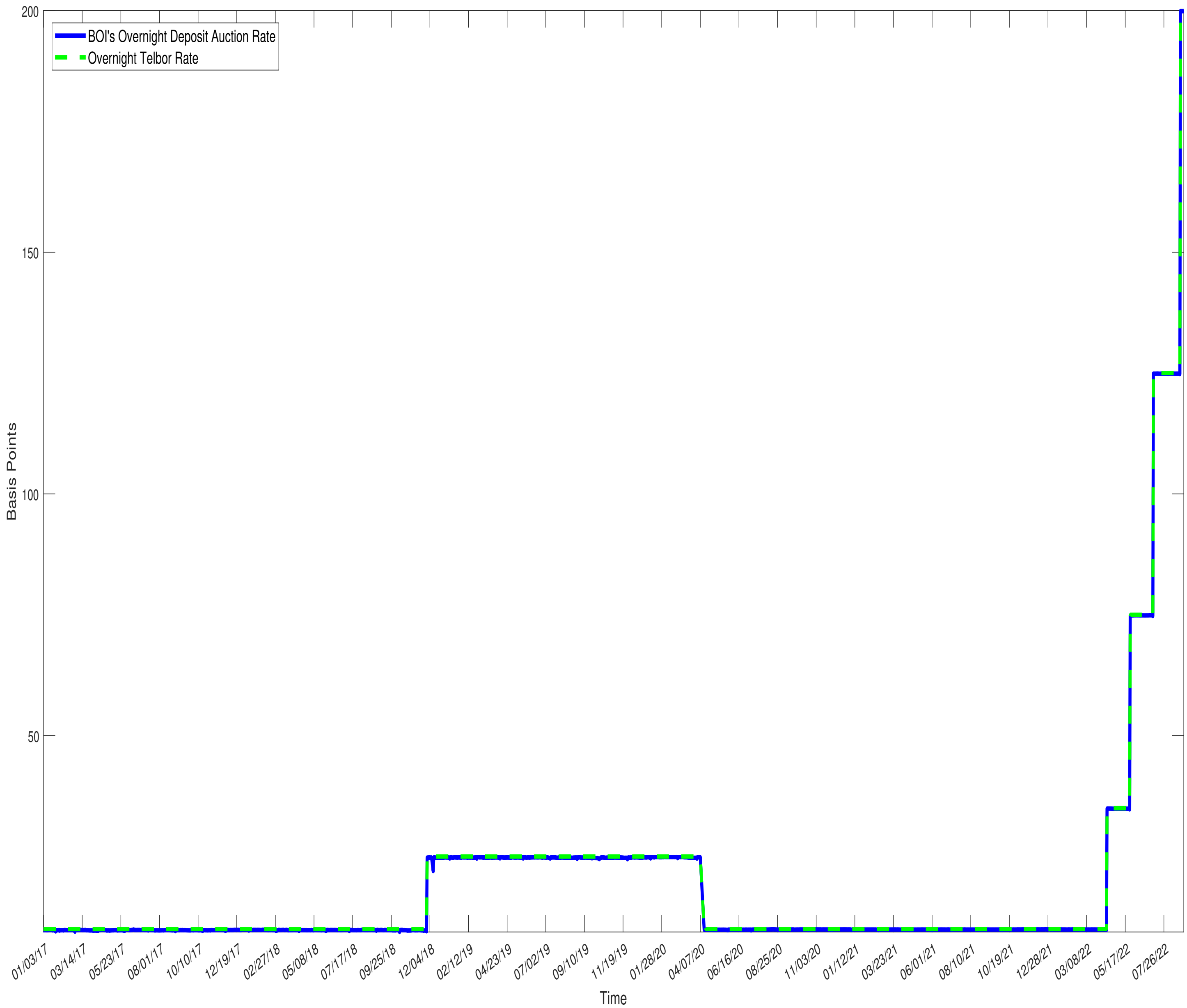
Notes: This figure presents the impulse responses (solid lines) to a GIV capital inflow shock of HFs' and FFIs' accumulated secondary market MAKAM flows as share of outstanding MAKAM. Responses are normalized such that the peak response of the baseline FFIs' accumulated net capital inflows variable is 10 (i.e., 10-percentage-point increase as share of outstanding MAKAM), implying a 3.4-standard-deviation GIV capital inflow shock size. 95% confidence bands (shaded areas) are based on standard errors computed from the heteroskedasticity- and autocorrelation-consistent procedure of Newey and West (1987) with the truncation lag equal to $h + 1$ (where $h = 0, 1, ..., 500$ is the local projection horizon). Horizons are on the x-axis (impact horizon (0) to 500th horizon). Values for the two sectors' accumulated flows variables are in percentage-point change units relative to the pre-shock value of the corresponding sector's share in outstanding MAKAM bonds.

Figure 8: **Impulse Responses to GIV Capital Inflow Shock: MFs' Accumulated Secondary Market Rebalancing Flows.**



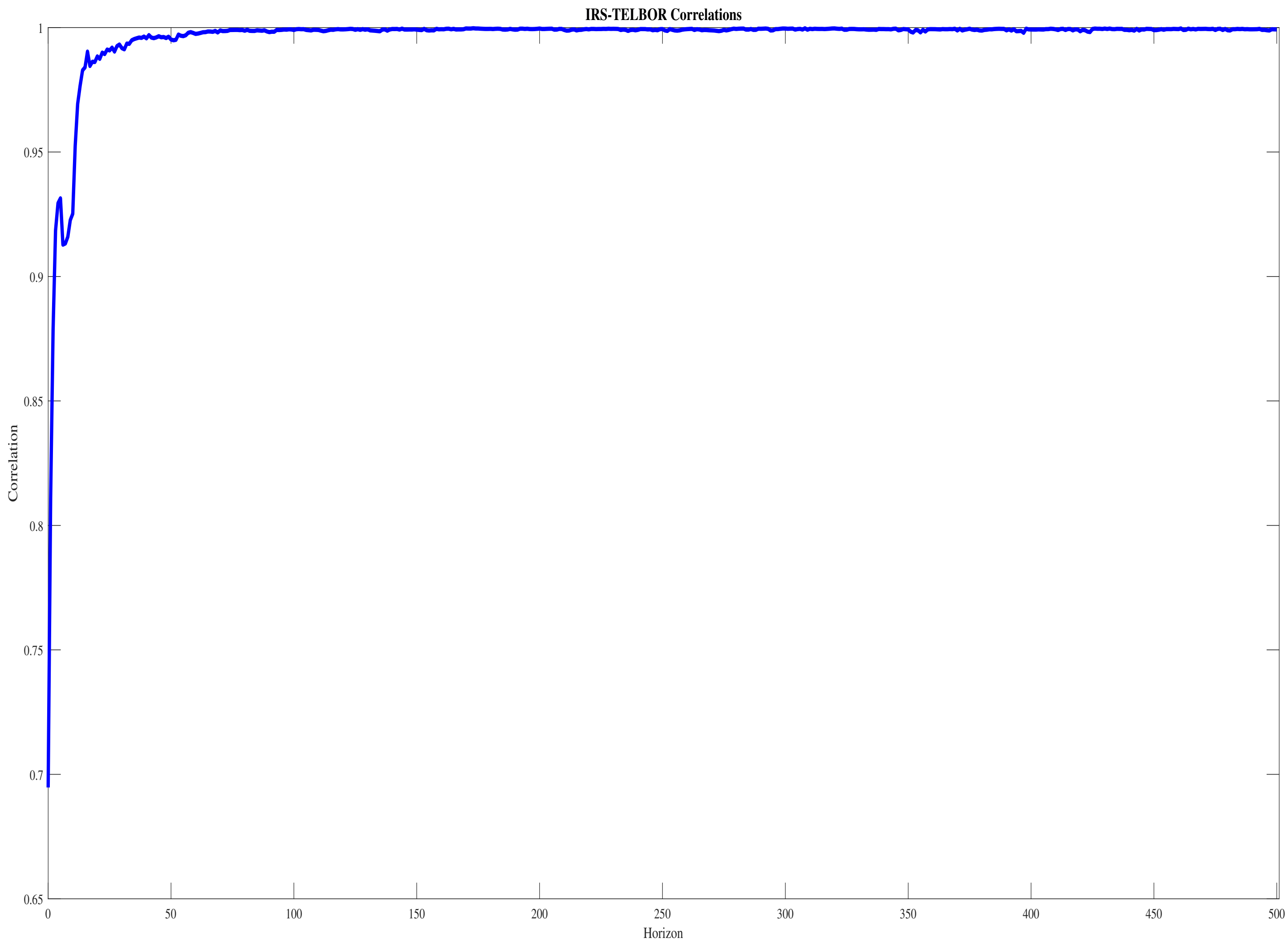
Notes: This figure presents the impulse responses (solid lines) to a GIV capital inflow shock of MFs' accumulated secondary market government bond, corporate bond, and equity flows as shares of outstanding MAKAM. Responses are normalized such that the peak response of the baseline FFIs' accumulated net capital inflows variable is 10 (i.e., 10-percentage-point increase as share of outstanding MAKAM), implying a 3.4-standard-deviation GIV capital inflow shock size. 95% confidence bands (shaded areas) are based on standard errors computed from the heteroskedasticity- and autocorrelation-consistent procedure of Newey and West (1987) with the truncation lag equal to $h + 1$ (where $h = 0, 1, ..., 500$ is the local projection horizon). Horizons are on the x-axis (impact horizon (0) to 500th horizon). Values for the accumulated flows variables (as shares of outstanding MAKAM) are in percentage-point change units relative to the pre-shock value of the corresponding sector's share in outstanding MAKAM bonds.

Figure 9: **Time Series of BOI's Overnight Deposit Auction Rate and Overnight TELBOR Rate.**



Notes: This figure presents the time series of the overnight rate from the BOI's daily deposit auctions (solid line) as well as the overnight TELBOR rate (dashed line). Both data series are from the BOI. The data cover 1/1/2017-8/31/2022. Time (daily dates) is on the x-axis. Values on the y-axis are in basis point units.

Figure 10: **Dynamic Correlations Between 1-Year IRS and TELBOR Rates.**



Notes: This figure presents the h-step-ahead correlation between the cumulative differences in the 1-year IRS and TELBOR rates. In particular, the figure shows the correlation between $irs\_rate_{t+h} - irs\_rate_{t-1}$ and $telbor\_rate_{t+h} - telbor\_rate_{t-1}$ for $h = 0, 1, ..., 500$. Horizon ($h = 0, 1, ..., 500$) is on the x-axis. Values are in fractional terms.