The Perfect Storm: Forex Interventions, Global Banks' Limited Risk-Bearing Capacity, Deviations from Covered Interest Parity, and the Impact on the USD/ILS Options Market¹

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Abstract Using confidential daily foreign exchange interventions (FXI) data, we analyze the

1 Introduction

the USD (nominal effective exchange rate (NEER)) compared to a trading day without FXI, which is large by both historical and international standards. We identify the existence of financial frictions in the form of capital-constrained global banks as a key determinant of the effectiveness of these FXI.

We also find that the deviation from covered interest rate parity (CIP) - usually

This extension is relevant for monetary policymakers, as they learn about the longerterm effect that FXI have on market expectations in the options market and therefore (indirectly) on the usefulness of FXI as an additional monetary policy tool in a zero interest environment. and empirically accepted that the effect of sterilized FXI is much lower when nominal interest rates are essentially zero.⁹ We analyze the role of financial frictions systematically and find that the more capital-constrained global banks are, the larger the impact

2 Metholodogy

ILS vis-à-vis the USD (the NEER) from 2008 until the end of our sample.¹³ In tandem, the bank intervened in the USD/ILS spot market, particularly during periods of strong appreciation pressure.

In the period displayed in Figure 1

displayed in percent, following the options markets' quoting convention (Reiswich and Wystup, 2010).

As the price quotes of these option strategies are highly persistent (column "AR(1)"),

Table 4: Descriptive statistics of the USD/ILS options data

Mean Median Std Min Max AR(1) N

2.2 Estimation

We begin our analysis with OLS regressions, consciously setting aside the potential for endogeneity biases in order to gauge their potential magnitude:

D

ticity and autocorrelation (HAC) consistent covariance matrix. We opt for this estimator, as it often exhibits better small sample properties than the two-step (or iterated) GMM estimator.

3 Results

This section presents the main results of the paper. We begin our empirical analysis

To summarize, Figure 2 suggests that the BOI is successful in creating a depreciation in the FX market according to the "event" and "dideprin tanda2(Figur [(in)ypicallyiation)]TJ 0 -21.26

day lagged two-week return of the NEER, as these are exogenous to the current exchange rate, but presumably correlated with the FXI data, as the decision to intervene and the size of FXI both depend on the trajectory of the spot rate. We choose the NEER, as one motivation of the BOI to start intervening in the FX market was the preservation of competitiveness (Cukierman, 2019 important currency in the world. We expect a broad devaluation of the USD (i.e. DEUR/USD > 0) to be associated with an appreciation of the ILS (i.e., H_a : d < 0).²⁶

VIX.

Hence, an unexpectedly positive US macroeconomic news should be associated with an appreciation of the USD (i.e., H_a : d > 0).

Table 5 displays the results of regressing the daily log return (in percent) of the USD/ILS spot rate (Panel A), the NEER (Panel B) and the three-month USD/ILS for-

(c)	Panel	С
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Dependent variable: $D \ln(3M \text{ forward}_t)$ (in %)

	[1]: OLS	[2]: CU-GMM	[3]: 2SLS
Intercept	-0.02***	-0.03***	-0.025**
	(–2.56)	(-2.02)	(–1.96)
FXIt	0.47***	0.73*	0.705*

often accompanied by verbal interventions.

Effect on the forward rate and the cross-currency basis. The estimated coefficient associated with the three-month USD/ILS forward rate equals 0.73% and is statistically significant only at the 10% significance level. Assuming constant domestic and foreign interest rates between two subsequent trading days, ³⁰ our result is at odds with the CIP

Dependent variable: D 3M Basis _t (in %)				
[1]: OLS	[2]: CU-GMM	[3]: 2SLS		

Table 6: Effect of interventions on the three-month cross-currency basis

investment decisions are only partially intermediated by these financiers. To restore equilibrium, financiers must therefore be compensated by a risk premium. Both bonds thereby become imperfect substitutes and asset returns then depend on relative asset supplies.

By altering relative supplies, central banks can then affect this risk premium. For instance, FXI with the goal of depreciating the domestic currency involve the purchase of risk-free foreign currency bonds, financed by selling risk-free domestic currency bonds. These transactions alter the relative supplies in the global bond market and thereby the size and the composition of the financiers' balance sheets. As an aftermath, the risk premium changes and so does the spot rate. The effect of FXI is thereby increasing in the severity of the friction.

To explore the role of financial frictions in explaining the effectiveness of the BOI's FXI in the spot market, we extend our regression from Table 5 and include the squared leverage ratio of primary dealers (i.e., major global banks³⁵) proposed by He, Kelly, and Manela (2017), abbreviated by "HKM" in the following. The HKM – equalling the

3.2 Interventions and the higher-order moments of the RND

To understand how option markets' expectations change when the BOI intervenes in the spot market, we extend now our analysis and assess to what extent option markets price in future FXI, as reflected in the price quotes of the ATMVs, the scaled RRs, and the scaled BF spreads. the same controls as in our benchmark specification in Table 5.

Table 8: Relationship between lagged scaled risk reversals, butterfly spreads, at-the-money implied volatilities and interventions

		Dependent variable: FXI _t					
	1 M	3 M	6 M	9 M	12 M		
Intercept	0.01*** (6.86)	0.01*** (6.90)	0.01*** (6.85)	0.01*** (6.82)	0.01*** (6.74)		
D							



(c) Cumulative change of the scaled risk reversals across five maturities

Notes: The figure shows the average cumulative change of the USD/ILS at-the-money volatility (panel (a)), butterfly spreads (panel (b)) and risk reversals (panel (c)) across five maturities at day $0, 1, \ldots, 100$, where 0 reflects the beginning of the trading day when the first intervention was carried out. The blue lines show the cumulative response, while the shaded light blue area displays the 90% confidence intervals.

3.3.1 Relationship between the lagged tail probabilities and interventions

This section analyzes the relation between option-implied tail (or crash) probabilities and the size of future FXI. Analyzing this relation serves three purposes: (i) In the preoptions,⁴⁷ \doteq a measure of the average volatility of the underling exchange rate,⁴⁸ the latter being an industry convention for stocks to allow comparisons across stocks (in our case: currencies) and t = T the time to maturity, with the T the date when the underlying option contracts expire.

We opted for this approach instead of using a jump-diffusion model as in e.g. Olijslagers, Petersen, de Vette, and van Wijnbergen (2020), as it is not plausible to expect a The results are presented in Table 9. The estimated coefficients all have the expected sign, although they are statistically significant only for the probabilities of a strong de-Thdncs in-310(ILS.)-3ultsight.26 Td [(pr)18(eciatah310(Td [(pr)05II)50)-309(p34(is45(356)18(co5IIsticalg

Figure 4: Longer-term effect of a FX intervention shock of size \$1 billion on probabilities of the RND

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(a) Cumulative change of left-tail probabilities across five maturities

(b) Cumulative change of right-tail probabilities across five maturities

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4 Conclusion

Since early 2008, the Bank of Israel (BOI) has periodically purchased USDs to weaken the foreign value of the ILS vis-à-vis the USD in the spot market. Focusing on the BOI's foreign exchange intervention (FXI) regime from 2013 until the COVID-19 pandemic erupted, we find that these FXI have caused a strong depreciation of the ILS. We show that the high effectiveness of the BOI's FXI can partially be explained by the existence of financial frictions – in the form of capital constrained major financial intermediaries – thereby providing empirical support to the recent theoretical research that rational-

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is only estimated to shield our empirical results against simultaneity bias and not in order to get a specification with a high explanatory power, the low \tilde{R}^2 is a minor issue.

Tables 6 and 9 in Galati et al. e235(0.8 rg 0 0.8 RG [-235(G(2007 g 0 G [-235((al.)4(whoal.)]Tsults)por(al.)]TJ0 -21.22d [02T

B Verbal interventions

Figure C.1: Longer-term effect of a FX intervention shock of size \$1 billion on spot rates (a) Cumulative returns of the USD/ILS spot rate



(b) Cumulative returns of the NEER

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