Bank FX hedging and the impact on covered interest parity, an Emerging Market perspective

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Disclaimer: The views in this presentation are those of the author and are not necessarily reflective of views at the Banco de México.

1. Motivation & Research Question
2. Data & Methodology
3. Results: EM 10 panel
4. Results: Mexico
    - System as a whole
    - Global banks
4. Conclude

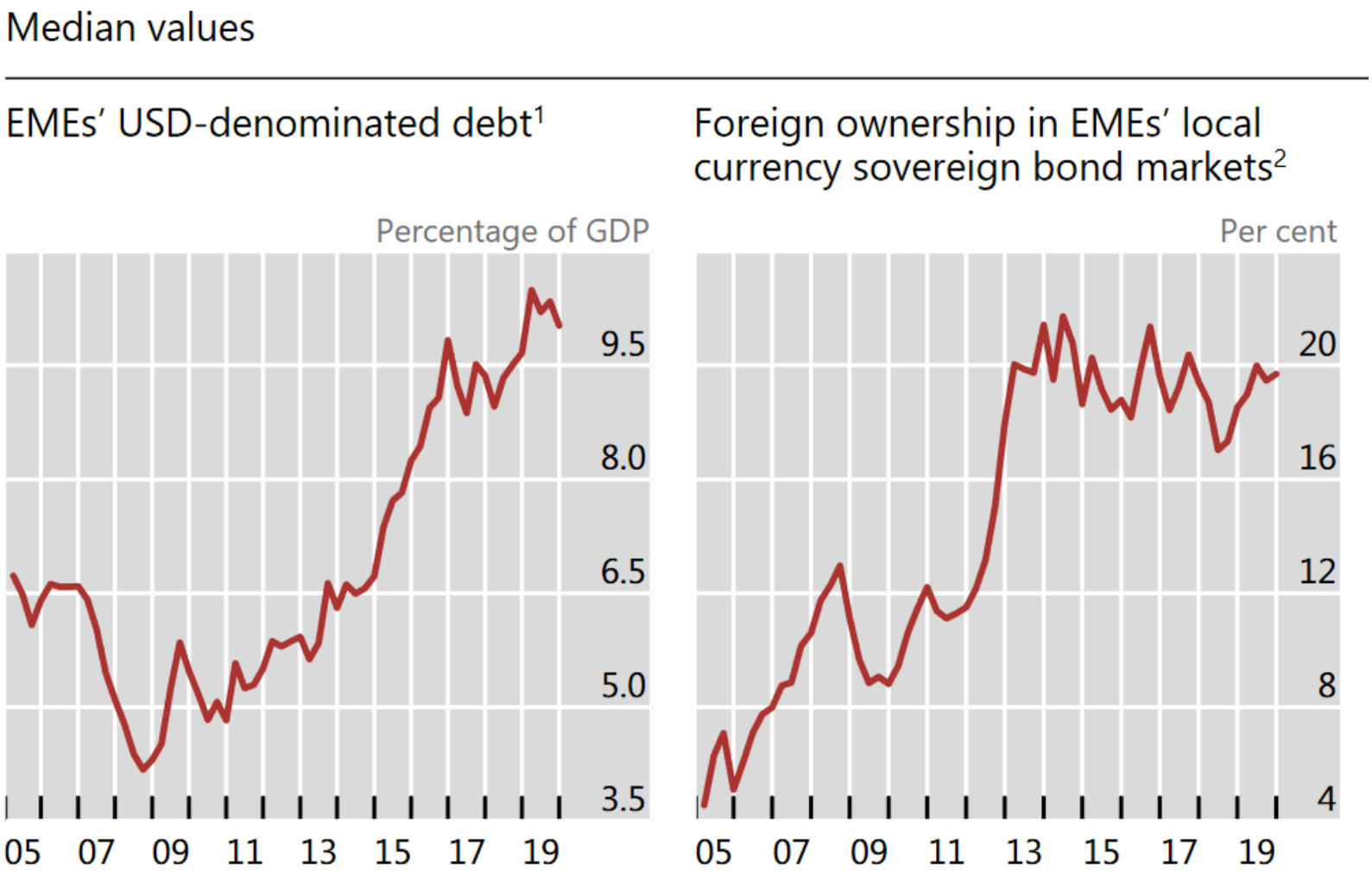
Motivation & Research Question

External vulnerabilities

- since the global financial crisis, banks and firms increasingly using external funding sources
- EMEs have mostly flexible exchange rate regimes
- bank (or firm) negative balance sheet effects from currency depreciation
- –> a need to hedge currency exposures

Financial stability policies: restrictions on bank currency mismatch, the banks use hedging to manage their foreign currency core balance sheet

EMEs Exposure to the US dollar



Source: BIS Quarterly Review, December 2020

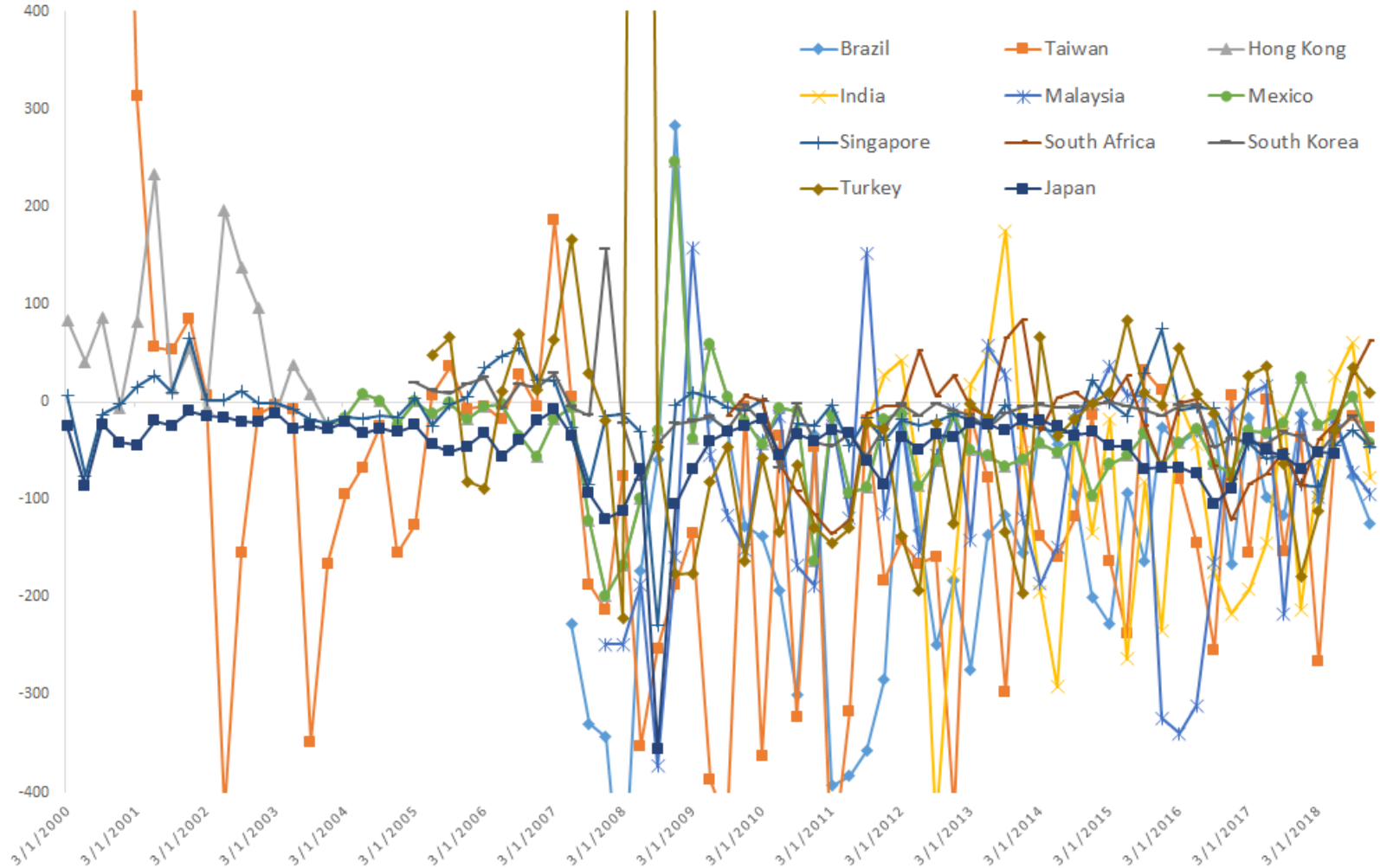
Aim of this paper:

i) Document deviations in EME Covered Interest Parity (CIP)

ii) Does resident bank behavior have an impact on the deviations, and

iii) Are there offsetting forces at work (foreign investors, arbitrageurs)

Emerging market CIP deviations for EM10 (3m, USD)



Source: Bloomberg, author calculations

Q: banking sector impact on the cost of hedging (Covered Interest Parity deviation)

Estimate econometric model of $b = g(Hedge, \mathbf{X})$, for a panel of emerging economies and a Mexico case study

- evidence that resident banking sector widens CIP deviations, even net of foreign investor hedging
- evidence that global banks are driving this effect
- mixed evidence on arbitrageur constraints

Contribution:
-focus on emerging economies, arguably more vulnerable
-exploits micro data for Mexico to test effect of foreign hedging demand, and global bank hypothesis (Bank level balance sheet data, FX derivatives transactions by counterparty)

Related literature (in brief)

- Ivashina, Scharfstein and Stein (2015) "Dollar funding and the Lending Behavior of Global Banks", Quarterly Journal of Economics
- Brauning and Ivashina (2019) "US monetary policy and emerging market credit cycles", Journal of Monetary Economics
- Bruno and Shin (2015) "Capital flows and the risk-taking channel of monetary policy", Journal of Monetary Economics
- Du, Tepper, Verdelhan (2018) "Deviations from Covered Interest Rate Parity", The Journal of Finance, June 2018
- Dagfinn, Schrimpf, Syrstad (2017) "Segmented money markets and covered interest parity arbitrage", BIS Working Papers No. 651
- Borio, McCauley, McGuire, Sushko (2016) "Covered interest parity lost: understanding the cross-currency basis", BIS Quarterly

How to study in EM context

-CIP deviations: need risk free interest rate and interest rate implied in forward market for same tenor CIP details

-construct hedging measures for

- resident banking sector (whole system, global banks)
- foreign investors

-measures for transaction costs, and arbitrageur constraints as highlighted in AE literature: relative funding for arbitrage trades, balance sheet costs (counterparty and market risk)

-regression analysis that addresses potential endogeneity of hedging, stationarity issues, country heterogeneity, and auto-correlation

Empirical model, panel setting

$$b_{i,t} = \alpha_i + \beta_1 Hedge_{i,t} + \beta_{\mathbf{2}} \mathbf{X_{i,t}} + \epsilon_{i,t}$$

- $b_{i,t}$, CIP deviation for country i CIP details
- α_i, country fixed effect i
- $Hedge_{i,t}$, variable of interest: hedging measures
- $\mathbf{X_{i,t}}$ includes other potential drivers of CIP deviations:
  - transaction or liquidity costs
  - relative funding conditions
  - arbitrageur balance sheet constraints
    - Counterparty risk
    - Market risk for foreign currency collateral

Hypothesis:
β_1 significant (resident banks vs foreigners, opposite sign)
Alternative: $Hedge$ has no identifiable effect.

Estimation

- Endogeneity of bank hedging and foreign hedging: estimated using IV 2SLS, instruments are lagged values
- relax homoscedastic errors assumption (variances of market variables versus balance sheet variables likely vary)
- allow for autocorrelation, persistence over time (monthly frequency, end-month value)
- test for stationarity, first difference if unit root suspected
- in panel setting:
  - country heterogeneity: country fixed effect, country factors (financial centers, global bank presence)
  - country outliers, crisis years Country details

Data

- $b_{i,t}$, cross-currency basis (Bloomberg)
- $Hedge_{i,t}$
  - resident banking sector USD core assets - liabilities (Banking statistics from the BIS)
  - Global banks USD core assets - liabilities (Banxico)
  - FX derivative position with foreign counterparties (Banxico)
- $\mathbf{X_{i,t}}$ (Bloomberg data)
  - bid ask spreads in the spot and forward markets
  - relative repo funding costs
  - arbitrageur balance sheet constraints
    - Counterparty risk, LIBOR-OIS spread
    - Market risk, FX Implied Volatility

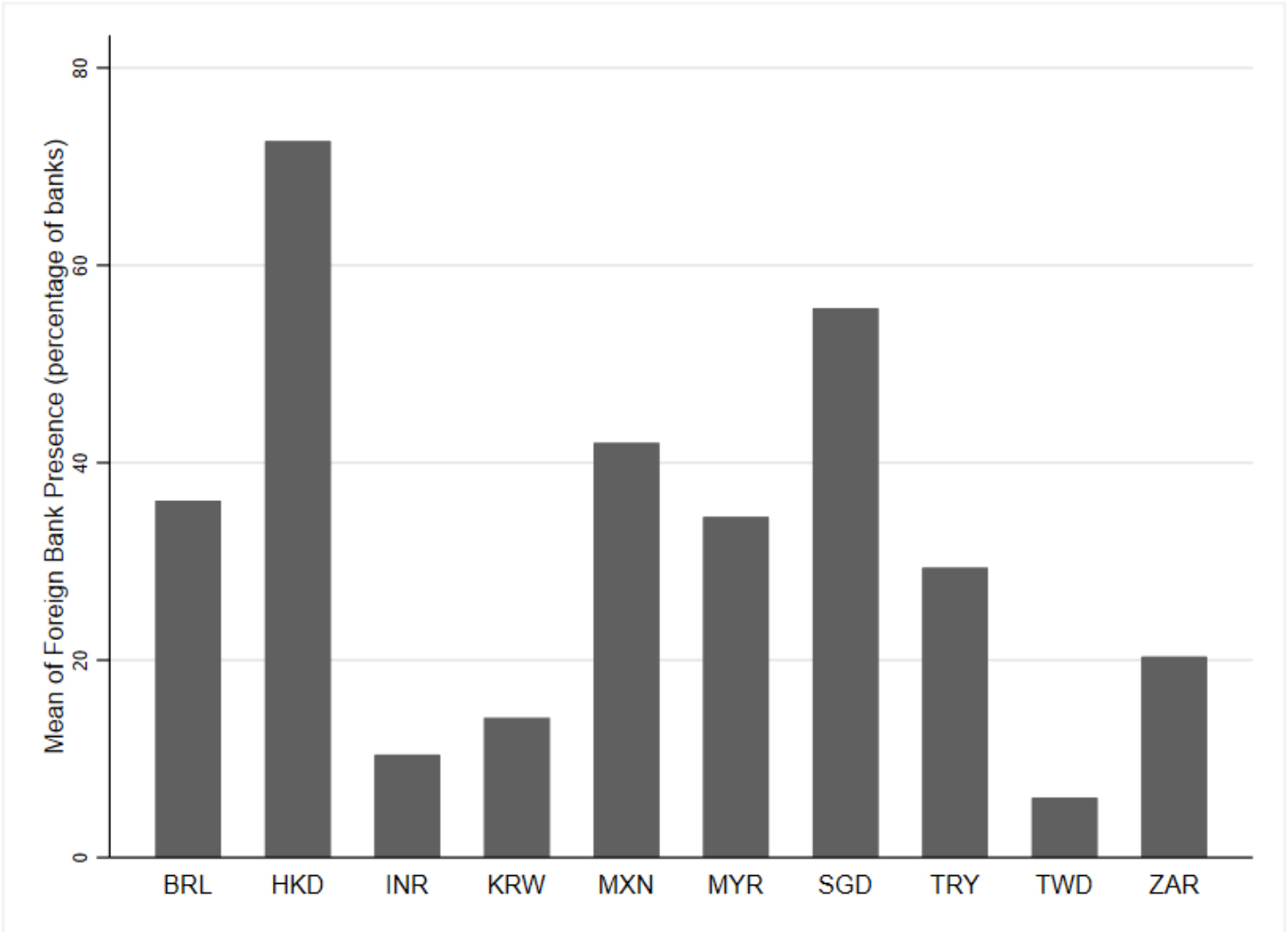
EM10 panel: unbalanced, March 2000-December 2008
Mexico: July 2013- November 2017

EM10: Resident bank hedging effect on 3-month CIP deviation

	(1)	(2)
Hedge, Resident Banks	-0.0214*	-0.0209*
	(0.0115)	(0.0114)
Bid-ask spreads	-1.142	1.019
	(14.57)	(16.38)
FX Implied Vol		0.906
		(1.569)
Observations	516	516
Adjusted R^2	0.176	0.175
F	10.38	9.768

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. HAC robust standard errors. Country fixed effects, excluding 2000, 2008.

Foreign bank presence, period avg % of total number of banks



Source: The World Bank

EM10: Resident bank hedging effect on 3-month CIP deviation: financial sector heterogeneity

	(1)	(2)	(3)
Hedge, Resident banks	-0.0209*	0.0334	-0.0131
	(0.0114)	(0.0416)	(0.0207)
Financial Center	159.3***	143.6***	
	(26.51)	(31.53)	
Hegde × Financial Center		-0.0706*	
		(0.0424)	
Foreign Banks, no. as pct. of total			-4.808**
			(1.993)
Observations	516	516	316
Adjusted R^2	0.175	0.179	0.225
F	9.768	11.32	6.963

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. HAC robust standard errors. Country fixed effects, excluding 2000, 2008.

EM panel results:
Evidence that

- bank hedging needs have a direct impact on CIP deviation,
- foreign bank presence is relevant, and
- arbitrageur variables weak

Why using micro data is essential:

- test directly the impact of foreign banks, versus that of the system as a whole
- test the effect of foreign investors on FX hedging

Mexico case study, exploiting supervisory data:

i) confirm the bank hedge effect on CIP deviations

ii) test the importance of arbitrageur variables

iii) test whether foreign counterparties offset the bank effect

iv) test for global bank effect

Since the 1990s, in Mexico the currency mismatch policy:
$|A_{USD} - L_{USD}| < 15\% * Tier1Capital$

Mexico, Resident bank hedging needs and CIP deviations

	3m	1m	3m	6m
Bid-ask spreads	-0.166	-0.181	-0.062	-0.134
	(0.115)	(0.110)	(0.104)	(0.098)
Relative Repo	-0.007	0.034	-0.058	-0.042
	(0.121)	(0.108)	(0.123)	(0.092)
LIBOR_OIS	-0.225*	-0.055	-0.206*	0.001
	(0.133)	(0.083)	(0.106)	(0.158)
FX Implied Vol.	0.087	-0.058	-0.117	0.187
	(0.116)	(0.119)	(0.125)	(0.154)
Hedge, Domestic Banks		-0.357*	-0.603***	-0.514**
		(0.216)	(0.201)	(0.201)
Observations	53	51	51	51
Root Mean Sqrd. Error	0.971	0.933	0.915	0.807
H0:exogeneity		0.81	0.17	0.26
p-values				

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. HAC robust standard errors. Hegde, Res. Bank instrumented by 1st and 2nd lags.

Mexico, Foreign investor hedging needs and CIP deviations

	3m	1m	3m	6m
Transaction Cost	-0.166	-0.087	0.071	0.029
	(0.115)	(0.103)	(0.114)	(0.101)
Relative Repo	-0.007	0.038	-0.102	-0.011
	(0.121)	(0.110)	(0.103)	(0.080)
LIBOR_OIS	-0.225*	-0.035	-0.150	-0.134
	(0.133)	(0.070)	(0.122)	(0.113)
FX Implied Vol.	0.087	-0.107	-0.109	0.111
	(0.116)	(0.127)	(0.139)	(0.118)
Hedge, Foreign		0.596***	0.771***	0.738***
		(0.151)	(0.184)	(0.181)
Observations	53	49	49	49
RMSE	0.971	0.858	0.754	0.629
H0:exogeneity p-values		0.33	0.24	0.28

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. HAC robust standard errors. Hegde, Foreign instrumented by its 3rd and 4th lags.

Mexico, Global resident banks effect on 3-month CIP deviation

	(1) System	(2) Global	(3) Sys. excl. Global	(4) Agg. Hedge
Hedge	-0.603***	-0.727***	-0.156	-0.480***
	(0.201)	(0.193)	(0.110)	(0.159)
Bid-ask spreads	-0.062	-0.045	-0.004	0.058
	(0.104)	(0.104)	(0.121)	(0.133)
RelRepoFF	-0.058	-0.067	-0.211	-0.107
	(0.123)	(0.118)	(0.134)	(0.122)
LIBOR_OIS 3M	-0.206*	-0.177*	0.056	-0.148
	(0.106)	(0.106)	(0.115)	(0.138)
FX Implied Vol.	-0.117	-0.296**	0.153	-0.293
	(0.125)	(0.121)	(0.170)	(0.200)
Observations	51	52	53	49
Root Mean Sqrd. Error	0.915	0.870	0.925	0.824

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. HAC robust standard errors.
Aggregate Hegde, defined as Global resident bank - Foreign hedging.
Aggregate Hegde is instrumented by its 4th lag, passing exogeneity tests.

Mexico, Interacting Agg. Hedge with arbitrageur balance sheet costs

	(1)	(2)	(3)	(4)
LIBOR_OIS 3M	-0.214*	-0.212**	-0.185**	-0.229**
	(0.107)	(0.097)	(0.087)	(0.103)
FX Implied Vol.	-0.133	-0.142	-0.137	-0.101
	(0.096)	(0.085)	(0.086)	(0.100)
Agg Hedge	-0.303***	-0.298***	-0.294***	-0.327***
	(0.058)	(0.054)	(0.052)	(0.076)
AggHedge × LIBOR_OIS	-0.025		0.053	0.083
	(0.054)		(0.045)	(0.056)
AggHedge × FX Implied Vol.		0.113***	0.140***	0.150***
		(0.033)	(0.038)	(0.040)
Triple Interaction				-0.080
				(0.075)
Observations	53	53	53	53
Adjusted R^2	0.271	0.319	0.311	0.305
Root Mean Sqrd. Error	0.846	0.818	0.822	0.826

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. HAC robust standard errors.
Aggregate Hedge defined as Resident bank - foreign hedging.

Summarizing Mexico results

Resident bank Hedging associated with deviation from CIP at short end

1. Resident bank hedging,
Estimated impact on the 3-month basis: -19.54,
(1 s.d. increase in Hedge, CIP deviation wider by 0.603 s.d.s)

2. Foreign hedging,
Estimated impact on the 3-month basis is 24.10,
(1 s.d. increase in Hedge, CIP deviation narrower by 0.771 s.d.s)

3. Global banks driving the effect

4. Arbitrageur constraints, inconclusive
-joint tests: yes, these variables matter
-interactions model: mixed evidence

Results:

- bank hedging needs affect the cost of hedging, evidence that global banks driving this
- arbitrageur constraints don't seem of first order importance
- changes to foreign participation are relevant

Caveats:

- Data frequency
- Currency in isolation vs. overall balance sheet
- Other regulatory effects, ie non-FX related

Thank You

CIP deviation measure = cross currency basis b:

Forward market implied rate (synthetic) minus observed risk free rate (cash)

Derived by the standard covered interest parity equation,

$$(1 + r_{t,m}) + b_m = (1 + r^*_{t,m})\frac{F_{t,m}}{S_t}$$

where b is approximately 0 under CIP.

1. **Foreign FX derivatives** endogeneity with CIP deviation:
Evidence of reverse causality for contemporaneous values

–> Instrument:

-exclusion restriction satisfied for lagged values (L.3, L.4, L.5)

No. of instruments	Endogeneity[1] H0:exogeneity	Overidentification[2] H0:well-identified
3	0.47	0.04
2	0.23	0.15
1	na	0.11

Results reported are with IV 2SLS with 2 instruments: L.3 and L.4

2. LIBOR_OIS spread endogeneity with CIP deviation:
Hausman augmented regression tests: passed with p-values from 0.48 to 0.58

H:Foreign

[1]Hausman augmented regression test

[2]Wooldridge