Arbitrating Covered Interest Rate Parity Deviations and Bank Lending

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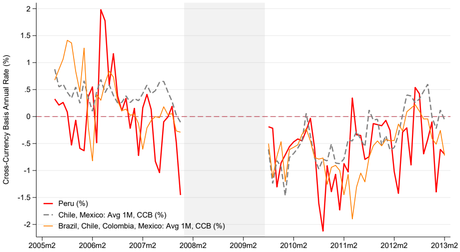
Motivation

- Covered interest rate parity (CIP): Pricing equation for FX forwards and swaps.
  - Return of lending in currency A = return of lending in B after hedging FX
- Large CIP deviations documented in developed economies in non-crisis period (Du, Tepper, and Verdelhan, 2018)
- Also exist in EM. I focus on Peru



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  2. Show funding in the currency required to arbitrage CIP deviations is scarce
  3. Exploit heterogeneity in banks' arbitrage sensitivities to CIP dev.
- **Find** that banks that allocate 1pp more of their assets to arbitrage CIP deviations substitute 20% lending of scarce currency.

Outline

1. Review of Covered Interest Rate Parity
2. Data
3. Step 1: Banks' transactions are consistent with arbitraging CIP deviations
4. Step 2: Currency required to borrow to arbitrage is scarce
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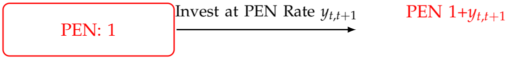
Covered Interest Rate Parity (CIP)

- Investor should be indifferent between:
  1. Lend in PEN $\rightarrow$ Return: $y_{t,t+1}$



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- Investor should be indifferent between:
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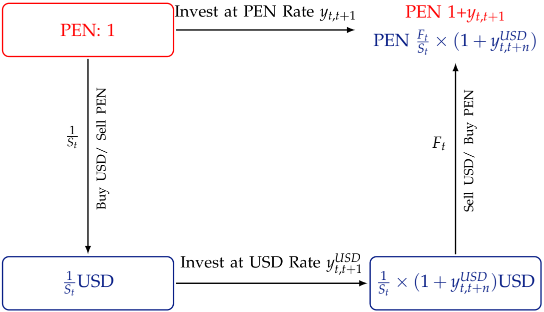
  2. Lend in USD, forward to swap to PEN $\rightarrow$ Return: $\frac{F_t}{S_t} \times (1 + y^{USD}_{t,t+n}) - 1$



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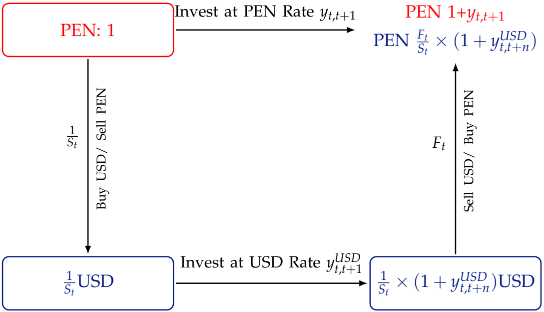
- $\therefore$ CIP holds when: $y_{t,t+1} = y^{fwd}_{t,t+1} \equiv \frac{F_t}{S_t} \times (1 + y^{USD}_{t,t+n}) - 1$
- Cross Currency Basis (CCB) = $y^{fwd}_{t,t+1} - y_{t,t+1}$



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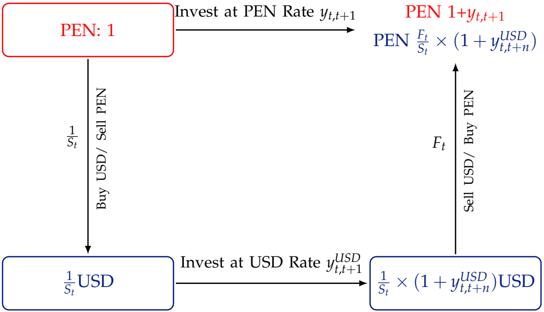
- Cross Currency Basis (CCB) = $y^{fwd}_{t,t+1} - y_{t,t+1}$
- If banks arb. and CCB $\uparrow$: (1) Borrow PEN, (2) Buy USD spot (3) Sell USD fwd (4) Invest USD



Outline

Sample and Datasets Used

- Sample for all datasets: February 2005 - February 2013, excluding NBER crisis
- End in 2013: Confounders of a deep depreciation shock and various regulations that came with it.
- Main Datasets
  1. Bank-level data: (i) Forward contracts, (ii) spot transactions, (iii) positions on money market accounts and (iv) interest rates paid on deposits
  2. Firm-bank-level data: Credit register of all loans to firms with at least USD 100,000 in loans once in the sample, from confidential reports to SBS. Over 28,000 firms.

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Step 1: Banks' transactions consistent with arb. CIP

- **Recall:** CCB = $y^{fwd}_{t,t+1} - y_{t,t+1}$ $\rightarrow$ **Expect:** As CCB $\uparrow$ banks (i) Borrow PEN and lend USD (ii) Hedge FX: Buy USD spot, Sell USD fwd. Stronger effects when CCB > 0.

- **Estimate:** $y_{(b)t} = \theta_{(b)0} + \theta_1 \text{CCB}_t \cdot \mathbf{1}(\text{CCB}_t > 0) + \theta_2 \text{CCB}_t \cdot \mathbf{1}(\text{CCB}_t \leq 0) + \varepsilon_{(b)t}$

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- **I find the expected results:**

	Borrowing		**Currency Exchange**		**Lending**	
	(1)	(2)	(3)	(4)	(5)	(6)
	PEN Liab: Fin Obl	USD Liab: Fin Obl	Spot Position	Fwd+Swap Position	PEN Asset: CB + Gvt	USD Asset: Investments
Panel A: Aggregate Banking System						
OLS: Positive CCB (%)	1.22***	-2.44***	4.21***	-3.56***	-2.61**	1.34***
	(2.60)	(-2.98)	(6.99)	(-6.59)	(-2.12)	(4.31)
OLS: Negative CCB (%)	-0.29*	-2.98***	2.61***	-2.06***	0.37	0.67***
	(-1.71)	(-4.52)	(5.50)	(-4.99)	(0.34)	(3.24)
Observations	77	77	77	77	77	77

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- **We expect:** As CCB $\uparrow$ banks (i) Buy USD spot and sell USD forward; (ii)borrow PEN and invest in USD. These effects should be stronger when CCB > 0.
- **I find the expected results:**

	Borrowing		Currency Exchange		Lending	
	(1)	(2)	(3)	(4)	(5)	(6)
	PEN Liab: Fin Obl	USD Liab: Fin Obl	Spot Position	Fwd+Swap Position	PEN Asset: CB + Gvt	USD Asset: Investments
Panel B: Bank-level Regressions						
OLS: Positive CCB (%)	0.46	-1.11***	3.48***	-2.48***	-1.76**	1.02***
	(1.14)	(-3.25)	(6.01)	(-4.83)	(-2.39)	(2.93)
OLS: Negative CCB (%)	-0.29**	-0.87***	2.20***	-1.86***	-0.08	0.48***
	(-2.16)	(-3.23)	(4.74)	(-4.46)	(-0.08)	(3.22)
Observations	873	873	873	873	832	873

Step 1: Differences in Arbitrage across Banks?

- I compute bank-specific sensitivities to arbitrage CIP in two steps:
  1. First, build a proxy for banks' assets invested in arbitrage, the matched position:

$$\text{Matched}_{bt} = \min\{|\text{Spot Pos.}|, |\text{Fwd+Swap Pos.}|\}$$

if spot and fwd positions have different signs. More specifically:

- Matched_{bt}: Takes sign of Spot Pos. (i.e. < 0 if Fwd > 0 and Spot Pos. < 0; > 0 if Fwd < 0 and Spot > 0)

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  2. Second, estimate the bank-specific sensitivity, β, with:

  $$\left(\frac{\text{Matched}}{\text{Assets}}\right)_{bt} = \alpha_b + \beta_b \text{CCB}_t + \varepsilon_{bt} \qquad \forall b \in B \tag{2}$$

     - Because $\uparrow$ CCB implies banks should sell USD Fwd, buy USD spot to arbitrage $\rightarrow$ **If bank b arbitrages: $\beta_b > 0$.**
     - If bank 1 arbitrages more aggressively than bank 2: $\beta_1 > \beta_2 > 0$.

Step 1: CCB and Matched/Assets

- I find that indeed CCB and Matched/Assets are positively correlated:

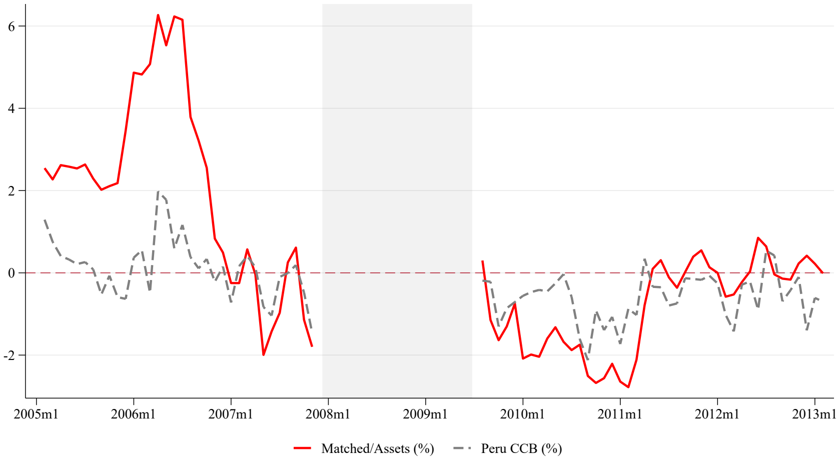

Figure: CIP deviations and Matched/Assets

Step 1: Differences in $\hat{\beta}$s

- There is heterogeneity in the distribution of $\hat{\beta}$s Explanations for heterogeneity in $\hat{\beta}$s

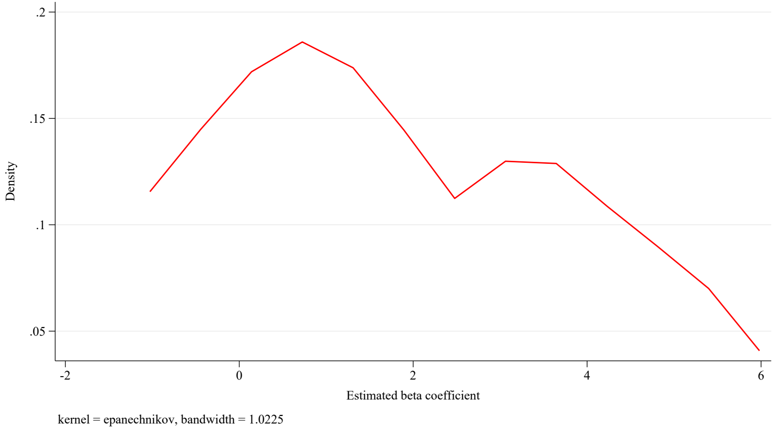

Figure: Smoothed density of the estimated $\widehat{\beta}$ coefficients

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Step 2: Currency required to borrow to arbitrage is scarce

- I estimate a regression like the one I used before, using rate spreads and liquid assets over total assets to proxy for liquidity

	Spreads		Liquidity Ratios	
	(1)	(2)	(3)	(4)
	PEN Spread: Term Dep.	USD Spread: Term Dep.	PEN Liq. (% Assets)	USD Liq. (% Assets)
Panel A: Aggregate Banking System				
OLS: Positive CCB (%)	0.36***	-0.43***	-3.13***	4.41***
	(4.12)	(-2.85)	(-2.86)	(6.82)
OLS: Negative CCB (%)	0.25***	-0.56***	-2.05***	1.51***
	(3.14)	(-3.97)	(-3.74)	(3.26)
Observations	77	77	77	77
Panel B: Bank-level Regressions				
OLS: Positive CCB (%)	0.40***	-0.82***	-2.59***	2.66***
	(3.41)	(-4.32)	(-4.08)	(6.04)
OLS: Negative CCB (%)	0.26**	-0.49***	-1.97***	0.55
	(2.30)	(-3.77)	(-3.71)	(1.37)
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Step 3: How can CIP arbitrage affect lending?

- **Expected results:**
  - $\uparrow$ CCB $\rightarrow$ arbitrage needs PEN funding $\rightarrow$ $\downarrow$ PEN lending, $\uparrow$ USD lending
  - $\downarrow$ CCB $\rightarrow$ arbitrage needs USD funding $\rightarrow$ $\uparrow$ PEN lending, $\downarrow$ USD lending

Step 3: How can CIP arbitrage affect lending?

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  - $\downarrow$ CCB $\rightarrow$ arbitrage needs USD funding $\rightarrow \uparrow$ PEN lending, $\downarrow$ USD lending
- **Estimation challenge: CCB is endogenous.**
  - CIP deviations affected by macroeconomic shocks that affect:
    - Banks' decisions to lend
    - Firms' investment opportunities
  - Banks' lending decisions themselves could affect USDPEN CIP deviations as banks operate in the FX and lending markets.

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  - $\downarrow$ CCB $\rightarrow$ arbitrage needs USD funding $\rightarrow$ $\uparrow$ PEN lending, $\downarrow$ USD lending
- **Estimation challenge: CCB is endogenous** $\rightarrow$ Solutions:
  - CIP deviations affected by macroeconomic shocks that affect:
    - Banks' decisions to lend $\rightarrow$ Compare banks with different β to arb. CIP ▸ β
    - Firms' investment opportunities$\rightarrow$ Within firm-month analysis
  - Banks' trading and lending decisions themselves could affect USDPEN CIP deviations as banks operate in the FX and lending markets. $\rightarrow$ Instrument USDPEN CCB
- **Results do not seem driven by FX**

Step 3: Main Equation

- To solve these challenges, I estimate the following 2-stage model:
  - **First stage**

$$CCB_{t-1}^{\text{Peru}} \times \text{Arb.Intensity}_b = \gamma_0 + \gamma_1 \text{CCB}_{t-1}^{ChMex} \text{Arb.Intensity}_b + X'_{b,t-1}\Theta + \text{Bank FE} + v_{b,t-1}$$

  - **Second stage**

$$y_{bft} = \alpha_0 + \alpha_1 \widehat{CCB_{t-1}^{\text{Peru}} \times \text{Arb.Intensity}_b} + \text{Bank} \times \text{Firm FE} + \text{Firm} \times \text{Month FE} + X'_{b,t-1}\Psi + \epsilon_{bft}$$

where $\text{Arb.Intensity}_b = \hat{\beta}_b$, y_{bft} is log(Credit)*100 and X_{bt} are bank controls.

- Main coefficient of interest is α_1.

Second Stage Results

- **First stage result:** Instrument is statistically significant and highly stable. ▸ St.1 Res
- **Second stage as expected:** ↑CCB → ↓ PEN Credit and ↑ USD Credit. ▸ OLS

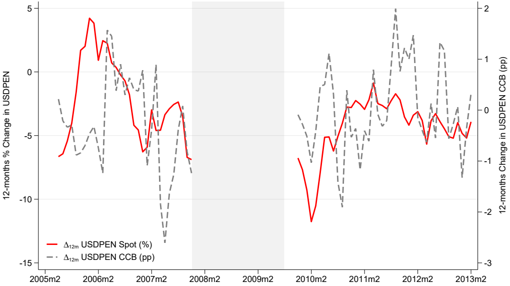
IV Results - Second Stage

	Log(PEN)	Log(USD)	Log(Total)	Ratio	Log(USD)-Log(PEN)
$CCB^{Peru}_{t-1} * (\hat{\beta})$	-24.30***	16.29***	3.377**	1.422***	40.58***
	(-3.44)	(3.50)	(2.18)	(3.40)	(3.74)
Firm * Month FE	Yes	Yes	Yes	Yes	Yes
Bank * Firm FE	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Observations	1,348,040	1,348,040	1,348,040	1,348,040	1,348,040

- Results robust to alternative specifications w/ FE, restricting sample to most common type of loan, restricting sample to similar banks, different clustering.

Alternative story: FX

- **In EM FX has a positive correlation with CCB:** PEN depreciates as $\uparrow$ CCB



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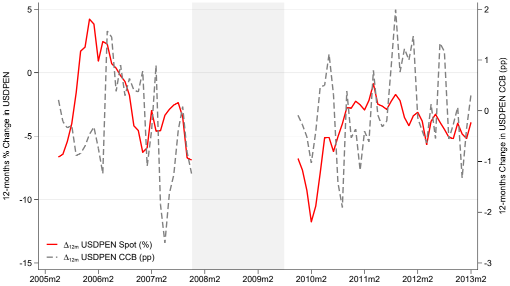

- **Confounder:**
  - FX channel: PEN depreciates → ↑ Savings switch to USD → banks ↓ PEN lending (but HH can ↑ credit dem in PEN)
  - CIP channel: As ↑ CCB → Banks borrow PEN to arb. → banks ↓ PEN lending

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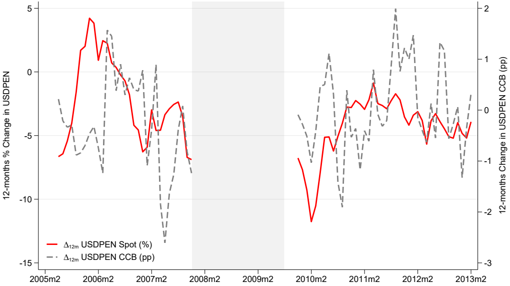

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- **But, for the FX channel to be a threat to the results:** The FX channel must also be correlated with banks' abilities to arbitrage and affect more those banks with higher ability to arbitrage.

Banks that arbitrage the most are not those most affected by FX

- If banks that arbitrage more are those for which agents switch more their deposits to USD as PEN depreciates (and CCB ↑) the results could be explained by FX.

- But banks that arbitrage the most are not the ones most affected by the FX.

	Low $\hat{\beta}$ $0 \leq \hat{\beta} < 0.2$		Medium $\hat{\beta}$ $1.6 \leq \hat{\beta} < 2.6$		Large $\hat{\beta}$ $3.5 < \hat{\beta}$	
	Mean	Sd	Mean	Sd	Mean	Sd
$\hat{\beta}$	0.08	0.08	2.11	0.39	4.24	0.59
Δ PEN Dep/Assets to 1% deprec. (pp)	-1.01	0.45	-0.33	0.21	-0.89	0.50
Δ USD Dep/Assets to 1% deprec. (pp)	0.53	0.24	0.83	0.05	0.62	0.76
Δ Total Dep/Assets to 1% deprec. (pp)	-0.47	0.56	0.49	0.16	-0.27	1.04

Results robust to including FX

- If banks that arbitrage more are those for which agents switch more their deposits to USD as PEN depreciates (and CCB ↑) the results could be explained by FX.
- But banks that arbitrage the most are not the ones most affected by the FX.
- Bank lending results robust to including log(FX)*($\hat{\beta}$)

	Log(PEN)	Log(USD)	Log(Total)	Ratio	Log(USD)-Log(PEN)
$CCB^{Peru}_{t-1} * (\hat{\beta})$	-17.03***	15.79***	5.220***	1.079***	32.82***
	(-2.88)	(3.28)	(3.06)	(2.97)	(3.32)
$\log(FX)_{t-1} * (\hat{\beta})$	-1.855***	0.356	-0.155	0.0914***	2.211***
	(-4.96)	(1.17)	(-1.37)	(4.03)	(3.67)
Firm * Date FE	Yes	Yes	Yes	Yes	Yes
Bank * Firm FE	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Observations	1,226,457	1,226,457	1,226,457	1,226,457	1,226,457

Conclusion

- CIP deviations can have important effects on bank lending in emerging economies.
- As banks arbitrage CIP deviations when the currency required to arbitrage is scarce, banks change the currency composition of their lending.
- Results suggest that CIP deviations can have the potential to affect real outcomes.

APPENDIX

CIP Deviations and Interest Rates

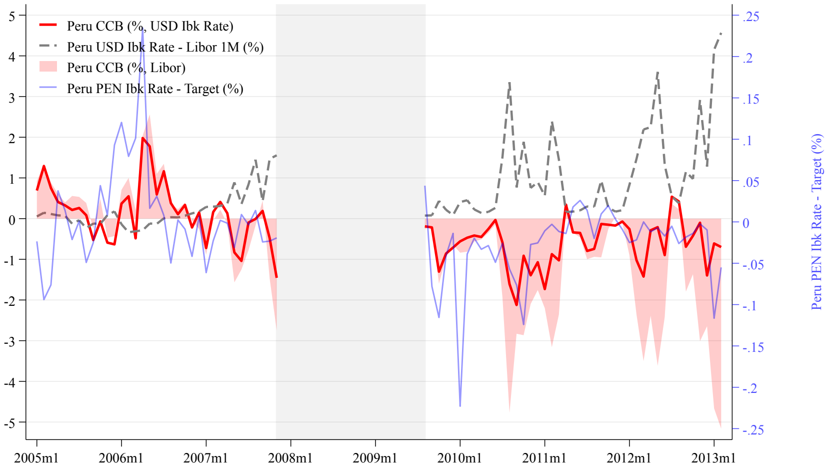


Figure: CIP deviations and Interest Rate Spreads

Outline

1. Step 1: Are banks arbitraging CIP? Do banks differ in their ability?
2. Step 2: Do banks face funding constraints?
3. Step 3: How can CIP arbitrage affect lending?

Step 1: Are banks arbitraging CIP?

- I check whether banks' FX and money market transactions are consistent with arbitrage of CIP deviations.

- Formally, I estimate the following equation at the aggregate and bank-level:

$$y_{(b)t} = \theta_{(b)0} + \theta_{(b)1}\text{CCB}_t \cdot \mathbf{1}(\text{CCB}_t > 0) + \theta_2\text{CCB}_t \cdot \mathbf{1}(\text{CCB}_t \leq 0) + \varepsilon_{(b)t} \tag{4}$$

  and check if $\hat{\theta}_1$ and $\hat{\theta}_2$ have the expected signs.

- Results: They do at the aggregate level and bank level. But less robust at the bank level $\rightarrow$ Suggests there could be bank heterogeneity.

Step 1: Aggregate and Bank-Level Results

	Borrowing		Currency Exchange		Lending	
	(1)	(2)	(3)	(4)	(5)	(6)
	PEN Liab: Fin Obl	USD Liab: Fin Obl	Spot Position	Fwd+Swap Position	PEN Asset: CB + Gvt	USD Asset: Investments
Panel A: Aggregate Banking System						
OLS: Positive CCB (%)	1.22***	-2.44***	4.21***	-3.56***	-2.61**	1.34***
	(2.60)	(-2.98)	(6.99)	(-6.59)	(-2.12)	(4.31)
OLS: Negative CCB (%)	-0.29*	-2.98***	2.61***	-2.06***	0.37	0.67***
	(-1.71)	(-4.52)	(5.50)	(-4.99)	(0.34)	(3.24)
Observations	77	77	77	77	77	77
Panel B: Bank-level Regressions						
OLS: Positive CCB (%)	0.46	-1.11***	3.48***	-2.48***	-1.76**	1.02***
	(1.14)	(-3.25)	(6.01)	(-4.83)	(-2.39)	(2.93)
OLS: Negative CCB (%)	-0.29**	-0.87***	2.20***	-1.86***	-0.08	0.48***
	(-2.16)	(-3.23)	(4.74)	(-4.46)	(-0.08)	(3.22)
Observations	873	873	873	873	832	873

Step1: Differences in Arbitrage across Banks?

- I compute bank-specific sensitivities to arbitrage CIP in two steps:
  1. First, build a proxy for banks' assets invested in arbitrage, the matched position:

$$\text{Matched}_{bt} = \begin{cases} -\min\{|\text{Spot Pos.}|, |\text{Fwd+Swap Pos.}|\} & \text{, if Fwd+Swap Pos.} > 0 \wedge \text{Spot Pos.} < 0 \\ +\min\{|\text{Spot Pos.}|, |\text{Fwd+Swap Pos.}|\} & \text{, if Fwd+Swap Pos.} < 0 \wedge \text{Spot Pos.} > 0 \\ 0 & \text{, if sgn(Fwd+Swap Pos.)} = \text{sgn(Spot Pos.)} \end{cases}$$

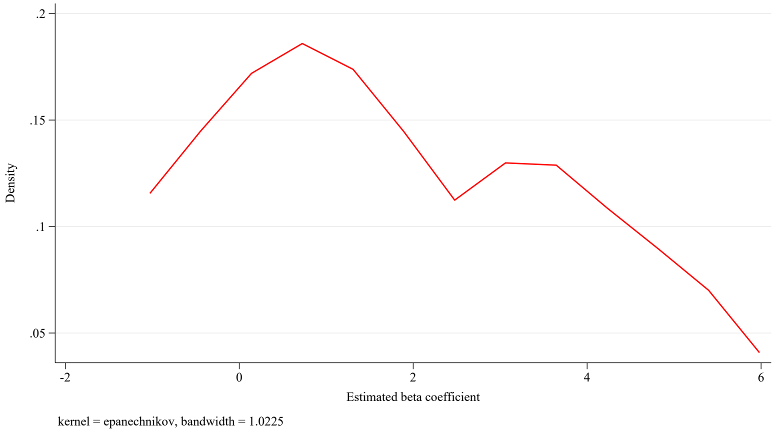
  2. Second, estimate the bank-specific sensitivity, β, with:

$$\left(\frac{\text{Matched}}{\text{Assets}}\right)_{bt} = \alpha_b + \beta_b \text{CCB}_t + \varepsilon_{bt} \qquad \forall b \in B \tag{5}$$

    - If bank b arbitrages: $\beta_b > 0$.
    - If bank 1 arbitrages more aggressively thank bank 2: $\beta_1 > \beta_2 > 0$.

Step 1: Differences in $\hat{\beta}$s

- There is heterogeneity in the distribution of $\hat{\beta}$s



Verifying usefulness of $\hat{\beta}$s

- I check if $\hat{\beta}$s are effective at capturing arbitrage ability.

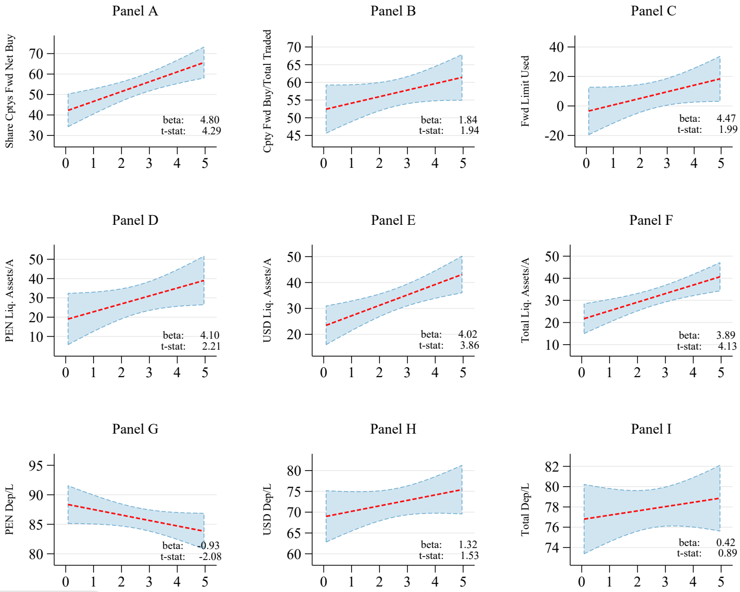
	Borrowing		Currency Exchange		Lending	
	(1)	(2)	(3)	(4)	(5)	(6)
	PEN Liab: Fin Obl	USD Liab: Fin Obl	Spot Position	Fwd+Swap Position	PEN Asset: CB + Gvt	USD Asset: Investments
Panel A: High-arbitrage banks						
OLS: Positive CCB (%)	1.20***	-2.21***	5.42***	-4.31***	-2.52**	0.80**
	(2.79)	(-3.34)	(5.83)	(-4.82)	(-2.28)	(2.43)
OLS: Negative CCB (%)	-0.23*	-2.05***	3.74***	-3.36***	-0.22	0.54***
	(-1.78)	(-4.36)	(4.86)	(-4.59)	(-0.19)	(3.22)
Observations	479	479	479	479	476	479
Panel B: Low-arbitrage banks						
OLS: Positive CCB (%)	-0.46	0.27	1.05***	-0.18***	-0.77**	1.28***
	(-1.11)	(0.66)	(5.40)	(-3.06)	(-2.13)	(3.14)
OLS: Negative CCB (%)	-0.38	0.55**	0.32**	-0.06	0.12	0.41**
	(-1.60)	(2.05)	(2.11)	(-0.67)	(0.18)	(2.48)
Observations	394	394	394	394	356	394

Explanations for arbitrage heterogeneity

- **Why can some banks arbitrage (β) more than others?**
  1. Constraints on the balance sheet
     - Distance to **capital control** limits
     - **Liquidity** in funding
  2. Type of client in the forward market
     - If demand in fwd market goes **against market flow** $\rightarrow$ easier to unwind position

- **Methodology:**
  1. Compute averages across time of bank indicators regarding these characteristics
  2. Regress these on banks' arbitrage intensities

Arbitrage intensity and bank indicators



◂ Step 1: Differences in $\hat{\beta}$s

Outline

1. Step 1: Are banks arbitraging CIP? Do banks differ in their ability?
2. Step 2: Do banks face funding constraints?
3. Step 3: How can CIP arbitrage affect lending?

Step 2: Banks face constraints when funding arbitrage?

- To engage in arbitrage banks need funding in PEN or USD
- How do they fund their CIP arbitrage? If banks are unconstrained, no trade-off between arbitrage and lend. If constrained, their decision depends on marginal profit of the competing business lines.
- Under liquidity constraints and CIP arbitrage $\rightarrow$ Lending in the currency required to do arbitrage is likely to fall.
  - If sourcing is internal: direct reallocation of funds from lending to trading.
  - If sourcing is external: pay higher rates for deposits $\rightarrow$ charge higher lending rate $\rightarrow$ less loans in equilibrium.

Evidence of liquidity constraints

- I estimate a regression like the one I used before, using rate spreads and liquid assets over total assets to proxy for liquidity

	Spreads		Liquidity Ratios	
	(1)	(2)	(3)	(4)
	PEN Spread: Term Dep.	USD Spread: Term Dep.	PEN Liq. (% Assets)	USD Liq. (% Assets)
Panel A: Aggregate Banking System				
OLS: Positive CCB (%)	0.36***	-0.43***	-3.13***	4.41***
	(4.12)	(-2.85)	(-2.86)	(6.82)
OLS: Negative CCB (%)	0.25***	-0.56***	-2.05***	1.51***
	(3.14)	(-3.97)	(-3.74)	(3.26)
Observations	77	77	77	77
Panel B: Bank-level Regressions				
OLS: Positive CCB (%)	0.40***	-0.82***	-2.59***	2.66***
	(3.41)	(-4.32)	(-4.08)	(6.04)
OLS: Negative CCB (%)	0.26**	-0.49***	-1.97***	0.55
	(2.30)	(-3.77)	(-3.71)	(1.37)
Observations	872	873	873	873

- When banks require PEN (USD) to arbitrage, liquidity in PEN (USD) is scarce

- **Note:** It is not important where this scarcity comes from. All that is required is that this happens simultaneously.

Outline

1. Step 1: Are banks arbitraging CIP? Do banks differ in their ability?
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Step 3: How can CIP arbitrage affect lending?

- **Expected results:**
  - $\uparrow$ CCB $\rightarrow$ arbitrage needs PEN funding $\rightarrow \downarrow$ PEN lending, $\uparrow$ USD lending
  - $\downarrow$ CCB $\rightarrow$ arbitrage needs USD funding $\rightarrow \uparrow$ PEN lending, $\downarrow$ USD lending
- **Estimation challenge: CCB is endogenous**
- **Solutions:**
  1. Compare lending on the same month across banks with different $|\hat{\beta}|$
  2. Control for shocks in Peru instrumenting Peru's CCB with CCB of Chile and Mexico.
  3. Control for changes in firms' inv. opportunities using within firm-month analysis.
  4. Analyze consequences of variable correlated with CCB: FX

Step 3: Main Equation

- To solve these challenges, I estimate the following 2-stage model:

$$CCB^{\text{Peru}}_{t-1} \times \text{Arb.Intensity}_b = \gamma_0 + \gamma_1 \text{CCB}^{ChMex}_{t-1} \text{Arb.Intensity}_b + X'_{b,t-1}\Theta + \text{Bank FE} + v_{b,t-1}$$

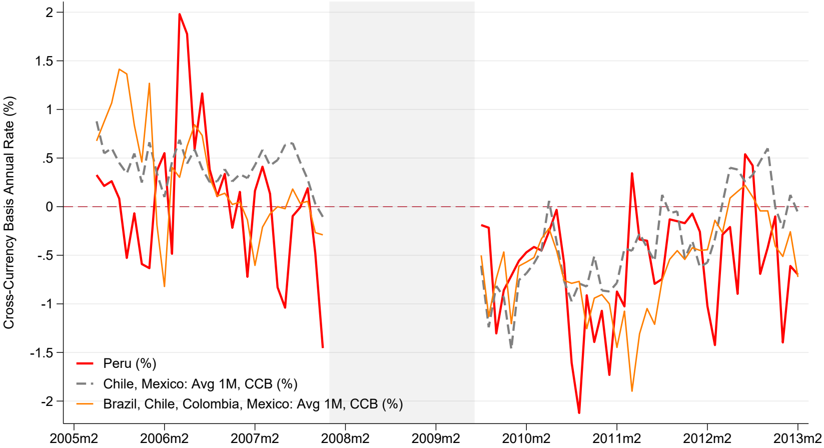
$$y_{bft} = \alpha_0 + \alpha_1 \widehat{CCB^{\text{Peru}}_{t-1} \times \text{Arb.Intensity}_b} + \text{Bank} \times \text{Firm FE} + \text{Firm} \times \text{Month FE} + X'_{b,t-1}\Psi + \epsilon_{bft}$$

where Arb.Intensity$_b$=$\hat{\beta}_b$, y_{bft} is log(Credit)*100 and X_{bt} are bank controls.

- Main coefficient of interest is α_1.

Step 3: First Stage Validity

- Instrument is statistically significant and highly stable.



Step 3: First Stage Validity

- Instrument is statistically significant and highly stable.

	(1)	(2)	(3)
$CCB_{t-1}^{Chile,Mex} * (\hat{\beta})$	0.811***	0.591***	0.576***
	(5.43)	(4.33)	(4.22)
Bank Controls	No	No	Yes
Bank FE	No	Yes	Yes
F	29.45	18.77	17.79
Observations	1348040	1348040	1348040

Second Stage Results: IV Results

- **Expected results:** $\uparrow$CCB $\rightarrow$ $\downarrow$ PEN Credit and $\uparrow$ USD Credit.

	Log(PEN)	Log(USD)	Log(Total)	Ratio	Log(USD)-Log(PEN)
$CCB^{Peru}_{t-1} * (\hat{\beta})$	-24.30***	16.29***	3.377**	1.422***	40.58***
	(-3.44)	(3.50)	(2.18)	(3.40)	(3.74)
Firm * Month FE	Yes	Yes	Yes	Yes	Yes
Bank * Firm FE	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Observations	1,348,040	1,348,040	1,348,040	1,348,040	1,348,040

Second Stage Results: OLS Results

- OLS estimates are consistently smaller than IV estimates.

	Log(PEN)	Log(USD)	Log(Total)	Ratio	Log(USD)-Log(PEN)
$CCB^{Peru}_{t-1} * (\hat{\beta})$	-6.693***	3.430***	0.409	0.361***	10.12***
	(-3.48)	(3.05)	(0.89)	(3.35)	(3.82)
Firm * Month FE	Yes	Yes	Yes	Yes	Yes
Bank * Firm FE	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Firm Cluster	18,374	18,374	18,374	18,374	18,374
Month Cluster	77	77	77	77	77
Observations	1,348,040	1,348,040	1,348,040	1,348,040	1,348,040
Adjusted R2	0.74	0.81	0.72	0.81	0.82

Du, W., A. Tepper, and A. Verdelhan (2018). Deviations from covered interest rate parity. *The Journal of Finance 73*(3), 915–957.