

The Dollar, Bank Leverage and Deviations from Covered Interest Rate Parity

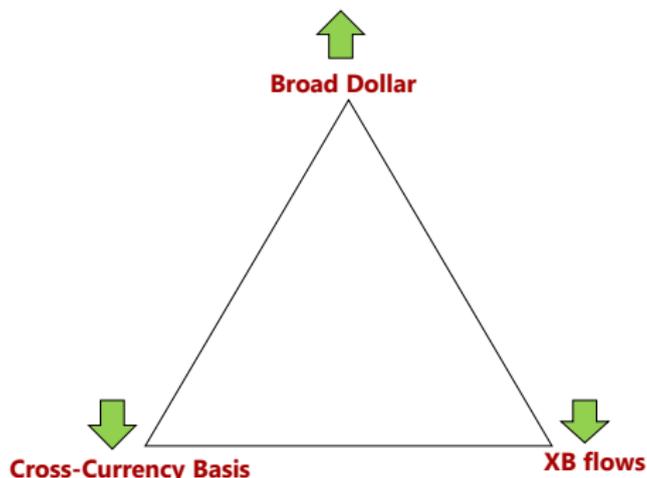
Stefan Avdjiev*, Wenxin Du**, Catherine Koch* and Hyun Song Shin*

*Bank for International Settlements, ** Federal Reserve Board

BIS CIP-RIP Symposium, May 23, 2017

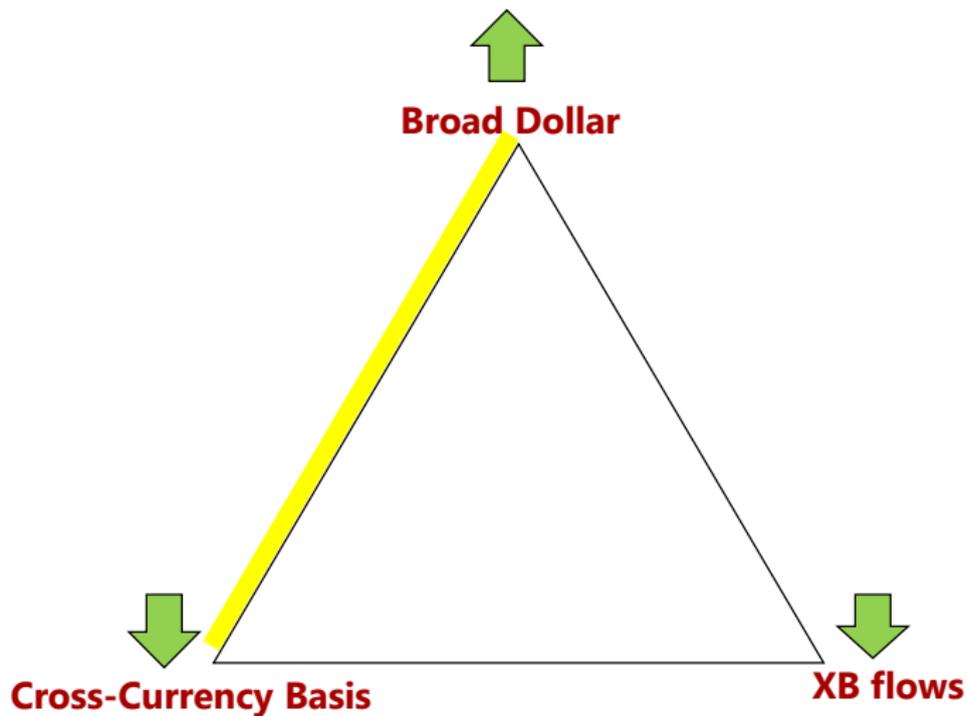
The views expressed in this presentation are those of the authors and not necessarily those of the Bank for International Settlements, the Federal Reserve Board of Governors, or the Federal Reserve System

Spot-Basis-XB Flows Triangle



- ▶ Stronger dollar, wider CIP deviations, lower cross-border lending in dollars
- ▶ The dollar is a risk barometer in global capital markets: stronger dollar, higher shadow cost of banks' balance sheet capacity and lower bank leverage.

Spot and Basis



Broad Dollar and the Basis



The red line shows the Federal Reserve Board's US trade-weighted broad dollar index, with higher values indicating a stronger US dollar. The blue line is the simple average of the five-year cross currency basis swap spreads for AUD, CAD, CHF, DKK, EUR, GBP, JPY, NOK, NZD and SEK vis-à-vis the US dollar.

Sources: Board of Governors of the Federal Reserve System; Bloomberg.

Regression of 3M Basis on the Dollar

	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Dollar_t$	-2.641*** (0.682)		-2.915*** (0.786)	-2.908*** (0.793)	-2.307*** (0.731)	-2.080*** (0.634)
ΔBER_t		-0.440* (0.236)	0.228 (0.233)	0.284 (0.238)	0.238 (0.222)	0.239 (0.194)
$\ln VIX_t$				0.000596 (0.00489)	0.00135 (0.00477)	0.00130 (0.00417)
$\Delta \ln VIX_t$				-0.0183 (0.0231)	0.00465 (0.0237)	-0.0158 (0.0191)
$\Delta \ln Vol_t$					-0.263*** (0.0613)	-0.221*** (0.0519)
ΔRRR_t					0.0112* (0.00587)	0.0110 (0.00748)
$\Delta(y_{it} - y_t^{US})$						0.106*** (0.0367)
$\Delta(ts_{it} - ts_t^{US})$						-0.140*** (0.0492)
Observations	21,555	21,949	21,555	20,896	20,495	18,092
R-squared	0.016	0.002	0.016	0.016	0.026	0.038

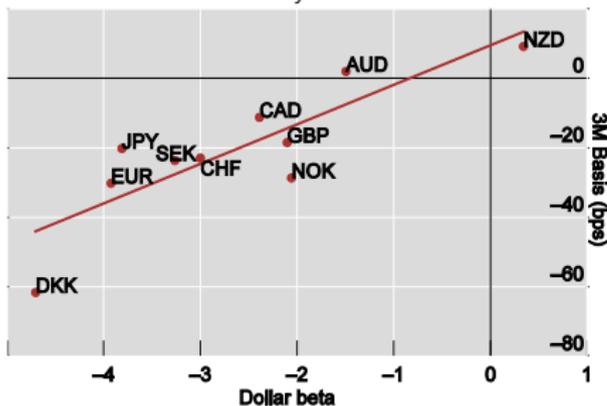
Regression of 5Y Basis on the Dollar

	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Dollar_t$	-1.399*** (0.303)		-1.293*** (0.437)	-1.071*** (0.370)	-1.078*** (0.404)	-0.965** (0.404)
ΔBER_t		-0.562*** (0.126)	-0.0738 (0.137)	-0.0885 (0.126)	-0.0398 (0.148)	-0.409** (0.202)
$\ln VIX_t$				-0.0338 (0.0250)	-0.0326 (0.0248)	-0.0383* (0.0223)
$\Delta \ln VIX_t$				-0.0472** (0.0238)	-0.0398 (0.0279)	-0.0108 (0.0342)
$\Delta \ln Vol_t$					-0.0188 (0.0436)	0.0144 (0.0333)
ΔRRR_t					-0.00327 (0.00987)	-0.00450 (0.00937)
$\Delta(y_{it} - y_t^{US})$						-0.0929*** (0.0236)
$\Delta(ts_{it} - ts_t^{US})$						0.0152 (0.0151)
Observations	360	360	360	360	358	316
R-squared	0.191	0.117	0.191	0.208	0.209	0.278

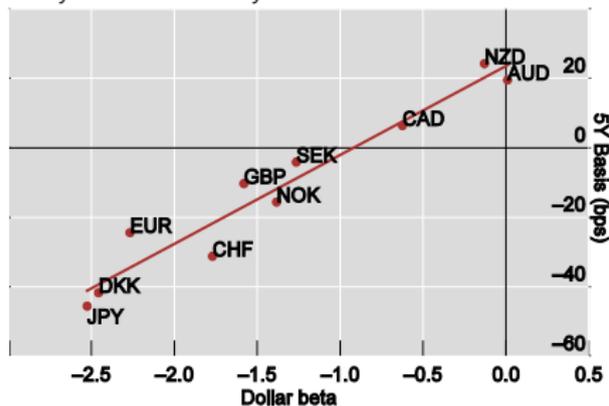
Cross-Currency Basis vs. Dollar Beta

- ▶ Dollar beta by currency: $\Delta x_{it} = \alpha_i + \beta_i \Delta \text{Dollar}_t + \epsilon_{it}$
- ▶ The dollar beta is strongly correlated with the level of the basis.
- ▶ The dollar is a potential risk factor pricing the cross-sectional of CIP arbitrage returns.

Three-month cross-currency basis vs dollar beta



Five-year cross-currency basis vs dollar beta



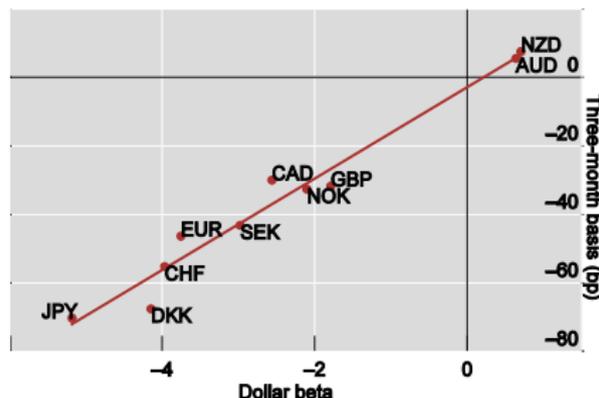
The Dollar and Basis after the U.S. Election

- ▶ The relationship between the dollar beta and the basis is strongly confirmed in the event study after the U.S. election.

Changes in the broad dollar index and three-month cross-currency basis since the US election

Currency	8/11/ 2016	29/11/ 2016	change	dollar beta ¹
Broad dollar	122.8	127.6	4.8 (3.9%)	
AUD	5.5	8.0	2.5 bps	0.64
CAD	-30.0	-40.0	-10.0 bps	-2.56
CHF	-55.3	-70.8	-15.5 bps	-3.97
DKK	-67.5	-83.7	-16.2 bps	-4.14
EUR	-46.4	-61.0	-14.7 bps	-3.75
GBP	-31.8	-38.8	-7.0 bps	-1.79
JPY	-70.3	-90.5	-20.3 bps	-5.18
NZD	7.5	10.3	2.8 bps	0.70
NOK	-32.6	-40.8	-8.2 bps	-2.10
SEK	-43.2	-54.9	-11.6 bps	-2.98

Cross-currency basis vs dollar beta²



¹ The dollar beta is calculated as the ratio of changes in the three-month cross-currency basis over changes in the broad US dollar index between 8 November and 29 November 2016.

² The vertical axis shows the three-month cross-currency basis expressed in basis points on 8 November 2016, while the horizontal axis indicates the dollar beta.

Sources: Board of Governors of the Federal Reserve System; Bloomberg; BIS calculations.

Alternative Base Currency

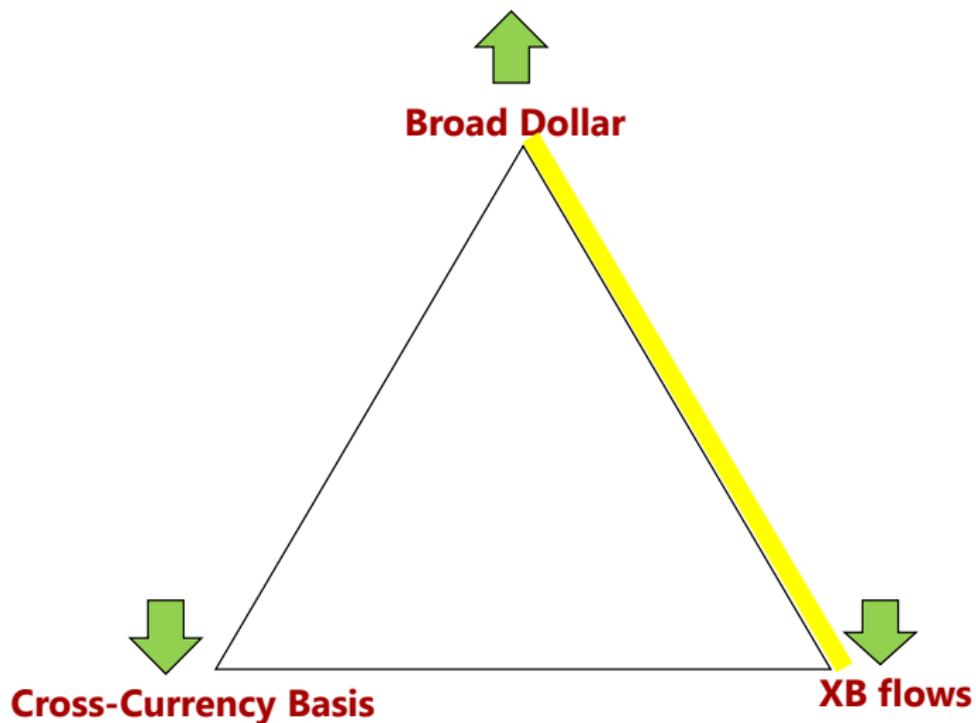
- ▶ The relationship between basis and the dollar is not mechanical.
- ▶ When we calculate the basis using another major currency as the base currency. Only for the euro, the spot and basis relationship is robust at both short and long maturity .

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	AUD	CAD	CHF	DKK	EUR	GBP	JPY	NOK	NZD	SEK
Panel (A): 3-month basis, daily frequency										
$\Delta \overline{NEER}_t^{(j)}$	-0.0963	-0.179	-0.0476	-0.633***	-0.378**	-0.165	-0.231	0.114	0.0677	-0.598***
	(0.209)	(0.209)	(0.274)	(0.239)	(0.174)	(0.194)	(0.232)	(0.206)	(0.270)	(0.159)
Panel (B): 5-year basis, quarterly frequency										
$\Delta \overline{NEER}_t^{(j)}$	0.156	0.093	-0.143	-0.418*	-0.589**	-0.0722	-0.119	-0.142	0.241	-0.14
	-0.32	-0.293	-0.162	-0.233	-0.232	-0.206	-0.283	-0.172	-0.302	-0.183

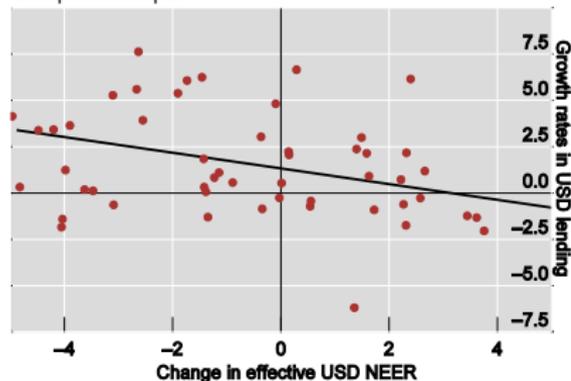
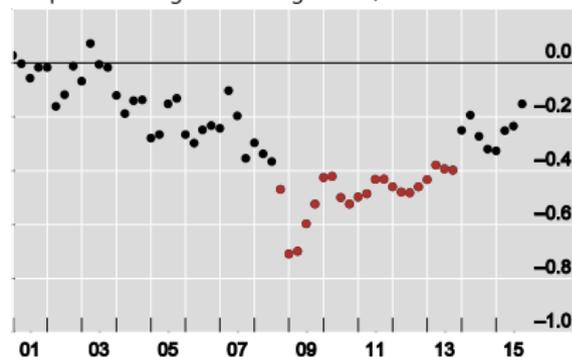
This table reports regression coefficients of changes in the cross-currency basis of currency i against the base currency j on changes in the aggregate exchange rate against the base currency j , $\Delta \overline{NEER}_t^{(j)}$, controlling for changes in the bilateral exchange rate of i against j , and the log level and changes in VIX. The variable $\Delta \overline{NEER}_t^{(j)}$ is the change in the BIS nominal effective exchange rate for currency j . Each column corresponds to a different base currency. Panel A is performed on daily changes for the 3-month basis and Panel B is performed on quarter changes for the 5-year basis.

Sources: Bloomberg; BIS bilateral exchange rates ; BIS calculations

Spot and XB Flows



Regression of Aggregate \$XB Flows on the Dollar

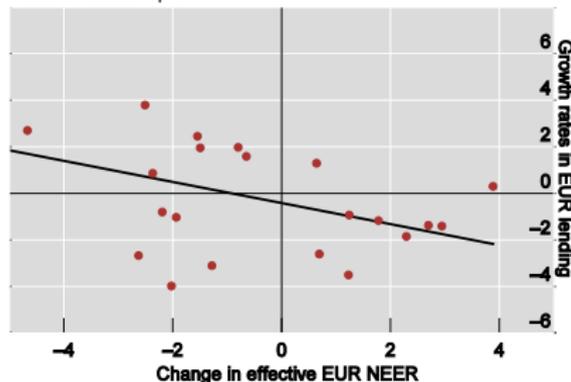
Complete sample¹20 quarter rolling window regression, all sectors²

Panel Regression of Bilateral \$XB Flows on the Dollar

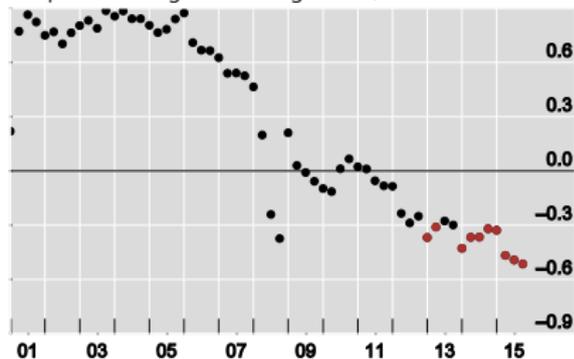
$\Delta Dollar_t$	-0.636*** (0.062)		-0.486*** (0.073)
ΔBER_{it}		-0.295*** (0.043)	-0.155*** (0.041)
Constant	-4.178* (2.264)	-4.649** (2.163)	-4.289* (2.237)
Observations	3,975	3,975	3,975
R ²	0.076	0.068	0.080

Regression of Euro-XB Flows on the EUR NEER

Post-crisis sample¹



20 quarter rolling window regression, all sectors²



Our Model

- ▶ A risk-neutral bank has two business lines:
 - ▶ Lend \$ to FX-mismatched borrowers (e.g. EME corporates) with gross return r_1 .
 - ▶ Provide \$ in the FX swap market with gross return r_2 .
- ▶ B/S identity: $a_1 + a_2 = e + d$.
- ▶ Bank maximizes profits subject to a VaR constraint:

$$\max_{a_1, a_2} \mathbb{E}(r_1 a_1 + r_2 a_2)$$

subject to $\alpha \sigma_r \leq e$.

- ▶ Let $\mu_1 = \mathbb{E}(r_1)$ and $\mu_2 = \mathbb{E}(r_2)$ and Σ be the covariance of returns.
 - ▶ $\mu_2 - 1$ is the absolute value of the basis.

Solving the Model

- ▶ Let λ be the Lagrange multiplier on the b/s constraint,

$$\lambda = \frac{\alpha}{2e} \sqrt{u' \Sigma^{-1} u}.$$

- ▶ Optimal supply of dollar loans from the banking sector:

$$\begin{bmatrix} A_1 \\ A_2 \end{bmatrix} = \frac{E}{\alpha} \frac{1}{\sqrt{u' \Sigma^{-1} u}} \Sigma^{-1} \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix}.$$

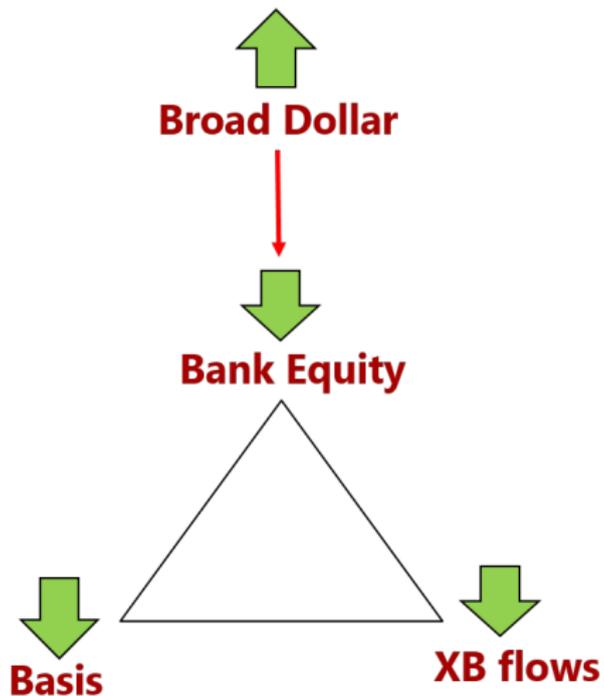
- ▶ Market clearing after imposing downward-sloping demand curves for dollars in the loan and FX swap markets:

$$\begin{bmatrix} X_1(\mu_1) \\ X_2(\mu_2) \end{bmatrix} = \frac{E}{\alpha} \frac{1}{\sqrt{u' \Sigma^{-1} u}} \Sigma^{-1} \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix}.$$

Proposition

An appreciation of the dollar entails a widening of the basis and a contraction of bank lending in dollars.

Extended Triangle



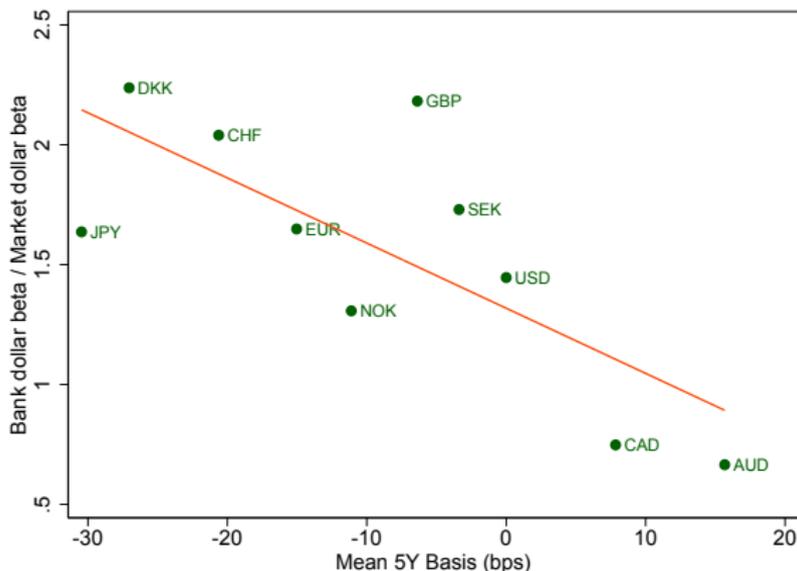
Impact of A Stronger Dollar on Bank Equities

Regressions of bank equity returns on the broad dollar movements

	(1)	(2)	(3)
	Bank Equity Return	Bank Equity Return	Bank Equity Return
$\Delta Broad_t$	-2.016*** (0.127)	-0.268** (0.103)	-0.0303 (0.0838)
$\Delta Broad_t \times bs_t$			2.875*** (0.808)
$\Delta Market_t$		1.246*** (0.0527)	1.236*** (0.0524)
Constant	-0.00444*** (3.25e-05)	-0.00762*** (0.000122)	-0.00728*** (0.000166)
Observations	3,755	3,755	3,755
R-squared	0.102	0.452	0.459

Dollar, Bank Equity and the Basis

Bank equity's dollar beta (normalized by market's dollar beta) vs. the basis



- ▶ A stronger dollar has a negative effect on bank equities.
- ▶ The effect is stronger for banks in countries with a more negative cross-currency basis, or a more severe dollar shortage.

Conclusion

- ▶ Triangular relationship among
 - ▶ The value of the dollar
 - ▶ CIP deviations
 - ▶ XB lending denominated in the dollar
- ▶ The U.S. dollar is a barometer of risk-bearing capacity in global capital markets.
 - ▶ A stronger dollar adversely affects bank equities, which limits the banks' balance sheet capacity,
 - ▶ CIP deviations widen and XB lending declines due to a higher shadow cost of bank balance sheet capacity.