Appendix to Staff Working Paper No. 779
Currency mispricing and dealer balance sheets

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This appendix presents supplementary results not included in the main body of the paper.

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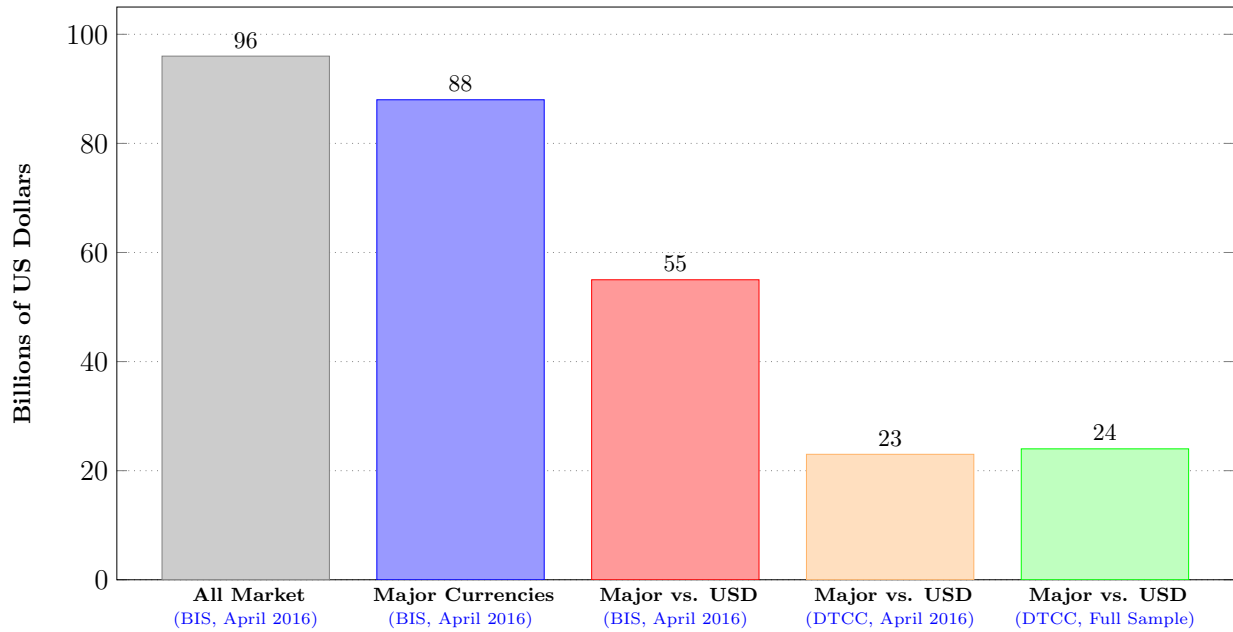
Figure A.1: Daily Volume on Cross-Currency Swaps

This figure displays average daily volume on cross-currency swaps based on the 2016 Triennial Central Bank Survey (BIS, 2016) and transaction-level data from the Depository Trust & Clearing Corporation (DTCC). The latter includes over-the-counter cross-currency swaps undertaken by UK legal entities under the European Market Infrastructure Regulation (EMIR). The sample comprises major currencies – Australian dollar (AUD), Canadian dollar (CAD), Swiss franc (CHF), euro (EUR), British pound (GBP), Japanese yen (JPY) – relative to the US dollar (USD), and runs between December 2014 and December 2016.
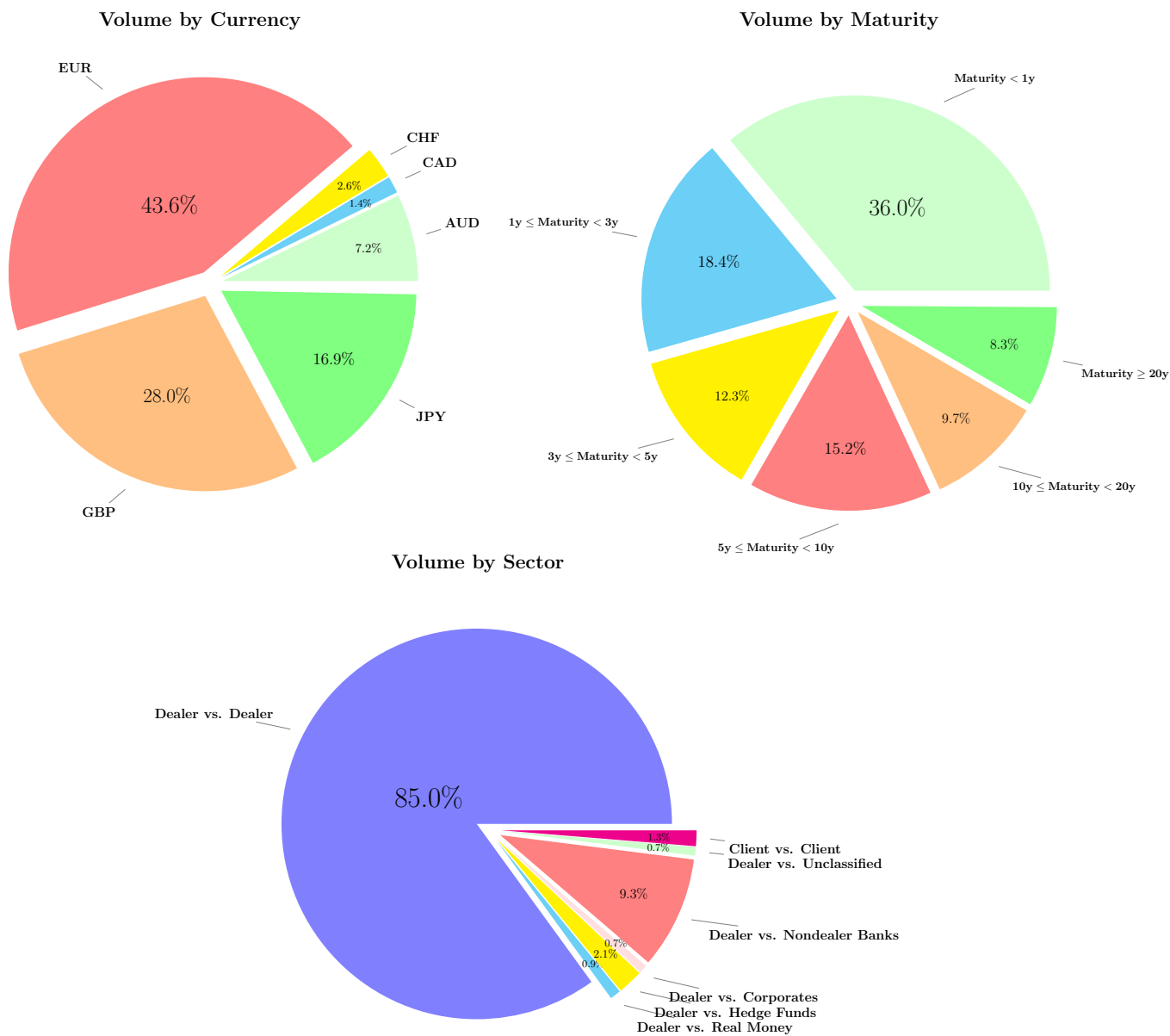
Figure A.2: Breakdown of Cross-Currency Swap Volume

This figure displays currency, maturity, and sector breakdown of daily volume on cross-currency swaps. Volume is constructed using transaction-level data from the Depository Trust & Clearing Corporation (DTCC) on OTC cross-currency swaps undertaken by UK legal entities under the European Market Infrastructure Regulation (EMIR) on derivatives. The sample runs between December 2014 and December 2016.

Table A.1: Descriptive Statistics of Dealer Banks' Variables

This table presents descriptive statistics of dealer-specific variables. *Leverage Ratio* is Tier 1 capital over total assets, *Capital Ratio* is Tier 1 capital over risk-weighted assets, *Capital Ratio Requirement* is the minimum requirement for the capital ratio, *Bank Size* is the log of a bank's total assets in levels, *Liquid Asset Share* is the holdings of liquid assets (i.e., cash and market loans) scaled by non-equity liabilities, and *Deposit Share* is the fraction of the banking organization's balance sheet financed with core deposits. These data are measured quarterly and are from the Bank of England. Δ *Bank CDS* is the weekly change in the 5-year CDS spread whereas Δ *Bank IVOL* is the weekly change in the 1-month option's implied volatility. These data are collected from Bloomberg. The sample runs between December 2014 and December 2016.

	mean	median	sdev	Q_{25}	Q_{75}
Leverage Ratio	3.92	3.80	1.41	3.02	4.61
Capital Ratio	11.42	10.93	1.80	10.05	12.67
Capital Ratio Requirement	7.05	6.25	3.35	5.15	7.25
Bank Size	25.12	25.51	2.03	23.73	26.85
Liquid Asset Share	19.82	20.85	15.77	7.73	26.18
Deposit Share	55.27	58.36	14.73	44.58	66.25
Δ *Bank CDS*	0.25	0.01	8.08	-3.10	3.33
Δ *Bank IVOL*	0.10	-0.09	3.83	-1.98	1.90

Table A.2: Summary Statistics of FX Forward Volume

This table presents summary statistics of weekly volume aggregated by currency and maturity. The volume is expressed in billions of USD and is based on contract-level FX forwards (outright forwards and forward legs of FX swaps) from the Depository Trust & Clearing Corporation (DTCC). The sample runs between December 2014 to December 2016.

	AUD		CAD		CHF	
Maturity ≤ 1-week	273.87	(66.89)	156.88	(42.52)	269.28	(79.63)
1-week < Maturity ≤ 1-month	29.79	(11.64)	18.33	(7.23)	31.91	(10.11)
1-month < Maturity ≤ 3-month	34.28	(11.21)	29.20	(28.44)	34.59	(14.32)
Maturity > 3-month	12.57	(6.98)	8.77	(5.61)	15.40	(6.99)
	EUR		GBP		JPY	
Maturity ≤ 1-week	1485.23	(289.31)	714.39	(136.28)	781.31	(190.75)
1-week < Maturity ≤ 1-month	199.83	(55.23)	93.88	(38.32)	94.42	(36.70)
1-month < Maturity ≤ 3-month	262.27	(81.06)	135.32	(52.09)	121.53	(46.77)
Maturity > 3-month	116.60	(46.11)	61.66	(25.88)	57.45	(25.53)

Table A.3: Dollar Basis and Balance Sheet Constraints: Major Currencies

This table presents estimates from fixed effects panel regressions. The dependent variable is the contract-level absolute dollar basis for the major currency pairs, i.e., euro, yen and pound against the dollar, using maturities between one week and three months. The sample only includes dealer-to-clients transactions. The set of independent variables is summarized in Table A.1 in the Internet Appendix. We include dealer, maturity, hour, currency, sector interacted with time (date), and currency interacted with both sector and time (date) fixed effects. Standard errors are clustered by currency and time dimension, and reported in parentheses. The superscripts *, **, and *** indicate statistical significance at 10%, 5%, and 1% respectively. The sample runs between December 2014 and December 2016.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Ratio	17.255***	18.283***	19.249***				15.698***	17.526***	18.478***
	(4.233)	(3.879)	(3.716)				(4.954)	(4.011)	(3.791)
Capital Ratio				3.418**	2.898*	3.051**	1.296	0.623	0.639
				(1.553)	(1.541)	(1.495)	(1.869)	(1.593)	(1.541)
Bank Size		48.385**	51.659**		32.643	35.085		47.941**	51.183**
		(18.795)	(21.925)		(20.310)	(23.361)		(17.422)	(20.491)
Liquid Asset Share		−1.238***	−1.362***		−1.445***	−1.576***		−1.225***	−1.350***
		(0.417)	(0.398)		(0.472)	(0.460)		(0.419)	(0.400)
Deposit Share		0.273	0.350**		0.170	0.240		0.273	0.350**
		(0.209)	(0.168)		(0.201)	(0.171)		(0.208)	(0.169)
Δ *Bank CDS*		−0.150	−0.074		−0.183	−0.108		−0.152	−0.075
		(0.274)	(0.233)		(0.276)	(0.227)		(0.272)	(0.233)
Δ *Bank IVOL*		−0.260	−0.227		−0.309	−0.277		−0.260	−0.226
		(0.211)	(0.181)		(0.216)	(0.190)		(0.212)	(0.182)
R^2	0.141	0.142	0.173	0.140	0.141	0.172	0.141	0.142	0.173
Obs	2,829,918	2,829,918	2,829,847	2,829,918	2,829,918	2,829,847	2,829,918	2,829,918	2,829,847
Dealer/Maturity/Hour	Y	Y	Y	Y	Y	Y	Y	Y	Y
Currency	Y	Y	N	Y	Y	N	Y	Y	N
Sector×Time	Y	Y	N	Y	Y	N	Y	Y	N
Currency×Sector×Time	N	N	Y	N	N	Y	N	N	Y

Table A.4: Controlling for Demand Conditions at Client Level: Major Currencies

This table presents estimates from fixed effects panel regressions. The dependent variable is the volume-weighted absolute dollar basis measured weekly for the major currency pairs, i.e., euro, yen and pound against the dollar, using between one week and three months. The sample only includes dealer-to-clients transactions. The set of independent variables is summarized in Table A.1 in the Internet Appendix. We include dealer, currency, sector interacted with time (date), and currency interacted with both sector and time (date) fixed effects. Standard errors are clustered by currency and time dimension, and reported in parentheses. The superscripts *, **, and *** indicate statistical significance at 10%, 5%, and 1% respectively. The sample runs between December 2014 and December 2016.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Ratio	15.955***	16.359***	16.855***				11.610***	12.335***	12.630***
	(4.927)	(4.835)	(4.444)				(4.140)	(3.937)	(3.678)
Capital Ratio				5.731***	5.434***	5.679***	4.296***	3.968***	4.176***
				(1.642)	(1.655)	(1.767)	(1.352)	(1.330)	(1.535)
Bank Size		17.946	25.183***		8.143	16.002*		17.295	24.652*
		(12.005)	(8.549)		(12.598)	(8.838)		(10.772)	(7.024)
Liquid Asset Share		−0.993**	−0.745**		−1.088**	−0.819**		−0.930**	−0.678**
		(0.396)	(0.290)		(0.443)	(0.335)		(0.391)	(0.287)
Deposit Share		0.399**	0.534*		0.281**	0.412		0.381**	0.511
		(0.172)	(0.299)		(0.175)	(0.316)		(0.172)	(0.302)
Δ Bank CDS		−0.004	0.028		−0.053	−0.022		−0.028	0.002
		(0.201)	(0.206)		(0.212)	(0.262)		(0.236)	(0.249)
Δ Bank IVOL		−0.147	−0.417		−0.173	−0.433		−0.125	−0.390
		(0.361)	(0.423)		(0.363)	(0.455)		(0.363)	(0.423)
R^2	0.599	0.599	0.599	0.599	0.599	0.599	0.599	0.599	0.600
Obs	566,814	566,814	299,763	566,814	566,814	299,763	566,814	566,814	299,763
Dealer	Y	Y	Y	Y	Y	Y	Y	Y	Y
Currency	Y	Y	N	Y	Y	N	Y	Y	N
Client×Time	Y	Y	N	Y	Y	N	Y	Y	N
Currency×Client×Time	N	N	Y	N	N	Y	N	N	Y

Table A.5: Difference-in-Differences: Public Disclosure

This table presents difference-in-differences estimates associated with the public disclosure of the leverage ratio on January 1, 2015. The dependent variable is the absolute volume-weighted dollar basis measured weekly. The sample only includes dealer-to-clients transactions. The *treatment group* includes dealer banks with a low (simple) leverage ratio as of December 2012 whereas the *control group* comprises dealer banks with a high (simple) leverage ratio as of December 2012. These groups are formed using the median value of a (simple) leverage ratio constructed as shareholder claims to total assets. The *pre-treatment* (*post-treatment*) period covers a month prior (post) to January 1, 2015. We exclude two weeks of data bracketing the year-end. The table also presents difference-in-differences estimates associated with a placebo date (February 1, 2016) using a month period prior (post) to this date as *pre-treatment* (*post-treatment*) sample. We include dealer, currency, client interacted with time (calendar date), and client interacted with both currency and time fixed effects. Standard errors are clustered by currency dimension, and reported in parentheses. The superscripts *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)
Panel A: Absolute Dollar Basis				
Affected Dealers × Post Regulatory Date	28.353**	40.521***		
	(13.571)	(14.285)		
Affected Dealers × Post Placebo Date			−2.554	−20.744
			(20.854)	(14.997)
R^2	0.654	0.693	0.656	0.692
Obs	13,424	5,506	14,806	6,151
Panel B: Percentage Log Volume				
Affected Dealers × Post Regulatory Date	−22.691**	−26.654***		
	(11.269)	(5.929)		
Affected Dealers × Post Placebo Date			−1.047	9.314
			(8.250)	(5.937)
R^2	0.753	0.784	0.754	0.779
Obs	13,424	5,506	14,806	6,151
Dealer	Y	Y	Y	Y
Currency	Y	N	Y	N
Client×Time	Y	N	Y	N
Currency×Client×Time	N	Y	N	Y