The Foreign Exchange Risk Premium in the Cross-Section of Stock Returns: International Evidence

Alain Krapl

Armin Varmaz

Haile/US Bank College of Business
Northern Kentucky University

Hochschule Bremen

82. Wissenschaftliche VHB-Jahrestagung, 18. – 20.03.2020, Frankfurt

Outline

HSB

Motivation

- If the effects of currency risk do not vanish in a well-diversified portfolio, exposure to the exchange risk factor should yield a risk premium.

- If PPP holds and if there are no barriers to international investments and no differences in consumption goods, then the single-index capital asset pricing model (CAPM) should hold internationally, and exchange risk should not be priced

- We try to explore the diversifiability in equities and equity portfolios

Motivation

- Motivated by FX exposure puzzle — in the unconditional setting, the empirical evidence for a significant FX risk premium is mixed
- Motivated by Krapl (2019) — diversifiability of currency portfolios is inversely related to FX total exposures for U.S. firms: Is FX risk completely diversifiable?

- Our research hypotheses are:
  - H1:   There exists a (significant) FX risk premium in equity returns
  - H2a: FX risk is not fully diversifiable
  - H2b: Diversifiability of the magnitude of FX risk is positively related to the currency risk

Main results from the paper

- Today's talk is about the diversifiablity of FX risk

- FX risk does not appear to be fully diversifiable for the investors from four major currency perspectives

- Results not presented

  - Using firm-level data from the U.S., UK, Germany, Japan, France, and Spain, we find support for an unconditional FX risk premium in a cross-section of stock returns (Jan. 1999 to Dec. 2017)

  - Using ICAPM-consistent estimates of ex-ante currency risk premia to a wealth-weighted currency index, we observe significant, negative FX risk premia for Japanese, U.S., and British firms

Data

- Firm-level data from six stock markets (U.S., UK, Germany, Japan, France, and Spain) are obtained form Datastream for the time period Dec-98 until Dec-17
  - Prices, return index (includes dividends), book value of equity (BM), market value of equity (Size), foreign sales / total sales (Fsale), foreign assets/total assets (Fasset)
- Risk factors
  - Global market portfolio: MSCI All country world index [similar results when local indexes used]
  - Currency portfolio: Wealth-weighted currency portfolio, trade-weighted currency portfolio, equal-risk-contribution portfolio (for diversifiability analysis) consisting of 27 currency pairs covering about 93% of world wealth

Diversifiability

- **Table 2**

Diversifiability of currency and equity portfolios

	Wealth-weighted currency indices				Equal-weighted equity indices			
	USD	GBP	EUR	JPY	USD	GBP	EUR	JPY
January 1999 to December 2017								
COR	0.355	0.464	0.420	0.643	0.148	0.196	0.157	0.156
$PC1$	0.389	0.506	0.482	0.647	0.202	0.247	0.215	0.204
$PC3$	0.502	0.660	0.620	0.754	0.339	0.375	0.347	0.339

This table presents of FX exposure diversifiability measures for wealth-weighted and ERC currency indices for the whole sample period January 1999 to December 2017 […]. The diversifiability measures are defined as follows: *COR* is the median of correlation coefficients of all sample bilateral FX rates, $PC1$ is the first principal component of the correlation matrix of the currency index (Volosovych, 2011), and $PC3$ is the explanatory power (adjusted R^2) of the first three principal components of the correlation matrix of the currency index (Pukthuanthong, Roll, 2009). Diversifiability measures are estimated from the USD, GBP, EUR, and JPY perspective. For sake of exposition, diversifiability measures for random equal-weighted stock index with 26 stocks—to match the number of bilateral FX rates used for the wealth-weighted currency indices—are also presented in the rightmost four columns.

Diversifiability

Panel C: FX exposures of the global market index: $Rm^C = \alpha + \gamma Rx_w^C + \varepsilon_i$

	January 1999 to December 2017					January 1999 to March 2007					April 2007 to December 2017				
	α	$tstat_\alpha$	γ	$tstat_\gamma$	R^2	α	$tstat_\alpha$	γ	$tstat_\gamma$	R^2	α	$tstat_\alpha$	γ	$tstat_\gamma$	R^2
USD	0.005	1.84	1.276	9.02	0.265	0.004	1.14	0.638	2.65	0.067	0.006	1.72	1.629	9.71	0.426
GBP	0.006	2.15	0.727	5.73	0.127	0.005	1.39	1.400	5.94	0.267	0.007	2.05	0.467	3.16	0.073
EUR	0.006	2.13	0.536	4.85	0.094	0.006	1.44	1.097	6.28	0.289	0.006	1.89	0.187	1.38	0.015
JPY	0.006	2.25	1.392	15.94	0.529	0.005	1.31	0.842	5.03	0.207	0.007	2.24	1.630	17.44	0.705

This table presents summary statistics based on monthly frequency spanning the sample period January 1999 to December 2017. […] Panel C shows FX exposures of the MSCI All Country World index from each currency perspective. The FX exposures (γ) for the global market index for each currency perspective (C) are based on the following model: $Rm^C = \alpha + \gamma Rx_w^C + \varepsilon_i$. Panel C reports FX exposure estimates for the whole sample period and two subperiods of interest: January 1999 to March 2007 and April 2007 to December 2017.

- Apparently, the diversifiability of currency portfolio is higher relative to equity portfolio for the time period under consideration and the global market portfolio is significantly exposed to the wealth-weighted currency portfolio
- H2a is somewhat supported in the data

Diversifiability

Pre- and post-formation global market and FX exposures: Wealth-weighted currency indices

	Pre-formation					Post-formation	
	γ_w^{pre}	% Sig	β_m^{pre}	Alpha	β_m^{post}	γ_w^{post}	Adj. R^2
United States of America (US): GRS test = 3.069**							
1	-3.958	73.374	1.775	0.005*	1.213***	-2.017***	0.630
2	-2.474	70.669	1.256	0.004*	1.092***	-1.941***	0.688
3	-1.839	64.485	0.923	0.005***	0.919***	-1.849***	0.691
4	-1.292	44.196	0.749	0.004**	0.888***	-1.789***	0.656
5	0.308	6.817	0.620	0.006**	0.976***	-1.673***	0.501

This table presents average pre- and post-formation estimates of global market and FX exposures to wealth-weighted currency indices. Columns labeled *Fsale* and *Fasset* show average (pre-formation) foreign sales and foreign asset ratios. Post-formation statistics include intercept terms (*Alpha*) and adjusted R^2 values. Statistical significance for the GRS tests and post-formation parameter estimates is indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Estimates of global market and FX risk premia

	ICAPM-consistent		Bootstrap mean	
	$\beta_m^{post} RP_M$	$\gamma_w^{post} RP_{Xw}$	$\beta_m^{post} RP_M$	$\gamma_w^{post} RP_{Xw}$
United States of America (US)				
1	7.180	-1.737	7.014	-2.122
2	6.464	-1.671	6.314	-2.042
3	5.440	-1.592	5.314	-1.945
4	5.256	-1.540	5.134	-1.882
5	5.777	-1.440	5.643	-1.760

This table presents estimates of global market risk and FX risk premia. The ICAPM-consistent factor risk premia RP_M and RP_{Xw} are based on Eqs. (2) and (3) assuming $\theta = 2.5$, which is reasonably close to values reported by prior literature (e.g. Dolde et al., 2012). Estimates in columns labeled "Bootstrap mean" rely on average bootstrap simulation estimates of RP_M and RP_{Xw}. The ICAPM-consistent factor risk estimates are available in online appendix Table OA.3. Bootstrap simulations of θ are provided in online appendix Table OA.5. Additional results based on historical estimates of RP_M and RP_{Xw} are provided in Table 9.

Empirical Approach

- We then run the fixed effects (FE) regression (Krapl, 2019):

$$\left|\gamma_w^{pre} RP_{Xw}\right|_{i,t} = \alpha + \beta_1 Div_t + \beta_2 \beta_{m,i,t}^{pre} + \sum_{k=3}^{K} \beta_k X_{k,t} + \sum_{j=1}^{J} \delta_j TFE_{j,t} + \varepsilon_{i,t}$$

- where $\left|\gamma_w^{pre} RP_{Xw}\right|_{i,t}$

  - is the absolute value of: 5-year rolling period ICAPM-based FX exposures of firm i multiplied by 5-year rolling period estimates of the wealth-weighted currency risk premia.

  - $Div_{i,t}$ is one of the FX risk diversifiability measures (using 5-year rolling periods): COR, $PC1$ or $PC3$.

  - $\beta_{m,i,t}^{pre}$ is the ICAPM-based global market exposure (5-year rolling period).

  - Further, $X_{k,t}$ is a vector of firm-specific control variables and $TFE_{j,t}$ represents a set of dummy variables capturing time fixed effects.

  - We use two-way clustered standard errors on firm and year (Petersen, 2009).

Diversifiability (Cont.)

- H2b is supported too
- Interestingly, firm's market exposure and firm's momentum positively related to the absolute currency risk

Table 7
Diversifiability of FX risk

	United States of America (US)		
COR	0.0585***		
	(38.97)		
PC1		0.0873***	
		(50.37)	
PC3			0.1232***
			(59.10)
$\hat{\beta}_m^{pre}$	0.0002***	0.0002***	0.0002***
	(5.24)	(5.36)	(5.83)
Fsale	0.0000	0.0000	0.0000
	(0.38)	(-0.83)	(-1.49)
Fasset	0.0000***	0.0000***	0.0000***
	(4.14)	(4.57)	(4.56)
Size	-0.0006***	-0.0006***	-0.0006***
	(-12.27)	(-12.65)	(-12.29)
BM	-0.0006	-0.0010***	-0.0013***
	(-1.29)	(-2.35)	(-3.03)
Mom	0.0002***	0.0002***	0.0002***
	(5.93)	(6.94)	(6.73)
Adj. R^2	0.941	0.951	0.955
Obs.	169,236	169,236	169,236

This table presents regression results of the following fixed effects (FE) model:

$$\left|\gamma_w^{pre} RP_{Xw}\right|_{i,t} = \alpha + \beta_1 Div_t + \beta_2 \beta_{m,i,t}^{pre} + \sum_{k=3}^{K} \beta_k X_{k,t} + \sum_{j=1}^{J} \delta_j TFE_{j,t} + \varepsilon_{i,t}$$

where $\left|\gamma_w^{pre} RP_{Xw}\right|_{i,t}$ is the absolute value of: 5-year rolling period ICAPM-based FX exposures of firm i multiplied by 5-year rolling period estimates of the wealth-weighted currency risk premia. $Div_{i,t}$ is one of the following FX risk diversifiability measures (using 5-year rolling periods): COR is the median of correlation coefficients of all sample bilateral FX rates, $PC1$ is the first principal component of the correlation matrix of the currency index, and $PC3$ is the explanatory power of the first three principal components of the correlation matrix of the currency index. $\beta_{m,i,t}^{pre}$ is the ICAPM-based global market exposure (5-year rolling period). Further, $X_{k,t}$ is a vector of firm-specific control variables and $TFE_{j,t}$ represents a set of dummy variables capturing time fixed effects. T statistics reported in parentheses are based on two-way clustered standard errors on firm and year (Petersen, 2009). Corresponding statistical significance is indicated as follows: *** p < 0.01, ** p < 0.05, * p < 0.1.

Summary

Our results suggest that

- FX risk is not fully diversifiable

- We find negative statistically and economically significant FX risk premia

  - For US, the FX-risk premia between -1.737 and -1.440

- Diversifiability of FX risk is positively related to the magnitude of FX risk premium

VIELEN DANK