

The Dollar Variance Risk Premium: A Tale of Two Investors

Young Ho Eom¹ Woon Wook Jang² Keon Hee Oh¹
 Sungjune Pyun¹

¹ Yonsei School of Business

²Yonsei University

FMA North America
October 2025

The risk premium on dollar uncertainty

How does the risk premium on dollar uncertainty affect the risk premium on dollar investments?

- ▷ A standard view
 - Since USD is a safe haven, dollar appreciation is unfavorable.
 - **US investors** may require a higher risk premium for foreign investments.
- ▷ An alternative: The **non-US investor** also may require a risk premium for investing in USD assets
 - Despite investing in a safe currency, international investments are riskier than local investments
 - Londono and Zhou (2017) find that the dollar variance risk premium predicts dollar appreciation

A tale of two investors

We show that signed variance matters: investors care about currency appreciation risk

- ▷ Foreign investors
 - Local currency appreciation risk is important (Up states)
 - Upside DVP (DVP^U) matters
 - Should predict future dollar appreciation
- ▷ US investors
 - Dollar appreciation risk (Down states)
 - Downside DVP (DVP^D) matters
 - Should predict foreign currency appreciation
- ▷ Skewness Risk Premium (SRP): Their difference should be a strong predictor of dollar returns.

Local currency appreciation risk

Why should investors dislike local currency appreciation?

- ▷ *Balance Sheet*: The US holds a net negative position in dollar-denominated asset (Gourinchas and Rey 2007, Caballero, Frahi, and Gourinchas 2008, Jiang, Krishnamurthy, and Lustig 2021)

→ US prefers dollar depreciation and other countries prefers dollar appreciation (=local currency depreciation)

- ▷ *Net Export*: Local currency depreciation stimulates economic growth if firms are net exporters (Rodrik 2008)
- ▷ *Investors*: Local currency appreciation leads to lower returns on foreign investment(e.g., Jansen, Shin, and von Peter 2024)

⇒ Investors dislike local currency appreciation

A preview of the main findings

- ▷ The dollar variance risk premium (DVP) predicts USD appreciation (Londono and Zhou 2017).
 - Foreign investors take dollar investments as “risky” even though a dollar position can hedge global risk.
- ▷ A tale of two investors
 - We find that a high risk premium on appreciative-component of the variance leads to currency depreciation (for both USD and non-US currencies)
- ▷ The sign is switched for safe (Japan and Switzerland) currencies: the upside of safe and the downside variance risk premium of other currencies contain information on global/US risk.

Model setup

- ▷ When the market is complete, currency returns is represented by:

$$\Delta q_{t+1}^i = m_{t+1}^i - m_{t+1}$$

- Higher q^i means appreciation for currency i
- m_{t+1}^i is the domestic SDF, m_{t+1} is the US SDF

- ▷ $m_{t+1}^i - E_t[m_{t+1}^i] = \delta^i \sqrt{\frac{z_t^i}{2}} (v_{t+1}^i - 1) + \lambda^i \sqrt{\frac{z_t}{2}} (v_{t+1} - 1),$
- v_{t+1}^i and v_{t+1} are i.i.d with Chi-square 1 (shocks to z)
 - US SDF is denoted without superscript i
 - We assume $\delta^i > \delta$ and $\lambda^i < \lambda$

Model setup

$$\Delta q_{t+1}^i - E_t[\Delta q_{t+1}^i] = \underbrace{(\delta^i - \delta)}_{\text{Positive}} \sqrt{\frac{z_t^i}{2}} (v_{t+1}^i - 1) + \underbrace{(\lambda^i - \lambda)}_{\text{Negative}} \sqrt{\frac{z_t}{2}} (v_{t+1} - 1),$$

- ▷ A higher q^i denotes higher currency value for i relative to USD
- ▷ Because shocks to v^i and v_t are positively skewed:
 - A positive **US** SDF/variance shock will **increase USD** and is likely to be more important for US investors
 - A positive **foreign** SDF/variance shock will **lower USD** and is important for non-US investors
- ▷ The up/down variance risk premium will capture the risk premium attached to each of the two components.

Data sources

- ▷ Data on currency options from Bloomberg
- ▷ Intraday data from histdata.com
- ▷ Daily currency returns from Bloomberg
- ▷ nine major developed-market currencies against the US dollar:
 - AUD, CAD, CHF, EUR, GBP, JPY, and NZD (Jan 2008 – Dec 2022)
 - NOK and SEK (Oct 2008 – Dec 2022)

Estimation

- ▷ The currency variance risk premium ($CVRP_i$) of the currency pair between country i and USD

$$CVRP_{i,t} = E_t^Q[QV_{i,t}] - E^P[QV_{i,t}], \quad (1)$$

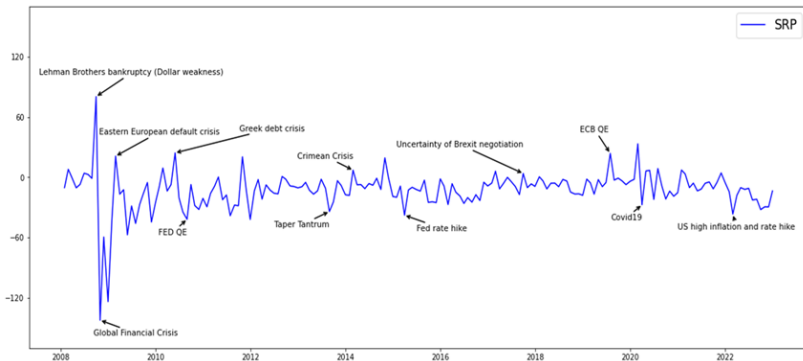
- Q component from option prices, P component using HAR-RV

- ▷ The dollar variance risk premium (DVP) is the cross-currency average of CVRP
- ▷ We also measure DVP^U (related to foreign currency appreciation) and DVP^D (related to dollar appreciation) from the semi-variance and define the skewness risk premium as

$$SRP = DVP^U - DVP^D$$

- ▷ The equity variance risk premium (EVRP) is the variance premium of the S&P 500 Index

$$\text{SRP} = \text{DVPU (USD depreciation)} - \text{DVPD (USD appreciation)}$$



Empirical Results (DVP)

$$\Delta q_{i,t+1} = b_0 + b_F DVP_t + b_E EVRP_t + b_I (y_{US,t} - y_{i,t}) + FE_i + e_{i,t+1} \quad (\text{Londono \& Zhou, 2017})$$

A. Using the dollar variance risk premium

	Dependent variable: currency returns							
	1-month		3-month		6-month		12-month	
DVP	0.947 (0.300)	-3.129 (0.917)	-4.771*** (2.990)	-6.253*** (3.516)	-2.133 (1.487)	-3.405** (2.555)	-1.494 (1.336)	-2.395** (2.277)
EVPR		1.005*** (4.913)		0.365*** (5.634)		0.312*** (2.929)		0.219*** (2.954)
$y_{US} - y_i$	1.847** (2.173)	2.302*** (2.782)	1.600* (1.933)	1.765** (2.153)	1.437* (1.733)	1.577* (1.891)	0.764 (1.362)	0.857 (1.538)
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj R ²	-0.001	0.015	0.013	0.020	0.017	0.027	0.022	0.033

- Our interpretation: Controlling for the global/US variance premium, the DVP represents the risk premium of investing in dollar for the **non-US investor**.

Empirical Results (DVP^U, DVP^D)

$$\Delta q_{i,t+1} = b_0 + b_U DVP_t^U + b_D DVP_t^D + b_I (y_{US,t} - y_{i,t}) + FE_i + e_{i,t+1}$$

B. Using the dollar semi-variance risk premium

	Dependent variable: currency returns							
	1-month		3-month		6-month		12-month	
DVP^U	-34.566*** (3.108)	-31.455*** (2.811)	-42.100*** (4.921)	-41.303*** (4.871)	-45.385*** (6.917)	-44.821*** (6.892)	-30.262*** (7.147)	-29.864*** (7.118)
DVP^D	15.001** (2.446)	8.673 (1.349)	8.230*** (2.779)	6.609** (2.217)	13.938*** (4.452)	12.785*** (4.291)	9.475*** (5.002)	8.657*** (5.024)
$EVRP$		0.889*** (4.228)		0.228*** (4.196)		0.161* (1.656)		0.113* (1.656)
$y_{US} - y_i$	2.150*** (2.734)	2.484*** (3.150)	1.854** (2.354)	1.940** (2.466)	1.764** (2.258)	1.823** (2.313)	0.975* (1.855)	1.014* (1.931)
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj R^2	0.006	0.019	0.034	0.036	0.081	0.083	0.089	0.092

▷ If we decompose DVP into up (dollar depreciation) and downside components,

- A high DVP^U should lead to future dollar appreciation.
- A high DVP^D should lead to future dollar depreciation.

Empirical Results (SRP)

$$\Delta q_{i,t+1} = b_0 + b_S SRP_t + b_D DVP_t + b_I (y_{US,t} - y_{i,t}) + FE_i + e_{i,t+1}$$

C. Using the dollar skewness risk premium

	Dependent variable: currency returns							
	1-month		3-month		6-month		12-month	
SRP	-20.758*** (3.098)	-16.699** (2.453)	-19.292*** (4.620)	-18.046*** (4.400)	-23.807*** (6.081)	-22.884*** (5.956)	-16.315*** (7.128)	-15.658*** (7.064)
DVP	-5.783* (1.782)	-8.244** (2.427)	-11.026*** (4.866)	-11.781*** (5.049)	-9.867*** (6.688)	-10.426*** (7.076)	-6.817*** (6.449)	-7.215*** (6.875)
EVRP		0.931*** (4.396)		0.286*** (5.038)		0.211** (2.190)		0.149** (2.224)
$y_{US} - y_i$	2.184*** (2.794)	2.539*** (3.266)	1.913** (2.424)	2.022** (2.567)	1.820** (2.318)	1.899** (2.399)	1.016* (1.921)	1.069** (2.027)
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj R ²	0.005	0.019	0.033	0.037	0.077	0.081	0.088	0.093

Shows that we can replace the DVP^U and DVP^D by the difference (SRP)

Empirical Results (Dollar Index)

- ▷ We show that identical pattern appears for dollar index:

$$-\Delta DXY_{t+1} = b_0 + b_S SRP_t + b_D DVP_t + b_E EVRP_t + b_I (y_{US,t} - y_{i,t}) + e_{t+1}$$

Also, with time-series regressions, we can avoid the possibility of cross-currency correlation driving the result.

- ▷ We also show that individual currency indices can be used (panel regression)

$$\Delta CX_{i,t+1} = b_0 + b_S CSRP_{i,t} + b_V CVRP_{i,t} + b_E EVRP_t + b_I (y_{US,t} - y_{i,t}) + e_{i,t+1}$$

CVRP and CSRP are measures against the USD, defined at the currency level.

Empirical Results (Safe: JPY, CHF)

We observe the opposite pattern if only safe currencies are used:

$$\Delta q_{i,t+1} = b_0 + b_U DVP_{t, Safe}^U + b_D DVP_{t, Safe}^D + b_E EVRP_t + b_I (y_{US,t} - y_{i,t}) + e_{i,t+1},$$

D. Using the semi-variance risk premium of safe currencies

	Dependent variable: currency returns							
	1-month		3-month		6-month		12-month	
DVP_{Safe}^U	-0.699	-6.265	8.394**	7.322*	15.173***	14.402***	15.015***	14.631***
	(0.105)	(0.984)	(2.032)	(1.754)	(5.103)	(4.813)	(6.130)	(5.855)
DVP_{Safe}^D	7.219	8.906	2.863	3.188	4.630	4.865	-0.901	-0.783
	(0.716)	(0.912)	(0.410)	(0.463)	(0.894)	(0.943)	(0.246)	(0.213)
$EVPR$		0.969***		0.187***		0.133		0.065
		(4.962)		(3.159)		(1.293)		(0.888)
$y_{US} - y_i$	1.958**	2.266***	2.212**	2.272**	2.307**	2.349**	1.373**	1.393**
	(2.508)	(2.966)	(2.505)	(2.581)	(2.470)	(2.493)	(2.297)	(2.319)
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj R ²	-0.002	0.014	0.014	0.015	0.061	0.062	0.101	0.102

- ▷ A high premium on safe currency appreciation risk leads to weak dollar returns.

Drivers of SRP (Downside spike: US or global shock)

$$SRP_t = \alpha + \beta_g \text{Global UNC}_t + \beta_1 SRP_{t-1} + \beta_u DVP_{t-1}^U + \beta_d DVP_{t-1}^D + \epsilon_t$$

Panel A. Explaining the SRP

Dependent variable: SRP						
Uncertainty	-45.194*** (3.58)	-32.611*** (3.90)				
CDS _{us}			-0.006** (2.47)	-0.005*** (2.87)		
GFC					0.003** (2.06)	0.003*** (2.63)
Lag SRP	0.075 (0.88)		0.219 (1.13)		0.197*** (3.44)	
Lag DVP ^U		0.534* (1.76)		0.854** (2.28)		0.915*** (2.75)
Lag DVP ^D		-0.069 (0.97)		-0.049 (0.76)		-0.136** (2.31)
Adj R ²	0.190	0.221	0.131	0.192	0.079	0.196

- ▷ SRP negatively related to global uncertainty from Bekaert, Engstrom, and Xu (2022) and US sovereign CDS spread
- ▷ Positively related to the global financial cycle factor (Miranda-Agrippino and Rey 2020).

Drivers of SRP (Downside spike: US or global shock)

$$DVP_t^{U/D} = \alpha + \beta_g \text{Global UNC}_t + \beta_U DVP_t^U + \beta_D DVP_t^D + \beta_u DVP_{t-1}^U + \beta_d DVP_{t-1}^D + \epsilon_t$$

Panel B. Semi-variance risk premium

	Dependent variable: DVP^D			Dependent variable: DVP^U		
Uncertainty	45.548*** (3.45)			-30.932*** (7.21)		
CDS _{us}		0.006*** (3.01)			-0.003* (1.91)	
GFC			-0.003** (2.14)			0.001** (2.09)
DVP^U	-0.474 (1.56)	-0.830** (2.02)	-0.832** (2.15)			
DVP^D				0.088 (0.83)	0.401*** (6.74)	0.171*** (6.66)
Lag DVP^U				0.169*** (8.60)	0.175*** (5.82)	0.423*** (8.70)
Lag DVP^D	1.371*** (4.56)	1.039*** (4.98)	1.001*** (4.43)			
Adj R ²	0.258	0.242	0.255	0.181	0.527	0.299

- ▷ Upside DVP negatively related to global uncertainty and US sovereign CDS spread and positively related to the global financial cycle factor.
- ▷ Opposite sign for downside DVP.

Drivers of SRP (Upside spike: Non-US shock)

Does more country-specific risk lead to higher CSRP (cross-currency)

$$CSRP_{c,t} = \alpha_1 + \beta_c \Delta CDS_{c,t} + \beta_1 CSRP_{t-1} + \beta_2 CVRP_{t-1} + \epsilon_t$$

Panel A. Currency-level skewness risk premium

Dependent variable: CSRP								
ΔCDS	0.082** (2.21)	0.070** (2.16)	0.074** (2.37)	0.070** (2.19)				
CDS					0.071** (2.04)	0.067* (1.96)	0.071** (2.14)	0.067* (1.97)
Lag CDS					-0.079** (1.99)	-0.074** (1.98)	-0.077** (2.22)	-0.074** (2.03)
Lag CSRP	0.425*** (5.06)	0.202*** (3.55)	0.309*** (5.01)	0.210*** (3.01)	0.275*** (5.49)	0.202*** (3.55)	0.309*** (5.00)	0.210*** (3.00)
Lag CVRP			0.084* (1.72)	0.013 (0.25)				0.013 (0.25)
Country FE	N	Y	N	Y	N	Y	N	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj R ²	0.076	0.130	0.087	0.130	0.076	0.130	0.078	0.130

Drivers of SRP (Upside spike: Non-US shock)

$$CVRP_{c,t}^{U/D} = \alpha_2 + \beta_c \Delta CDS_{c,t} + \beta_v CVRP_{c,t} + \beta_u CVRP_{t-1}^U + \beta_d CVRP_{t-1}^D + \epsilon_t$$

Panel B. Semi-variance risk premium

	Dependent variable: $CVRP^U$				Dependent variable: $CVRP^D$			
ΔCDS	0.033** (2.12)	0.030* (1.77)			-0.033** (2.12)	-0.030* (1.77)		
CDS			0.031* (1.93)	0.025 (1.39)			-0.031* (1.93)	-0.025 (1.39)
Lag CDS			-0.034** (1.98)	-0.033* (1.67)			0.034** (1.98)	0.034* (1.67)
CVRP	0.350*** (10.34)	0.325*** (9.48)	0.351*** (10.33)	0.325*** (9.47)	0.650*** (19.19)	0.675*** (19.71)	0.650*** (19.41)	0.675*** (19.70)
Lag $CVRP^U$	0.280*** (5.46)	0.157*** (3.11)	0.279*** (5.66)	0.157*** (3.11)	-0.280*** (5.46)	-0.157*** (3.11)	-0.279*** (5.66)	-0.157*** (3.11)
Lag $CVRP^D$	-0.082** (2.58)	-0.063* (1.88)	-0.082** (2.58)	-0.063* (1.87)	0.082** (2.58)	0.063* (1.88)	0.082** (2.58)	0.063* (1.87)
Country FE	N	Y	N	Y	N	Y	N	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj R^2	0.608	0.648	0.608	0.648	0.785	0.807	0.785	0.807

Conclusion

- ▷ We provide an alternative explanation why a high DVP could lead to a dollar appreciation.
- ▷ The DVP contains information on the currency risk premium required by both US and non-US investors
- ▷ Decomposing the DVP into upside and downside components, the downside DVP contains information on the risk premium of the US investor, and the upside contains non-US investor's risk premium
- ▷ For safe currencies, the upside and downside variance risk premiums are switched.