The U.S. Dollar Safety Premium

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International Monetary System characterized by the existence of a *Reference Country* and a *Reference Currency*:

- Pre WW I: UK, British Pound Sterling, Gold
- Post WW II: US, US Dollar

Key Characteristic: Safe Haven during periods of crisis. Global Flight to Quality toward the Reference Currency

First emphasized by Bagehot (1873) for Sterling. 2008 Lehman Crisis was a painful reminder of the mechanism

Convert conventional wisdom into finance terminology:

- The USD is a global safe asset since it pays high in bad states of the world $\Rightarrow$ Unconditional Safety Premium> 0
- There is a GFtQ to the USD during bad times $\Rightarrow$ Conditional Safety Premium increases during bad times

Def. The USD Safety Premium is the excess return of investing in foreign currency while shorting the USD

Previous literature focused on the first point: contentious

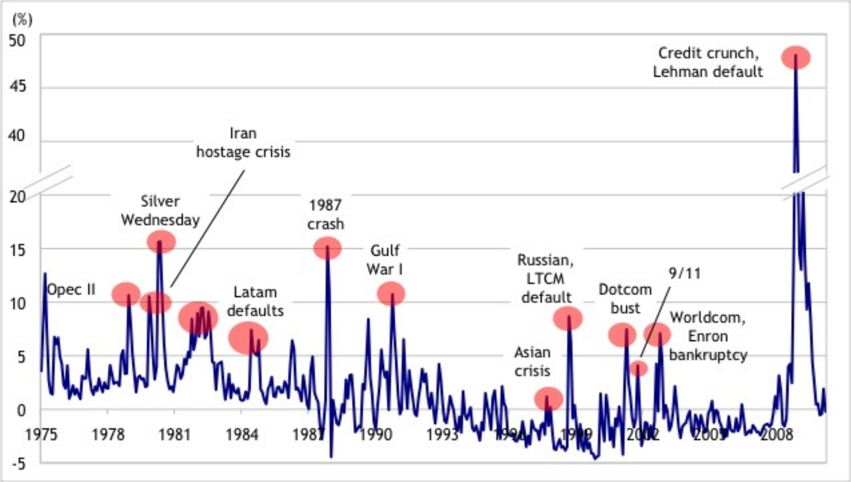
- *Large Safety Premium:* Gourinchas, Rey (2007,2010); Forbes (2010); Habib (2010)
- *No Safety Premium:* Curcu, Dvorak, Warnock (2008, 2009); Lane, Milesi-Ferretti (2009)

UIP and carry trade literature: Lustig, Rousannov, Verdhelan (2010,11)

My Contribution

- New Dataset: high quality estimates of global currencies returns
- Measure the Unconditional and *Conditional* USD Safety Premium
  - 1% on average for the modern floating period (1973-2010)
  - Near 10% during crises, and as large as 50% during the Oct 2008 collapse
- Confirm the role of the USD as a Safe Haven during crises
- Interpret these findings in terms of risk: no free lunch for the US

Results Preview: Dollar Safety Premium



Simple law of one price asset pricing:

$$1 = E_t[\Lambda_{t+1} R_{t+1}] \qquad 1 = E_t[\Lambda^*_{t+1} R^*_{t+1}]$$

* are Foreign variables

Proposition 1 There exist two stochastic discount factors, one for each country, such that:

$$\Lambda_{t+1} = \Lambda^*_{t+1} \frac{\mathcal{E}_t}{\mathcal{E}_{t+1}} \qquad \mathcal{E}_t \downarrow: \text{ USD appreciates}$$

The stochastic discount factors:

$$M_{t+1} \equiv proj(\Lambda_{t+1} | A) \qquad M^*_{t+1} \equiv proj(\Lambda^*_{t+1} | A^*)$$

where $A = A^* \mathcal{E}_{t+1}$ is the space of internationally traded assets, always satisfy the above relationship

Return Decomposition

Proposition 2 Assume that asset returns, SDFs and the exchange rate are jointly log-normally distributed. Then the expected excess return in Home currency of the Foreign asset over the Home asset is:

$$E_t[r^*_{t+1} + \Delta e_{t+1} - r_{t+1}] + \frac{1}{2} Var_t(r^*_{t+1} + \Delta e_{t+1}) - \frac{1}{2} Var_t(r_{t+1}) =$$
$$\underbrace{-Cov_t(m^*_{t+1}, r^*_{t+1}) + Cov_t(m_{t+1}, r_{t+1})}_{domestic\ \ risk} \underbrace{+Cov_t(r^*_{t+1}, \Delta e_{t+1}) - Cov_t(m_{t+1}, \Delta e_{t+1})}_{exchange\ \ rate\ \ risk}$$

- $-Cov_t(m^*_{t+1}, r^*_{t+1})$: Foreign asset risk premium in Foreign currency
- $-Cov_t(m_{t+1}, r_{t+1})$: Home asset risk premium in Home currency
- $Cov_t(r^*_{t+1}, \Delta e_{t+1})$: Foreign asset is riskier for Home investors if it pays high when the Home currency depreciates
- $-Cov_t(m_{t+1}, \Delta e_{t+1})$: currency risk premium

Safe currency

If assets are the risk free rate for each country, then the currency risk premium:

$$E_t[r^*_{f,t+1} + \Delta e_{t+1} - r_{f,t+1}] + \frac{1}{2} Var_t(\Delta e_{t+1}) = -Cov_t(m_{t+1}, \Delta e_{t+1})$$

A currency is safe if the covariance is positive: i.e. the currency appreciates in bad times

- Interesting to analyze: $Cov_t(risky\ return_{t+1}, \Delta e_{t+1})$
  - $risky\ return_{t+1} = r^*_{t+1}$: measures 3rd term
  - $risky\ return_{t+1} = r^w_{t+1}$: then under CAPM $m_{t+1} \equiv a_t - b_t r^w_{t+1}$ it is a direct measure of the currency risk premium

$$-Cov_t(m_{t+1}, \Delta e_{t+1}) = b_t Cov_t(r^w_{t+1}, \Delta e_{t+1})$$

The challenge: what matters is the *conditional* covariance. Not observable

Identification Strategy: Intuition

Methodology originally developed by Campbell (1987) and Harvey (1989). I follow Duffee (2005). Intuition:

- I want to measure: $b_t \; Cov_t(r_{t+1}, \Delta e_{t+1})$
- By definition: $r_{t+1} = E_t[r_{t+1}] + \eta^r_{t+1}$ $\qquad \Delta e_{t+1} = E_t[\Delta e_{t+1}] + \eta^e_{t+1}$
- So we have: $Cov_t(r_{t+1}, \Delta e_{t+1}) = E_t[\eta^r_{t+1}\eta^e_{t+1}]$

This leads to a three stage econometric procedure

Identification Strategy: Econometric Technique

- **Zero Order** regressions: Predictive regressions

$$r_{t+1} = \alpha_r Y_t^r + \epsilon_{t+1}^r$$
$$\Delta e_{t+1} = \alpha_e Y_t^e + \epsilon_{t+1}^e$$

$\widetilde{Cov}(r_{t+1}, \Delta e_{t+1}) \equiv \hat{\epsilon}_{t+1}^r \hat{\epsilon}_{t+1}^e$ is the estimated ex-post covariance

- **First Order** regression: Time varying covariance

$$\widetilde{Cov}(r_{t+1}, \Delta e_{t+1}) = \alpha_z Z_t + \xi_{t+1}$$

- **Second Order** regressions: relation between covariance and returns: Constant price of risk:

$$r_{f,t+1}^* + \Delta e_{t+1} - r_{f,t+1} + \frac{1}{2}\widetilde{Var}(\Delta e_{t+1}) = d_0 + d_1 \widetilde{Cov}(r_{t+1}, \Delta e_{t+1}) + \omega_{t+1}$$

Time varying price of risk:

$$r_{f,t+1}^* + \Delta e_{t+1} - r_{f,t+1} + \frac{1}{2}\widetilde{Var}(\Delta e_{t+1}) = d_0 + [d_1 + d_2\ b_t]\widetilde{Cov}(r_{t+1}, \Delta e_{t+1}) + \omega_{t+1}$$

Instruments: Empirical

$$
\begin{aligned}
Y_t^r &= [1, dp_t, r_t] \\
Y_t^e &= [1, r^*_{f,t+1} - r_{f,t+1}, \Delta e_t] \\
Z_t &= [1, dp_t, r^*_{f,t+1} - r_{f,t+1}, r_t, \Delta e_t, vol_t'^{r}, vol_t'^{e}, cov'_{t-1}]
\end{aligned}
$$

Definitions:

- $vol_t'^{x} \equiv \sum_{i=0}^{1} (x_{t-i} - \bar{x})^2$ for $x = \{r, e\}$
- $cov'_t \equiv \sum_{i=0}^{2} (r_{t-i} - \bar{r})(\Delta e_{t-i} - \bar{\Delta e})$

Robustness checks:

- cay: Lettau and Ludvingson (2001)
- nxa: Gourinchas and Rey (2001)
- volatility index: Bloom (2009)
- carry trade risk factors: Lustig, Roussanov, Verdhelan (2009)

World and Developed Markets Indices

- Stock Market indices and capitalization weights from MSCI-Barra
- USD Currency indices: my own estimates based on forward, Libor, and government rates
- I build two market cap. weighted indices: Dec 1969 - March 2010
  - World: 45 Developed (D) and Emerging (EM) countries.
  - Developing: 23 Developed countries.

Currency Return Dataset: more extensive in both coverage and time span, and higher quality than datasets currently used in the literature

Average USD Safety Premium:1970-2010

$$\$SP = r^*_{f,t+1} + \Delta e_{t+1} - r_{f,t+1} + \frac{1}{2}\widetilde{Var}(\Delta e_{t+1})$$

	World	*Developed*	*Equally Wght*
Mean	0.98%	0.99%	1.18%
Stand. Dev	8.06%	8.26%	7.16%
Subcomponents			
$\overline{\Delta e}$	0.72%	1.12%	-2.20%
$\overline{r^*_f - r_f}$	-0.05%	-0.45%	3.13%

- Safety Premium is positive, but not statistically significant
- This is a symptom of low Sharpe Ratios and short samples. Even if true, it would take at least 64 years of data to have statistical significance!
- Simple, pervasive, but surprisingly under-appreciated problem in the literature

Figure : USD Safety Premium: Roll start date - 2010

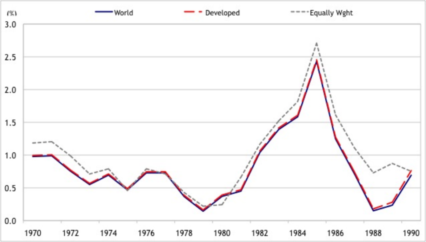
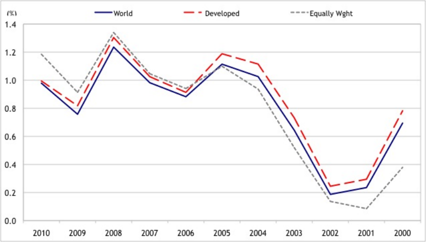


Figure : USD Safety Premium: 1970 - Roll end date



Zero Order Regressions: Predictive Regressions

$$r_{t+1} = \alpha_r Y_t^r + \epsilon_{t+1}^r \qquad \Delta e_{t+1} = \alpha_e Y_t^e + \epsilon_{t+1}^e$$

	World	*Developed*
Equity Returns	r_{t+1}	r_{t+1}
const.	0.0463	0.0448
	[2.41]	[2.34]
dp_t	0.0106	0.0102
	[2.03]	[1.95]
r_t	0.1259	0.1227
	[1.68]	[1.67]
R^2	0.0238	0.0228
Exchange Rate Changes	Δe_{t+1}	Δe_{t+1}
const.	0.0004	0.0013
	[0.29]	[1.01]
$r^*_{f,t+1} - r_{f,t+1}$	0.1072	0.1330
	[1.96]	[2.22]
Δe_t	0.0526	0.0415
	[0.99]	[0.81]
R^2	0.0133	0.0169

First Order Regressions: Covariance Predictability

$$\widetilde{Cov}(r_{t+1}, \Delta e_{t+1}) = \alpha_z Z_t + \xi_{t+1}$$

Panel A: Exploring covariance predictability

	World		*Developed*	
Instruments	$F-Stat$	$\chi^2\ p-val$	$F-Stat$	$\chi^2\ p-val$
All	14.12	(0.0000)	13.49	(0.0000)
ex int. diff	15.76	(0.0000)	15.38	(0.0000)
ex dp ratio	14.03	(0.0000)	13.18	(0.0000)
ex covariance	17.10	(0.0000)	15.65	(0.0000)
ex volatilities	5.12	(0.0004)	4.11	(0.0025)
ex return & exch. rate chg.	19.70	(0.0000)	19.15	(0.0000)

Panel B: Details

	World		*Developed*	
	Coeff. $\times 10^4$	$\chi^2 p-value$	Coeff. $\times 10^4$	$\chi^2 p-value$
int. diff.	-0.600332	(0.2725)	-0.435235	(0.5021)
	-[1.10]		-[0.67]	

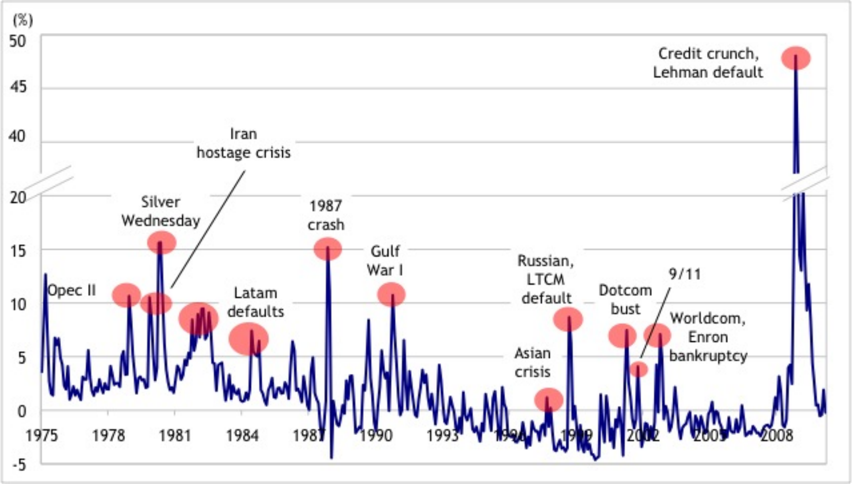
Second Order Regressions: USD Safety Premium

$$r^*_{f,t+1} + \Delta e_{t+1} - r_{f,t+1} + \frac{1}{2}\widetilde{Var}(\Delta e_{t+1}) = d_0 + d_1 \widetilde{Cov}(r_{t+1}, \Delta e_{t+1}) + \omega_{t+1}$$

	World		*Developed*	
	d_0	d_1	d_0	d_1
All	0.0001	10.2047	0.0006	9.4118
	[0.03]	[2.54]	[0.34]	[2.28]
ex int. diff.	-0.0028	12.0672	-0.0031	12.4887
	-[1.45]	[3.19]	-[1.51]	[3.17]
ex dp ratio	-0.0042	16.3391	-0.0041	15.4557
	-[1.59]	[2.55]	-[1.55]	[2.46]
ex covariance	-0.0031	13.1771	-0.0035	13.7937
	-[1.56]	[3.16]	-[1.64]	[3.14]
ex volatilities	-0.0005	3.6559	-0.0006	3.8685
	-[0.22]	[0.82]	-[0.27]	[0.79]
ex return & exch. rate chg.	-0.0009	4.6295	-0.0012	5.6272
	-[0.44]	[1.07]	-[0.54]	[1.21]

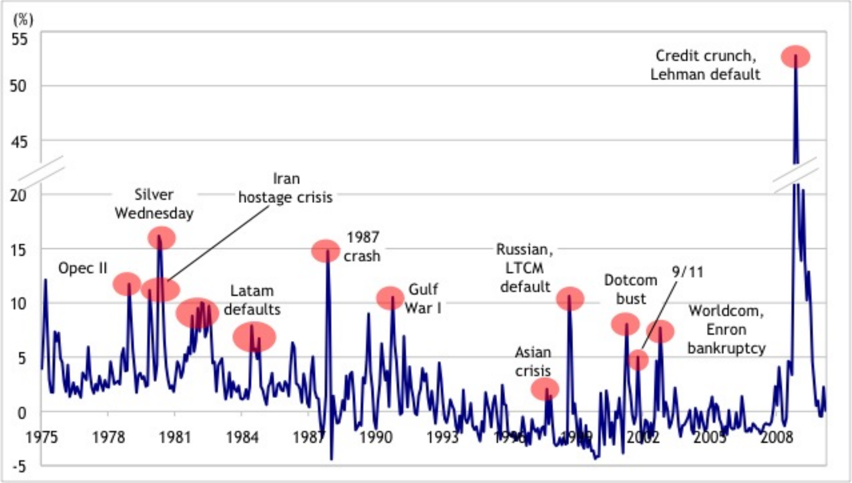
Dollar Safety Premium Developed Index

$$\hat{d}_0 + \hat{d}_1 \widetilde{Cov}(\widehat{r_{t+1}, \Delta e_{t+1}})$$



Dollar Safety Premium World Index

$$\hat{d}_0 + \hat{d}_1 \widetilde{Cov}(\widehat{r_{t+1}, \Delta e_{t+1}})$$



Conclusion

Main points:

- There is a positive USD safety premium
- There is substantial time variation in the safety premium
- The dollar acts as a Safe Haven during crisis

Evidence supports the role of the USD as a global reserve currency.