Stock Market Uncertainty and Uncovered Equity Parity Deviation: Evidence from Asia

JiYong Jung [1] Kuk Mo Jung [2]

[1] School of Economics, Sogang University

[2] School of Economics, Sogang University

ASSA 2021 Annual Meeting

Motivation

Uncovered Interest Parity

- so-called, (interest rate differential-based) portfolio balance approach (PBA).
- Failed to explain *what actually drives FX movements*.

Any Solution? $\Longrightarrow$ 'Uncovered Equity Parity (UEP)'

- Potential of providing a solution for PBA-based FX research anomaly.

  $\Rightarrow$ "maybe not fundamentally flawed, just merely misspecified!"
- Focus more on the behavior of international investors' equity portfolio rebalancing.

Motivation

UEP Condition

- Negative relationship

  : When a stock market outperforms, curreny tends to depreciate.

- Portfolio rebalancing mechanism.

But, is it true for every country? ... *Nope* !

- Empirical studies were only for major advanced country currencies.
- Asian currencies and equity markets become important investment targets recently.
- We find a **positive correlation** for Asian countries.

Implication

Portfolio Rebalancing Mechanism (PR)

- Main driving force of the UEP condition, Hau and Rey (2006).
- Foreign equity markets outperform domestic ones.

  $\Downarrow$ ($\because$ assuming that FX market is incomplete)

  Domestic investors are exposed to higher relative FX risk.

  $\Downarrow$

  Repatriate some of the foreign equities.

  $\Downarrow$

  Foreign currency depreciate resulting from the associated selling.

Contradict the Portfolio Rebalancing Mechanism

- Asian currency and FX market are relatively more volatile and incomplete.

  $\Rightarrow$ PR channel should be stronger, **but exact opposite!**
- Portfolio rebalancing-based explanation might not be the sole explanation.

Conjecture

Monetary Policy or Inflation Process ?

- Maybe the Asian currencies are prone to more bouts of high inflation and higher inflation volatility.

  $\Rightarrow$ However, both *nominal* and *real* variables show the UEP deviation.

(Idiosyncratic) Stock Market Uncertainty? (Jung (2017))

- Stock mkt. *Volatility* $\uparrow$ $\rightleftarrows$ Aggregate Consumption $\downarrow$ $\Rightarrow$ Home currency *Appreciation*

  $\searrow$ Domestic *Asset Prices* $\uparrow$

  ($\because$ Pastor and Veronesi (2006) effect)

- Test the marginal effect of relative stock market volatility.

  $\Rightarrow$ We find that *stock market volatility* **intensifies** the UEP deviation.

Related Literature

UEP (for advanced country) : Hau and Rey (2006), Kim (2011), Melvin and Prins (2015), Curcuru et al. (2014), Griffin et al. (2004), Geromichalos and Jung (2018), Pavlova and Rigobon (2007), Chabot et al. (2014), Cenedese et al. (2015), Djeutem and Dunbar (2018), and Jung et al. (2020).

Monetary policy or inflation process : Jung (2017), Jung et al. (2020).

Idiosyncratic stock market volatility : Pastor and Veronesi (2006).

UEP in international macroeconomic view : Coeurdacier (2009), Wincoop and Warnock (2010), Pyun (2018).

Validity of the portfolio rebalancing mechanism : Curcuru et al. (2014), Jung et al. (2020).

Data & Variables

Data (summary in Appendix A)

- 18 Asian countries, U.S., and EU.
- Foreign exchange rate & Stock market index (from *Datastream*)

  Frequency : Daily, Monthly, and Quarterly.
  US dollar (or Euro) per Unit of Local currency. (e.g. X USD $= 1$ KRW)
- Consumer price index (from *Datastream*, *FRED*, *IMF*)

Variables

- Stock market returns, $R_t^N = \ln(SI_{t+1}) - \ln(SI_t)$, where SI : stock market index.

$\rightarrow$ In real term, $R_t^R = R_t^N - \{\ln(CPI_{t+1}) - \ln(CPI_t)\}$.

- Change in FX rate, $\Delta q_t^N = \ln(FX_{t+1}) - \ln(FX_t)$.

$\rightarrow$ In real term, $\Delta q_t^R = \Delta q_t^N + \{\ln(CPI_{t+1}) - \ln(CPI_t)\} - \{\ln(CPI_{t+1}^{US}) - \ln(CPI_t^{US})\}$.

Empirical Evidence

Unconditional correlations : $\rho(\Delta q_t, (R_t - R_t^{US}))$

Table: Monthly Correlations

	No. of obs	Nominal	No. of obs	Real
Bangladesh	83	0.049	83	-0.084
China	348	0.210***	323	0.231***
Hong Kong	477	0.356***	470	0.203***
India	477	0.192***	476	0.122***
Indonesia	356	0.646***	287	0.638***
Japan	477	0.430***	477	0.412***
Kazakhstan	233	0.245***	233	0.233***
Laos	96	0.096	96	-0.172*
Malaysia	455	0.382***	455	0.362***
Pakistan	307	0.216***	221	0.223***
Philippines	331	0.449***	331	0.402***
Singapore	244	0.406***	244	0.332***
South Korea	464	0.477***	464	0.477***
Sri Lanka	318	0.310***	118	0.174*
Taiwan	434	0.252***	434	0.148***
Thailand	455	0.343***	455	0.307***
Turkey	275	0.518***	274	0.507***
Viet Nam	233	0.208***	233	-0.001

Empirical Evidence

Table 3
Monthly correlations of exchange rate and foreign stock market excess returns

	$\text{corr}\left[-dE_t, \left(dR_t^{f^*} - dR_t^h\right)/\overline{P}\right]$		
	(a) January 1980–December 2001	(b) January 1990–December 2001	(c) January 1995–December 2001
Australia	0.1796***	0.0102	−0.1415
Austria	−0.1020	−0.1998**	−0.1507
Belgium-Luxembourg	−0.2508***	−0.2569***	−0.1352
Denmark	−0.2179***	−0.2934***	−0.3358***
Finland	−0.1580**	−0.2570***	−0.1794**
France	−0.1230**	−0.3473***	−0.3118***
Germany	−0.1409**	−0.2871***	−0.3679***
Ireland	−0.2710***	−0.2805***	−0.2996***
Italy	−0.1308**	−0.1312	−0.1755**
Japan	0.6590	−0.0276	−0.2810***
Netherlands	−0.3403***	−0.3689***	−0.3059***
Norway	−0.0936	−0.1787**	−0.0264
Portugal	−0.0763	−0.1341*	−0.0669
Spain	−0.1250**	−0.2183***	−0.2090**
Sweden	−0.2287***	−0.2862***	−0.0930
Switzerland	−0.1761***	−0.2318***	−0.1376
U.K.	−0.1187*	−0.2778***	−0.2530***
Mean	−0.1009	−0.2169	−0.2041
SD	0.2248	0.1059	0.1012
Pooled data	−0.1232***	−0.2119***	−0.1901***

Source : Hau and Rey (2006)

Empirical Evidence

Table: Correlations between Exchange rate and Stock market Excess returns

$$\rho(\Delta q_t, (R_t - R_t^{US}))$$

	Daily	Monthly		Quarterly	
	Nominal	Nominal	Real	Nominal	Real
Mean	0.263	0.321	0.251	0.390	0.311
SD	0.156	0.153	0.207	0.173	0.237
Pooled data	0.333***	0.355***	0.338***	0.404***	0.390***

Note : *** denotes significance at 1% level.

Empirical Evidence

Pooled Country Regressions

Table: $\Delta q_t = \alpha_i + \beta[R_t - R_t^{US}] + \varepsilon_t$

	Daily	Monthly		Quarterly	
	Nominal	Nominal	Real	Nominal	Real
FE	0.096***	0.111***	0.110***	0.128***	0.124***
Pooled OLS	0.096***	0.111***	0.110***	0.128***	0.123***

Note : Panel regression is country-specific fixed effect.
*** denotes significance at 1% level.

Empirical Evidence

Robustness Test (Time-Trend Effect & Non-USD)

Table: $\Delta q_t = \alpha_i + \beta[R_t - R_t^{US}] + \sum_\tau \delta_\tau D_\tau + \varepsilon_t$

	Daily	Monthly		Quarterly	
	Nominal	Nominal	Real	Nominal	Real
FE	0.096***	0.109***	0.110***	0.126***	0.125***
Pooled OLS	0.096***	0.109***	0.109***	0.125***	0.124***

Note : D_τ are year-dummy variables excluding the first year.

$$\Delta q_t = \alpha_i + \beta[R_t - R_t^{EU}] + \varepsilon_t$$

	Nominal	Real	Nominal	Real
FE	0.024**	0.017*	0.038**	0.032**
Pooled OLS	0.024**	0.017*	0.038**	0.033**

Note : Panel regression is country-specific fixed effect.

*, **, *** denotes significance at 10%, 5%, 1% level, respectively.

Empirical Evidence

Stock Market Uncertainty Test (Quarterly)

- Various proxy measures for uncertainty, $X_{j,t}$, $j = \{1, ..., 6\}$, based on,
  1. Volatility Close-to-Close (defined by *Refinitiv Datastream*),

$$\sqrt{\frac{\tau}{N-1}\sum_{j=1}^{N}\left(\ln(\frac{U_i}{U_{j-1}}) - \mu\right)^2},$$

where $\mu = 1/N\sum_{j=1}^{N}\ln(U_i/U_{j-1})$, U_i is i^{th} closing price, N is total number of observations, and τ is 4 for quarterly frequency.

This measure captures the *price movement*, so potentially the *market uncertainty*.

  2. Standard Deviation of stock returns, σ_{R_t}.
(rolling standard deviation of R_t between $t-10$ and $t+10$)

Empirical Evidence

Stock Market Uncertainty Test (Nominal Term)

Table: $\Delta q_t^N = \alpha_i + \beta[R_t^N - R_t^{N,US}] + \gamma[R_t^N - R_t^{N,US}]X_{j,t}^N + \varepsilon_t^N$

	Panel with FE		Pooled OLS	
When $X_{j,t}^N$ is:	$\hat{\beta}$	$\hat{\gamma}$	$\hat{\beta}$	$\hat{\gamma}$
vol. ctc	0.082***	0.002***	0.081***	0.002***
U.S vol. ctc	0.255***	-0.005***	0.256***	-0.005***
net vol. ctc	0.106***	0.002***	0.105***	0.002***
$\sigma_{R_t^N}$	0.034**	0.407***	0.033**	0.411***
$\sigma_{R_t^{N,US}}$	0.187***	-0.453***	0.188***	-0.462***
$\sigma_{R_t^N} - \sigma_{R_t^{N,US}}$	0.079***	0.482***	0.079***	0.489***

Note : 'vol. ctc' is volatility close-to-close.

, * denotes significance at 5%, 1% level, respectively.

Empirical Evidence

Stock Market Uncertainty Test (Real Term)

Table: $\Delta q_t^R = \alpha_i + \beta[R_t^R - R_t^{R,US}] + \gamma[R_t^R - R_t^{R,US}]X_{j,t}^R + \varepsilon_t^R$

	Panel with FE		Pooled OLS	
When $X_{j,t}^R$ is:	$\hat{\beta}$	$\hat{\gamma}$	$\hat{\beta}$	$\hat{\gamma}$
vol. ctc	0.086***	0.001***	0.086***	0.001***
U.S vol. ctc	0.240***	-0.005***	0.237***	-0.005***
net vol. ctc	0.103***	0.002***	0.102***	0.002***
$\sigma_{R_t^R}$	0.010	0.493***	0.010	0.488***
$\sigma_{R_t^{R,US}}$	0.192***	-0.526***	0.190***	-0.515***
$\sigma_{R_t^R} - \sigma_{R_t^{R,US}}$	0.060***	0.627***	0.060***	0.620***

Note : 'vol.' is volatility and 'vol. ctc' is volatility close-to-close.
*** denotes significance at 1% level.

Conclusion

Empirical Evidence on the UEP Condition: *Positive relation!*

- Test the UEP by employing data from Asian countries for the first time.
- Asian countries show reversed relation against to Advanced ones.

Cast doubt on Conventional UEP Explanation: *Not the Only One?*

- Conventional: Portfolio Rebalancing with Incomplete FX Risk Hedging.

$\Rightarrow$ Accepting that Asian markets are *less complete*, our reversed result is contradiction.

Explanation for this UEP Deviation? *"Stock Market Uncertainty"*

- Various proxy variables show that UEP reversal becomes stronger with *stock market uncertainty*.
- More detailed investigation is for future work.