An Analysis of Yield Spread Variance in US International Investing

Econ 403 International Macroeconomics

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Introduction

The US is known as a safe haven for investment. Its domestic actors consistently collect more income from interest on international investments than they pay out. Yet, the US is one of the largest net debtors in the world. This investment phenomenon is referred to as exorbitant privilege. This paradox is explained by the US being able to borrow for cheap and lend expensively. The consistency of these interest rates over time has resulted in negative net foreign debts, with positive returns.

The issue facing the United States is the longevity of the spread, defined as the interest rate differential between returns in the US (i^{US}) and returns in the rest of the world (i^{ROW}). US liabilities exceed their assets. For reference, the BEA reported the value of US assets at 33.6 trillion, where liabilities were 51.6 trillion at the end of 2023. In the case of increasingly equalizing returns, the interest payments the US makes on their liabilities would increase substantially. This, combined with a decrease in foreign investment returns would cause indefinite negative net interest payments, hampering US investment as more capital is consumed servicing debts.

We quantify the potential of the volatility of multiple economies to influence the spread on the cost of funds that the US enjoys compared to the rest of the world ($_{ROW}$). Using AAA bond returns and US interest receipts on foreign direct investment (FDI) we estimate international returns. We encompass the volatility of the US, Chinese, Japanese, German, and global economies, where volatility is measured as the standard deviation of the past five quarters of GDP growth rates. We predict the connection is due to the interest rates response to economic downturns and investors' risk-averse behavior.

Our empirical model uses reduced form parameters which measure the direction and magnitude of the effects increases in growth rate volatility of multiple countries and the world have on US international yield spread. We estimate the effects in terms of percentage points in spread per percentage point increase in growth rate volatility. We take an analytical approach in contrast to the mechanical approach utilized in Fernández-Villaverde et al. (2015). The benefit of this approach shows how dynamic effects evolve over time.

The findings indicate that foreign country-specific shocks are only significant in countries with large, developed stock exchanges and significant foreign domestic investment, such as China. They also work to move the spread in the opposite direction than shocks that ripple throughout the world, increasing the difference between percentage returns on investment that US nationals receive. World and US shocks, which have been largely linked in recent decades, both serve to decrease the relatively elevated levels of interest US nationals can receive elsewhere compared to domestic investment. Previous literature (Hui Guo & Robert F. Whitelaw 2006) analyzing the effects of stock market returns and different measures of risk in different international markets found results that concur with the results of this model.

Papers that measure increases in country-specific risk using credit rating agency guidelines (Afonso et al. 2014) have shown a correlation between future stock returns and a downgrade in credit rating, which characterizes stock market variance. This paper builds upon previous literature by showing that changes in certain international GDP growth volatilities have significant effects on the percentage return advantage US nationals can receive from investing internationally.

Literature Review:

Hui Guo & Robert F. Whitelaw (2006) explore the proposed relationship between stock market returns and variance in multiple international stock markets. They find that when combined with the US *cay* variable (wealth to consumption ratio) stock market variance in many international markets is significant and positively related to future returns. This contradicts the negative risk-return relation previously found in literature, suggesting that an omitted variable issue may be present in previous papers.

They also find that the US cay variable is also correlated with stock returns of many international stock markets, showing a great degree of global integration of capital markets, with country-specific shocks being less important than large, linked shocks between countries, with the US at its center.

Pierre-Oliver Gourinchas and Helene Rey (2007) examined the historical evolution of the United States external position. The authors contributed a break-up of exorbitant privilege of the United States by breaking down US gross assets and liabilities and applying valuation to each component. A significant finding of their research is an upward historical trend in share in high-yielding risky assets of the United States from 1955-2005. The trend is in correspondence with a positive difference between US assets and liabilities. Further indicating that yields the US receives on external assets are higher than the United States' payments on their liabilities.

Fernández-Villaverde et al. (2015) analyze the effects of unexpected fiscal volatility shocks on economic activity. They use a vector autoregression model (VAR) for the US economy using time-varied volatility. Assumptions held by the authors include that high fiscal uncertainty is temporary and the economy is at the zero lower bound of the nominal interest rate at the beginning of the

analysis. The estimated VAR model suggests that immediately following a positive two-standard deviation change in fiscal volatility, the capital income tax, output, consumption, real gross private investment, and the price level fall and stay low for several quarters.

Their graph displays an extended decline in investment when nominal interest rates and inflation increases. Their model also identifies shocks recursively using a linear time trend and a quarterly four lagged VAR with a constant. Ultimately, they find that fiscal volatility shocks take away up to 1.5 percentage points from output when the nominal interest rate is at a zero lower bound.

Ammer et al. (2018) analyzed the effect of home interest rates on cross border portfolio investments. Their research indicates that low interest rates in the investor's home country increased their investments in the United States (as a ratio to their home GDP). The authors use foreign US bonds holdings as an independent variable, representing investment. They found that a decrease of 100 basis-points in home interest rates is correlated with a 3.6-5.3% rise in US corporate bond holdings. The authors suggest that international investors pursue a "search-for-yield," meaning they shift their investment behavior towards the US when their returns in their home countries become low. Data on domestic investment portfolios were not included in the study, therefore the authors cannot compare domestic investment behavior to that of foreign countries.

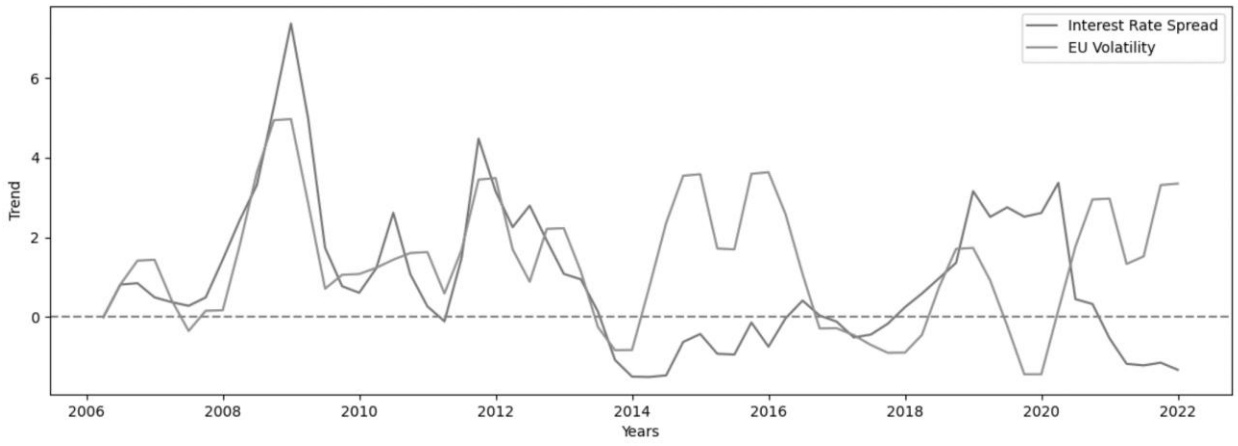
When accounting for coinciding decreases in risk, investment behavior becomes less volatile. A decrease in interest rates in home countries can also indicate a safer investment environment. Consequently, international investors are less reactive to changes in interest rates because they too factor in risk. One of the driving factors for international investors to shift investment into the US is to decrease the risk they take on.

Theory

Our model examines the effect of investment risk in the form of GDP growth volatility on the international yield spread, or difference in yields, between the US and an average of other countries. It is generally accepted that the reason for low US yields is due to the safety and general predictability of investments. The inverse applies to countries worldwide, with higher risk countries providing higher returns. Changes in the growth volatilities of these countries would alter their respective yields, which changes the yield spread, or the difference between US and foreign investment yields. This is because successful investments further a country's GDP creating quarterly GDP growth, which reflects the risk level perceived by investors, as well as the returns they accept in accordance with their risk preference.

Since the US experiences consistent economic growth, their assets are relatively safe and predictable. Therefore, it is when assets in foreign become riskier that investors are compelled to invest in the US.

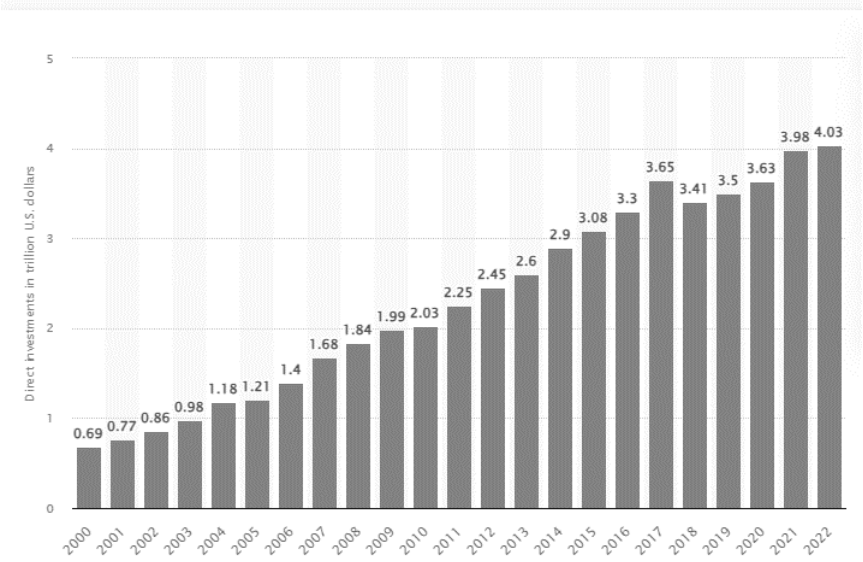
Figure 1.1 *Mapping EU volatility and the Spread*



As the US was heavily invested in Europe, the trend for Yield Spread in US IIP closely follows EU volatility. In 2014, the lines decouple, likely due to the Russian invasion of Crimea, and the

subsequent sanctions and economic/energy unrest in the Eurozone. The increased risk associated with European investment at the time led the US to stall its growing investment into Europe and diversify into other countries.

Figure 1.2 *US Foreign Direct Investment in Europe in trillion U.S. dollars*, graph from Statista Finance & Insurance statistics (2023).



1.2 The bar graph above shows new US Foreign Direct Investment into Europe steadily growing, then beginning to stagnate near the end of 2016.

Methodology:

The following model is constructed to explain the difference in yields. It will be iterated multiple times, with each iteration shifting the endogenous variable one quarter forward, to analyze effects over time.

$$i_t^d = i_t^{ROW} - i_t^{US}$$

$$i_t^d = \beta_0 + \beta_1 \sigma GDP_t^{\mathbf{WLD}} + \beta_2 \sigma GDP_t^{\boldsymbol{US}} + \beta_3 \sigma GDP_t^{\mathbf{JP}} + \beta_4 \sigma GDP_t^{\mathbf{CN}} + \beta_5 \sigma GDP_t^{\mathbf{DE}} + e$$

We measure the exorbitant privilege as the difference between the return on investment the US (i^{US}) offers and the return the rest of the world offers on investment (i^{ROW}). The US generally received a higher net return on investments abroad with an average interest rate differential of 11%. The rate of the US will be represented by the 10-year AAA corporate bond yield. The rate the rest of the world offers is derived from the value of Primary Income Receipts received by the US divided by US Assets, represented by US outward FDI.

The variables measuring GDP growth volatility are measured using the standard deviation of GDP growth rates over the past 5 year**s**. The size of the rolling window portrays the average number of years investors are looking into the past for an indication of macroeconomic volatility, assumed to be 5. The GDP growth volatility of the following countries are included in the model: United States of America, China, Japan, Germany. The growth rate volatility of the world is also included.

The measure of world GDP volatility is obtained by regressing time variables upon fluctuations in average world growth rate, controlling for individual country fluctuations through dummy variables.

Data

Table 1.1 **Descriptive Statistics**

	i^{US}(AAA)	i^{ROW}	Spread
count	70.000000	70.000000	70.000000
mean	4.208857	15.286674	11.077817
stdev	0.997377	2.344605	1.840100
min	2.140000	11.307068	8.272698
25%	3.562500	13.428320	9.680758
50%	3.990000	15.468412	10.701100
75%	5.137500	16.292650	12.148656
max	6.280000	22.779136	16.930630

The US investment yield (i^{US}) is represented by Moody's 10-year AAA corporate bond yield (AAA), measured in monthly percentages over the time span of 1919-2023, sourced from FRED.

Foreign investment yield (i^{ROW}) is derived by dividing US income receipts by US FDI assets. The assets were sourced from Table 2.1 US Direct Investment Positions from the BEA, line 9: outward direct investment (US direct investment abroad) measured in millions of dollars per year. The primary income receipts were sourced from line 5 of the BEA Table 1.1 U.S. International Transactions (millions of dollars per year).

Recessions have varying impacts on yield spreads. Noteworthy recession years, including 2009 and 2020 contain opposite trends. The Great Recession of 2009 contains the maximum values of the spread, at 15-16.9% for the interval observed, while the COVID recession of 2020 contains the lowest, at around 8-9%.

Table 1.2 **Descriptive Statistics**

	World GDP Volatility	US GDP Volatility	Japan GDP Volatility	China GDP Volatility	Germany GDP Volatility
count	70	70	70	52	70
mean	0.771974	0.479434	0.670243	0.450448	0.574508
stdev	1.34125	0.21625	0.37717	0.338389	0.264975
min	0.088682	0.089128	0.09883	0.119929	0.086808
25%	0.211569	0.304272	0.397729	0.248021	0.323648
50%	0.318504	0.453172	0.570522	0.34388	0.562808
75%	0.503063	0.616007	0.942704	0.504304	0.746929
max	5.656896	0.94414	1.549822	1.457592	1.139264

Volatilities are calculated from GDP growth rates, calculated from quarterly GDP figures, sourced from FRED Real Gross Domestic Product Accounts, for each country. The original data is adjusted to current USD.

Notable trends in the data include a greater world in volatility during the COVID-19 pandemic (2020-2021) than individual countries, creating outlier data points which significantly increased the mean and standard deviation of the world growth volatility variable.

Regression Results

The results of the regression across the seven iterations each with the dependent variable lagged forward by a quarter is as below:

Table 1.3 **Regression Outputs**

	Constant	World GDP Volatility	US GDP Volatility	Japan GDP Volatility	China GDP Volatility	Germany GDP Volatility	R^2
i_t^d	8.86	-4.39	0.67	-0.82	7.05	1.82	**0.546**
i_{t+1}^d	8.95	-0.74	-0.92	0.23	4.33	1.29	**0.541**
i_{t+2}^d	9.63	2.97	-2.47	1.28	2.09	-0.81	**0.654**
i_{t+3}^d	9.62	4.15	-1.97	1.03	0.55	0.45	**0.617**
i_{t+4}^d	9.76	2.4	-2.54	1.51	0.68	0.4	**0.357**
i_{t+5}^d	10.04	1.46	-2.22	1.47	0.02	0.99	**0.172**
i_{t+6}^d	10.13	1.42	-1.01	1.23	-1.49	1.46	**0.109**

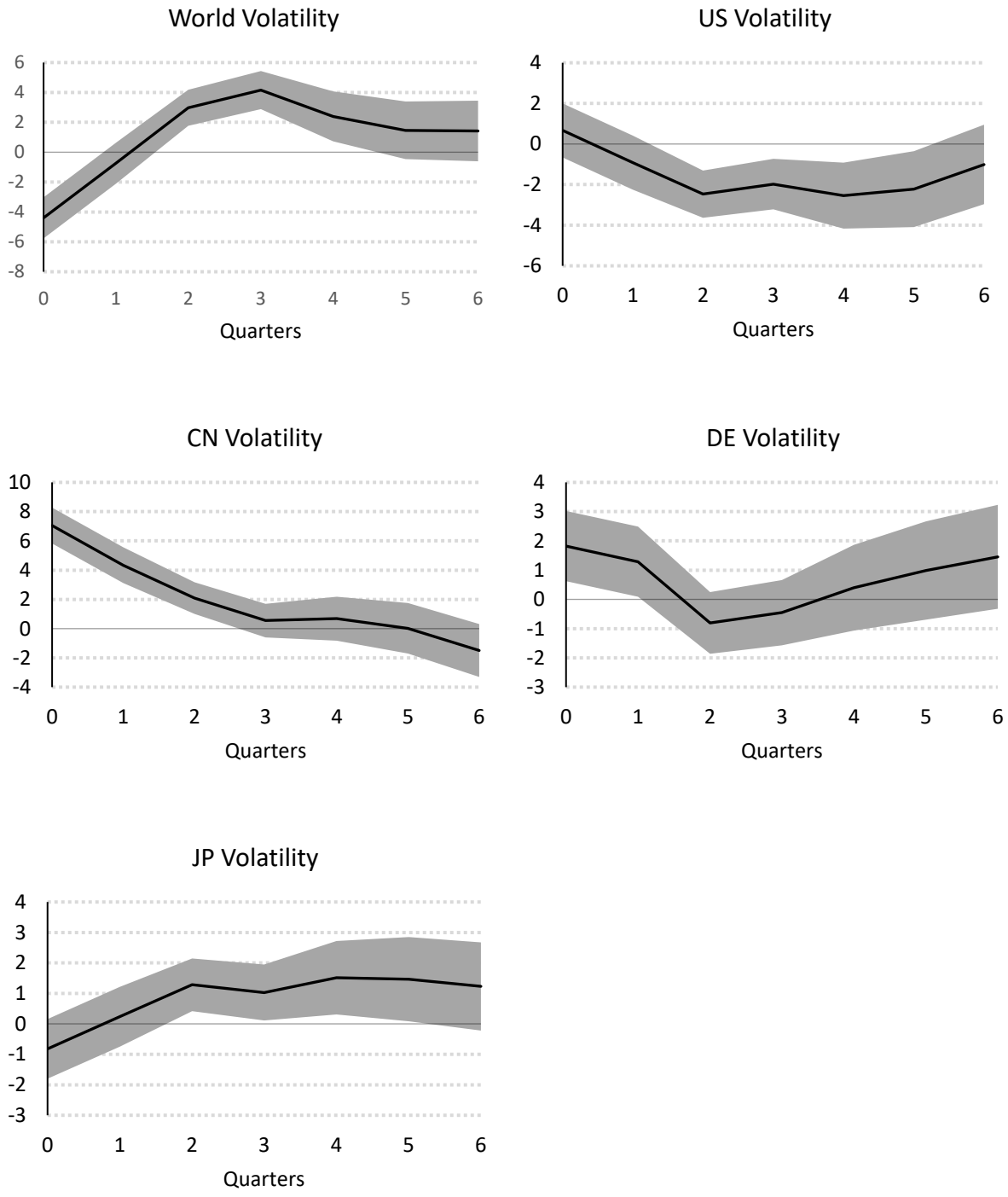
Table 1.3 reveals significant volatilities at the 5% level across most of the early regression are World, US, and China. After approximately four quarters, those individual country volatilities fail to become significant at estimating spread variance. World volatility also drops off at the 5th iteration. As the variables become less significant, the intercept more closely estimates the average spread.

For a 1 percent increase in World GDP volatility, the spread decreases by -4.39 percentage points. On average, we can attribute the decreasing difference in yields to a larger decrease in the foreign investment rate of return. As we continue to lag the model, the US experiences a smaller decrease in net returns on foreign investment. Beginning in quarter two, the coefficient of World GDP Volatility becomes positive, signaling an inversion from the shock, the beginning of a recovery

period, and a return of the US to an advantageous investment environment. The diminishing effect of World GDP volatility on the spread reflects the dissipation of shocks over time.

The Chinese investment market is an alternate market to the United States market with the second largest stock exchange. According to our model an increase in Chinese GDP volatility increases the US net investment returns by 7.05 percentage points immediately following an economic shock. We ascribe China's impact on the spread to capital flight towards US markets. The shift in capital increases investment demand in the US which lowers offered rates of return and simultaneously increases foreign yield. The effect of increases in Chinese growth volatility remains positive for 5 subsequent quarters, further increasing US income receipts. As with world volatility, the effect diminishes and begins countering the initial effects as the observed period becomes further past the initial shock quarter.

Figure 1.3 *Response in spread to percent changes in growth rate volatilities*



Conclusion

Global and US increases in volatility impact US investment opportunities negatively. The elevated rate of return they receive relative to their debt payments initially becomes smaller during global panics and inverts in the recovery phase, which returns the tightened spread to normal.

Significant variables that model an increase in country-specific volatility have the inverse affect, improving US yield spreads. This follows theory, which predicts that shocks isolated to foreign countries will cause increases in their interest rate, as well as capital flight to “safe” countries like the US, which lowers the average offered rate of return in the United States, further amplifying the yield spread.

Other country-specific volatilities, coming from mainly economies with relatively small stock exchanges and foreign direct investment, result in insignificant variables when determining US yield spread. This likely indicates a general trust in the financial institutions of these countries, and an aversion to capital flight during times of isolated macroeconomic fluctuation.

References

Afonso, A., Gomes, P., & Taamouti, A. (2014). Sovereign credit ratings, market volatility, and financial gains. *Computational Statistics & Data Analysis, 76,* 20-33.

Ammer, J., Claessens, S., Tabova, A., & Wroblewski, C. (2018). Searching for yield abroad: risk-taking through foreign investment in US bonds. *FRB International Finance Discussion Paper*, (1224).

Fernández-Villaverde, J., Guerrón-Quintana, P., Kuester, K., & Rubio-Ramírez, J. (2015). Fiscal volatility shocks and economic activity. *American Economic Review*, *105*(11), 3352-3384.

Guo, H., & Whitelaw, R.F. (2006). Uncovering the Risk–Return Relation in the Stock Market. *The Journal of Finance*, *61*, 1433-1463.

Gourinchas, P. O., & Rey, H. (2007). From world banker to world venture capitalist: US external adjustment and the exorbitant privilege. In *G7 current account imbalances: sustainability and adjustment* (pp. 11-66). University of Chicago Press

Statista Research Department (2023). Foreign direct investment position of the United States in Europe from 2000 to 2022 (in trillion U.S. dollars, on a historical-cost basis). *Statista*.