Currency Returns and Global Shocks: Safe vs Risky Currencies and the Role of Global Risk Factors

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Abstract

This project analyses currency returns within the framework of global shocks and the global financial cycle. Essentially, this empirical report aims to answer the question: How do different currencies respond to global shocks, and can they be classified as "safe" or "risky" based on their co-movements with global financial risk factors? Additionally, does Bitcoin behave like a safe-haven asset, akin to gold? The study then explores how these currency groups covariate with macro-financial variables such as the S&P 500, gold, and Bitcoin. Finally, we provide an extended discussion linking our empirical results with key findings in the literature.

1 Related Literature

Our project is grounded on the empirical literature and closely related to the findings Lustig et al. state that excess returns are related to global risk factors, such as dollar risk exposure and carry trade risk. Lustig et al. (2011) identified these two systematic risks, which explain the cross-sectional variation in currency exchange returns. Using principal component analysis within two closely related parameters revealed a structure that exhibits sensitivity of currencies to shocks and provides a perspective on categorising currencies as safe or risky. We used the same categorisation to classify currencies with the coefficients provided by the regression analyses.

Menkhoff et al. (2012) empirically examine the risk-return profile of carry trades. In addition to Lustig et al. (2011), this paper considers global FX volatility and examines the carry trade performances. The time series analysis in this paper provides global fx volatility innovations that refer to changes and shocks in global foreign exchange volatility. Innovation is the difference between realised volatility and predicted volatility. As a result of this regression, they captured that high-interest, i.e. high-risk, premia currencies are negatively affected by unexpected global shocks. This might also be related to the geopolitical risk factors of countries, which have not been covered in this paper. The paper empirically proves that higher returns in the risky currencies are compensation for bearing risk, which we also observe in our analysis.

2 Model Motivation and Data Structure

Due to their empirical prominence in international finance, we selected Dollar Risk and Carry Trade Risk as the core explanatory variables in our analysis. Lustig et al. (2011) demonstrate that these two principal components extracted from currency returns capture systematic variation in excess returns. Dollar Risk (the first component) acts as a level factor, representing broad comovement in currency markets, while Carry Trade Risk (the second component) reflects the returns to the carry trade strategy—going long on high interest rate currencies and short on low interest rate ones.

To estimate a currency's sensitivity to these global shocks, we use the following regression:

$$R_{i,t} = \alpha_i + \beta_{1,i} \cdot \text{DollarRisk}_t + \beta_{2,i} \cdot \text{CarryTradeRisk}_t + \varepsilon_{i,t} \tag{1}$$

where $R_{i,t}$ is the monthly return of currency i relative to the U.S. dollar, and β_1, β_2 represent loadings on the two risk factors.

The dataset includes monthly forward returns of 30 currencies, gold, Bitcoin, the S&P 500 index, and its volatility, covering a multi-decade period. We apply Principal Component Analysis (PCA) to the return matrix to replicate the original factor structure. The second principal component cleanly separates high-yielding, volatile currencies from low-risk counterparts.

Currencies such as the Euro, Danish Krone, and Swiss Franc have high positive loadings on PC2 and are labelled "safe." Others, such as the Turkish Lira, Mexican Peso, and Indian Rupee, exhibit strong negative loadings and are categorised as "risky."

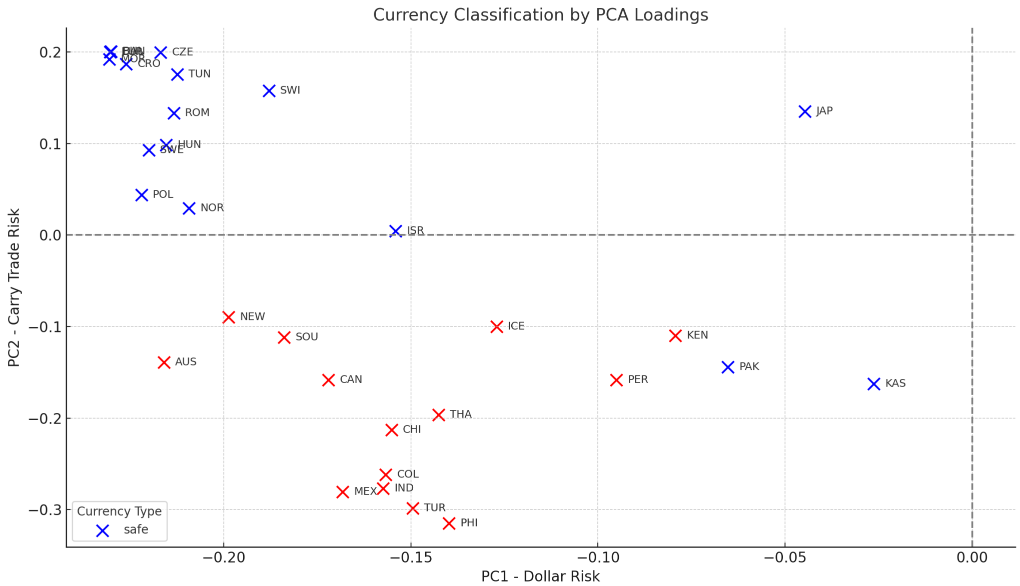

Figure 1: Scatterplot of PCA Loadings: Dollar Risk vs. Carry Trade Risk

3 Alternative Approach and The Group Results

An alternative and complementary approach to PCA-based classification is a direct regression-based method, which we initially implemented using Stata. In this approach, we estimate a

Table 1: Full Currency Classification Based on PCA Loadings

Currency	PC1 (Dollar Risk)	PC2 (Carry Risk)	Classification
AUSTRALIAN	-0.216	-0.139	risky
BULGARIAN	-0.230	0.201	safe
DANISH	-0.230	0.201	safe
EURO	-0.230	0.200	safe
CZECH	-0.217	0.199	safe
MOROCCAN	-0.231	0.192	safe
CROATIAN	-0.226	0.187	safe
TUNISIAN	-0.212	0.175	safe
SWISS	-0.188	0.158	safe
JAPANESE	-0.045	0.135	safe
ROMANIAN	-0.213	0.133	safe
HUNGARIAN	-0.215	0.098	safe
SWEDISH	-0.220	0.093	safe
POLISH	-0.222	0.044	safe
NORWEGIAN	-0.209	0.029	safe
ISRAELI	-0.154	0.004	safe
NEWZEALAND	-0.199	-0.090	risky
ICELAND	-0.127	-0.100	risky
KENYAN	-0.079	-0.110	risky
SOUTH	-0.184	-0.112	risky
AUSTRALIAN	-0.216	-0.139	risky
PAKISTANI	-0.065	-0.144	safe
CANADIAN	-0.172	-0.159	risky
PERU	-0.095	-0.159	risky
KAZAKHSTAN	-0.026	-0.163	safe
THAI	-0.143	-0.196	risky
CHILEAN	-0.155	-0.213	risky
COLOMBIAN	-0.157	-0.262	risky
INDIAN	-0.157	-0.277	risky
MEXICAN	-0.168	-0.280	risky
TURKISH	-0.149	-0.298	risky
PHILIPPINE	-0.140	-0.315	risky

time-series regression for each currency, regressing monthly returns on the two key global risk factors—Dollar Risk and Carry Trade Risk. Specifically, the equation takes the form:

$$R_{i,t} = \alpha_i + \beta_{1,i} \cdot \text{DollarRisk}_t + \beta_{2,i} \cdot \text{CarryTradeRisk}_t + \varepsilon_{i,t}.$$

After obtaining the β coefficients for each currency, we classify currencies into "safe" or "risky" categories based on the sign and magnitude of their sensitivities. Currencies with low or negative β_2 (Carry Risk) coefficients are considered safe, as they are less exposed to global carry trade shocks, while those with high positive coefficients are deemed risky. This empirical strategy directly exploits the regression output without requiring dimensionality reduction. It also facilitates transparent and interpretable classification, especially in settings where the PCA structure may not be stable over time. The results of this method were documented in the provided Excel file `currency_classification.xlsx`, generated from the Stata script `First Part of The Code_Currencies.do`, and reflect a coherent alignment with the PCA-based classification discussed later in the report.

4 Empirical Results

4.1 Portfolio Return Calculation

To quantify the economic consequences of currency risk classification, we compute the monthly return spread between risky and safe currency portfolios. Specifically, we take equal-weighted averages of the currencies grouped under each category and calculate the difference $R_t^{\text{risky}} - R_t^{\text{safe}}$ for each month. This spread captures the premium investors require for bearing global risk exposure, akin to excess returns in equity markets. Economically, this approach is grounded in the risk-return tradeoff: riskier currencies are expected to offer higher returns as compensation for their vulnerability during global financial downturns. By analyzing this differential, we assess whether risk exposure in FX markets is indeed priced over time.

The results show an average monthly return spread of approximately 0.15% in favor of risky currencies, with a standard deviation of 1.57%. While the mean is modest, it accumulates significantly over time and reflects meaningful compensation for carry-related risk. These findings align with previous studies (e.g., Menkhoff et al., 2012), which show that excess returns are correlated with volatility risk. Table 2 reports the corresponding statistics. The computations were carried out using Stata, and the full replication code is provided in the appendix file `Second Part of The Study.do`.

Table 2: Summary Statistics for Risky – Safe Return Spread

Statistic	Value
Mean of Risky – Safe Returns	0.0015
Standard Deviation	0.0157

5 Economical Analysis of The Results

5.1 Correlation Analysis: Linking Currency Spreads to Global Shocks

Correlation analysis is a foundational tool in evaluating how financial variables co-move over time, particularly under conditions of systemic stress. In international finance, understanding the interrelationship between currency return differentials and global risk factors is vital for deciphering market behaviour, portfolio sensitivity, and systemic transmission channels. By examining correlations, we are not asserting causality but instead highlighting patterns of co-movement that may reflect shared exposure to latent macro-financial forces.

The empirical correlation matrix demonstrates that Carry Risk is the dominant explanatory factor for currency return spreads. As shown in Table 3, the return differential between risky and safe currencies is strongly positively correlated with Carry Trade Risk (correlation: +0.93), confirming that carry strategies amplify the performance of high-yielding currencies during global expansions. Dollar Risk, in contrast, exhibits a modest negative correlation (-0.23), suggesting that safe currencies may serve as hedges against broad USD fluctuations.

Additionally, the return spread correlates weakly with the S&P 500 return (+0.13), but negatively with its volatility (-0.17). This is consistent with the flight-to-safety narrative, where investors retreat from risky assets—such as carry currencies—during periods of financial uncertainty. Gold returns, however, show negligible correlation (-0.04), affirming its status as a weakly connected, standalone hedge.

Table 3: Correlation with Risky–Safe Currency Return Spread

Variable	**Correlation**
Carry Trade Risk	+0.93 (Strong positive link)
Dollar Risk	-0.23 (Weak negative relation)
S&P 500 Return	+0.13 (Mildly positive)
S&P 500 Volatility	-0.17 (Negative relationship)
Gold Return	-0.04 (Negligible impact)

6 Extended Analysis: Bitcoin as a Safe Haven?

6.1 Motivation and Method

In recent years, Bitcoin has often been touted as "digital gold," a safe-haven asset offering portfolio diversification and protection during periods of financial distress. This claim has gained attention amid global macroeconomic uncertainty and increased institutional adoption of digital assets. However, the classification of Bitcoin as a safe haven remains highly debated in the empirical literature. While Baur et al. (2018) and Smales (2019) argue that Bitcoin may act as a hedge under certain market conditions, others, such as Corbet et al. (2018), emphasize its speculative characteristics and high volatility.

In this section, we empirically assess Bitcoin's relationship with global risk factors by including it in the correlation matrix previously constructed for traditional financial assets and risk indicators. We use a restricted sample period due to limited historical availability of Bitcoin returns. The aim is to determine whether Bitcoin behaves like a safe-haven asset—characterized by low or negative correlation with risky assets and volatility—or if it co-moves with high-risk exposures, much like equity or carry trade investments.

The analysis is conducted using Stata and the dataset `CurrencyReturnAnalysis.dta`. The implementation details are available in the replication file `Second Part of The Study.do`.

6.2 Findings and Interpretation

Table 4 reports the correlations between Bitcoin returns and six macro-financial variables.

The results reveal that Bitcoin's behavior diverges from that of traditional safe havens:

- **Positive correlation with carry trade risk (+0.21)** implies that Bitcoin benefits from risk-on environments, where speculative flows into high-yield assets dominate.

Table 4: Correlation with Bitcoin Return

Variable	**Correlation**
Risky–Safe Return Spread	+0.18 (Mildly positive)
Carry Trade Risk	+0.21 (Some alignment)
Dollar Risk	+0.12 (Weak relationship)
S&P 500 Return	+0.24 (Slight co-movement)
S&P 500 Volatility	-0.28 (Inverse link)
Gold Return	+0.00 (No meaningful tie)

- **Its negative correlation with volatility (-0.28)** indicates vulnerability during market stress, when investors typically liquidate high-risk positions—contradicting the characteristics expected of a safe-haven.
- **The absence of any meaningful relationship with gold returns (+0.00)** further challenges the narrative of Bitcoin as digital gold. Gold has historically served as a store of value across centuries; Bitcoin's short track record and speculative demand hinder its comparability.
- **Its modest correlation with equity returns (+0.24)** aligns Bitcoin more closely with high-beta, tech-sector assets—suggesting it behaves more like a pro-cyclical investment vehicle than a hedge.

These findings align with those of Corbet et al. (2018), who argue that Bitcoin lacks the necessary stability and independence to function as a reliable hedge or safe haven. While Bitcoin may offer diversification in specific contexts, its co-movement with other risk-on assets and its decline during volatility spikes point to a speculative profile, not a defensive one.

References

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Appendix A: Code Files and Replication

The following Stata ".do" files were used to produce the empirical results in this report. Each script is labeled by its corresponding part in the analysis:

A.1 First Part of the Code: Currency Classification

`First Part of The Code_Currencies.do` contains the Stata commands used to regress each currency's return on Dollar Risk and Carry Trade Risk. The results from this script were used to group currencies into "safe" or "risky" categories based on the sign and magnitude of regression coefficients.

- Input: Monthly forward currency returns, Dollar Risk, Carry Risk.
- Output: A table of regression coefficients (β_{Dollar}, β_{Carry}), later summarized in extttcurrency_classification.xlsx.

A.2 Second Part of the Study: Return Differential

`Second Part of The Study.do` calculates the monthly return spread between risky and safe portfolios. It computes the average returns for each group and generates the time series of $R_t^{\text{risky}} - R_t^{\text{safe}}$.

- Input: Grouped portfolio returns from Part A.1.
- Output: Mean and standard deviation of the spread, used in Section 3 of the report.

A.3 Bitcoin Analysis Code

`Bitcoin Analyis Part.do` extends the correlation matrix by incorporating Bitcoin returns. This file filters data to the available Bitcoin sample and estimates the pairwise correlations between Bitcoin and financial variables like Dollar Risk, Carry Risk, S&P 500, Gold, and the Risky–Safe Return Spread.

- Input: Monthly Bitcoin returns with macro variables.
- Output: Extended correlation matrix (Table 4).

All files are available upon request and have been validated for replication consistency using the dataset CurrencyReturnAnalysis.dta.