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Policy uncertainty in financial markets, an international study analysis

"How does policy uncertainty, as measured by the Economic Policy Uncertainty (EPU) index, impact stock and bond returns, and their correlation, across different international markets?"

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I extend my heartfelt thanks to everyone who supported me throughout the journey of this thesis. Their invaluable assistance and encouragement were crucial to the successful completion of this work.

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Abstract:

This study investigates the impact of Economic Policy Uncertainty (EPU) on stock and bond returns, and their correlations across 22 international markets from 2000 to 2023. Using the EPU index by Baker et al. (2016), along with additional macroeconomic variables, we employ multivariate OLS regression models to assess these effects.

The findings reveal significant variations in market sensitivity to EPU across different countries. Developed markets show a pronounced negative impact of EPU on stock returns and a positive impact on bond returns, reflecting a flight-to-quality behavior. Conversely, emerging markets exhibit varied and often muted responses due to local economic conditions and market maturity.

Stock-bond return correlations are negatively affected by rising EPU in developed markets, indicating a shift towards safer assets during periods of high uncertainty. In contrast, emerging markets display a positive correlation, suggesting simultaneous impacts on both asset classes. The study also notes the mitigating effect of government interventions in markets like China.

This research contributes to the literature by providing a global analysis of EPU's impact on financial markets, emphasizing the importance of market-specific characteristics and government policies. The findings offer valuable insights for investors, financial managers, and policymakers to develop more resilient investment strategies and policy frameworks amid economic uncertainty.

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During the preparation of this master's thesis, the author utilized GPT-4 for the following purpose:

1. Proofreading
2. R Packages understanding

After using GPT-4, the author diligently reviewed and edited the content produced by the tool. We take full responsibility for the final content presented in this thesis.

By signing this declaration, we affirm that the content of this master's thesis reflects our original work, augmented by the responsible use of AI.

Table of content

Introduction

The global economic landscape has been increasingly characterized by recurrent financial shocks, leading to heightened market uncertainty. This uncertainty, stemming from various sources, particularly major political and economic events, poses significant challenges for financial market stakeholders. The introduction of the Economic Policy Uncertainty (EPU) index by Baker et al. (2016) has provided a crucial tool for understanding and quantifying this uncertainty.

The concept of uncertainty plays a pivotal role in the dynamics of financial markets. In fact, the EPU index specifically refers to the ambiguity and unpredictability regarding economic policies, which can significantly impact the financial markets. This type of uncertainty, brought by less predictability on the markets, can lead to important volatility as investors adjust their portfolios towards safer assets, or withdraw from investments to mitigate potential losses. Thus, understanding the influence of uncertainty is not just academic, it has practical implications for portfolio management, risk assessment, and policy makers.

The contribution of this research topic, "How does policy uncertainty, as measured by the Economic Policy Uncertainty (EPU) index, impact stock and bond returns, and their correlations, across different international markets?" to the existing literature is interesting and impactful.

Firstly, it offers a global perspective by extending the analysis of EPU's impact to a cross-country framework, considering the diverse economic and political landscapes across nations. This broad analysis is crucial as EPU's effect is found to be not uniform but varying with the context of each market, making a global analysis imperative for a comprehensive understanding. Secondly, the research integrates the study of both stock and bond markets in relation to EPU. Indeed, while existing literature explains a part of the influence of EPU on financial markets, there is still a lack in the understanding of this impact on assets when considering both stock and bond returns. As a consequence, this approach provides a more holistic view of EPU's influence on different asset classes, a key aspect for diversified investment portfolios.

Also, the papers pointing to differences in financial systems and sectors are focused on the firm-level view, and the assessment of the influence of EPU by country is focused on financial stability. There is thus no investigation of these variations at a global market level regarding stock and bond returns at an international level. Furthermore, by exploring how EPU influences the correlation between stock and bond returns, the study sheds light on the dynamics of risk under policy uncertainty. This aspect is particularly significant for risk management and portfolio diversification strategies, offering insights into how to navigate periods of high policy uncertainty.

Finally, the practical implications of this research are profound. The findings can be instrumental for investors, financial managers, and policymakers. In fact, stakeholders will be able to have a broader look at the different drivers of the international financial market and thus, make more informed decisions when building their balanced portfolio or implementing new policies. Making their decisions more resilient to potential crises. Therefore, this research not only contributes to the theoretical understanding of EPU's role in international financial markets but also provides practical insights for various stakeholders in the financial world.

In sum, the study of uncertainty's impact on financial markets is essential for understanding the broader economic implications of policy decisions and market reactions. It helps in crafting more informed economic and investment strategies that can better withstand the challenges posed by an uncertain economic environment. This thesis aims to dissect these dynamics, providing a granular analysis of how uncertainty affects financial markets across various economies.

The method followed will use data from 22 countries, taking into account their national EPU index. Alongside additional basic macro economical explanatory variables, we will assess the impact of these factors on the stock and bond returns using a regression model in R. This method will allow us to have a precise look at all the trends and different influences of the EPU across a long period of time as the historical data starts from 2000.

This paper is divided into four parts. The next section discusses the existing literature on the subject, building the foundation for this work. This is followed by the methodology and data explanation, detailing the models and the nature and origin of the data used. The subsequent section presents the results, providing a thorough analysis of the models' outcomes and exploring next steps for further investigation. Finally, the conclusion wraps up all the preceding sections, summarizing the key findings and their implications.

Literature review

The literature on Economic Policy Uncertainty (EPU) and its relationship with financial markets and firm behavior is clearly pointing to its importance as a research topic. This review synthetizes the key findings from recent studies in order to provide a broad understanding of the influence of EPU on economic activities and decision-making process.

First, through their pioneering work on the EPU index, Baker et al. (2016) built the foundation for the analysis of the macroeconomic impact of policy uncertainty. Based on newspaper coverage frequency, their index reveals EPU increases during times of major political and economic events. It also highlights the fact that these events affect investment, employment, and stock price volatility, with predominant impact in policy-sensitive sectors (Baker et al., 2016). The EPU index introduced by Baker et al. (2016) is extensively used in subsequent studies and will also serve as a primary data source in this research.

In their study, Phan et al. (2018) explore the EPU's predictive ability on stock return at global and sector-specific levels. Using a specific methodology considering different time periods and various levels of risk aversion. The main finding is that EPU's predictive power is not universally applicable but varies markedly across different countries and sectors. Moreover, the authors identify the discount rate channel as the primary source for the EPU to influence stock returns, affecting both the cost of capital and investment risk perception (Phan et al., 2018).

Additionally, the study reveals an asymmetric predictability in responses to positive versus negative EPU shocks, which may mirror divergent investor behaviors or market conditions, indicating varying levels of risk tolerance or optimism amidst uncertainty (Phan et al., 2018). Finally, based on all these findings, the paper demonstrates that the forecasts of EPU-based models can offer benefits when used in investment strategies, pointing out the credibility of this new index (Phan et al., 2018). This research builds upon and extends Baker et al. (2016), by offering deeper insights into EPU's operational mechanisms and its variable effects across different market sectors and geographical contexts. These findings highlight the critical need for international analyses to fully comprehend the disparate influences of EPU and underscore its significant role in shaping market participant's strategies and outlooks.

Furthermore, EPU is found to significantly influence corporate strategic decisions. In fact, Bonaimé et al. (2018) established a robust connection between policy uncertainty and a reduction in mergers and acquisitions (M&A) activity. Specifically, increased uncertainty allows target companies to negotiate more favorable terms, consequently leading to a decrease in both the frequency and magnitude of M&A transactions. This observation is consistent with findings by Kang et al. (2014), who assert that heightened EPU prompts firms to adopt a more conservative stance towards long-term investments. Bonaimé et al. (2018) further affirmed that the effect of EPU on M&A varies with the nature of the policy uncertainty involved, with monetary, fiscal policies, and regulatory changes exerting the most substantial impact.

This sector-specific sensitivity to EPU is corroborated by studies such as those by Phan et al. (2018) and Drobetz et al. (2018), which reveal that the influence of EPU is not uniformly distributed across sectors but varies significantly. Extending this line of inquiry, Phan et al. (2021) explore how the impact of EPU on financial stability differs across financial systems. Their analysis suggests that financial systems that are either highly competitive or less regulated are particularly susceptible to the destabilizing effects of EPU. This nuanced understanding underscores the importance of conducting international analyses to uncover the variable impacts of EPU across different financial landscapes, offering insights into the unique vulnerabilities and resilience patterns of diverse financial systems. The insights brought by this study will constitute the base of the following hypotheses:

H.1. Stock and bond returns are more affected by EPU on highly internationally opened markets.
H.2. Stock and bond returns are less affected by EPU on highly regulated markets.

The first insights on the influence of EPU on the financial markets given by the literature picture an expected but significant negative relation. In fact, many studies, like the ones of Chiang (2019) and Gong et al. (2022), found that in times of high EPU, the stock market tends to have less returns as risk-averse investors sell their equities or seek safer assets. This last movement dynamic is called a “flight-to-quality” and is confirmed by the recent work of Leippold and Matthys (2022b) on the influence of EPU on the bond yield curve. Indeed, the researchers have found that higher policy uncertainty induces a fall in the level of yields explained by a rise in demand from investors seeking safer returns when uncertainty arises.

Moreover, Giofré (2022) explored the flight to advanced economies during the COVID-19 crisis, when uncertainty was really high. The author discovered that during that period, an important flight-to-quality from developing economies to safer assets in developed markets was observed. This brings us to new hypotheses:

H.3. Stock-bond returns correlation is negatively affected by a rise in EPU in developed markets.
H.4. Stock-bond returns correlation is positively affected by a rise in EPU in emerging markets.

In fact, a flight-to-quality would deteriorate the correlation between the two asset classes while foreign investors selling both assets in emerging countries during high uncertainty would lead to coordinated movement in both classes, enforcing the correlation.

Additionally, the construction of our model which will be detailed in the next section, incorporates foundational studies from a variety of sources. First, the work of Phan et al. (2021), as previously discussed, offers crucial guidance for structuring the model and selecting pertinent variables, ensuring the model's framework is robust and reflective of current economic realities. Additionally, the paper of Phan et al. (2018) provides valuable insights for choosing appropriate stock indices in the different countries assessed, allowing for a nuanced analysis of regional market response to uncertainty.

For selecting specific factors that influence market dynamics, we also incorporate works such as Chen et al. (1986), which provides foundational financial models used in many research papers. The recent contributions of Abiad and Qureshi (2023) and the findings of Dang et al. (2023) further enrich our model by introducing contemporary perspectives and latest empirical data, which are crucial for adapting the model to reflect modern market conditions and uncertainties. This comprehensive approach ensures that our model is both theoretically grounded and practically relevant, essential to analyze the relations between EPU and the equity markets.

Finally, regarding the analysis of the correlation between the stock and bond returns, we also rely on pivotal research. In fact, the paper of Fang et al. (2017) is assessing the long-term impact of EPU on the correlation between these assets on the U.S. financial market. The result is a significant negative influence of EPU on this correlation on the market analyzed. We will expand this research to an international level, assessing country specifics and relations.

Furthermore, the construction of the model for this part of the research is influenced by papers like the one of McMillan (2019b), which gives insights on the method to analyze such a correlation between assets using a rolling window analysis.

In summary, the existing literature on Economic Policy Uncertainty (EPU) highlights its complex but significant impact on financial markets and corporate decision-making. Studies by Baker et al. (2016), Phan et al. (2018), Bonaimé et al. (2018), Kang et al. (2014), and Drobetz et al. (2018) reveal EPU as a multifaceted factor influencing investment strategies, stock returns, corporate actions like mergers and acquisitions, and overall financial stability. These works underscore the necessity of international analyses to understand EPU's variable effects across different financial landscapes, offering insights into the unique vulnerabilities and resilience patterns of diverse financial systems.

Data & Methodology

Data Description

As introduced in the literature review, the pioneering work of Baker et al. (2016) is widely utilized in studies related to uncertainty. Following this pattern, our primary source of data is the Economic Policy Uncertainty (EPU) index. This index measures the level of uncertainty in the news by identifying predefined keywords. The EPU data is retrieved from Baker et al.'s website, covering 22 countries: USA, Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, South Korea, Mexico, Netherlands, Russia, Singapore, Spain, Sweden, and the UK. We use the local EPU indexes for each country, enabling us to consider regional differences in the influence of policy uncertainty. The diverse economic and political contexts of these regions make this multi-country analysis essential for a comprehensive understanding.

Our second data source comprises the national stock returns for these 22 countries over the period from July 2000 to September 2023. Due to data availability constraints, some countries have shorter time spans, such as Chile (starting August 2004), Greece (June 2002), Ireland (September 2003), the UK (November 2002), and India (December 2016). The stock returns are based on national indices, ensuring a broad representation of each market. To provide a clearer picture of performance and risk compensation, we transformed stock gross returns into excess returns by subtracting the short-term government bond yield for each country.

Table 1 : Stock indices used by country.

Country	Stock Index
Australia	All Ordinary Index
Brazil	BOVESPA
Canada	S&P/TSX Composite Index
Chile	MSCI Chile
China	Shanghai Composite Index
Colombia	FTSE Colombia
France	CAC 40
Germany	FAZ
Greece	FTSE Greece
India	S&P BSE Sensex 50
Ireland	ISEQ Overall
Italy	FTSE MIB
Japan	Nikkei 225
Korea	FTSE Korea
Mexico	FTSE Mexico
Netherlands	AEX All Shares
Russia	RTSI
Singapore	FTSE Singapore
Spain	General Madrid
Sweden	FTSE Sweden
United Kingdom	FTSE All-Share UK
United States	S&P 500

The bond returns dataset comprises national government bonds with 5-year maturity for the same 22 countries and time periods. Similar to stock returns, there are minor delays in the starting periods for some countries, which do not pose significant issues for the overall analysis. Bond returns are represented by the inverse variation in yields, capturing the relationship between yield and price.

Moreover, in order to analyze the effects of EPU on the stock-bond returns correlation, we build a rolling correlation on the previously presented data of the excess stock and bond returns. To do so, we use a 12-months rolling window as suggested in the work of McMillan (2019b) on the subject. This approach ensures a good balance between responsiveness and stability, having a good vision on market development while controlling for transient instabilities or anomalies.

Finally, while the research is focused on the EPU, other uncertainty indexes are interesting to explore. First, the Oil Price Uncertainty Index (OPU). It is a news-based index like the EPU, this recent index was developed by Abiad and Qureshi (2023) and is proven to have a significant impact on real economic activity. Secondly, we will briefly observe the Energy-Related Uncertainty Index (EUI) created by Dang et al. (2023). This index analyzes the uncertainty around the energy market for 28 developed and developing countries from 1996 to 2022.

Control Variables

To assess the influence of uncertainty on stock and bond returns comprehensively, we incorporate control variables from established financial models. These control variables ensure that our analysis accounts for other factors that can influence returns, thereby isolating the specific impact of EPU.

Following Chen et al. (1986), we include the risk premium and the real interest rate. The risk premium represents the additional return over the risk-free rate that investors require for taking on higher risk. It is a crucial variable as it directly affects the valuation of assets and investor behavior. The real interest rate, representing the nominal interest rate adjusted for inflation, influences borrowing costs and investment decisions. These rates are retrieved from the Federal Reserve Bank of Cleveland for the United States, as U.S. financial markets exert significant influence globally (Hartman, 1984; Georgiadis, 2016). Using these American rates for all countries provides a consistent benchmark for international financial analysis.

Additionally, we utilize factors from the Fama/French three-factor model, specifically SMB (Small Minus Big) and HML (High Minus Low). These factors capture the size and value effects in stock returns. The SMB factor measures the performance difference between small-cap and large-cap stocks, reflecting the size effect, while the HML factor captures the performance difference between value stocks and growth stocks, reflecting the value effect. Including these factors ensures our model accurately reflects the cross-sectional variations in stock returns due to these well-documented effects. These factors are calculated separately for developed and emerging markets, following the IMF's classification, to account for the distinct characteristics and behaviors of these markets.

Models

Using these different variables from our datasets, we are able to build a first model aiming at measuring the influence of EPU on stock returns. This model will consist in a multivariate OLS regression, with for each the stock and bond returns being the dependent variable. This process will then be applied at a country-level as well as to a global one. The model is built as follows:

$$\boldsymbol{R_{t,i} = \beta_1 EPU_{t,i} + \gamma Control_t + \varepsilon_t} \quad (1)$$

Dependent variable:

- $\mathbf{R_{t,i}}$: excess stock returns at time t in country i

Explanatory variable:

- $\mathbf{EPU_{t,i}}$: EPU index at month t in country i

Control variables:

- $\mathbf{SMB_t}$: SMB at month t
- $\mathbf{HML_t}$: HML at month t
- $\mathbf{RP_t}$: Real Risk Premium at month t
- $\mathbf{I_t}$: Real Interest Rate at month t

The character t represents a certain month out of a certain year in the dataset. This model will permit the assessment of the influence of EPU on excess stock returns in each country.

The second model aims at assessing the impact of EPU on bond returns. It follows the same principles as for the first model (1).

$$R_{t,i} = \beta_1 EPU_{t,i} + \gamma Control_t + \varepsilon_t \quad (2)$$

Dependent variable:

- $\mathbf{R_{t,i}}$: bond returns at time t in country i

Explanatory variable:

- $\mathbf{EPU_{t,i}}$: EPU index at month t in country i

Control variables:

- $\mathbf{SMB_t}$: SMB at month t
- $\mathbf{HML_t}$: HML at month t
- $\mathbf{RP_t}$: Real Risk Premium at month t
- $\mathbf{I_t}$: Real Interest Rate at month t

The next model will assess the impact of EPU on the stock and bond correlation. While using the same control variables as in the first regression, this model requires calculating a rolling correlation over time. This new variable will then be the dependent variable in this second regression model.

$$Corr_{t,i} = \beta_1 EPU_{t,i} + \gamma Control_t + \varepsilon_t \quad (3)$$

Dependent variable:

- $Corr_{t,i}$: Correlation between stock and bond returns at time t in country i

Explanatory variable:

- $\mathbf{EPU_{t,i}}$: EPU index at month t in country i

Control variables:

- $\mathbf{SMB_t}$: SMB at month t
- $\mathbf{HML_t}$: HML at month t
- $\mathbf{RP_t}$: Real Risk Premium at month t
- $\mathbf{I_t}$: Real Interest Rate at month t

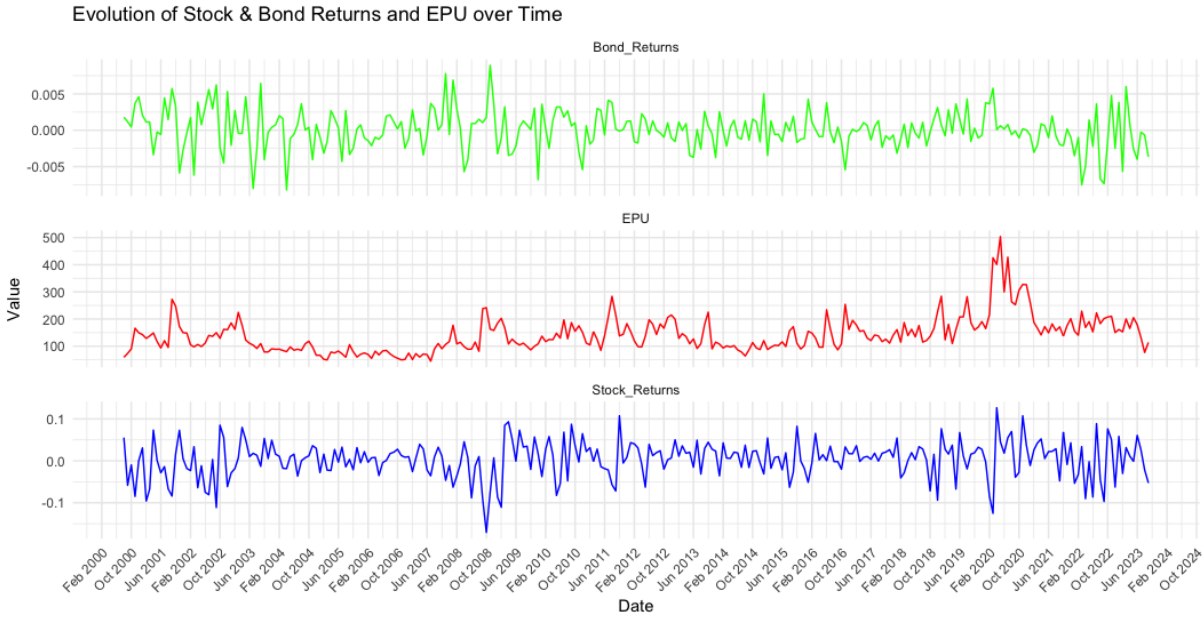
Empirical Results

In this section, we analyze the empirical results of our models through different spectrums. We will first make a description of the data used regarding its evolution through time, summary statistics, as well as the correlation matrix regrouping all the variables used in the models described in the section above. We will then analyze the results of these regression models, starting with the impact of EPU on stock returns, to move on then to the assessment of this impact on the bond returns, and finish with the analysis of the stock-bond returns correlation affectation by uncertainty. Finally, the last part of this section will be dedicated to the assessment of the country-specifics.

Descriptive Statistics

Summary Statistics

In a first time, we observe the graph of the evolution of stock & bond returns in the US and EPU over time. This graph is generated using the entire time range of the data collected which has been described earlier in the data section of this paper.



Graph 1: Evolution of stock & bond returns and EPU over time

In this first graph, we can clearly observe the impact of the Global Crisis in 2008 as well as the crisis brought by the COVID-19 pandemic in 2020. Accompanying these shocks in stock & surge in bond returns, we can easily identify a rise in the uncertainty characterized by the EPU index on the graph. This first overview gives a preliminary insight at a possible negative correlation between the EPU index and the stock returns, and a positive play with bond returns.

The following table presents the summary statistics for stock returns, bond returns, and the Economic Policy Uncertainty (EPU) index for the United States, covering the period from 2000 to 2023.

Table 2: Summary Statistics for Stock returns, Bond returns, and EPU

Statistic	Stock Returns	Bond Returns	EPU
Observations	278	278	278
Mean	0.0033	0.000055	140.91
Standard Deviation	0.0446	0.0027	65.51
Minimum	-0.1707	-0.0082	44.78
25th Percentile	-0.0199	-0.0013	96.48
Median	0.0083	0.000085	127.9
75th Percentile	0.0306	0.0014	170.07
Maximum	0.1266	0.0089	503.96

The summary statistics provide key insights into the tendencies and variability of the primary variables. The mean monthly stock return is 0.33%, with a standard deviation of 4.46%, indicating high variability. The observed returns range from -17.07% to 12.66%. The mean monthly bond return is approximately 0.005%, with a standard deviation of 0.27%, reflecting the more stable nature of bonds compared to stocks. Bond returns range from -0.82% to 0.89%. The mean EPU index value is 140.91, with significant variability as indicated by a standard deviation of 65.51. The EPU index values range from 44.78 to 503.96, highlighting periods of both low and extreme policy uncertainty.

These statistics underscore the differing characteristics of stock and bond returns, as well as the substantial fluctuations in economic policy uncertainty over the analyzed period. This first understanding is crucial for interpreting the results of the regression models and understanding the broader implications of EPU on financial markets.

Correlation Matrix

In this next subsection, we will analyze the correlation matrix of all the variables used in the different models for the United States.

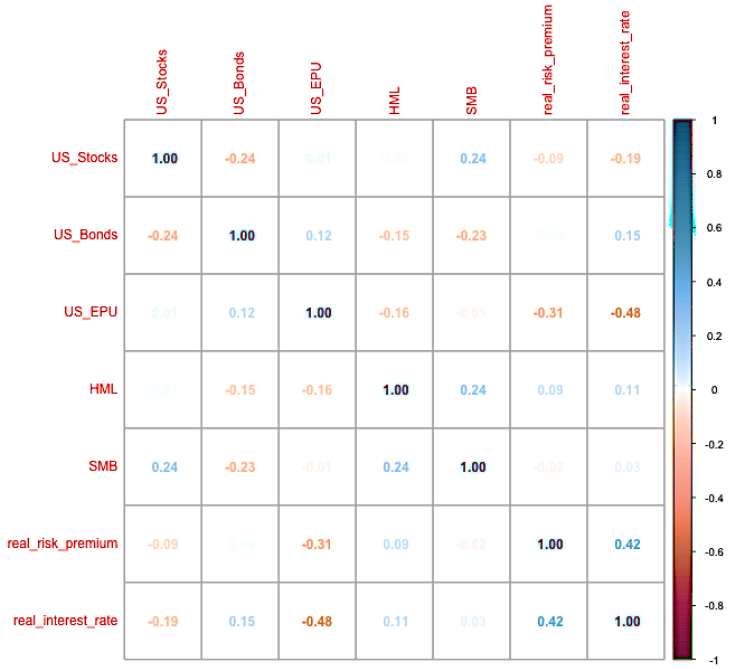


Figure 1: Correlation matrix

From this correlation matrix, we can see that EPU is set to have very little direct association with immediate stock and bond markets performance. This is possibly due to market resilience in the US or highlight a more delayed effect of policy changes on performance. The positive correlation between EPU and bond returns as well as the negative relationship observed between the stock and bond returns aligns with the flight-to-quality theory during times of market stress, where investors might sell stocks and buy safer government bonds, driving down yields and rising prices.

Also, the negative relation between SMB and bond returns informs also on this flight-to-quality phenomenon. In fact, while small-cap stocks will perform well in a growing economic environment, they will suffer during downturns due to their higher operational leverage and less diversified business models. On the other hand, government bonds often perform well during economic downturns as interest rates typically fall, and investors seek safer assets.

Finally, the strong negative correlation observed between the EPU and the real interest rate could be indicative of a central bank's response to uncertainty by lowering interest rates to stimulate investment and consumption when the economic outlook is unclear or risky.

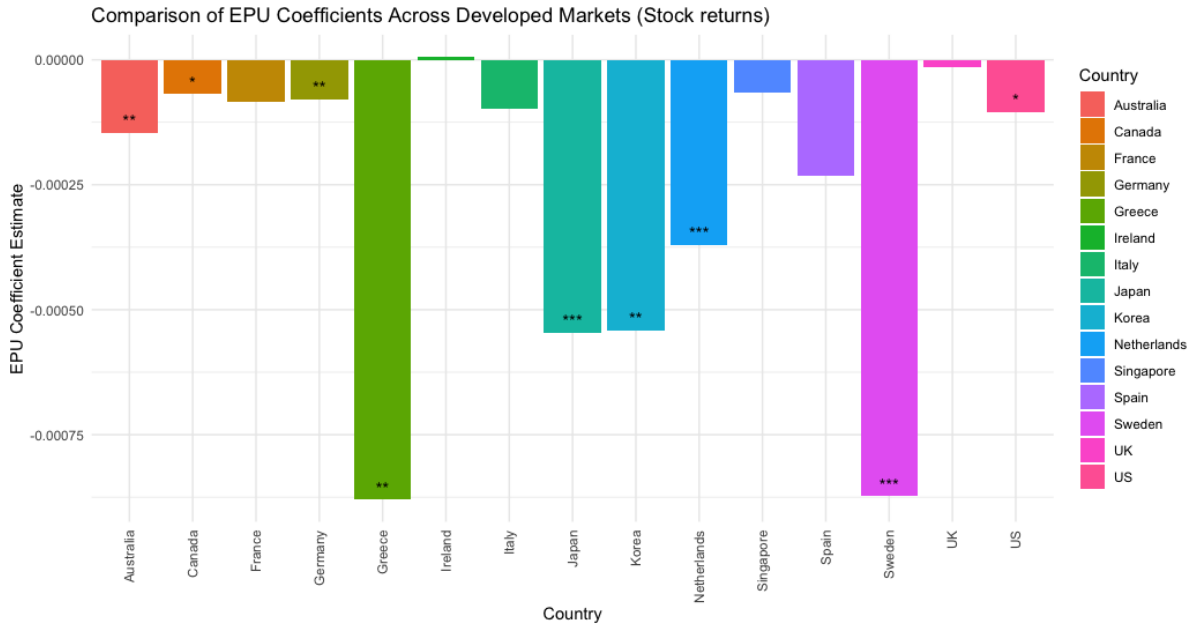
In summary, the descriptive statistics provide a foundational understanding of the data characteristics and preliminary relationships between key variables.

Regression Results Overview

In this section, we analyze the results of the different regression models presented earlier regarding the impact of the EPU index. We will begin with the assessment of the impact of EPU on stock returns, following with the bond returns model, and the impact on the stock-bond returns correlation. Finally, we will briefly delve into the observation of the impact of other uncertainty indexes.

Impact of EPU on Stock Returns

We start by examining the influence of the Economic Policy Uncertainty (EPU) index on stock returns across the 22 countries sampled in the model. The graph below represents the EPU coefficient estimate per developed country. The stars on each column indicate the significance level, with one star being 5% confidence, two stars 1%, and three stars 0.1%.

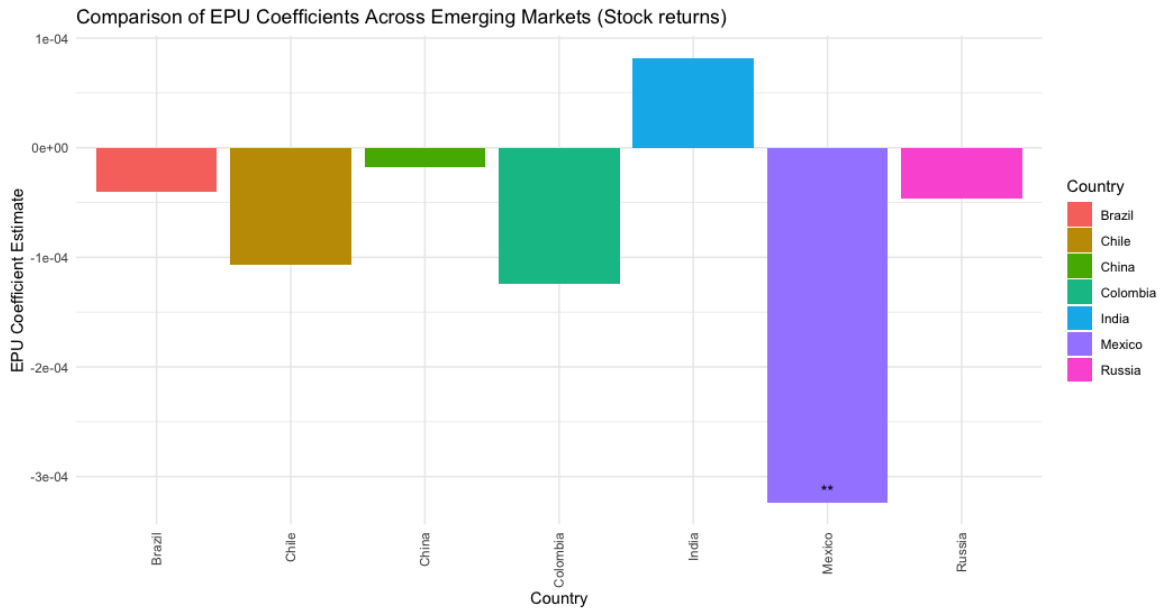


Graph 2: Comparison of EPU coefficients across developed markets regarding stock returns

From this graph, we observe that the regression coefficients for EPU are predominantly negative across the different countries, suggesting that an increase in policy uncertainty would lead to a decrease in stock returns. Also, as the negative EPU influence is found to be significant for several countries, this confirms that the impact is not uniform but varies across nations, confirming the papers analyzed during the literature review (Phan et al., 2018). The most significant effects are observed in Greece, Japan, Korea, and Sweden, suggesting that stock returns in these countries are particularly sensitive to changes in policy uncertainty.

The significant negative coefficients in Australia, Canada, Germany, Greece, Japan, Korea, Netherlands, Sweden, and the US suggest there is a significant impact on stock returns on these markets. In this case, the EPU's significant impact highlights the relevance of this index on financial markets.

Also, the high negative influence of EPU in Greece, Japan, and Korea is interesting. With a magnitude of the coefficients among the highest, this result could be linked to the economic challenges that have recently marked their economic landscape with periods of fiscal and monetary policy adjustments (Revuelta, 2021 & Ouraga, 2021).

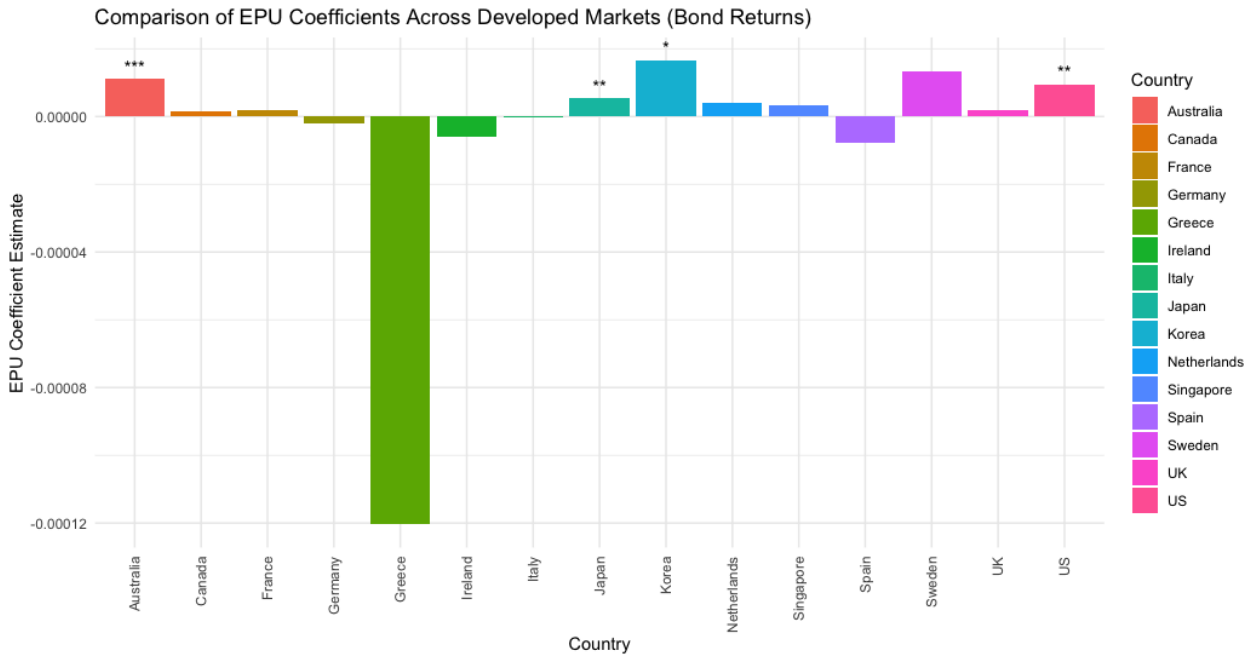


Graph 3: Comparison of EPU coefficients across emerging markets regarding stock returns

The graph shows the influence of EPU on stock returns in emerging markets. The insignificant relationship in these countries could suggest that factors other than the EPU may play a more substantial role in influencing the stock returns. This difference is potentially due to diverse investor bases, regulatory environments, or other economic conditions that we will analyze in a further section of this paper. The exception here is Mexico with a significant negative impact of EPU on stock returns. This could be due to the country's close relations to the US and significant policy changes and reforms.

Impact of EPU on Bond Returns

We will now assess the impact of the EPU index on the bond returns across the 22 countries by running the model previously presented. We will then make a short comparison of these results with the ones of the impact of EPU on stock returns detailed in the last sub-section. Note that the levels of significance are the same as for the last model analysis.

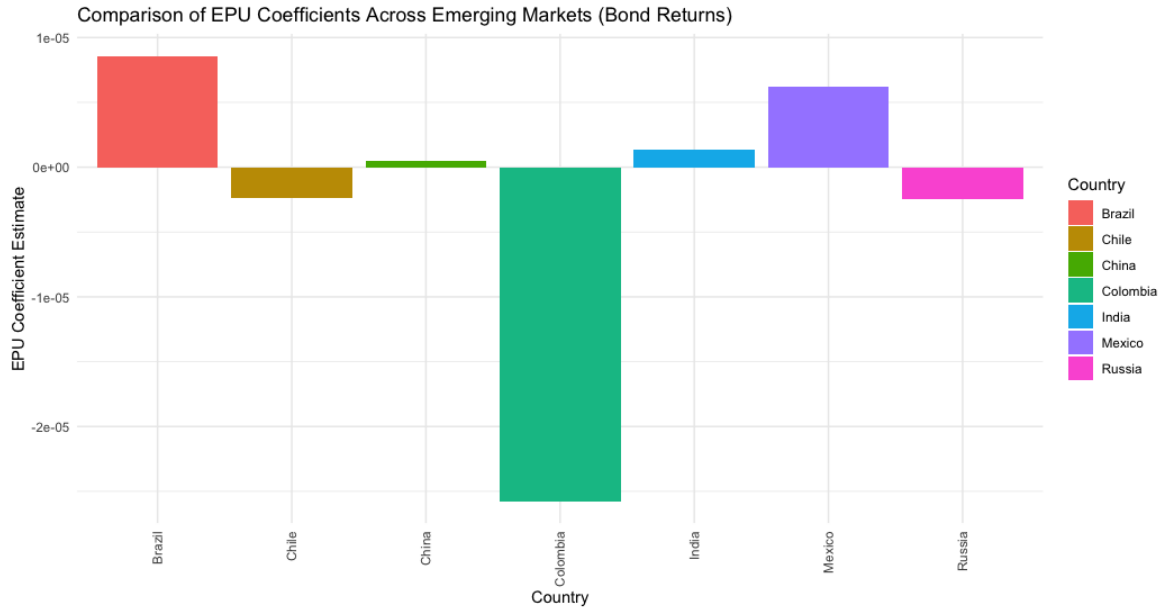


Graph 4: Comparison of EPU coefficients across developed markets regarding bond returns

From this graph of the impact of EPU on bond returns in developed markets, we immediately find a marked positive effect of EPU within the significant rates. Also, with different levels of coefficient estimates across the countries, it confirms that even for the bond market, the effect is not uniform but depends on the country assessed, revealing the importance to assess the national drivers behind such differences.

For the bond markets of Australia, Japan, Korea, and the US, we find a significant positive effect which could induce a flight-to-quality, with investors switching to government bonds as a safe place for their investments. This reaction could reflect the change in risk aversion from the investors which would be less confident in Stocks, increasing the demand in government bonds, thus increasing its price, and reducing its yield. Notably, Australia and Korea stand alone with a high positive level of impact.

Another highlighted country from these results is Australia with the highest significant coefficient estimate by far. This bond market appears thus to be particularly sensitive to EPU, suggesting that uncertainty plays a significant role in investment decisions in Australia where investors will prefer high stability.



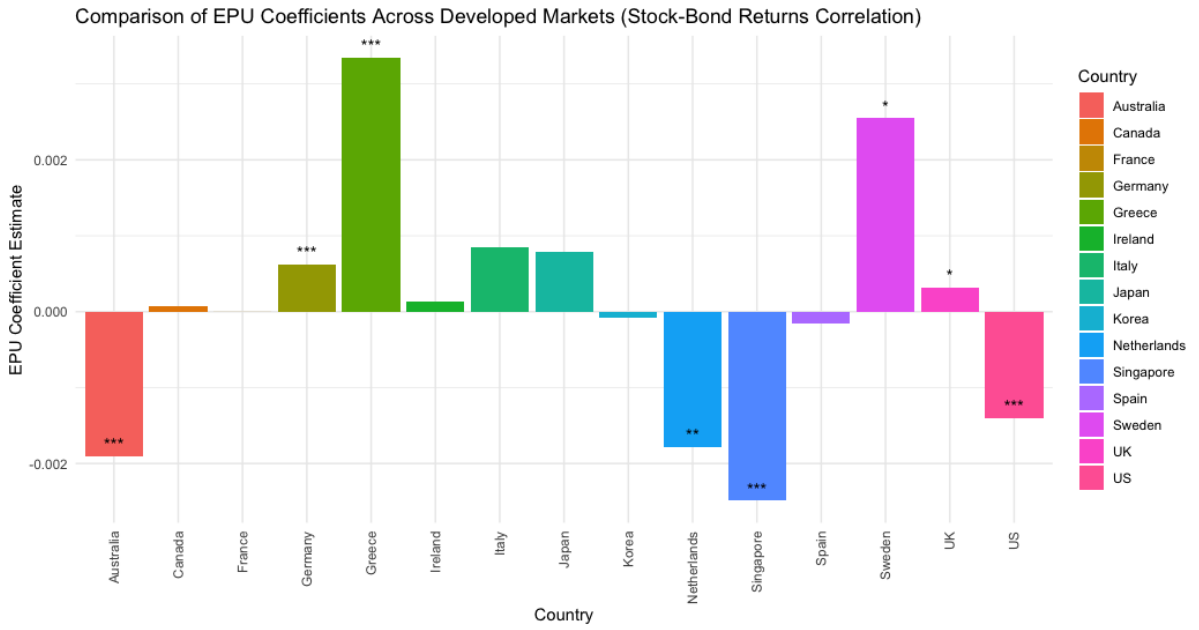
Graph 5: Comparison of EPU coefficients across emerging markets regarding bond returns

From this graph of the influence of EPU on bond returns in emerging markets, we find that none of the emerging bond markets are significantly influenced by EPU. In addition, we observe from the results that the influence of EPU on the bond returns is insignificant in a major part of the countries assessed. This could be due to a variety of factors, including differing investor perceptions, market structures, or the predominance of other local or global forces over EPU in influencing the bond markets of these regions.

When comparing the results of the last model, we observe that the direction of EPU's impact was predominantly diverging among the significant countries in both analyses. Also, the level of statistical significance and the magnitude of EPU's impact appear more pronounced in the stock market for certain countries. This difference could be due to the stock market's higher sensitivity to immediate economic and policy changes, where the bond market might react differently due to its different nature and investor base.

Impact of EPU on Stock-Bond returns correlation

In this section, we will analyze the influence of EPU on the stock-bond returns correlation using the model of the rolling correlation described earlier. The countries analyzed are still the same as for the other models and the level of significance also follows the same pattern. We will first analyze the effects of EPU in the developed markets, followed by the emerging markets analysis.

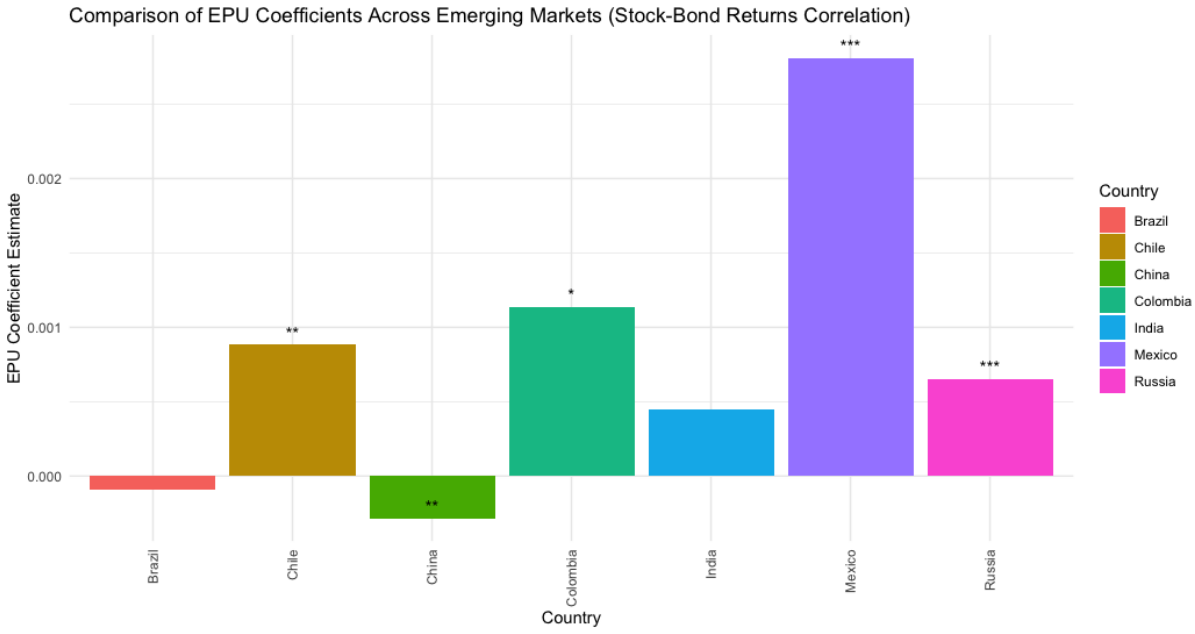


Graph 6: Comparison of EPU coefficients across developed markets regarding stock-bond returns correlation

The regression outputs show heterogeneity in the impact of EPU on the correlation between bond and stock returns, with certain countries demonstrating a statistically significant relationship, both positive and negative, while others do not exhibit significant effects.

In countries like Australia, Netherlands, Singapore, and the US, the EPU has a negative and significant impact on the bond-stock returns correlation, with p-values well below the conventional significance thresholds. Notably, Australia, Singapore, and the US show particularly strong relationships, suggesting that during periods of higher uncertainty, the bond and stock markets in these countries move more opposite directions, showing first insights of a flight-to-quality.

On the other hand, we find a positive and significant relationship between EPU and the stock-bond returns correlation in Germany, Greece, Sweden, and the UK. This relationship gives insights on how the markets in these countries work, highlighting that during periods of high uncertainty, investors in both markets tend to move in concert.



Graph 7: Comparison of EPU coefficients across emerging markets regarding stock-bond returns correlation

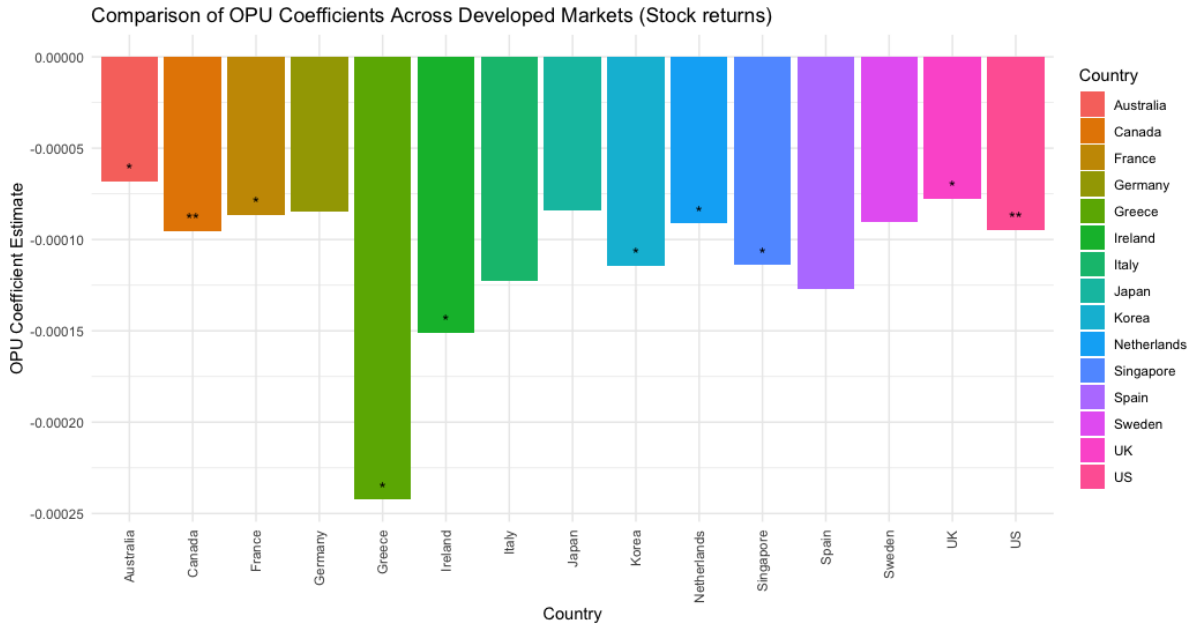
From the graph on the influence of EPU on stock-bond returns correlation in emerging markets, we find a more unified response. In fact, while in the developed countries the influence of EPU on stock-bond returns correlation seems to vary, here the influence seems mostly positive. The exception in this trend is China, which exhibits a significantly negative coefficient. This unified positive response in emerging markets suggests a more consistent interplay between stock and bond markets under economic uncertainty, possibly reflecting less diversified economic structures or different investor behaviors compared to developed financial markets.

For the remaining countries analyzed, the relationship between EPU and stock-bond returns correlation is statistically insignificant. This indicates that the correlation between these asset classes may not be strongly impacted by EPU, or potentially, the effect of EPU is being masked by more dominant factors. This lack of significant impact suggests that in these nations, other economic or financial variables could play a more critical role in shaping the relationship between stocks and bonds under conditions of economic uncertainty.

In comparison with the earlier models assessing the impact of EPU on stock or bond returns alone, this model's findings suggest that EPU has a broader and sometimes different impact on market dynamics when considering the correlation between asset classes. For instance, the presence of significant positive coefficients in the correlation model highlights that EPU can induce a simultaneous investor response across both markets, whereas the stock returns model may show only the isolated impact on stock markets.

Effects of Other Uncertainty Factors

In this part, we will analyze the effects of the other Uncertainty factors. In fact, while this paper is focused on the influence of EPU on the financial markets, we want to have an overview of the effects of the Oil Price Uncertainty (OPU) index, and the Energy-Related Uncertainty Index (EUI). This interesting analysis permits to gain quick insights on the influence of these factors from a country-specific point of view, opening the path for future research on the subject.



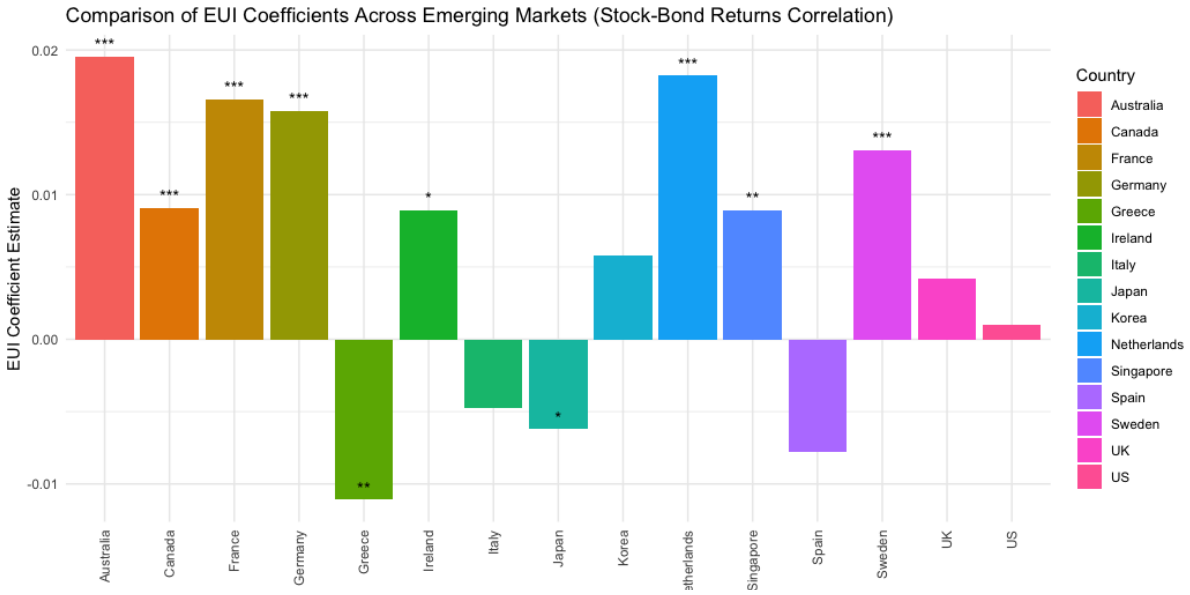
Graph 8: Comparison of OPU coefficients across developed markets regarding stock returns correlation

On graph 8, we observe that the impact of OPU on the stock returns is significant for the great majority of the countries assessed. While its negative impact is still moderate, it highlights the importance of the oil price for many countries and investors on the market. This importance could be explained by the fact that for countries that are net importers of oil, their national companies would face higher costs during uncertainty periods and thus reduce the profit margin and future stock price predictability.

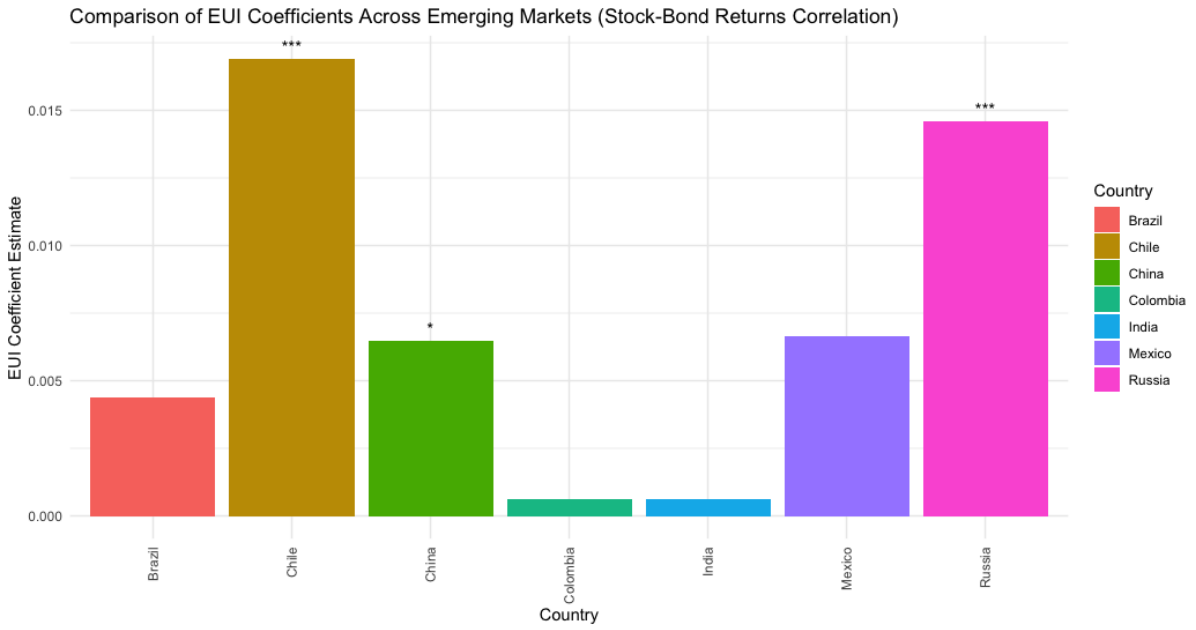
Also, volatile oil prices often lead to inflationary pressures as they increase the cost of goods and services throughout the economy. Higher inflation can erode purchasing power and reduce consumer spending, which is detrimental to economic growth. Central banks might respond by raising interest rates to curb inflation, which can further lead to lower stock prices due to higher discount rates applied to the valuation of future cash flows of companies.

Finally, oil price volatility adds a layer of uncertainty to the economic landscape. For businesses, unpredictable costs complicate budgeting and operational planning. For investors, the uncertainty can lead to higher risk premiums demanded on investments. Both scenarios are conducive to negative sentiment in the stock market. Overall, these statements are in accordance with the paper of Abiad and Qureshi (2023) regarding the fact that the OPU has a significant influence on world industrial production.

We will now assess the impact of the Energy-Related Uncertainty Index (EUI) regarding the stock-bond returns correlation.



Graph 9: Comparison of EUI coefficients across developed markets regarding stock-bond returns correlation



Graph 10: Comparison of EUI coefficients across emerging markets regarding stock-bond returns correlation

Regarding these two graphs (graph 9 & 10), we discover a significant positive impact of EUI on stock-bond returns correlation for many countries. This gives new insights on how the investors are reacting on each market. In fact, the countries where the impact is found to be the most significant are major importers and exporters of energy of all kinds. For those energy exporters, EUI can signify volatility in revenue from energy exports, directly impacting the economy and fiscal health. Uncertainties in energy markets could lead to decreased investor confidence in both markets of these countries. Also, in response to energy uncertainties, governments might adjust their spending and investment patterns, affecting government bond yields. If fiscal stability is threatened, bond yields might rise due to perceived higher risk, moving bond prices down, in the same direction as stock prices if the latter decline due to reduced economic prospects.

Overall, these two indices reflect the uncertainty on the financial markets focusing on different sectors that are crucial to many countries. Further research would be interesting regarding causality and the different sector and country specific reactions to oil and energy uncertainty.

Country-Specific Analysis

In this section, we assess the differences in the influence of EPU on stock and bond returns across the 22 countries analyzed and explore the potential explanations for these variations.

Stock Returns

We start by analyzing the differences in the influence of EPU on the stock returns across the 22 countries. The table regroups the precise p-values and the estimate coefficients of EPU parameters for each country assessed.

Table 2: results from regression model on stock returns

Country	Estimate	P.Value	Significance
US	-0.0001049	0.02845219	*
UK	-1.421E-05	0.4462118	
Sweden	-0.0008879	1.0068E-05	***
Spain	-0.0002314	0.14706859	
Singapore	-6.526E-05	0.22111815	
Netherlands	-0.0003702	2.7771E-05	***
Korea	-0.0005559	0.00080973	***
Japan	-0.0005429	5.8106E-07	***
Italy	-9.863E-05	0.42003381	
Ireland	5.803E-06	0.91963074	
Greece	-0.0008802	0.00271087	**
Germany	-7.877E-05	0.00676989	**
France	-8.56E-05	0.05391908	
Canada	-6.94E-05	0.01515403	*
Australia	-0.0001456	0.00112662	**
Brazil	-4.058E-05	0.34382655	
Chile	-0.0001068	0.08944484	
China	-1.764E-05	0.55920518	
Colombia	-0.0001246	0.19958522	
India	8.1959E-05	0.71480254	
Russia	-4.624E-05	0.2895419	
Mexico	-0.0003234	0.00231927	**

The results from this table indicate a significant difference between countries regarding their vulnerability to EPU. In fact, developed economies with significant coefficients (like Australia, Canada, Germany, the US, …) may have stock markets that are particularly reactive to domestic policy uncertainty for various reasons. First, this may be explained by the advanced maturity of the market. In fact, these markets typically have more mature financial systems where policy decisions are matching stock movements due to an easy and efficient access to information for the investors (Goldstein & Yang, 2017).

Second, developed markets often have a higher proportion of institutional investors who could respond more quickly to policy uncertainty (Davis & Steil, 2004). Finally, stringent regulatory frameworks in these countries might mean that policy changes have a broad impact on corporate operations and profitability.

In contrast, emerging economies like Chile and Mexico display a more mixed and less pronounced negative relationship between EPU and stock returns. This could be explained by the lack of information dissemination on those markets where the news may take more time to reach the investors. This downturn in efficiency may thus delay the pricing of EPU on stock returns in those economies, which would then not be captured by our non-lagged model. Also, a less diverse investor base, with more retail participation, could result in a more muted or delayed response to uncertainty. In the end, in some emerging markets, policy decisions may be less predictable which could lead to a chronic state of uncertainty that might be less distinguishable from the "normal" state of market volatility (Kohers et al., 2006).

Additionally, developed markets, with their deeper integration into global finance, might show a uniform negative impact due to a 'globalization' effect where investors across these markets respond similarly to national policy uncertainty. Developing markets, with their more localized investment climates, may not exhibit such uniformity.

Next, in countries like Japan and Korea, the high sensitivity and negative correlation between stock returns and EPU can be linked to the historical interconnections between corporate structures and governmental frameworks. Specifically, the closely knit conglomerates (Keiretsu in Japan and Chaebol in Korea) exhibit deep-rooted affiliations with government policies, rendering their market performances particularly vulnerable to shifts in policy uncertainty. These conglomerates, which encompass various interconnected companies across multiple industries, often rely heavily on government contracts, subsidies, and regulations (Kuk, 1988 & Choi et al., 2008). As a result, any fluctuation in political climate or policy directives can lead to significant impacts on their operational stability and financial health. This interdependence means that when policy uncertainty escalates, these conglomerates face increased risks, leading to more pronounced market reactions. The investors, aware of these sensitivities, may react more sharply to EPU changes, driving greater volatility in the stock prices of these companies.

Moreover, the significant role these conglomerates play in their respective national economies amplifies their impact on the broader stock market, making the market indices of Japan and Korea particularly reactive to changes in policy uncertainty.

Also, in China, the influence of EPU is found to be insignificant. In this country, where the government has a significant intervention, the market might experience policy buffering as its politics will strive to enhance market stability through multiple interventions. (Brunnermeier et al., 2021). Indeed, strong government control over economic affairs could buffer stock markets from the immediate impacts of policy uncertainty. Also, the size and diversity of this market mean that no single factor, like EPU, is dominating stock market behavior.

Bond Returns

We will now assess the country-specific impact of EPU on bond returns and compare it to the previous analysis on the stock returns.

Table 3: results from regression model on bond returns

Country	Estimate	P.Value	Significance
US	9.3999E-06	0.00107286	**
UK	1.741E-06	0.14743713	
Sweden	1.3332E-05	0.08780136	.
Spain	-7.688E-06	0.34888367	
Singapore	3.2091E-06	0.15075917	
Netherlands	4.1945E-06	0.26569174	
Korea	1.6503E-05	0.03120455	*
Japan	5.3127E-06	0.00260124	**
Italy	-3.001E-07	0.95851117	
Ireland	-5.824E-06	0.35086635	
Germany	-2.089E-06	0.05994706	.
Greece	-0.0001204	0.18972284	
France	1.7913E-06	0.33906162	
Canada	1.4752E-06	0.34996291	
Australia	1.1043E-05	0.00010642	***
Brazil	8.5765E-06	0.53074161	
Chile	-2.387E-06	0.74065167	
China	4.6851E-07	0.70148992	
Colombia	-2.575E-05	0.26626737	
India	1.3107E-06	0.74518734	
Russia	-2.496E-06	0.72032772	
Mexico	6.2076E-06	0.32897712	

First, in developed countries like the US and Australia, the results demonstrate a significant positive influence of EPU on bond returns. The findings can be attributed to the high responsiveness of the investors to policy uncertainty.

In fact, this can lead the market's stakeholders to react quickly to any uncertainty that may arise in these countries. In response to rising uncertainty, there is a predictable shift towards safer assets, predominantly government bonds, which are considered low-risk investments during volatile periods. This shift results in a surge in demand for these bonds, subsequently driving down their yields as prices rise. The underlying mechanism involves risk aversion, where investors seek to preserve capital in the face of uncertain fiscal, monetary, or political landscapes. This flight-to-quality behavior, also discovered in the work of Leippold and Matthys (2022b), will be deepened in the following section on the influence of EPU on the stock-bond returns correlation.

Also, the high significance of the impact of EPU on bond returns in the US may be explained by the fact that this market plays a role as a global financial hub. In fact, investors in this country may perceive EPU as a signal of broader economic instability which could lead to a flight to quality. This behavior could then increase the demand for government bonds and thus depressing yields, driving up prices. In fact, in the chapter 4 of their book, Haberly and Wójcik (2022) explain that national decisions between the two hubs of London and New-York have fueled the global financial crisis of 2008. Thus, policy uncertainty in these financial hubs could easily spread and amplify to a global level, raising the alarm for the investors.

Moreover, Germany exhibits a slightly negative response to EPU on its government bonds market with a p-value close to being significant (0.0599). This intriguing result can be explained by the fact that Germany benefits from a high degree of economic stability and integration with the EU. In fact, the solid German economic fundamentals may tend to buffer the bond market against extreme volatility.

Next, Japan and Korea both exhibit a positive and significant influence of EPU on bond returns. The Japanese government's high debt level and long-standing deflationary pressures in Japan might explain that investors are more sensitive to a shift in economic policy. Then, Korea being an export-driven economy, its financial markets are highly sensitive to economic policies that could affect trade. Also, with the already exposed conglomerates in this country who have significant interactions with government policies, changing in policies that might affect these conglomerates can lead to shifts in economic expectations and investor behavior in the bond market. Overall, all these reasons may induce a flight-to-quality observed in other developed markets.

Then, on the emerging markets, we find a mixed and insignificant impact of EPU on bond returns. This suggests that EPU might not be a predominant driver for bond market movements, possibly overshadowed by local economic factors. For example, in Mexico, the Interest Rate and the HML play a major role in influencing the bond returns. Also, the reasons for the lack of transparency and market maturity exposed for the stock returns can be applied in the case of bond returns as well.

Additionally, the highly insignificant coefficient for China might reflect investor confidence in the government's ability to manage policy uncertainty effectively. Indeed, as we have seen earlier, the Chinese government is highly active on the market. This leads to a certain predictability of the financial markets (Long et al., 2015). The investors in China might then trust the financial system and mitigate the importance of EPU.

Further, Greece shows a highly negative but non-significant impact of EPU on bond returns. This could be explained by the fact that this country is struggling with high levels of public debts. Thus, investors may already expect a certain degree of policy uncertainty on this market. This expectation could be incorporated into bond prices, making the response to a delta in EPU less significant.

Finally, as we can observe from the results of this regression model, most of the countries do not share a significant level compared to the stock returns model. This could imply some variations in the reactions and sentiments of the investors in the two different financial markets. In fact, investors might react differently by taking into account a larger time horizon to make decisions on the bond markets than for the stocks. Also, the stakeholders might consider different factors on the two markets.

In summary, the country-specific analysis highlights the varying impact of EPU on financial markets across different nations. Developed markets exhibit more pronounced responsiveness to EPU, driven by mature financial systems and institutional investor behaviors. Emerging markets show more varied responses, influenced by local economic conditions, market maturity, and government interventions. Understanding these differences is crucial for developing tailored investment strategies and policy frameworks that account for the unique characteristics of each market.

Stock-Bond Returns Correlation

We will now have a look at the influence of EPU on the stock-bond returns correlation and continue to assess the common points and differences between the countries.

Table 4: results from regression model on stock-bond returns correlation

Country	Estimate	P.Value	Significance
US	-0.0014048	1.6944E-05	***
UK	0.00031682	0.04903089	*
Sweden	0.00254554	0.02804232	*
Spain	-0.0001502	0.8900338	
Singapore	-0.0024911	1.4816E-12	***
Netherlands	-0.0017793	0.00284961	**
Korea	-7.821E-05	0.92529693	
Japan	0.00078812	0.23582593	
Italy	0.00084931	0.13505152	
Ireland	0.00012744	0.713586	
Greece	0.00334329	3.3003E-05	***
Germany	0.00061864	0.00011055	***
France	1.3481E-06	0.99604477	
Canada	6.8989E-05	0.73720471	
Australia	-0.0019005	3.0775E-06	***
Brazil	-8.994E-05	0.66717702	
Chile	0.00088181	0.00103235	**
China	-0.0002829	0.0055224	**
Colombia	0.0011358	0.01056454	*
India	0.00044664	0.68150687	
Russia	0.00065341	6.8934E-05	***
Mexico	0.00281052	0.00037987	***

First, regarding the developed economies of Australia, Singapore, Netherlands, and the US, we find a significant and negative impact of EPU on stock-bond returns correlation. This result suggests that when policy uncertainty rises, both market returns tend to move in opposite directions. This confirms a flight-to-quality during periods of uncertainty in these countries. Indeed, when stocks are negatively affected by the Policy Uncertainty, the market's stakeholders may opt for government bonds as a safer place. This higher demand in bonds will translate into a higher price and thus a lower yield. This movement tends to be predominant in these highly developed markets as the investors can easily anticipate the reaction of the policymakers to such an uncertainty. Adversely, this confidence might not reflect in some emerging markets, which could be a reason for their mainly positive coefficients.

On the other hand, the emerging market of China exhibits a negative coefficient. The fact that the coefficient is found to be one of the smallest might suggest that the influence of the government on the financial markets could mitigate the flight-to-quality effect observed in other countries. Indeed, to strengthen the stability of its markets, the Chinese government runs multiple interventions that might mitigate the effects of uncertainty periods more than in other economies, like the United States. As an example, if the stock market falls and the government reacts by buying shares of companies to compensate for this downturn, this will soften the fall of the stock returns, and less movement will be observed between the two asset classes.

Afterwards, the developed markets of Germany, Greece, Sweden, and the UK, are marked by a positive impact from EPU on the stock-bond returns correlation. In these countries, a positive coefficient could imply that, while stocks are adversely affected by uncertainty (leading to lower prices and returns), bonds do not experience a corresponding increase in price (decrease in yield) that would suggest the flight-to-quality phenomenon exposed earlier. Instead, bonds may also be negatively affected, or they may not react as strongly as expected to the uncertainty. This variation in reaction can be explained by multiple factors. First, if the investors expect the interest rates to rise (possibly due to inflation fears), bond yields may not decrease during times of uncertainty. Instead, they might hold steady or increase, which would counter the typical flight-to-quality observation. Then, in countries with fiscal challenges or where government bonds are seen as risky (e.g., during sovereign debt concerns in Greece), EPU might not lead to lower bond yields.

Next, Colombia, Mexico, and Chile significant positive correlation indicate that uncertainty could be leading to investors having the same reaction on both stock and bond markets. An explanation could be that the economic structures of these countries, heavily influenced by commodity exports, mean that policy changes impacting trade or regulation can simultaneously depress stock and bond markets. Also, like many emerging markets, those countries may be particularly sensitive to the sentiment of foreign investors, who might rapidly adjust their portfolios away from stocks towards fixed income or even out of the country in response to heightened policy uncertainty, affecting both bond yields and stock returns in the same direction. This is confirmed by the work of Giofré (2022) which highlights that during periods of crisis, the international investors are seeking safe assets by diverging on more developed national markets like the ones members of the G7.

Finally, the results for Russia are worth analyzing. In fact, Russia shows a positive and significant relation with EPU which indicates a concordance in the reaction on the two different asset markets. First, Russia is mostly active in the energy sector, this dominance can be hardly affected by disruption in this sector as well as by any sanction from another country. These disruptions can force the investors to reconsider holding Russian assets as the overall economic outlook of the country is uncertain. This downturn can be even more pronounced in this country as foreign investors are a significant part of its markets. This loss of trust and future forecast can lead to more EPU which will negatively affect the stock market as well as the government bonds.

In conclusion, this country-specific analysis has underscored the various impacts that EPU may have across financial markets. We highlighted clear differences between the reactions of developed and emerging financial systems, where developed markets exhibit a more pronounced responsiveness to EPU. Also, specific markets like Japan and Korea display higher sensitivity, reflecting their unique corporate-government dynamics. Simultaneously, large economies like China show less sensitivity to EPU, hinting at the mitigating influence of government's interventions. Next, we discovered that bonds in global financial centers respond significantly to EPU, suggesting an investor tendency towards risk aversion and quality. Collectively, these insights reveal that EPU's influence is multifaceted and varies according to each nation's economic system and situation, investor behavior, and the clarity of policy direction.

Discussion

This discussion part is where the interpretation of the findings will be driven, assessing the potential theoretical implications as well as the practical ones. In fact, we will delve into the difference the analysis of EPU can make for the international market and its different stakeholders. Then, we will close this section with an explanation of the different limitations of this work as well as the potential future research directions on this subject.

Interpretation of Findings

Here, we will start by assessing the theoretical implications of our findings and then continue with the practical and policy implications.

Theoretical Implications

The findings of our research highlight the fact that the EPU universally impacts financial markets, but with a different magnitude across countries. This suggests a need for analysis models to dynamically incorporate EPU indicators, adapting to the varying ways uncertainty affects investor expectations and market valuation. For example, an advanced asset pricing model might weight the EPU index more heavily for markets shown to be particularly sensitive to its influence, improving its predictive accuracy for each different market.

Also, the highlighted contrast between the significant impacts of EPU in developed markets (e.g., US, Australia, …) versus its insignificance or lower impact countries like Brazil and Chile underscores the importance of economic structure and information flow in financial sensitivity to policy uncertainty. Our results support the hypothesis that stock and bond returns are more affected by EPU in highly internationally open markets. Developed markets, such as the US, Australia, and Germany, which are highly integrated into the global financial system, show pronounced sensitivity to EPU. This is likely due to their more mature financial systems and the influence of institutional investors who react swiftly to uncertainty. Conversely, the hypothesis that stock and bond returns are less affected by EPU in highly regulated markets is partially supported. For instance, Japan and Korea exhibit significant sensitivity to EPU despite having substantial regulatory frameworks. This suggests that while regulation can buffer markets, it does not entirely mitigate the impacts of policy uncertainty, particularly in markets with complex corporate-government dynamics.

These findings can serve as a basis for future theoretical models that account for the economic maturity and international integration of markets. This could offer a framework to predict how different markets might react to similar policy uncertainty shocks.

Next, the different results across countries open the analysis of the varying stakeholders' behaviors. In fact, the hypothesis that stock-bond returns correlation is negatively affected by a rise in EPU in developed markets is confirmed in countries such as Australia, Singapore, and the US. During periods of high EPU, investors shift towards safer assets like government bonds, resulting in a negative correlation between stock and bond returns. This "flight-to-quality" behavior aligns with traditional financial theory. This flight-to-quality aligns with the expected investors' reaction regarding a risk-averse behavior. Similarly, the hypothesis that stock-bond returns correlation is positively affected by a rise in EPU in emerging markets is largely supported. In emerging markets like Mexico and Chile, the correlation between stock and bond returns tends to be positive under high EPU, indicating that policy uncertainty affects both asset classes similarly, possibly due to less diversified economic structures and foreign investor behaviors that tend to seek for safer assets in developed economies during high EPU. However, we found that the reaction to uncertainty can vary regarding the government influence on the market and geopolitical situation (e.g., Russia, China), reinforcing the necessity to consider each market to be different and not responding to universal rules when building diversification strategies. This could influence how portfolios are diversified internationally to manage risk.

Finally, the destabilizing effect of EPU on financial markets, evidenced by the negative stock returns and altered stock-bond correlations, highlights the role of clear and consistent policy making in market stability.

Practical Implications

First, the varied reactions to EPU underscore the importance of incorporating such indices into risk management. For instance, a risk manager observing the significant negative impact of EPU on stock returns in Japan might increase the portfolio's bond allocation or seek hedging options during periods of rising EPU to protect against expected stock market downturns.

Then, businesses and investors located in markets which showed a very high sensitivity to EPU, like Greece, could lobby for policies that minimize uncertainty, fostering transparency and stability in future economic policies.

These stakeholders could be doing so by participating in public consultations or policy forums to emphasize the economic costs of uncertainty for private companies and government.

Also, the findings suggest adapting investment strategies to prevailing levels of EPU. As an example, during periods of high EPU, an investor might reduce exposure to equities in highly sensitive markets like Greece, and instead increase holdings in less sensitive or negatively correlated assets, such as bonds in markets where EPU has a lesser or opposite effect on bond returns. This differential impact of EPU on market sensitivities also illustrates the importance of dynamic portfolio diversification. In fact, an investor might diversify not just across geographic regions but also consider the EPU sensitivities of those regions, reducing exposure to regions where markets are highly sensitive to policy uncertainty, thus crafting a more resilient portfolio.

Finally, financial analysts can improve market forecasts by incorporating EPU indices, especially in sensitive markets. For instance, an analyst might adjust growth forecasts downward for the equity markets of countries like Japan and Korea during periods of anticipated high EPU, while also advising on the potential for bond market gains in the same regions, based on observed reactions to policy uncertainty.

Policy Implications

From the results and implications exposed above, some insights could inform the policymakers about the right frameworks and improvements to the actual financial system to foster better management of the markets.

First, as we have seen in the previous sections, EPU has a consequent negative impact on stock returns in developed countries. This adverse effect is affecting market confidence as well as economic performance and is something policymakers have to minimize. This minimization can come from greater transparency and predictability of the policy-making processes. For instance, central banks might adopt more transparent communication strategies regarding monetary policy, providing clearer guidance on future interest rate paths or easing measures. These measures could mitigate the market volatility associated with policy uncertainty observed in the results. Also, taking into account similar reactions to EPU in developed markets, global institutions like the IMF or the G20 could play a major role in fostering global dialogue and cooperation on economic policy matters.

Indeed, synchronizing as much as possible policy response during times of high uncertainty might help dampen the global spillover effect of some influential nations.

Also, the observation that EPU can lead to flight-to-quality movements, with investors seeking refuge in government bonds during periods of high uncertainty, underscores the role of confidence in economic policy. In order to improve the confidence of the investors in the market, governments could implement policies aimed at ensuring fiscal sustainability and present them as clearly as possible to the market's stakeholders.

In conclusion, fostering transparency and predictability of policy-making processes could lead to more confidence from investors and improved market efficiency. In emerging markets, a need for better infrastructure and communication is crucial to improve resilience to external shocks and enable the investors to make more informed decisions. Finally, clear roadmaps aiming at exposing the clear government's commitment to fiscal stability might reassure investors in the country's ability to respond to uncertainty.

Limitations and Future Research Directions

This analysis of the impact of the EPU on the stock and bond returns as well as their correlation, is facing some limitations in its actual state. First, assessing a large number of countries demands for less flexibility in the choice of the variables that are going to be used in the different models. By choosing variables that are not specific to each country, some of the information on the real impact of EPU is lost. This could imply that some countries found not significantly impacted by EPU could be, in reality. The purpose of this work is to give an overview of the international influence of the EPU on the financial markets and spot the different drivers of that impact for each country. However, a future direction would be to have models tailored for each country, assessing in more detail the drivers behind policy uncertainty, and delve deeper into the analysis proposed in this paper. Furthermore, more explanatory variables can be used in the model to improve its reliability regarding the financial markets' reality.

Secondly, another path for future research on the subject would be to assess the vulnerability of each country to the global EPU that is also proposed in the database used for this work. This would permit us to have another vision on which countries are more exposed to global policy uncertainty and assess the different drivers behind the possible variation across countries. Also, assessing the influence of EPU spreading across countries might reveal insightful results. In fact, modeling the impact of national EPU on other nations' markets could lead to advanced understanding of the influence each country has on the international market. This would help the investors to better manage national portfolios regarding what is happening in other countries with potential high spread on local markets.

Next, one significant limitation of this research involves the treatment of temporality between EPU and market reactions, specifically the potential lag effect. In our analysis, we assumed a uniform response time across different markets and countries to variation in EPU. However, the reaction and timing can vary considerably due to factors like market efficiency, investor behavior, and the speed at which information is assimilated into market prices. This limitation is critical as it may lead to an underestimation or overestimation of the true impact of EPU, particularly in more volatile or less transparent markets.

Consequently, future research could consider more complex models that incorporate variable lag structures, to capture the delayed effects of EPU more accurately across diverse economic and regulatory environments. This approach could significantly enhance our understanding of the temporal dynamics between policy uncertainty and market behavior, providing a clearer picture of the causality and magnitude of these effects in different global contexts.

Then, as we have quickly explored in a section of this paper, the modeling of the impact of other uncertainty indexes like the OPU or the EUI might be interesting as well. Indeed, assessing the grouped impact of those indexes jointly with EPU might give a broader vision on the impact of uncertainty on financial markets. Moreover, exploring these relationships might help identify whether these uncertainties compound each other's effects or if they operate independently, influencing the markets in varied ways. Further studies could also investigate whether the sensitivity to these uncertainty indexes varies across other types of assets. This differentiation could provide deeper insights into the risk management strategies that financial institutions might adopt in response to rising uncertainties.

Finally, while this paper gives first insights on the impact of EPU on specific local indices and government bonds, the reality of portfolio management can be more complex. In fact, a diversified portfolio would contain various stocks and bonds coming from across the globe, and not only national indices. As a result, further research on the subject could assess the impact of different national EPU's or global EPU on specifically constructed portfolios that would represent a more realistic picture of the investments made by the different stakeholders.

In conclusion, this research gives to the different markets' stakeholders an addition to their map to navigate their portfolio through uncertainty. By trying to explain the differences and possible drivers of the varying reactions of the nations, it aims at understanding the international financial market as a whole. This generalization may have led to a lack of precision in mirroring the economic reality of some markets. Thus, next research on the subject could focus on having more parameters tailored to each country. Also, the treatment of temporality on the market using lagged periods might be seen as a next step to this paper. Moreover, the assessment of global EPU, and other uncertainty index jointly with EPU, could reveal new trends of the influence of uncertainty on the financial markets.

Conclusions

Having delved into the multiple impacts of Economic Policy Uncertainty (EPU) on stock and bond returns across various international markets, this thesis has revealed profound insights that add value to both academic perspectives and practical financial strategies. This exploration has dug into the nuanced influences of EPU, revealing that its impact is not a backdrop to financial dynamics but a major force that shapes international markets outcomes in many ways.

The research demonstrated that Economic Policy Uncertainty significantly influences financial markets with varying intensity across different countries and regions. Developed markets often showed a pronounced sensitivity to policy shifts, likely due to their more structured financial systems and the influence of institutional investors who react swiftly to uncertainty. This reactivity, among other national particularities explored, is critical as it not only affects investment strategies but also compels policymakers to consider the implications of their decisions on global financial stability.

Another finding of this research is the influence government interventions may have on the financial markets. Indeed, in markets with high government interventions, like China, the results of the influence of EPU were absent or low compared to other free markets. This highlights the important destabilizing role the government might have on financial markets in an effort to stabilize the economy.

Furthermore, we highlighted that the relationship between stock and bond returns under different EPU conditions could serve as a barometer for investor sentiment and market health. In periods of high uncertainty, the typical flight-to-quality response (where investors shift towards safer assets) was evident, reinforcing the traditional financial theory in the context of modern market behaviors. However, this movement was not universal across developed markets where other macroeconomic and financial trends were affecting the country's vulnerability to EPU. Also, the negative influence of EPU on stock-bond returns correlation on most of the developing markets confirms the flight to developed economies presented in the literature review.

In practical terms, this research equips financial managers and policymakers with the knowledge to better navigate the complexities of global markets. It suggests that investment strategies should be agile, incorporating real-time data on policy changes and market reactions to maintain stability and capitalize on emerging opportunities. Additionally, the findings advocate for enhanced transparency and consistency in policy making, which could alleviate market volatility and foster a more stable investment climate.

Ultimately, this thesis not only contributes to the academic field by filling crucial gaps in our understanding of how EPU affects financial markets but also provides tangible strategies for mitigating the adverse effects of uncertainty on global financial systems.

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Appendix

Appendix 1: Stocks Regression Results for Developed Markets

	US	UK	Sweden	Spain	Singapore	Netherlands	Korea	Japan	Italy	Ireland	Greece	Germany	France	Canada	Australia
(Intercept)	6.18e−02	4.65e−02	8.29e−02	−8.23e−02	7.96e−02	5.55e−02	1.47e−01*	1.39e−01*	9.03e−02	−8.03e−02	2.00e−01	−4.70e−03	−4.91e−02	2.39e−03	6.25e−02
	(5.30e−02)	(4.83e−02)	(6.47e−02)	(1.21e−01)	(6.37e−02)	(5.88e−02)	(7.13e−02)	(6.19e−02)	(1.18e−01)	(8.23e−02)	(1.67e−01)	(6.24e−02)	(5.80e−02)	(4.57e−02)	(4.59e−02)
US_EPU	−1.05e−04*														
	(4.76e−05)														
SMB	−1.11e−01	1.59e−01	−5.79e−02	−8.74e−02	5.14e−01*	7.42e−02	8.31e−01***	6.65e−01***	−2.70e−01	4.42e−01	2.76e−01	−1.70e−01	−3.72e−01+	3.08e−01*	3.25e−01*
	(1.63e−01)	(1.63e−01)	(2.09e−01)	(3.25e−01)	(2.17e−01)	(1.85e−01)	(2.29e−01)	(1.87e−01)	(3.25e−01)	(3.01e−01)	(5.72e−01)	(2.09e−01)	(1.95e−01)	(1.48e−01)	(1.45e−01)
HML	−2.11e−01*	3.18e−01**	−4.77e−01***	6.44e−01**	3.88e−01**	−9.01e−02	−3.66e−01*	−3.26e−02	8.20e−01***	9.99e−02	7.83e−01*	−5.70e−02	4.75e−02	−1.90e−01*	−8.27e−02
	(1.05e−01)	(1.11e−01)	(1.33e−01)	(1.93e−01)	(1.46e−01)	(1.18e−01)	(1.48e−01)	(1.21e−01)	(1.93e−01)	(1.73e−01)	(3.75e−01)	(1.33e−01)	(1.24e−01)	(9.49e−02)	(9.37e−02)
real_risk_premium	−2.46e+00	−3.06e+00	2.28e+00	1.03e+01	−5.41e+00	−1.82e−01	−6.78e+00	−4.87e+00	−6.09e+00	7.80e+00	−1.04e+01	2.86e+00	7.20e+00	2.31e+00	−3.22e+00
	(4.27e+00)	(4.15e+00)	(5.40e+00)	(1.05e+01)	(5.44e+00)	(4.76e+00)	(5.84e+00)	(4.90e+00)	(1.03e+01)	(7.15e+00)	(1.40e+01)	(5.37e+00)	(5.10e+00)	(3.77e+00)	(3.76e+00)
real_interest_rate	−1.25e+00**	−4.66e−01	−2.22e+00***	−2.16e+00	−1.01e−01	−1.58e+00***	−3.48e−01	−1.77e+00***	−3.45e−01	−2.08e+00*	1.37e−01	−1.46e+00**	−1.96e+00**	−1.28e+00**	−6.48e−01+
	(3.98e−01)	(4.57e−01)	(5.38e−01)	(1.85e+00)	(6.34e−01)	(4.37e−01)	(5.26e−01)	(4.36e−01)	(1.66e+00)	(8.24e−01)	(1.26e+00)	(5.18e−01)	(6.09e−01)	(4.20e−01)	(3.49e−01)
UK_EPU		−1.42e−05													
		(1.86e−05)													
Sweden_EPU			−8.88e−04***												
			(1.97e−04)												
Spain_EPU				−2.31e−04											
				(1.59e−04)											
Singapore_EPU					−6.53e−05										
					(5.32e−05)										
Netherlands_EPU						−3.70e−04***									
						(8.68e−05)									
Korea_EPU							−5.56e−04***								
							(1.64e−04)								
Japan_EPU								−5.43e−04***							
								(1.06e−04)							
Italy_EPU									−9.86e−05						
									(1.22e−04)						
Ireland_EPU										5.80e−06					
										(5.74e−05)					
Greece_EPU											−8.80e−04**				
											(2.88e−04)				
Germany_EPU												−7.88e−05**			
												(2.89e−05)			
France_EPU													−8.56e−05+		
													(4.42e−05)		
Canada_EPU														−6.94e−05*	
														(2.84e−05)	
Australia_EPU															−1.46e−04**
															(4.42e−05)
Num.Obs.	267	240	266	144	234	266	267	267	160	162	148	267	267	267	267
R2	0.074	0.048	0.133	0.142	0.072	0.091	0.115	0.158	0.119	0.073	0.113	0.048	0.049	0.068	0.064
R2 Adj.	0.056	0.028	0.116	0.111	0.051	0.074	0.098	0.142	0.090	0.043	0.082	0.029	0.031	0.051	0.046
AIC	−909.1	−884.5	−786.2	−423.3	−738.6	−841.6	−728.2	−834.8	−446.0	−481.4	−262.3	−783.8	−822.5	−963.6	−970.0
BIC	−884.0	−860.2	−761.1	−402.5	−714.4	−816.5	−703.1	−809.6	−424.4	−459.8	−241.3	−758.7	−797.4	−938.5	−944.9
Log.Lik.	461.575	449.262	400.092	218.658	376.299	427.803	371.096	424.375	229.975	247.713	138.132	398.903	418.246	488.799	492.023
F															3.580
RMSE	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.05	0.06	0.05	0.10	0.05	0.05	0.04	0.04

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Appendix 2: Stocks Regression Results for Emerging Markets

	Brazil	Chile	China	Colombia	India	Russia	Mexico
(Intercept)	1.88e−01*	9.98e−02	2.07e−01*	1.46e−01+	1.43e−01	6.93e−02	8.94e−02
	(7.93e−02)	(1.20e−01)	(8.94e−02)	(8.61e−02)	(1.23e−01)	(1.09e−01)	(6.61e−02)
Brazil_EPU	−4.06e−05						
	(4.28e−05)						
SMB	−7.40e−01**	−6.00e−01	−1.63e−01	−2.82e−01	2.30e−01	−7.65e−01*	−3.92e−01+
	(2.42e−01)	(3.63e−01)	(2.83e−01)	(2.57e−01)	(3.94e−01)	(3.46e−01)	(2.07e−01)
HML	1.75e+00***	1.18e+00***	6.58e−01**	1.15e+00***	9.83e−01***	1.31e+00***	9.34e−01***
	(2.09e−01)	(2.77e−01)	(2.48e−01)	(2.26e−01)	(2.55e−01)	(3.03e−01)	(1.64e−01)
real_risk_premium	−1.56e+01*	−7.10e+00	−1.76e+01*	−1.14e+01	−1.22e+01	−5.50e+00	−5.49e+00
	(6.80e+00)	(1.06e+01)	(7.64e+00)	(7.17e+00)	(1.07e+01)	(9.48e+00)	(5.58e+00)
real_interest_rate	3.32e−02	−1.03e+00	1.03e+00	4.87e−01	5.36e−02	2.75e−01	−1.16e+00
	(6.94e−01)	(1.58e+00)	(8.55e−01)	(7.21e−01)	(1.82e+00)	(1.01e+00)	(7.77e−01)
Chile_EPU		−1.07e−04+					
		(6.25e−05)					
China_EPU			−1.76e−05				
			(3.02e−05)				
Colombia_EPU				−1.25e−04			
				(9.68e−05)			
India_EPU					8.20e−05		
					(2.23e−04)		
Russia_EPU						−4.62e−05	
						(4.36e−05)	
Mexico_EPU							−3.23e−04**
							(1.05e−04)
Num.Obs.	201	175	244	222	70	254	181
R2	0.295	0.123	0.052	0.130	0.224	0.100	0.225
R2 Adj.	0.277	0.098	0.032	0.110	0.164	0.082	0.203
AIC	−577.8	−421.1	−582.7	−590.4	−218.5	−492.3	−620.4
BIC	−554.7	−399.0	−558.2	−566.6	−202.8	−467.5	−598.0
Log.Lik.	295.923	217.562	298.340	302.225	116.247	253.139	317.219
F							10.173
RMSE	0.06	0.07	0.07	0.06	0.05	0.09	0.04

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Appendix 3: Bond Regression Results for Developed Markets

	US	UK	Sweden	Spain	Singapore	Netherlands	Korea	Japan	Italy	Ireland	Germany	Greece	France	Canada	Australia
(Intercept)	−2.34e−04	4.46e−03	−9.27e−04	3.47e−03	3.05e−03	1.60e−03	−1.01e−03	−8.73e−04	6.54e−03	1.05e−03	2.07e−03	3.12e−02	3.09e−03	2.77e−03	−9.36e−04
	(3.16e−03)	(2.77e−03)	(2.55e−03)	(3.81e−03)	(2.65e−03)	(2.54e−03)	(3.31e−03)	(1.02e−03)	(4.04e−03)	(7.21e−03)	(2.39e−03)	(4.82e−02)	(2.45e−03)	(2.54e−03)	(2.91e−03)
US_EPU	9.40e−06**														
	(2.84e−06)														
SMB	−6.68e−03	−2.49e−03	−3.95e−03	−5.94e−03	−9.36e−03	3.43e−03	4.33e−04	−1.41e−03	−6.66e−03	−2.74e−02	3.82e−03	−6.28e−02	6.65e−03	−1.21e−03	−3.24e−03
	(9.71e−03)	(9.19e−03)	(8.23e−03)	(1.22e−02)	(8.99e−03)	(7.98e−03)	(1.06e−02)	(3.09e−03)	(1.29e−02)	(2.40e−02)	(8.02e−03)	(1.57e−01)	(8.23e−03)	(8.22e−03)	(9.23e−03)
HML	−1.33e−02*	−1.05e−02+	−5.47e−03	7.18e−03	−1.05e−02+	−4.53e−03	−5.26e−03	3.46e−05	1.35e−02	1.86e−02	−5.47e−03	1.07e−01	−6.61e−03	−1.77e−02***	−1.04e−02+
	(6.27e−03)	(5.90e−03)	(5.23e−03)	(7.89e−03)	(6.10e−03)	(5.13e−03)	(6.86e−03)	(1.99e−03)	(8.35e−03)	(1.54e−02)	(5.11e−03)	(1.02e−01)	(5.23e−03)	(5.27e−03)	(5.95e−03)
real_risk_premium	−1.71e−01	−4.47e−01+	−5.51e−02	−1.92e−01	−3.38e−01	−1.81e−01	−8.36e−02	1.85e−02	−5.41e−01	4.51e−02	−1.39e−01	−1.43e+00	−3.11e−01	−2.98e−01	−6.27e−02
	(2.55e−01)	(2.35e−01)	(2.13e−01)	(3.11e−01)	(2.26e−01)	(2.06e−01)	(2.71e−01)	(8.08e−02)	(3.32e−01)	(6.21e−01)	(2.06e−01)	(4.03e+00)	(2.16e−01)	(2.09e−01)	(2.39e−01)
real_interest_rate	1.06e−01***	6.61e−02**	4.47e−02*	−1.57e−02	5.78e−02*	2.95e−02	4.76e−02+	1.07e−02	7.09e−03	−8.39e−02	1.00e−02	−2.31e−01	4.30e−02+	6.80e−02**	6.05e−02**
	(2.38e−02)	(2.47e−02)	(2.12e−02)	(3.92e−02)	(2.63e−02)	(1.88e−02)	(2.44e−02)	(7.20e−03)	(3.17e−02)	(6.57e−02)	(1.98e−02)	(3.56e−01)	(2.58e−02)	(2.33e−02)	(2.22e−02)
UK_EPU		1.74e−06													
		(1.20e−06)													
Sweden_EPU			1.33e−05+												
			(7.78e−06)												
Spain_EPU				−7.69e−06											
				(8.19e−06)											
Singapore_EPU					3.21e−06										
					(2.23e−06)										
Netherlands_EPU						4.19e−06									
						(3.76e−06)									
Korea_EPU							1.65e−05*								
							(7.62e−06)								
Japan_EPU								5.31e−06**							
								(1.75e−06)							
Italy_EPU									−3.00e−07						
									(5.76e−06)						
Ireland_EPU										−5.82e−06					
										(6.23e−06)					
Germany_EPU											−2.09e−06+				
											(1.11e−06)				
Greece_EPU												−1.20e−04			
												(9.16e−05)			
France_EPU													1.79e−06		
													(1.87e−06)		
Canada_EPU														1.48e−06	
														(1.58e−06)	
Australia_EPU															1.10e−05***
															(2.81e−06)
Num.Obs.	267	267	266	267	238	267	267	267	267	267	267	267	267	267	267
R2	0.093	0.041	0.026	0.009	0.050	0.015	0.027	0.038	0.019	0.014	0.029	0.014	0.019	0.070	0.077
R2 Adj.	0.075	0.023	0.007	−0.010	0.030	−0.004	0.008	0.019	0.000	−0.005	0.011	−0.005	0.001	0.053	0.060
AIC	−2414.3	−2446.3	−2505.7	−2294.7	−2261.5	−2520.8	−2367.2	−3026.8	−2260.9	−1934.6	−2525.6	−927.2	−2511.4	−2507.6	−2442.4
BIC	−2389.2	−2421.2	−2480.6	−2269.6	−2237.2	−2495.7	−2342.1	−3001.7	−2235.8	−1909.5	−2500.5	−902.0	−2486.3	−2482.5	−2417.3
Log.Lik.	1214.165	1230.156	1259.858	1154.367	1137.760	1267.425	1190.623	1520.387	1137.466	974.305	1269.797	470.580	1262.724	1260.805	1228.219
F															4.367
RMSE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Appendix 4: Bond Regression Results for Emerging Markets

	Brazil	Chile	China	Colombia	India	Russia	Mexico
(Intercept)	−5.91e−03	−4.10e−03	−1.70e−03	1.36e−02	1.12e−02***	−1.57e−02	−5.68e−03
	(2.11e−02)	(1.03e−02)	(3.35e−03)	(1.89e−02)	(3.36e−03)	(1.65e−02)	(6.50e−03)
Brazil_EPU	8.58e−06						
	(1.37e−05)						
SMB	−5.21e−03	2.14e−02	1.41e−02	−3.75e−02	−2.02e−03	−2.04e−02	−1.86e−02
	(6.64e−02)	(3.23e−02)	(1.05e−02)	(5.65e−02)	(1.03e−02)	(5.17e−02)	(1.99e−02)
HML	−5.78e−02	2.60e−03	−1.03e−02	3.35e−03	3.53e−03	6.68e−02	−2.95e−02
	(6.03e−02)	(2.96e−02)	(9.57e−03)	(5.14e−02)	(9.38e−03)	(4.71e−02)	(1.81e−02)
real_risk_premium	4.79e−01	2.70e−01	1.40e−01	−9.10e−01	−9.66e−01***	1.34e+00	4.49e−01
	(1.79e+00)	(8.73e−01)	(2.83e−01)	(1.54e+00)	(2.78e−01)	(1.42e+00)	(5.45e−01)
real_interest_rate	−7.71e−02	6.47e−02	−1.16e−02	−2.53e−02	4.49e−02+	−9.45e−02	−3.94e−02
	(1.69e−01)	(8.21e−02)	(2.88e−02)	(1.39e−01)	(2.50e−02)	(1.43e−01)	(5.01e−02)
Chile_EPU		−2.39e−06					
		(7.20e−06)					
China_EPU			4.69e−07				
			(1.22e−06)				
Colombia_EPU				−2.57e−05			
				(2.31e−05)			
India_EPU					1.31e−06		
					(4.03e−06)		
Russia_EPU						−2.50e−06	
						(6.97e−06)	
Mexico_EPU							6.21e−06
							(6.35e−06)
Num.Obs.	267	267	267	267	267	267	267
R2	0.009	0.008	0.014	0.007	0.047	0.013	0.019
R2 Adj.	−0.010	−0.011	−0.004	−0.012	0.029	−0.006	0.000
AIC	−1361.4	−1744.0	−2345.6	−1446.6	−2356.1	−1493.2	−2003.0
BIC	−1336.2	−1718.8	−2320.5	−1421.5	−2331.0	−1468.1	−1977.9
Log.Lik.	687.680	878.977	1179.821	730.285	1185.062	753.592	1008.489
F							1.006
RMSE	0.02	0.01	0.00	0.02	0.00	0.01	0.01

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Appendix 5: Stock-Bond Correlation Regression Results for Developed Markets

	US	UK	Sweden	Spain	Singapore	Netherlands	Korea	Japan	Italy	Ireland	Greece	Germany	France	Canada	Australia
(Intercept)	−2.12e+00***	−2.94e+00***	−2.03e+00***	6.72e−01	−8.19e−02	−1.84e+00***	−4.59e−01	−1.60e−01	5.90e−01	−7.12e−01	−6.51e−01	−2.11e+00***	−2.11e+00***	−2.60e+00***	−1.67e+00***
	(3.71e−01)	(4.29e−01)	(4.02e−01)	(8.38e−01)	(3.96e−01)	(4.18e−01)	(3.82e−01)	(3.92e−01)	(5.82e−01)	(5.09e−01)	(4.70e−01)	(3.67e−01)	(3.84e−01)	(3.49e−01)	(4.37e−01)
US_EPU	−1.40e−03***														
	(3.20e−04)														
SMB	−2.87e+00*	9.86e−01	5.10e−01	5.32e+00*	−7.18e−01	−3.00e−01	−1.37e+00	1.58e+00	1.83e+00	1.40e+00	2.37e+00	7.40e−01	1.37e+00	−7.95e−01	−2.82e+00*
	(1.12e+00)	(1.44e+00)	(1.26e+00)	(2.28e+00)	(1.34e+00)	(1.28e+00)	(1.20e+00)	(1.18e+00)	(1.60e+00)	(1.69e+00)	(1.57e+00)	(1.18e+00)	(1.23e+00)	(1.10e+00)	(1.35e+00)
HML	3.77e−01	−1.53e+00	5.66e−01	−2.95e+00*	−9.85e−01	−9.45e−01	1.24e+00	1.02e+00	−1.90e+00*	−6.57e−01	2.23e+00*	−7.71e−01	−1.23e+00	−9.37e−01	−1.60e+00
	(8.20e−01)	(9.57e−01)	(9.06e−01)	(1.33e+00)	(9.12e−01)	(9.33e−01)	(8.66e−01)	(8.60e−01)	(9.35e−01)	(1.01e+00)	(9.95e−01)	(8.44e−01)	(8.88e−01)	(8.00e−01)	(9.84e−01)
real_risk_premium	1.77e+02***	2.36e+02***	1.38e+02***	−2.65e+01	5.67e+01+	1.77e+02***	3.48e+01	−2.77e+01	−3.13e+01	6.70e+01	3.38e+01	1.50e+02***	1.76e+02***	1.91e+02***	1.55e+02***
	(3.04e+01)	(3.69e+01)	(3.41e+01)	(7.31e+01)	(3.38e+01)	(3.45e+01)	(3.19e+01)	(3.18e+01)	(5.09e+01)	(4.47e+01)	(4.01e+01)	(3.18e+01)	(3.39e+01)	(2.93e+01)	(3.63e+01)
real_interest_rate	−1.36e+01***	−3.91e+00	−1.26e+01***	−1.55e+01	−2.29e+01***	−3.08e+01***	−9.12e+00**	8.14e+00**	1.05e+01	−2.02e+01**	−3.87e+00	−1.32e+01***	−2.60e+01***	3.92e+00	−1.73e+01***
	(2.97e+00)	(3.97e+00)	(3.45e+00)	(1.29e+01)	(3.94e+00)	(3.30e+00)	(2.97e+00)	(2.99e+00)	(8.56e+00)	(6.19e+00)	(3.76e+00)	(3.14e+00)	(4.02e+00)	(3.34e+00)	(3.49e+00)
UK_EPU		3.17e−04*													
		(1.60e−04)													
Sweden_EPU			2.55e−03*												
			(1.15e−03)												
Spain_EPU				−1.50e−04											
				(1.08e−03)											
Singapore_EPU					−2.49e−03***										
					(3.33e−04)										
Netherlands_EPU						−1.78e−03**									
						(5.90e−04)									
Korea_EPU							−7.82e−05								
							(8.33e−04)								
Japan_EPU								7.88e−04							
								(6.63e−04)							
Italy_EPU									8.49e−04						
									(5.65e−04)						
Ireland_EPU										1.27e−04					
										(3.47e−04)					
Greece_EPU											3.34e−03***				
											(7.87e−04)				
Germany_EPU												6.19e−04***			
												(1.57e−04)			
France_EPU													1.35e−06		
													(2.72e−04)		
Canada_EPU														6.90e−05	
														(2.05e−04)	
Australia_EPU															−1.90e−03***
															(3.98e−04)
Num.Obs.	256	229	255	133	238	256	256	256	149	181	202	256	256	256	256
R2	0.225	0.186	0.138	0.130	0.206	0.265	0.049	0.043	0.067	0.074	0.127	0.214	0.247	0.212	0.168
R2 Adj.	0.209	0.168	0.121	0.096	0.189	0.250	0.030	0.023	0.035	0.047	0.105	0.198	0.232	0.196	0.152
AIC	97.4	138.8	144.1	118.7	122.0	166.0	128.3	121.4	40.6	119.6	129.6	113.9	138.4	84.4	191.0
BIC	122.2	162.8	168.9	138.9	146.3	190.8	153.1	146.3	61.6	142.0	152.7	138.7	163.3	109.2	215.8
Log.Lik.	−41.701	−62.398	−65.044	−52.331	−54.009	−75.988	−57.161	−53.723	−13.304	−52.806	−57.781	−49.952	−62.221	−35.176	−88.478
F	14.496	10.210	7.970	3.810	12.073	18.030	2.569	2.225	2.065	2.783	5.722	13.620	16.409	13.433	10.115
RMSE	0.28	0.32	0.31	0.36	0.30	0.33	0.30	0.30	0.26	0.32	0.32	0.29	0.31	0.28	0.34

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Appendix 6: Stock-Bond Correlation Regression Results for Emerging Markets

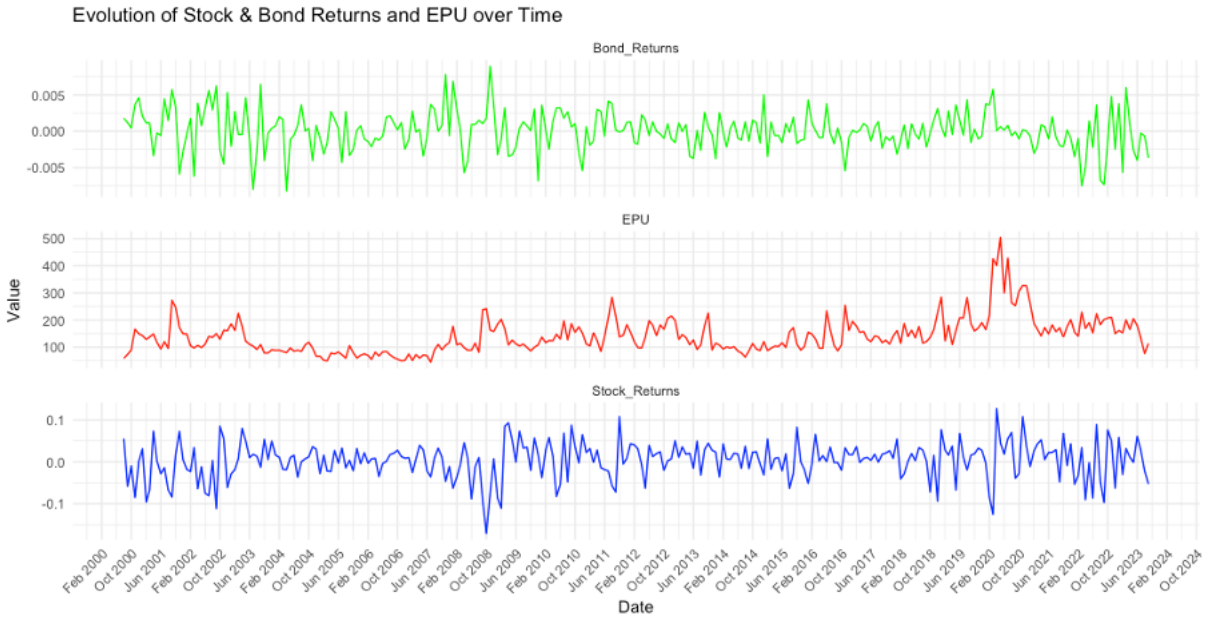
	Brazil	Chile	China	Colombia	India	Russia	Mexico
(Intercept)	1.66e+00***	−1.19e−01	−1.16e+00***	1.12e+00**	−2.30e+00***	5.20e−04	−9.09e−02
	(3.95e−01)	(5.44e−01)	(3.06e−01)	(3.98e−01)	(5.61e−01)	(4.24e−01)	(5.60e−01)
Brazil_EPU	−8.99e−05						
	(2.09e−04)						
SMB	−1.08e+00	−2.77e+00+	2.01e−01	9.78e−02	3.74e+00*	−2.40e+00+	−1.20e+00
	(1.22e+00)	(1.58e+00)	(9.61e−01)	(1.19e+00)	(1.84e+00)	(1.32e+00)	(1.61e+00)
HML	−2.04e+00+	−1.39e+00	−1.28e+00	−3.36e−01	−6.22e−01	−4.89e+00***	1.41e+00
	(1.04e+00)	(1.15e+00)	(8.50e−01)	(1.05e+00)	(1.17e+00)	(1.17e+00)	(1.21e+00)
real_risk_premium	−1.42e+02***	1.54e+01	8.73e+01***	−9.09e+01**	1.92e+02***	4.64e+01	9.07e+00
	(3.40e+01)	(4.82e+01)	(2.61e+01)	(3.32e+01)	(4.87e+01)	(3.68e+01)	(4.77e+01)
real_interest_rate	1.86e+01***	7.90e+00	6.19e+00*	8.66e+00**	−2.39e+01**	−3.01e+01***	−2.27e−01
	(3.98e+00)	(7.79e+00)	(2.91e+00)	(3.30e+00)	(8.14e+00)	(4.01e+00)	(7.13e+00)
Chile_EPU		8.82e−04**					
		(2.63e−04)					
China_EPU			−2.83e−04**				
			(1.01e−04)				
Colombia_EPU				1.14e−03*			
				(4.40e−04)			
India_EPU					4.47e−04		
					(1.08e−03)		
Russia_EPU						6.53e−04***	
						(1.61e−04)	
Mexico_EPU							2.81e−03***
							(7.74e−04)
Num.Obs.	190	153	233	211	59	235	170
R2	0.161	0.107	0.206	0.073	0.304	0.431	0.087
R2 Adj.	0.139	0.077	0.189	0.050	0.238	0.419	0.060
AIC	55.4	64.8	5.5	74.9	−7.7	158.4	93.1
BIC	78.1	86.0	29.6	98.3	6.9	182.7	115.0
Log.Lik.	−20.685	−25.390	4.267	−30.430	10.834	−72.221	−39.546
F		3.533			4.627		3.144
RMSE	0.27	0.29	0.24	0.28	0.20	0.33	0.31

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Appendix 7: Table of the stock index used for each country

Country	Stock Index
Australia	All Ordinary Index
Brazil	BOVESPA
Canada	S&P/TSX Composite Index
Chile	MSCI Chile
China	Shanghai Composite Index
Colombia	FTSE Colombia
France	CAC 40
Germany	FAZ
Greece	FTSE Greece
India	S&P BSE Sensex 50
Ireland	ISEQ Overall
Italy	FTSE MIB
Japan	Nikkey 225
Korea	FTSE Korea
Mexico	FTSE Mexico
Netherlands	AEX All Shares
Russia	RTSI
Singapore	FTSE Singapore
Spain	General Madrid
Sweden	FTSE Sweden
United Kingdom	FTSE All-Share UK
United States	S&P 500

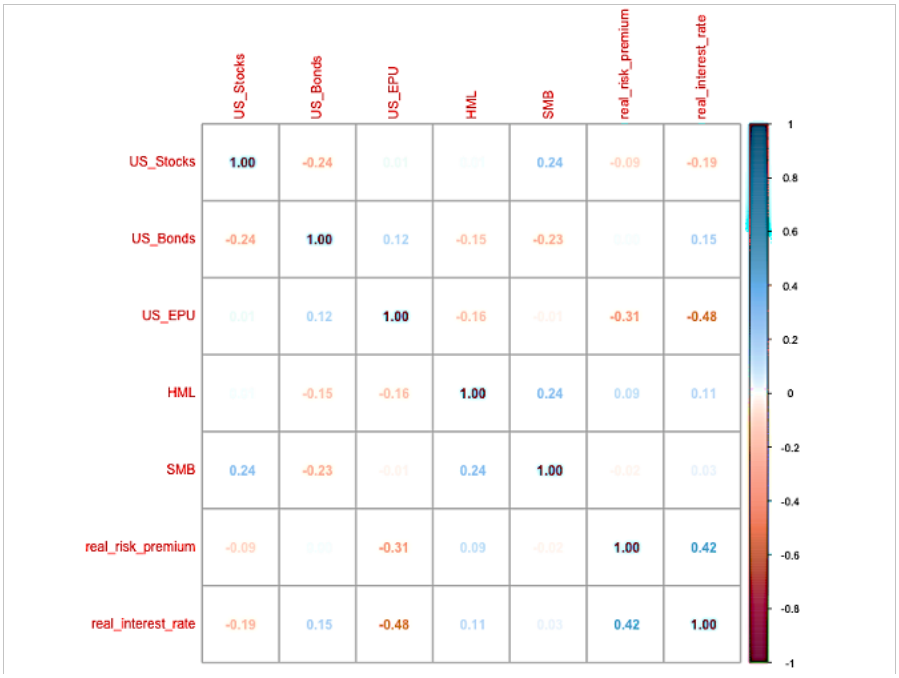
Appendix 8: Graph of the evolution of stock & bond returns and EPU over time



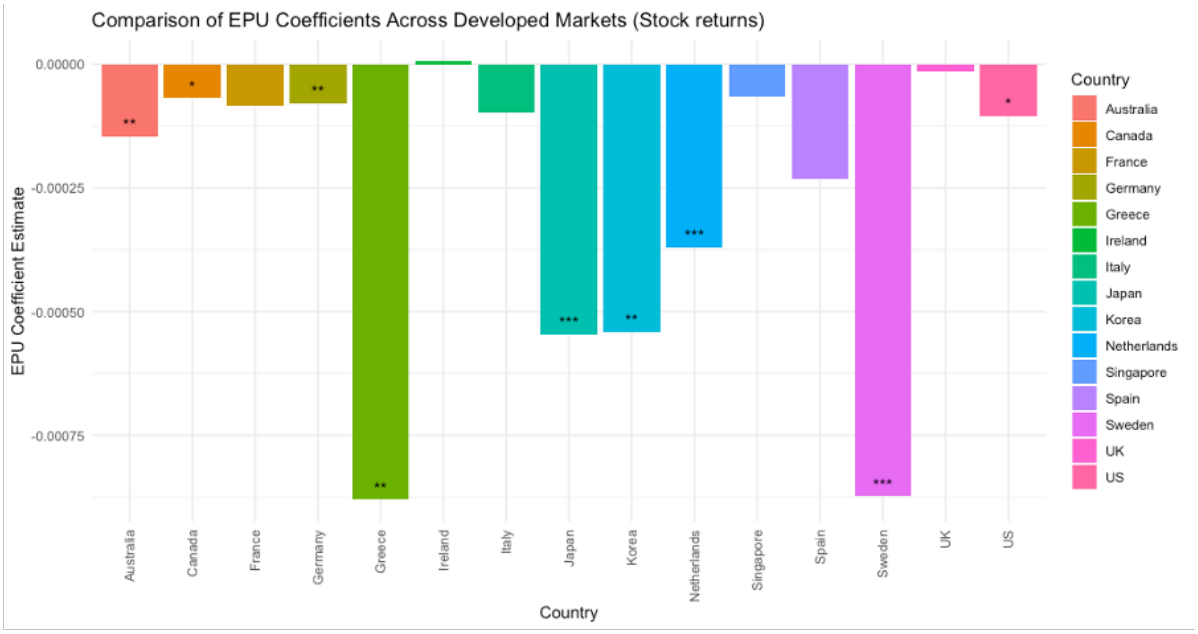
Appendix 9: Summary statistics table for the Stock returns, Bond returns, and EPU

Statistic	Stock Returns	Bond Returns	EPU
Observations	278	278	278
Mean	0.0033	0.000055	140.91
Standard Deviation	0.0446	0.0027	65.51
Minimum	-0.1707	-0.0082	44.78
25th Percentile	-0.0199	-0.0013	96.48
Median	0.0083	0.000085	127.9
75th Percentile	0.0306	0.0014	170.07
Maximum	0.1266	0.0089	503.96

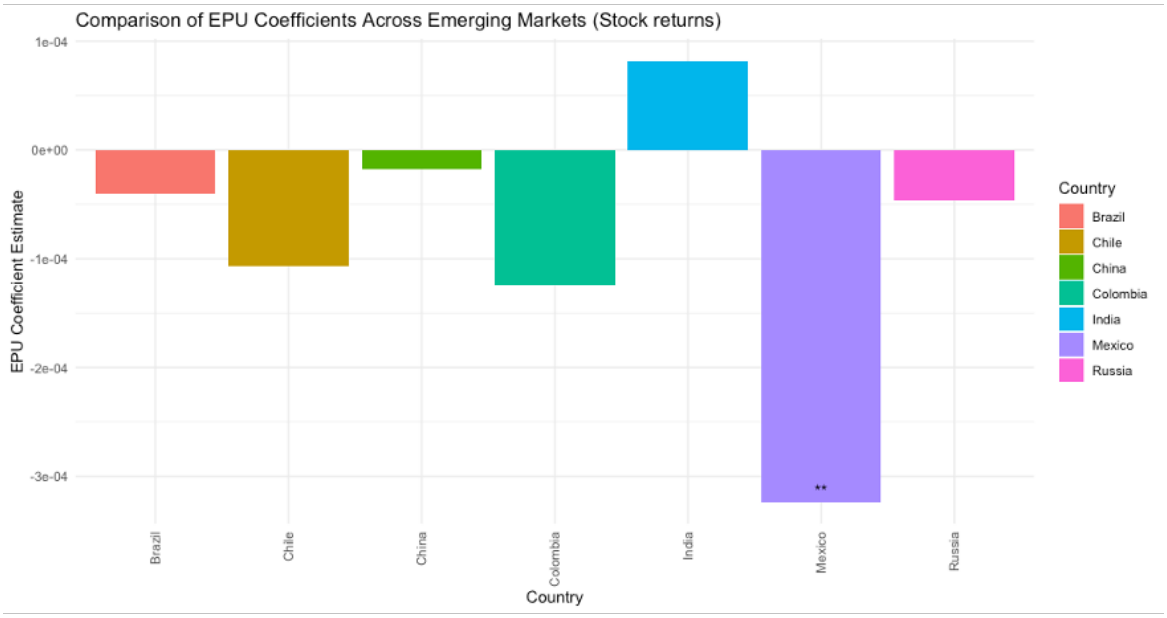
Appendix 10: Correlation matrix



Appendix 11: Graph of the EPU coefficients across developed markets for stock returns

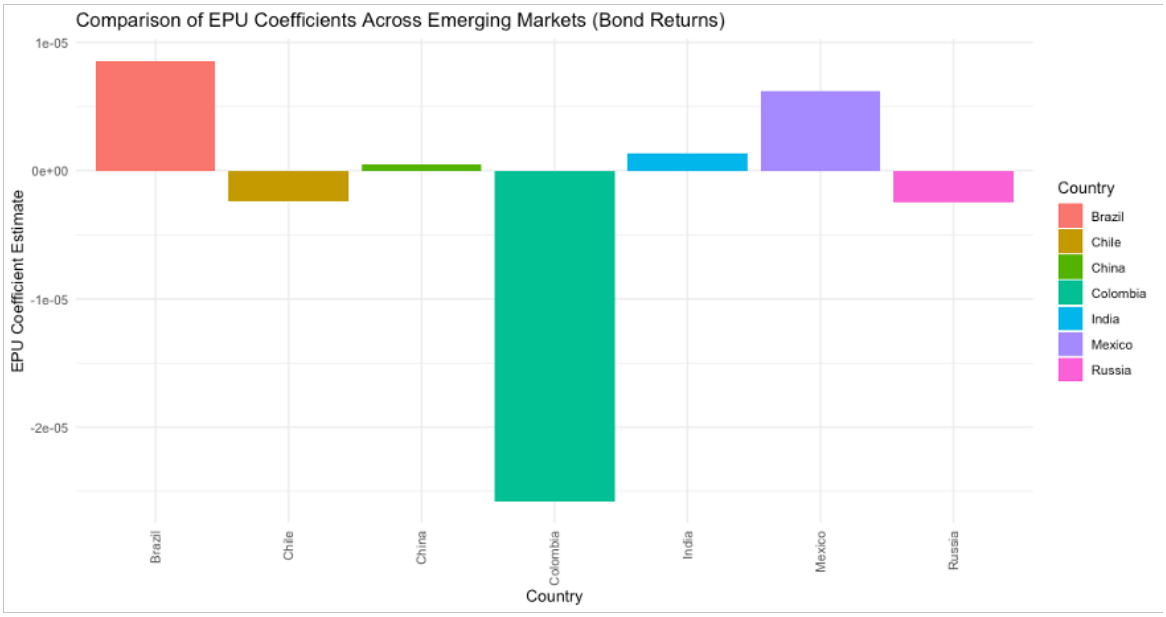


Appendix 12: Graph of the EPU coefficients across emerging markets for stock returns

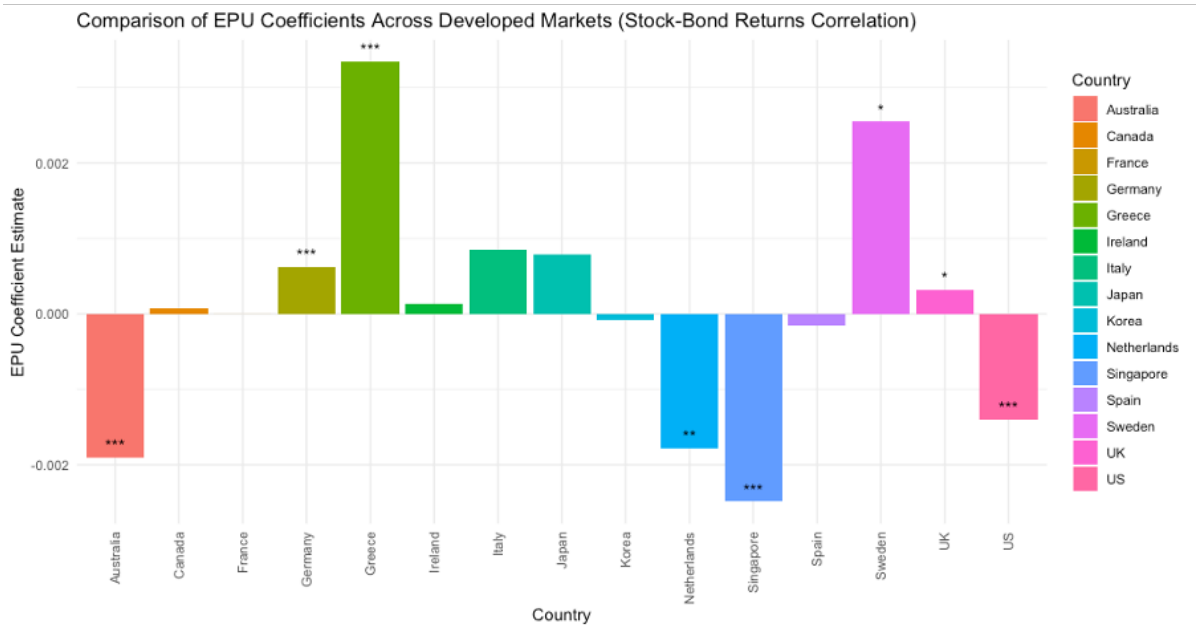


Appendix 13: Graph of the EPU coefficients across developed markets for bond returns

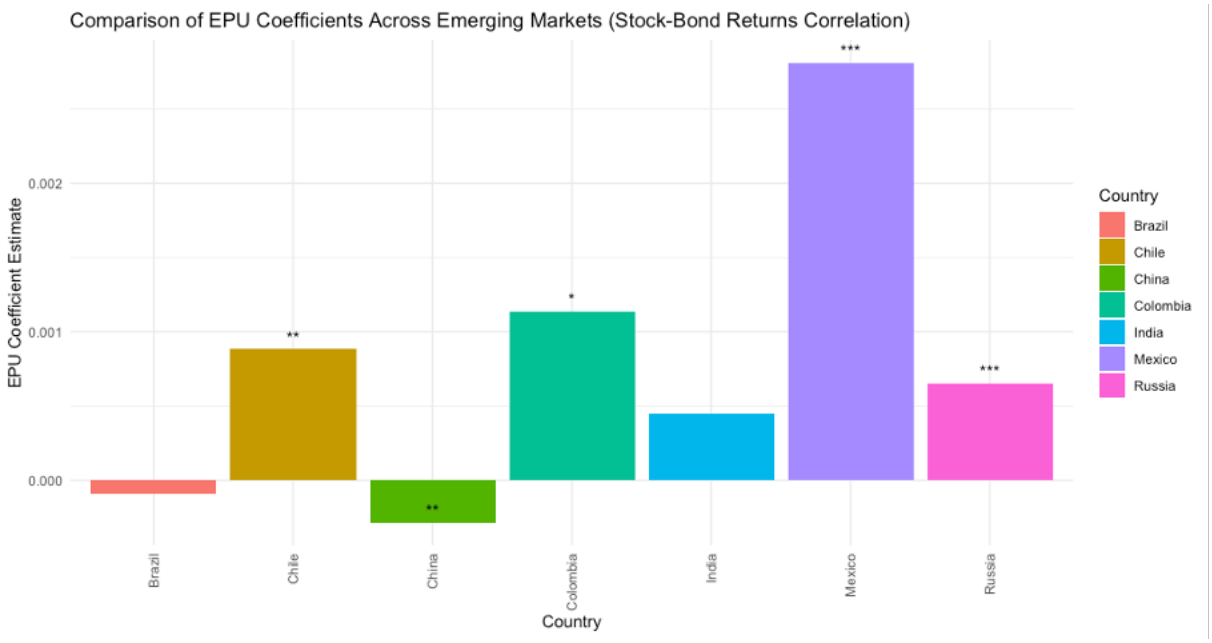
Appendix 14: Graph of the EPU coefficients across emerging markets for bond returns



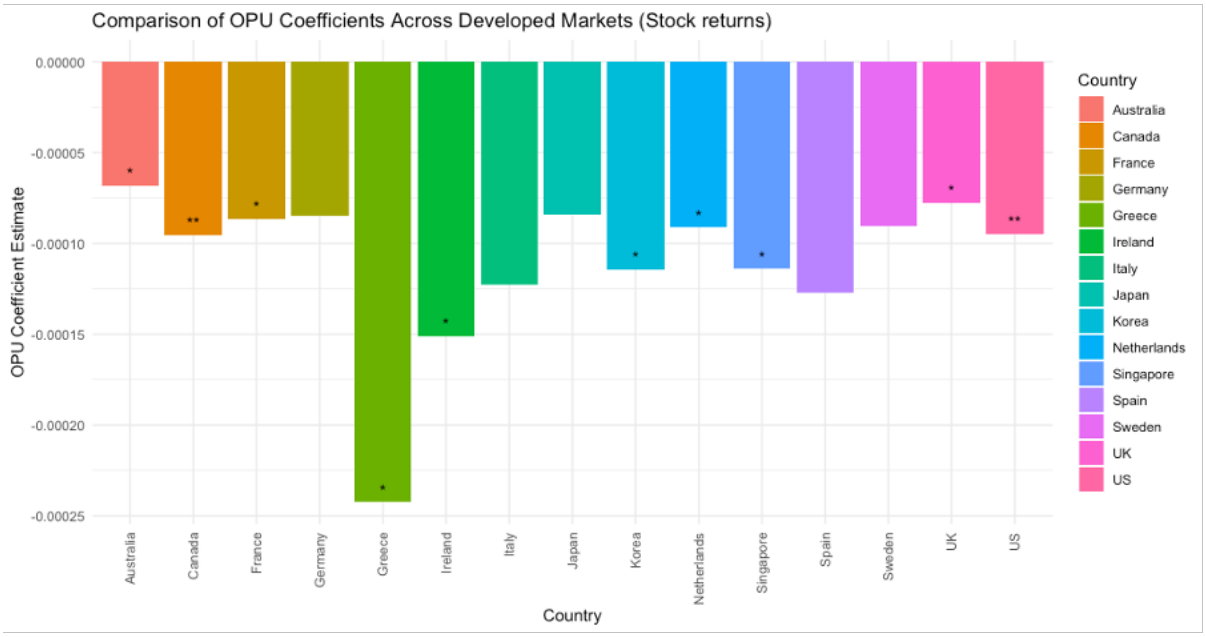
Appendix 15: Graph of the EPU coefficients across developed markets for stock-bond returns correlation



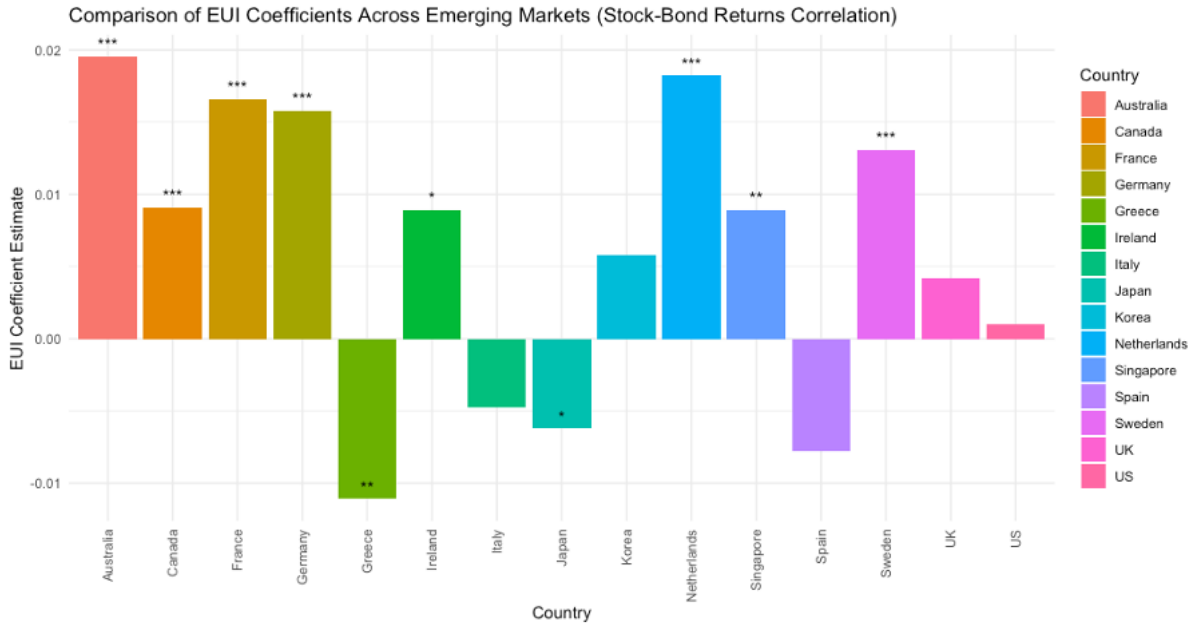
Appendix 16: Graph of the EPU coefficients across emerging markets for stock-bond returns correlation



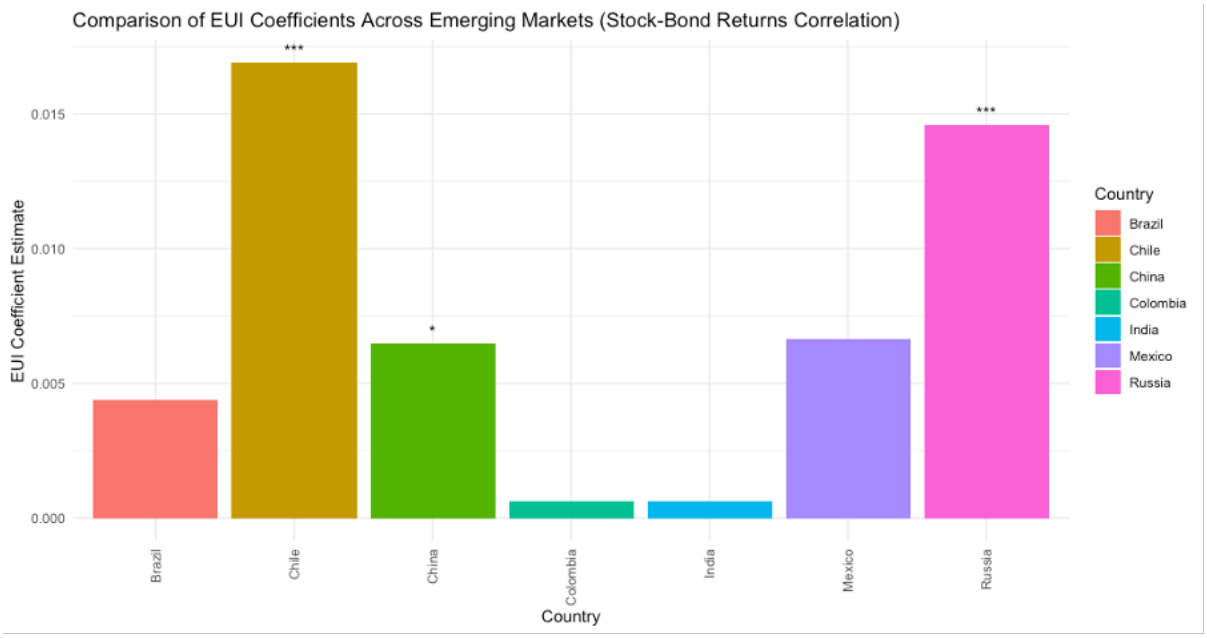
Appendix 17: Graph of the OPU coefficients across developed markets for stock returns



Appendix 18: Graph of the EUI coefficients across developed markets for stock-bond returns correlation



Appendix 19: Graph of the EUI coefficients across emerging markets for stock-bond returns correlation



Appendix 20: Table of regression results for stock returns model

Country	Estimate	P.Value	Significance
US	-0.0001049	0.02845219	*
UK	-1.421E-05	0.4462118	
Sweden	-0.0008879	1.0068E-05	***
Spain	-0.0002314	0.14706859	
Singapore	-6.526E-05	0.22111815	
Netherlands	-0.0003702	2.7771E-05	***
Korea	-0.0005559	0.00080973	***
Japan	-0.0005429	5.8106E-07	***
Italy	-9.863E-05	0.42003381	
Ireland	5.803E-06	0.91963074	
Greece	-0.0008802	0.00271087	**
Germany	-7.877E-05	0.00676989	**
France	-8.56E-05	0.05391908	
Canada	-6.94E-05	0.01515403	*
Australia	-0.0001456	0.00112662	**
Brazil	-4.058E-05	0.34382655	
Chile	-0.0001068	0.08944484	
China	-1.764E-05	0.55920518	
Colombia	-0.0001246	0.19958522	
India	8.1959E-05	0.71480254	
Russia	-4.624E-05	0.2895419	
Mexico	-0.0003234	0.00231927	**

Appendix 21: Table of regression results for bond returns model

Country	Estimate	P.Value	Significance
US	9.3999E-06	0.00107286	**
UK	1.741E-06	0.14743713	
Sweden	1.3332E-05	0.08780136	.
Spain	-7.688E-06	0.34888367	
Singapore	3.2091E-06	0.15075917	
Netherlands	4.1945E-06	0.26569174	
Korea	1.6503E-05	0.03120455	*
Japan	5.3127E-06	0.00260124	**
Italy	-3.001E-07	0.95851117	
Ireland	-5.824E-06	0.35086635	
Germany	-2.089E-06	0.05994706	.
Greece	-0.0001204	0.18972284	
France	1.7913E-06	0.33906162	
Canada	1.4752E-06	0.34996291	
Australia	1.1043E-05	0.00010642	***
Brazil	8.5765E-06	0.53074161	
Chile	-2.387E-06	0.74065167	
China	4.6851E-07	0.70148992	
Colombia	-2.575E-05	0.26626737	
India	1.3107E-06	0.74518734	
Russia	-2.496E-06	0.72032772	
Mexico	6.2076E-06	0.32897712	

Appendix 22: Table of regression results for stock-bond returns correlation model

Country	Estimate	P.Value	Significance
US	-0.0014048	1.6944E-05	***
UK	0.00031682	0.04903089	*
Sweden	0.00254554	0.02804232	*
Spain	-0.0001502	0.8900338	
Singapore	-0.0024911	1.4816E-12	***
Netherlands	-0.0017793	0.00284961	**
Korea	-7.821E-05	0.92529693	
Japan	0.00078812	0.23582593	
Italy	0.00084931	0.13505152	
Ireland	0.00012744	0.713586	
Greece	0.00334329	3.3003E-05	***
Germany	0.00061864	0.00011055	***
France	1.3481E-06	0.99604477	
Canada	6.8989E-05	0.73720471	
Australia	-0.0019005	3.0775E-06	***
Brazil	-8.994E-05	0.66717702	
Chile	0.00088181	0.00103235	**
China	-0.0002829	0.0055224	**
Colombia	0.0011358	0.01056454	*
India	0.00044664	0.68150687	
Russia	0.00065341	6.8934E-05	***
Mexico	0.00281052	0.00037987	***

Appendix 23: Complete R code

```
# Load necessary libraries
library(readxl)
library(dplyr)
library(lubridate)
library(stargazer)
library(broom)
library(ggplot2)
library(gridExtra)
library(tidyr)
library(plm)
library(systemfit)
library(lavaan)
library(TTR)
library(xts)
library(zoo)
library(corrplot)
library(openxlsx)
library(modelsummary)
library(webshot2)


# Load the data
epu_data <- read_excel("~/Library/Mobile
Documents/com~apple~CloudDocs/Mémoire/Data/Data.xlsx",sheet = "EPU")
opu_data <- read_excel("~/Library/Mobile
Documents/com~apple~CloudDocs/Mémoire/Data/Data.xlsx",sheet = "OPU")
eui_data <- read_excel("~/Library/Mobile
Documents/com~apple~CloudDocs/Mémoire/Data/Data.xlsx",sheet = "EUI")
stocks_data <- read_excel("~/Library/Mobile
Documents/com~apple~CloudDocs/Mémoire/Data/Data.xlsx",sheet = "Stocks")
bonds_data <- read_excel("~/Library/Mobile
Documents/com~apple~CloudDocs/Mémoire/Data/Data.xlsx",sheet = "Bonds3")
famaDEV_data <- read_excel("~/Library/Mobile
Documents/com~apple~CloudDocs/Mémoire/Data/Data.xlsx",sheet = "FamaDev")
famaEME_data <- read_excel("~/Library/Mobile
Documents/com~apple~CloudDocs/Mémoire/Data/Data.xlsx",sheet = "FamaEme")
InflExp_data <- read_excel("~/Library/Mobile
Documents/com~apple~CloudDocs/Mémoire/Data/Data.xlsx",sheet =
"InflationEx")
```

```
#### Stock Regression ####
# Make a list with countries names

##DEV countries (put a "#" in front of list when running for emerging
markets)
stocks_data_DEV <- stocks_data[c("Date",
"US","UK","Sweden","Spain","Singapore","Netherlands","Korea","Japan","It
aly", "Ireland", "Greece", "Germany", "France","Canada", "Australia")]
#countries <- setdiff(names(stocks_data_DEV), "Date")

##EME countries(put a "#" in front of list when running for developed
markets)
countries <- setdiff(names(stocks_data), c("Date",
"US","UK","Sweden","Spain","Singapore","Netherlands","Korea","Japan","It
aly", "Ireland", "Greece", "Germany", "France","Canada","Australia"))

# Initialize an empty list to store regression models
regression_models <- list()
regression_results <- list()

# Loop through each country and perform regression
for(country in countries) {
  # Merge EPU, stock, and control data for the specific country
  merged_data <- merge(epu_data[c("Date", country)],
stocks_data[c("Date", country)], by = "Date", suffixes = c("_EPU",
"_Stocks"))
  #Supplement line to avoid suffixe issues
  merged_data <- merge(merged_data, epu_data[c("Date", country)], by =
"Date")

  ##DEV countries (put a "#" in front of list when running for emerging
markets)
  #merged_data <- merge(merged_data, famaDEV_data, by = "Date")

  ##EME countries(put a "#" in front of list when running for developed
markets)
  merged_data <- merge(merged_data, famaEME_data, by = "Date")

  merged_data <- merge(merged_data, opu_data[c("Date", "OPU")], by =
"Date")
  merged_data <- merge(merged_data, eui_data[c("Date", "EUI")], by =
"Date")
  merged_data <- merge(merged_data, InflExp_data[c("Date",
"real_risk_premium", "real_interest_rate")], by = "Date")
```

```
  # Create the column names for EPU and Stocks
  epu_col_name <- paste(country, "_EPU", sep = "")
  stocks_col_name <- paste(country, "_Stocks", sep = "")



  # Construct the regression formula as a string and convert it to a
formula object
  formula_str <- paste(stocks_col_name, "~ ", "+",epu_col_name, " + SMB
+ HML + real_risk_premium + real_interest_rate")



  formula <- as.formula(formula_str)

  #Store the regression results
  model <- lm(formula, data = merged_data)
  regression_models[[country]] <- model
  regression_results[[country]] <- summary(model)
}

#Export summary table in html
modelsummary(
  regression_models,
  output = "Stocks Regression EME.html",
  conf_level = 0.95,
  fmt = fmt_sci(digits = 3),
  stars = TRUE,
  shape = term + statistic ~ model,
)

print(regression_results)

comparative_results <- NULL
#merging the EPU coefficient results together for comparative analysis
for (country in countries) {
  # Extract tidy results from the model
  tidy_results <- broom::tidy(regression_results[[country]])

  # Filter for the specific variable (e.g., "EPU")
  epu_results <- tidy_results[tidy_results$term == paste(country,
"_EPU", sep = ""),]
```

```
# Create a data frame for this country's results
  country_results <- data.frame(Country = country,
                                Estimate = epu_results$estimate,
                                Std.Error = epu_results$std.error,
                                Statistic = epu_results$statistic,
                                P.Value = epu_results$p.value)



  # Add to the comparative results
  comparative_results <- rbind(comparative_results, country_results)
}

# Add a new column for significance levels
comparative_results$Significance <- ifelse(comparative_results$P.Value <
0.001, "***",

ifelse(comparative_results$P.Value < 0.01, "**",

ifelse(comparative_results$P.Value < 0.05, "*", "")))

#Plot the EPU coefficient for all countries
ggplot(comparative_results, aes(x = Country, y = Estimate, fill =
Country)) +
  geom_bar(stat = "identity", position = position_dodge()) +
  theme_minimal() +
  geom_text(aes(label = Significance), vjust = -0.5) +
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1)) +
  labs(y = "EPU Coefficient Estimate", x = "Country", title =
"Comparison of EPU Coefficients Across Developed Markets (Stock
returns)")

# View the comparative results

print(comparative_results)
summary(comparative_results)


# Use stargazer to create a report of all regressions
stargazer(comparative_results, type = "latex", omit = 'dependent',
          single.row = TRUE, column.labels = c("Country Stock"),
          title = "Regression Results", dep.var.labels.include=
FALSE,font.size = "tiny")
```

```
#Create excel file
ExcelCompResults <- data.frame(comparative_results)
write.xlsx(ExcelCompResults, "CompResultsStocksEME.xlsx")

# Convert the data frame to a grid table
table_plot <- grid.table(comparative_results)


#### Bond Regression ####
# Make a list with countries names
##DEV countries (put a "#" in front of list when running for emerging
markets)
stocks_data_DEV <- stocks_data[c("Date",
"US","UK","Sweden","Spain","Singapore","Netherlands","Korea","Japan","It
aly", "Ireland", "Germany", "Greece", "France","Canada", "Australia")]
countries <- setdiff(names(stocks_data_DEV), "Date")

##EME countries(put a "#" in front of list when running for developed
markets)
#countries <- setdiff(names(stocks_data), c("Date",
"US","UK","Sweden","Spain","Singapore","Netherlands","Korea","Japan","It
aly", "Ireland", "Greece", "Germany", "France","Canada","Australia"))

# Initialize an empty list to store regression models
regression_models <- list()
regression_results <- list()


#Make sure data is in numeric format
bonds_data$France <- as.numeric(bonds_data$France)
bonds_data$Germany <- as.numeric(bonds_data$Germany)
bonds_data$Italy <- as.numeric(bonds_data$Italy)
bonds_data$Netherlands <- as.numeric(bonds_data$Netherlands)
bonds_data$UK <- as.numeric(bonds_data$UK)
bonds_data$Sweden <- as.numeric(bonds_data$Sweden)


# Loop through each country and perform regression
for(country in countries) {

  # Merge EPU, stock, and control data for the specific country
  merged_data <- merge(epu_data[c("Date", country)],
bonds_data[c("Date", country)], by = "Date", suffixes = c("_EPU",
"_Bonds"))
  merged_data <- merge(merged_data, epu_data[c("Date", country)], by =
"Date")
```

```
  ##DEV countries (put a "#" in front of list when running for emerging
markets)
  merged_data <- merge(merged_data, famaDEV_data, by = "Date")

  ##EME countries(put a "#" in front of list when running for developed
markets)
  #merged_data <- merge(merged_data, famaEME_data, by = "Date")

  merged_data <- merge(merged_data, opu_data[c("Date", "OPU")], by =
"Date")


  merged_data <- merge(merged_data, eui_data[c("Date", "EUI")], by =
"Date")
  merged_data <- merge(merged_data,
InflExp_data[c("Date","real_risk_premium", "real_interest_rate")], by =
"Date")

  # Create the column names for EPU and Stocks variables
  epu_col_name <- paste(country, "_EPU", sep = "")
  bonds_col_name <- paste(country, "_Bonds", sep = "")

  # Construct the regression formula as a string and convert it to a
formula object
    formula_str <- paste(bonds_col_name, "~ ","+",epu_col_name, " + SMB
+ HML  + real_risk_premium + real_interest_rate")


  formula <- as.formula(formula_str)

  #Store regression results
  model <- lm(formula, data = merged_data)
  regression_models[[country]] <- model
  regression_results[[country]] <- summary(model)
}

#Export summary table in html
modelsummary(
  regression_models,
  output = "Bond Regression DEV.html",
  conf_level = 0.95,
  fmt = fmt_sci(digits = 3),
  stars = TRUE,
  shape = term + statistic ~ model,
)
```

```
print(regression_results)

comparative_results <- NULL


#merging the EPU coefficient results together for comparative analysis
for (country in countries) {
  # Extract tidy results from the model
  tidy_results <- broom::tidy(regression_results[[country]])

  # Filter for the specific variable (e.g., "EPU")
  epu_results <- tidy_results[tidy_results$term == paste(country,
"_EPU", sep = ""),]

  # Create a data frame for this country's results
  country_results <- data.frame(Country = country,
                                Estimate = epu_results$estimate,
                                Std.Error = epu_results$std.error,
                                Statistic = epu_results$statistic,
                                P.Value = epu_results$p.value)

  # Add to the comparative results
  comparative_results <- rbind(comparative_results, country_results)
}


# Add a new column for significance levels
comparative_results$Significance <- ifelse(comparative_results$P.Value <
0.001, "***",

ifelse(comparative_results$P.Value < 0.01, "**",

ifelse(comparative_results$P.Value < 0.05, "*", "")))

#Plot the EPU coefficient for all countries
ggplot(comparative_results, aes(x = Country, y = Estimate, fill =
Country)) +
  geom_bar(stat = "identity", position = position_dodge()) +
  theme_minimal() +
  geom_text(aes(label = Significance), vjust = -0.5) +
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1)) +
  labs(y = "EPU Coefficient Estimate", x = "Country", title =
"Comparison of EPU Coefficients Across Emerging Markets (Bond Returns)")
```

```
# View the comparative results

print(comparative_results)
summary(comparative_results)


# Use stargazer to create a report of all regressions
stargazer(comparative_results, type = "latex", omit = 'dependent',
          single.row = TRUE, column.labels = c("Country Stock"),
          title = "Regression Results", dep.var.labels.include=
FALSE,font.size = "tiny")



#Create excel file
ExcelCompResults <- data.frame(comparative_results)
write.xlsx(ExcelCompResults, "CompResultsBondEME.xlsx")

# Convert the data frame to a grid table
table_plot <- grid.table(comparative_results)



#### Rolling Correlation per Country ####

#Make sure data is in numeric format
bonds_data$France <- as.numeric(bonds_data$France)
bonds_data$Germany <- as.numeric(bonds_data$Germany)
bonds_data$Italy <- as.numeric(bonds_data$Italy)
bonds_data$Netherlands <- as.numeric(bonds_data$Netherlands)
bonds_data$UK <- as.numeric(bonds_data$UK)
bonds_data$Sweden <- as.numeric(bonds_data$Sweden)



##DEV countries (put a "#" in front of list when running for emerging
markets)
stocks_data_DEV <- stocks_data[c("Date",
"US","UK","Sweden","Spain","Singapore","Netherlands","Korea","Japan","It
aly", "Ireland", "Greece", "Germany", "France","Canada","Australia")]
#countries <- setdiff(names(stocks_data_DEV), "Date")

##EME countries(put a "#" in front of list when running for developed
markets)
countries <- setdiff(names(stocks_data), c("Date",
"US","UK","Sweden","Spain","Singapore","Netherlands","Korea","Japan","It
aly", "Ireland", "Greece", "Germany", "France","Canada","Australia"))
```

```
# Loop through each country and perform regression
for(country in countries) {

  # Merge EPU, stock, and control data for the specific country
  merged_data <- merge(epu_data[c("Date", country)],
bonds_data[c("Date", country)], by = "Date", suffixes = c("_EPU",
"_Bonds"))

  ##DEV countries (put a "#" in front of list when running for emerging
markets)
  #merged_data <- merge(merged_data, famaDEV_data, by = "Date")

  ##EME countries(put a "#" in front of list when running for developed
markets)
  merged_data <- merge(merged_data, famaEME_data, by = "Date")

  merged_data <- merge(merged_data, opu_data[c("Date", "OPU")], by =
"Date")
  merged_data <- merge(merged_data, eui_data[c("Date", "EUI")], by =
"Date")
  merged_data <- merge(merged_data,
InflExp_data[c("Date","real_risk_premium", "real_interest_rate")], by =
"Date")
  merged_data <- merge(merged_data, stocks_data[c("Date", country)], by
= "Date")
  merged_data <- merge(merged_data, stocks_data[c("Date", country)], by
= "Date", suffixes = c("", "_Stocks"))



  # Create the column names for EPU, Stocks, and Bond variables
  epu_col_name <- paste(country, "_EPU", sep = "")
  bonds_col_name <- paste(country, "_Bonds", sep = "")
  stocks_col_name <- paste(country, "_Stocks", sep = "")

  #Set rolling correlation window size (in months)
  window_size <- 12

  # Impute missing values
  merged_data[[stocks_col_name]] <-
na.approx(merged_data[[stocks_col_name]], na.rm = FALSE)
  merged_data[[bonds_col_name]] <-
na.approx(merged_data[[bonds_col_name]], na.rm = FALSE)
```

```
 # After imputation, calculate the rolling correlation
  merged_data$Rolling_Corr <- NA  # Initialize the column with NAs

  # Calculate rolling correlation only for the non-NA part of the series
  # valid_data_indices <- which(!is.na(merged_data[[stocks_col_name]]) &
!is.na(merged_data[[bonds_col_name]]))
  #merged_data$Rolling_Corr[valid_data_indices] <-
runCor(merged_data[[stocks_col_name]][valid_data_indices],
merged_data[[bonds_col_name]][valid_data_indices], n = window_size, use
= "everything")

  merged_data$Rolling_Corr <- runCor(merged_data[[stocks_col_name]],
merged_data[[bonds_col_name]], n = window_size, use = "complete.obs")



  # Construct the regression formula as a string and convert it to a
formula object
  formula_str <- paste("Rolling_Corr ~ ","+",epu_col_name, " + SMB + HML
+ real_risk_premium + real_interest_rate")
  formula <- as.formula(formula_str)


  model <- lm(formula, data = merged_data)
  regression_models[[country]] <- model
  regression_results[[country]] <- summary(model)
}

#Export regression summary in html
modelsummary(
  regression_models,
  output = "Stock-Bond Regression EME.html",
  conf_level = 0.95,
  fmt = fmt_sci(digits = 3),
  stars = TRUE,
  shape = term + statistic ~ model,
)


print(regression_results)

comparative_results <- NULL
epu_results <- NULL
#merging the EPU coefficient results together for comparative analysis
for (country in countries) {
  # Extract tidy results from the model
  tidy_results <- broom::tidy(regression_results[[country]])
```

```
  # Filter for the specific variable (e.g., "EPU")
  epu_results <- tidy_results[tidy_results$term == paste(country,
"_EPU", sep = ""),]


  # Create a data frame for this country's results
  country_results <- data.frame(Country = country,
                                Estimate = epu_results$estimate,
                                Std.Error = epu_results$std.error,
                                Statistic = epu_results$statistic,
                                P.Value = epu_results$p.value)

  # Add to the comparative results
  comparative_results <- rbind(comparative_results, country_results)
}



# Add a new column for significance levels
comparative_results$Significance <- ifelse(comparative_results$P.Value <
0.001, "***",

ifelse(comparative_results$P.Value < 0.01, "**",

ifelse(comparative_results$P.Value < 0.05, "*", "")))

#Plot the EPU coefficient for all countries
ggplot(comparative_results, aes(x = Country, y = Estimate, fill =
Country)) +
  geom_bar(stat = "identity", position = position_dodge()) +
  theme_minimal() +
  geom_text(aes(label = Significance), vjust = -0.5) +
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1)) +
  labs(y = "EPU Coefficient Estimate", x = "Country", title =
"Comparison of EPU Coefficients Across Emerging Markets (Stock-Bond
Returns Correlation)")


#Create excel file
ExcelCompResults <- data.frame(comparative_results)
write.xlsx(ExcelCompResults, "CompResultsS-BrEME.xlsx")

#### Data Analysis ####
```

```
##Summary Analysis
data_frame_SBEPU <- data.frame(stocks_data$US, bonds_data$US,
epu_data$US)
summary(data_frame_SBEPU)

##Graph over time
data_frame_SBED <- data.frame(
  Date = stocks_data$Date,
  Stock_Returns = stocks_data$US,
  Bond_Returns = bonds_data$US,
  EPU = epu_data$US
)

# Convert to long format for ggplot2
combined_long <- pivot_longer(data_frame_SBED,
                              cols = -Date,
                              names_to = "Variable",
                              values_to = "Value")

# Convert 'Date' column to Date class
combined_long$Date <- as.Date(combined_long$Date)



ggplot(combined_long, aes(x = Date, y = Value, color = Variable)) +
  geom_line() +
  facet_wrap(~Variable, scales = "free_y", ncol = 1) +
  theme_minimal() +
  labs(title = "Evolution of Stock & Bond Returns and EPU over Time",
       x = "Date",
       y = "Value") +
  scale_color_manual(values = c("Stock_Returns" = "blue",
                                "Bond_Returns" = "green",
                                "EPU" = "red")) +
  theme(legend.position = "none") + # Hide the legend
  scale_x_date(date_breaks = "1 month",
               date_labels = "%b %Y",
               #limits = c(min(combined_long$Date),
max(combined_long$Date))) + # Customize the x-axis
               limits = as.Date(c("2011-01-01", "2013-01-31"))) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) # Improve
label readability


#### Correlation Matrix####
data_frame_CorrM <- merge(epu_data[c("Date", "US")],
stocks_data[c("Date", "US")], by = "Date", suffixes = c("_EPU",
```

```
"_Stocks"))
data_frame_CorrM <- merge(data_frame_CorrM, bonds_data[c("Date", "US")],
by = "Date")
data_frame_CorrM <- merge(data_frame_CorrM, bonds_data[c("Date", "US")],
by = "Date", suffixes = c("", "_Bonds"))
data_frame_CorrM <- merge(data_frame_CorrM, famaUS_data[c("Date", "SMB",
"HML")], by = "Date")
data_frame_CorrM <- merge(data_frame_CorrM,
InflExp_data[c("Date","real_risk_premium", "real_interest_rate")], by =
"Date")
correlation_matrix <-  cor(data_frame_CorrM[c("US_Stocks","US_Bonds",
"US_EPU", "HML", "SMB","real_risk_premium", "real_interest_rate")], use
= "pairwise.complete.obs")



#### Test ####


# Convert  columns to time series
bonds_ts <- ts(bonds_data$US)
stocks_ts <- ts(stocks_data$US)
epu_ts <- ts(epu_data$US)
SMB_ts <- ts(famaDEV_data$SMB)
HML_ts <- ts(famaDEV_data$HML)
RRP_ts <- ts(InflExp_data$real_risk_premium)
RI_ts <- ts(InflExp_data$real_interest_rate)

# Perform ADF test variables


adf_bonds <- adf.test(bonds_ts, alternative = "stationary")
adf_stocks <- adf.test(stocks_ts, alternative = "stationary")
adf_epu <- adf.test(epu_ts, alternative = "stationary")
adf_SMB <- adf.test(SMB_ts, alternative = "stationary")
adf_HML <- adf.test(HML_ts, alternative = "stationary")
adf_RRP <- adf.test(RRP_ts, alternative = "stationary")
adf_RI <- adf.test(RI_ts, alternative = "stationary")

# Print results
print(adf_bonds)
print(adf_stocks)
print(adf_epu)
print(adf_SMB)
print(adf_HML)
print(adf_RRP)
print(adf_RI)
```