Time-Varying Safe Haven Properties of Currencies, Government Bonds and Commodities: The Role of Economic, Institutional and Geopolitical Concerns

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Abstract

This thesis introduces an innovative approach that analyses safe haven assets by integrating news-based indices to capture the influence of economic, institutional, and geopolitical concerns on investor behaviour. Unlike traditional studies that focus solely on macroeconomic fundamentals, this framework accounts for complex and often intangible factors, such as regulatory uncertainty or geopolitical tensions, offering a more comprehensive view of safe haven dynamics. Using data spanning 2000 to 2023, I study the performance of currencies, government bonds, and commodities during crisis periods defined by extreme volatility and returns in global equity and uncertainty indexes.

The results reveal that safe haven properties vary significantly depending on the nature of the crisis. Currencies, such as the USD and CHF, consistently outperform during economic and institutional crises, benefiting from institutional stability and significant foreign exchange reserves. Government bonds show context-dependent behaviour, with U.S. Treasuries excelling under economic concerns and German Bunds performing strongly during institutional crises. Commodities, like gold, appear as the preferred safe haven during geopolitical conflicts driven by their tangible value, while silver and platinum remain constrained by their industrial demand. These findings highlight the time-varying nature of safe haven behaviour and provide practical insights for investors and policymakers seeking tailored crisis-period strategies.

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Abstrato

Esta tese apresenta uma abordagem inovadora na análise de "safe havens" através da integração de índices que utilizam notícias, de forma a captar a influência de preocupações económicas, institucionais e geopolíticas no comportamento de investidores. Ao contrário de estudos tradicionais que se focam em variáveis macroeconómicas, esta abordagem tem em conta fatores complexos e muitas vezes intangíveis, como incerteza regulatória ou tensões geopolíticas, oferecendo uma visão mais abrangente da dinâmica de "safe havens". Utilizando dados de 2000 a 2023, estudo o desempenho de moedas, obrigações do Tesouro e metais preciosos durante períodos de crise definidos por volatilidade e retornos extremos de índices globais de ações e incerteza.

Os resultados revelam que as propriedades como "safe haven" variam significativamente consoante a natureza de crise. As moedas, como o dólar americano e o franco suíço, demonstram um desempenho consistentemente superior durante crises económicas e institucionais, beneficiando de estabilidade institucional e reservas cambiais significativas. As obrigações do Tesouro apresentam um comportamento dependente do contexto analisado, com os títulos do Tesouro dos EUA a destacarem-se sob preocupações económicas e as Bunds alemãs a demonstrarem um forte desempenho durante crises institucionais. Os metais preciosos, como o ouro, surgem como "safe havens" mais atrativos durante conflitos geopolíticos devido ao seu valor tangível, enquanto a prata e a platina reagem de forma limitada devido à sua aplicação industrial. Estas conclusões realçam a variabilidade temporal do comportamento de "safe haven" e fornecem informações práticas a investidores e órgãos políticos que procuram estratégias adaptadas a períodos de crise.

Título: Propriedades Temporalmente Variáveis de Refúgio Seguro de Moedas, Obrigações do Tesouro e Metais Preciosos: O Papel de Preocupações Económicas, Institucionais e Geopolíticas

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Palavras-Chave: Refúgio, Crise financeira, Índice baseado em notícias, Económico, Institucional e Geopolítico

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1. Introduction

As financial markets grow increasingly complex, safe haven assets - those that retain or appreciate in value during periods of extreme market turmoil - have become increasingly important. Traditional diversification strategies often fail during crises, pushing investors to seek safer investments, a behaviour described as a "flight to quality" phenomenon (Caballero & Krishnamurthy, 2008). Safe haven assets, including gold and the Swiss Franc (CHF), have been widely studied, particularly across commodities, government bonds, and currencies.

However, existing literature highlights that the safe haven properties of these assets are time-varying and determined by the nature of the studied event (Scruggs & Glabadanidis, 2003; Lucey & Li, 2015). For example, German Bunds served as strong safe havens during the Eurozone Sovereign Debt Crisis (De Santis, 2012) but provided weaker protection during the COVID-19 pandemic (Choudhury et al., 2022). These inconsistencies inspired a strand of the literature to focus on which factors are more relevant to the hedging ability of these assets (Habib & Stracca, 2012). Meanwhile, I found that little attention has been given to understanding how investors weigh different factors and interpret their relevance in major sources of information. This gap is significant, as investor priorities are directly related to how assets behave in periods of turmoil yet remain underexplored in the literature[1].

In this thesis, I address this gap by analysing how specific types of concerns - economic, institutional, and geopolitical - influence investor decisions regarding safe haven assets. Unlike previous studies that mainly focus on macroeconomic fundamentals, my approach allows the consideration of factors often difficult to measure, such as regulatory uncertainty[2]. By focusing on the investor's decision-making process, this study provides a new perspective on the drivers of safe haven behaviour and offers a broader understanding of asset performance during crises.

My analysis focuses on three asset classes: commodities (gold, silver, platinum), government bonds (US, Germany, Switzerland, Japan), and currencies (USD, CHF, JPY). Using crisis intervals defined by extreme tails of volatility and return distributions for the S&P Global 1200 index and the VIX (proxies to global equity market and investor uncertainty respectively), I study how these assets behave across different crisis periods between 2000 and 2023.

[1] For examples of behavioural frameworks linking asset behaviour to investor decisions, see Barberis & Thaler (2003).
[2] For a comprehensive analysis of the macroeconomic implications of regulatory uncertainty, see Bloom, (2009).

By studying correlation coefficients without considering any type of concern, I find that bonds and currencies consistently act as safe havens across crises, with the Japanese Yen, US and German bonds standing out. In contrast, gold remains significantly uncorrelated with global equity markets, while investors react more strongly to volatility spikes than to extreme negative returns. To isolate the relevance of economic, institutional, and geopolitical concerns, I use news-based indexes constructed by Baker et al. (2019) and Caldara & Iacoviello (2022). which track investor-relevant topics across major US newspapers. This allows me to assess how specific assets behave when the most relevant topics belong to each of the considered concerns.

I find that currencies consistently appear as the most reliable safe havens, significantly outperforming other asset classes under both economic and institutional concerns. The performance of government bonds is more context-dependent, with US bonds providing significant protection during economic uncertainty, while German bonds exhibit superior performance during institutional crises. Commodities, led by gold, act as strong safe havens exclusively amid geopolitical concerns, reinforcing their role as tangible stores of value during diplomatic conflicts. These findings highlight that safe haven properties are not constant but vary significantly based on the nature of investor concerns. In that sense, a detailed analysis of the most relevant topics influencing asset behaviour should provide investors with tailored strategies to safeguard against crises of different natures.

The remainder of this thesis is organized as follows. Section 2 reviews the existing literature on safe haven assets. Sections 3 and 4 describes the data and methodology respectively, including the construction of news-based indexes, crisis classification, and econometric framework. Section 5 presents the empirical results and their connection to the literature, while Section 6 discusses limitations and avenues for future research. Finally, Section 7 concludes with a summary of findings and a discussion of practical implications.

2. Literature Review

Definition and Strength

While the literature on safe haven properties has been significant for quite some time, there was no initial consensus on a technical definition for such properties. I find a first attempt with Baur and Lucey (2010). In their definition, an asset is considered a safe haven if it is uncorrelated or negatively correlated with another asset or portfolio in times of market turmoil. They differentiate it from a hedge by stating that the latter should present such uncorrelation or negative correlation on average. These definitions became a reference for the majority of literature that followed, consequently providing the basis for adaptations that focused on a specific asset class. I see this for the case of currencies with Hossfeld & McDonald (2015).

Baur & McDermott (2010) highlight the importance of distinguishing between a hedge and a safe haven. The reason is that the definition of a hedge does not presuppose that it must offer protection during specific moments of market turmoil, as the value is calculated for the whole sample. By extending the work of Baur & Lucey (2010), they argue that a distinction between a strong and weak safe haven is also relevant. Here, they stress that, while significant negative correlation guarantees opposite returns for an asset and its counterpart, uncorrelation does not. In such case, the results can be unpredictable. A possible outcome states that as an asset appreciates during moments of financial downturn, the market's overall stability is benefited. This could produce positive reactions from another asset that are mistaken for safe haven properties.

Commodities

Regarding commodities, I highlight the case of gold which, as the most prominent safe haven, has drawn significant analysis from the literature over time. Its ability to preserve value during financial downturns has been attributed to its historical role as a store of value and medium of exchange. Baur & Lucey (2010) use their definition for the first time specifically to study the protective properties of gold. Their main conclusion is that gold only behaves as a safe haven up to 15 trading days after a significant market decline. Given my study focuses on longer periods of turmoil, gold’s safe haven status cannot be explained by abrupt reactions from investors that quickly fade.

Baur & McDermott (2010) define market turmoil using the tails of returns distribution, which becomes popular among the following literature. By studying gold's behaviour against different countries' equity indexes, they find that it works as a strong safe haven in developed markets, but weak in emerging[3]. As I use a global index to represent the equity market, my results could be influenced by this lack of distinction. Hood & Malik (2013) contradict gold's safe haven properties, but assert it remains a hedge. Focusing on periods of extreme volatility instead of declining returns, they find that sharp movements of the VIX index do not produce significant reactions from the asset.

Leveraging on the methodology of Baur & McDermott (2010), Lucey & Li (2015) extend the scope of their analysis to silver, platinum and palladium. Focusing on the time-variability of safe haven properties, they find that gold is not the strongest option at all times. This indicates that specific economic and political concerns of the considered market should be accounted for. This thought is developed in Li & Lucey (2017), by studying if time-variability could derive from political risk, exchange rates, interest rates or credit spreads. This analysis represents the closest approximation to my approach. They find that political effects are much more determinant in the performance of said assets in comparison to economic factors. This difference should be observable in the performance of commodities amidst economic and institutional concerns.

Lastly, I denote the common denomination of precious metals in USD, as it has become a standard in international markets and the reference for most of the literature on safe haven properties of such asset class. Baur & McDermott support this approach, by highlighting the consistency and comparability from the widespread use of USD across markets. However, when studying the safe haven properties of gold, they isolate price movements solely caused by changes in USD-based exchange rates, which they label as "currency effect". They find that, while USD-denomination introduces a degree of co-movement with non-US stock indexes during stable periods, its impact diminishes significantly under extreme market conditions[4]. For my analysis, this indicates that the use of USD-denominated values should have no significant effect on the determination of the safe haven properties of precious metals.

[3] The main developed markets here encompass large economies within the Eurozone as Germany, France and Italy, as well as US, Switzerland and the UK. Additionally, the findings here point to less relevance of safe haven assets in emerging markets as the BRICS countries, meaning investors that suffer losses here do not seek havens but rebalance their portfolios by increasing the weight of developed markets.

[4] See Baur & McDermott (2010) for a detailed discussion of the results of different "currency effects".

Government Bonds

Turning to government bonds, financially stable countries have long been considered a safe bet during moments of uncertainty due to their creditworthiness and liquidity. Scruggs & Glabadanidis (2003) provide some of the first results by examining the dynamic covariance between stock and bonds returns. Their most significant finding points to the variability of such covariance over time, indicating that certain factors could influence it.

Following this, several works focused specifically on economic factors. Kim et al. (2006) use the case of the European Monetary Union to find that macroeconomic convergence contributed for the stock-bond correlation to become increasingly negative in developed economies. Baele et al. (2010) contradict such findings with a dynamic factor model detailing that macroeconomic fundamentals have little explanatory power, while liquidity presents a more significant role. The prevalence of economic concerns should manifest in significant reactions to economic concerns for my study.

Regarding the study of government bonds, I find that much of the literature uses major crisis as samples of market turmoil. Starting with the GFC and ESDC, I have two events with significant economic (and some institutional) concerns for investors. Liu (2020) employs a regression framework with return tails as a measure of market downturn. With a sample from 1993 to 2013, the study focuses significantly on the aforementioned crises, finding that, among 16 international markets, the US stands as one of the best safe haven options. Its known economic stability and liquidity emphasize its popular role as a benchmark for "risk-free asset".

The German case serves the same purpose within the Eurozone, with De Santis (2012) highlighting its notable performance due to increased demand from other European nations during the ESDC. As both the GFC and ESDC represent a notable concentration of the most economically relevant events in my sample, I should observe significant outperformance from both these assets.

The COVID-19 pandemic, along with other epidemics, provides relevant market dynamics, closely related to reactions to institutional concerns. Choudhury et al. (2022) use a GARCH model from Engle (2002) to analyse the variation of conditional correlation of different government bonds against a US equity index, along 6 major epidemics. They find that the US and Japanese cases offer the best protection during said events, outperforming the Swiss and German bonds, that fall under the weak safe haven status. While relevant, I highlight that such

results should not be necessarily visible in my analysis, particularly due to the variety of institutionally relevant events in my sample besides epidemics.

Currencies

Currencies have drawn significant attention as a safe haven asset class, with several works focused on which determinants are more relevant. Habib & Stracca (2012) use a factor model to compare such determinants among exchange rates from 52 developed and emerging countries. They find that Net Foreign Asset position, which indicates exposure to the foreign exchange market, is the most significant factor for such protective properties. They then conclude that large and less financially open economies provide the best safe haven currencies. This conclusion is expressed in the main assets analysed by the literature, with emphasis on the CHF, JPY and USD.

Hossfeld & MacDonald (2015) specified that a safe haven currency should follow the behaviour of typical safe haven assets, when separated from the effect of carry-trade reversals. They focus on this distinction because, during financial crises, the closure of open carry-trade positions drives an appreciation of typically low-interest currencies that is mistaken for safe haven behaviour[5]. Using a regression framework on certain determinants, they find that the JPY falls in this carry funding category, while the CHF and USD remain as the best safe haven options. In my study, if the JPY responds positively to concerns besides the economic (particularly interest rates), I should argue in favour of its safe haven status, apart from a carry funding role.

Several works focused on the interaction of currencies with volatility. Coudert et al. (2014) matched several known events between 1993 and 2013 with the peaks of the VIX index. Defining safe haven currencies as assets that depreciate in the long run but appreciate during financial turmoil, they find that the JPY and USD outperform the CHF due to lack of consistency. Ranaldo & Söderlind, 2010 and Cho & Han (2021) contradict such results, employing factor and cross-quantilogram models to study currencies' dependence on volatility. Both works find that the JPY and CHF appreciate significantly during extreme volatile

[5] In carry-trade strategies, investors borrow low-interest rate currencies (carry funding) and buy typically high-interest rate currencies (target) due to perceived arbitrage opportunities. This arbitrage is derived from the inconsistency between the interest rate differential and the expected appreciation (depreciation) of the carry funding (target) currency.

intervals. I believe these findings highlight the difference between the volatility of global stock returns and the US-focused VIX framework.

Lastly, by targeting individual crisis, I focus on the ESDC that served as the basis for works on safe haven status specifically against the euro. Using a sample from 1990 to 2011, Grisse & Nitschka (2015) employ augmented UIP regressions to study the influence of several risk factors on different CHF-based exchange rates. They find strong safe haven properties against the euro, but inconsistent results against the USD and JPY. Their justification for this inconsistency lies on the limited size and liquidity of the CHF-denominated assets market.

Wong & Fong (2017) confirm these findings, highlighting the increasing demand of CHF-denominated assets in the lead up to the ESDC. This influenced the Swiss National Bank's (SNB) decision in 2011 to peg the CHF to the euro to manage its valuation. In this decision, the euro should keep its value above 1.20 francs, guaranteeing that the CHF could not significantly appreciate and hurt Switzerland's exports.

Furthermore, on January of 2015 the SNB decided to remove such peg, indicating that the measure was only supposed to be a temporary protection for Swiss exporters against the consequences of the ESDC. This prompted an immediate appreciation of the CHF of around 20% and several critics that did not see such an obvious economic improvement as the country's inflation remained negative (article from Financial Times[6]). These events around and following the ESDC represent some of the most economically relevant periods to my analysis, so the results for the CHF should follow these findings.

3. Data

Instruments

As previously stated, I analyse the safe haven characteristics of the following assets: gold, silver, platinum, 10-year government bonds issued by the US, Germany, Switzerland and Japan, as well as the effective exchange rates of USD, CHF and JPY. The protective properties of these assets are studied against the S&P Global 1200 index which provides an exposure to the global equity market[7]. I perform the same analysis for the VIX index by following the reasoning of

[6] Link to the article: "The Swiss currency bombshell – cause and effect".
[7] The index is produced through a combination of 7 major indexes, all widely accepted in their own region. In that sense, it achieves a representation of around 70% of global market capitalization and provides variations on a daily basis that are not consistent for other recognized global indexes as the MSCI World. For a more detailed overview of its composition and performance, see S&P Global.

Kopyl & Lee (2016), that argue for the idea that a market crisis or shock is not only seen in significant value declines, but notorious spikes in volatility as well. The VIX is widely used in the literature as a good measure of investor uncertainty, moving with changes in bid/ask rates on SPY options[8].

The daily values for the S&P Global 1200, commodities and government bonds were retrieved from Datastream, while the effective exchange rates were retrieved from the Bank of International Settlements database[9]. For these, the chosen sample ranged from 2000 to 2023. The particular value chosen for the commodities was the daily closing spot price in USD per troy ounce, which aligns with the standard practice described in the Literature Review. Furthermore, I used effective exchange rates as these provide insight on the absolute movement of currencies, as opposed to bilateral currency pairs that would only determine how one moves against another (Hossfeld & MacDonald, 2015).

Regarding government bonds, the German and Swiss cases did not present bid prices prior to 2012. In that sense, an approximation that leverages on the bond's duration (calculated from the period post-2012) and daily yields (available for the whole sample) was used to calculate daily returns. This method is a good approximation as the bond's duration is relatively constant particularly given the low default risk and high credit quality of German and Swiss bonds during the considered sample (Paret & Weber, 2019).

Table 1 presents the descriptive statistics for the data, starting with both indexes and following with the instruments. I first note that there are less VIX observations available. The S&P Global 1200 and the commodities tendentially outperform other instruments in their distribution, which is expected as bonds depend on interest rate policies, credit ratings, and yield curves that tend to remain relatively stable for the countries analysed. While commodities react to global supply-demand dynamics and geopolitical tensions, and equities are influenced by growth expectations and market sentiment, bonds are more limited by the fixed-income nature of their returns and their dependence on macroeconomic conditions, such as monetary policy stability. As a result, their general performance should be less volatile but also lower in terms of returns.

As for the stability of exchange rates, the USD is typically managed through monetary policy, while Japan uses their significant foreign exchange reserves in money market

[8] The VIX index is produced by the Chicago Board Options Exchange, so for a detailed overview of its construction and performance, see CBOE.
[9] The effective exchange rate of a currency is determined through a geometric trade-weighted average of bilateral exchange rates against 64 other currencies. For more details, see Bank of International Settlements.

interventions, thus guaranteeing its attractivity for exports. Switzerland not only boasts significant reserves of foreign currency, but has historically kept a low-interest rate environment to manage the appreciation of the CHF. Its significant appreciation against the EUR around the ESDC (Wong & Fong, 2017) should be a major factor for the average return of CHF to be positive. From a volatility standpoint, the results seem to be the same for commodities and the S&P, with the VIX surging as a standalone case due its different nature, meaning its reactions in percentual terms are usually more extreme than the reactions seen from equities for the same day.

Table 1
The table presents the descriptive statistics for returns of all instruments and indexes used. The statistics are based on daily returns.

	Mean	Standard Deviation	Maximum	Minimum	Skewness	Kurtosis	Observations
S&P Global 1200 Index	0,0002	0,0103	0,0931	-0,0996	-0,5110	10,0735	6260
VIX Index	-0,0001	0,0703	0,7682	-0,3506	1,0081	6,3890	6049
Gold	0,0003	0,0105	0,0687	-0,1016	-0,3765	6,0227	6260
Silver	0,0002	0,0183	0,1366	-0,1353	-0,5343	5,8960	6260
Platinum	0,0001	0,0151	0,0934	-0,1728	-0,6628	8,2503	6260
US 10 Bond	0,0000	0,0069	0,1424	-0,1052	0,7263	67,8367	6260
Germany Bond	0,0001	0,0048	0,1488	-0,0594	4,3437	160,8208	6260
Swiss Bond	0,0001	0,0083	0,2486	-0,3197	-4,6421	645,9806	6260
Japan Bond	0,0000	0,0030	0,0563	-0,0305	1,4036	51,3849	6260
USD	0,0000	0,0033	0,0202	-0,0232	0,0741	3,3557	6260
JPY	0,0000	0,0059	0,0473	-0,0331	0,3402	4,8472	6260
CHF	0,0001	0,0042	0,1512	-0,0799	6,3845	297,0296	6260

News-based Indexes

The news-based indexes are produced individually for each specific topic, meaning these were assigned to each of my considered concerns, as shown below:

- Economic: Macroeconomic News and Outlook; Fiscal Policy; Monetary Policy; Inflation; Interest Rates; Labor Markets; Business Investment and Sentiment; Consumer Spending and Sentiment; Commodity Markets; Financial Crises; Exchange Rates.

- Institutional: Trade Policy; Regulation; Elections and Political Governance; Government-Sponsored Enterprises; Healthcare Policy; Food and Drug Policy; Transportation, Infrastructure, and Public Utilities and Agricultural Policy.

- Geopolitical: Threats and Actions.

Regarding how they are constructed, I start with the economic and institutional concerns that are derived from Baker et al. (2019). First, a concept called EMV Tracker is generated as

a monthly value that uses the movements of the VIX and the realized volatility returns of the S&P 500. These are correlated to the number of newspaper articles from 11 main US newspapers considered EMV. These must mention at least one term of E (Economic: “economic”, “economy” and “financial”), M (Market: "stock market", “equity”, “equities”, "Standard and Poor’s" and variants) and V (Volatility: “volatility”, “volatile”, “uncertain”, “uncertainty”, “risk”, “risky”).

After this, topic-specific indexes are generated through the multiplication of the EMV Tracker (for a certain month) by the share of EMV articles that mention the determined topic (in that same month). Each of these topics encompasses a list of terms that are scanned for in such articles to produce its index’s value.

In a separate dataset, now produced in Caldara & Iacoviello (2022), a similar approach is seen. Here, they use the amount of search results stored in the archives of 10 major US newspapers to provide a monthly value of geopolitical uncertainty[10]. The authors specify this value in 8 different categories separated in two groups in the form of Acts and Threats[11].

4. Methodology

Crisis Classification

I started by defining the time windows considered as moments of financial turmoil through a quantitative definition, in order to counter most subjective critics. The reason for this is that the starting and ending dates for relevant events that I want to study vary a lot according to the reference used. In that sense, the indexes’ data will determine such windows.

I then leveraged on the methodology from Baur & McDermott (2010) as some of the literature does (e.g. Hasan et al., 2021). In their study, they define moments of financial downturns with the criteria of belonging to the 1%, 5% or 10% tail of lowest daily or weekly returns of an equity index. I consider daily variations to carry too much noise (Baur and McDermott, 2010), as several cases of single-day variations are unrelated to significant crisis events (e.g. market corrections). The interest here is rather in continuous moments of either a significant decline in value or increased uncertainty. In that sense, I used the cumulative returns

[10] While the newspapers used in both papers are all US-based, the topics and correspondent terms that are relevant to my analysis, include events or concerns whose significance extends beyond the scope of American investors (e.g. Eurozone Sovereign Debt Crisis).

[11] For a more detailed overview of the indexes’ construction including the lists of terms employed for each topic, see Baker et al. (2019) and Caldara & Iacoviello (2022).

and standard deviation for a moving window of 30 trading days. Practically, both these statistics were for the windows t=1 to t=30, t=2 to t=31 and so forth for all my time sample and in the case of both indexes.

I chose the 5% tail as it provides enough days to encompass major events connected to a sufficient variety of topics. The sample then avoids occasional downturns unrelated to the topics I consider, as observed with the 10% tail, but does not solely concentrate on the most popular examples as the GFC or COVID-19 pandemic, as seen in the 1% tail. In that sense, I end up with 4 different groups of days that are considered as possible moments of financial turmoil, which are studied individually. These are the 5% tail of 30-trading days windows with lowest cumulative returns and highest volatility for the S&P Global 1200. For the VIX, I use the highest cumulative returns and volatility.

By doing this, a consequence was the possible overlap of such intervals, as the statistics for the interval t=205 to t=234 are very similar to the ones in t=206 to t=235, for example. These overlapping intervals were then merged into one longer than 30 trading days, so for the previous example the interval considered would be t=205 to t=235. Crises are then defined in 4 different ways so that consistency among the results for different definitions increases the robustness of my conclusions. I also provide insight on how returns and volatility impact investors differently.

I accomplished my goal of focusing on the most relevant financial downturns of the 21st century, as shown by Tables A1 to A4 in the Appendix. These present the months in my sample with at least one crisis day according to each of the 4 crisis definitions. Such relevant events can be seen in concentrations around the September 11th attacks (09/2001), the GFC (2007, 2008 and 2009), the Eurozone sovereign debt crisis (2010 and 2011) and the COVID-19 pandemic (2020).

With the different crisis definitions, I perform an analysis of the behaviour of all assets, without considering the different concerns for investors. I then use the correlation coefficients between the return of each index and asset shown in Table 2. From a hedge perspective (2 last columns), all bonds and currencies provide positive signs in safeguarding against value decline and volatility spikes. The US and German bonds stand out, while the JPY is the most consistent currency. The USD reacts somewhat significantly to movements of the VIX, aligning with the results in Coudert et al. (2014). Aside from these, gold is the only commodity that shows possibly interesting results, by fitting within the hedge category only against the VIX. As it is not in a significant way, it remains the closest instrument to an uncorrelated case, thus a very uncertain option for investors.

Table 2
The table presents the correlation coefficients between the instruments and both indexes for the whole sample and crisis periods. The first 4 columns present the results for crisis periods defined by returns or volatility in both indexes, while the last 2 indicate the results in the full sample.

	S&P Global 1200		VIX		S&P Global 1200	VIX
	Returns	Volatility	Returns	Volatility		
Gold	0,0078	0,0402	0,0734	0,0447	0,0669	0,0232
Silver	0,1755	0,2440	-0,0410	-0,0912	0,2059	-0,0717
Platinum	0,2396	0,3159	-0,1091	-0,1469	0,2067	-0,0865
US 10 Bond	-0,2804	-0,3751	0,2552	0,3188	-0,1947	0,1869
Germany Bond	-0,1693	-0,4129	0,1658	0,2262	-0,1976	0,1354
Swiss Bond	-0,1260	-0,3752	0,0918	0,2008	-0,0882	0,0596
Japan Bond	-0,0508	-0,0746	0,0352	0,0966	-0,0434	0,0099
USD	-0,3587	-0,4387	0,1655	0,2203	-0,3038	0,1278
JPY	-0,3982	-0,4472	0,2327	0,2992	-0,2883	0,1762
CHF	-0,2336	-0,2303	0,1262	0,1632	-0,1523	0,1063

Looking at the correlations during each of the crisis periods (first 4 columns), the results as safe havens follow closely the ones seen with hedges. The most significant assets within bonds and currencies remain the same, while gold is almost uncorrelated to returns of the S&P index. Moreover, Silver and Platinum consistently fail as safe havens, which possibly aligns with the influence of economic and political factors raised by Lucey & Li (2015). As these metals are significantly demanded by the industrial sector, it is possible that their value decreases as industrial activity goes down with the market, denoting the cyclicality of such sector. Finally, I focus on a consistent result for the two indexes, which resides in the fact that the significance of the correlation against any instrument seems always higher for volatility-based definitions. This points to the idea that investors prefer to react to a surge in uncertainty than a decline in value.

Assignment of Concerns

I then used the news-based indexes to assign one or more specific concerns to each crisis day in the different crisis definitions. My premise is that investors are more concerned with topics that present abnormally higher index values, meaning they are mentioned in news articles at a more frequent rate than usual. Of course, several topics, associated with different concerns, could be unusually relevant at the same time and are consequently called overlapping concerns.

The possibility of overlapping concerns is natural since the ones chosen for this study are not in any way mutually exclusive and tend to be deeply connected. I highlight the economic and institutional cases here because, in major economic events, it is a main concern among investors how regulatory bodies will respond through policy. An example is the reframing of

the banking sector's regulation in the US during the GFC, in response to the collapse of Lehman Brothers and the deterioration of the whole sector.

I started by standardizing the monthly values for all indexes according to their sample mean and standard deviation. This is done to make all topics comparable, as some of them are naturally more popular in our day-to-day (e.g. Macroeconomic News and Outlook appear more often than Exchange Rates). I end up with monthly z-scores for each of these that indicate if their relevance was higher (positive value) or lower (negative value) than normal. With these values, I can derive the monthly relevance of economic, institutional and geopolitical concerns, which are defined as z-scores as well, through two different frameworks:

- Max Z-Score: for each month, I use the highest z-score among all topics, so that each concern is treated according to its topic that increased the most in relevance;

- Weighted Z-Score: here, for each concern, I use all the topics that present positive z-scores and weigh them according to their natural popularity, so the average value of their index.

An implicit consequence of such distinction will be that in the Max Z-Score approach the values are always more extreme. In that sense, it is easier to observe larger differences between Weights for different concerns. With the monthly relevance of each concern, I define two frameworks to interpret them. These are:

- Binary Approach (BA): here, a concern-based dummy yields the value of 1 if the monthly z-scores translate to percentiles that surpass the threshold of the 75^{th} percentile, and 0 otherwise. I interpret this as an indicator that states if a concern is relevant for investors or not during that specific month;

- Weights with Z-Scores (WZ): with this approach, weights are generated instead. The correspondent z-scores determine such weights in relation to the sum of the 3 concerns' z-scores (ignoring values below 0). Here, I produce an indicator for the weight of economic, institutional or geopolitical concerns on investors' decisions.

As the dummies or weights are derived on a monthly basis, I assume that they are equally applied to every crisis day in each month. Meaning, if in a specific crisis definition, the 10 last days of October of 2007 belong to a crisis period, the dummy or weight for that month is assumed for all those 10 days.

I account for overlapping concerns in the BA, as it could yield more than one concern-based dummy with a value of 1 for the same month. The WZ framework accounts as well, while also offering insights on which concerns are assumed as more relevant for investment decisions. I clarify that the end product here is 4 separate combinations of frameworks, with both the Max and Weighted Z-Score being treated through the BA and WZ approaches.

A possible outcome with such frameworks appears when, for a specific month, none of the concerns presents a positive dummy or weight. This happens when every topic's z-score is negative or when using the BA, none of the z-scores translate to percentages above 75%. I found this to be very rare, but when it presented, the crisis for such month was then considered to present a cause that is not significantly correlated to any of the considered topics. In that sense, I considered it to be outside the range of crisis periods relevant to the analysis.

Econometric Analysis

I then analyse the correlation between the indexes and assets, individually measured by the relevance of each concern. For this, the regression framework from Baur & McDermott (2010) was adapted, meaning it is set in one main regression whose variables are dynamically set by three others, as follows:

$$r_{asset,t} = a + b_t r_{economic,t} + c_t r_{institutional,t} + d_t r_{geopolitical,t} + e_t \quad (1a)$$

$$r_{economic,t} = r_{index,t} w_{economic,t} \quad (1b)$$

$$r_{institutional,t} = r_{index,t} w_{institutional,t} \quad (1c)$$

$$r_{geopolitical,t} = r_{index,t} w_{geopolitical,t} \quad (1d)$$

The coefficients b_t, c_t and d_t in equation (1a) signal the relationship between the returns of the asset and index according to the relevance of economic, institutional and geopolitical concerns respectively. Equations (1b), (1c) and (1d) serve to dynamically set the relationships for each concern. The w variable assumes the value of 0 for stable moments and the value of the dummies or weights previously calculated, during moments of financial turmoil. This analysis is repeated using the S&P and VIX as indexes, each with two possible sets of crisis intervals. At the same time, I repeat the process with weights or dummies from the 4

combinations of frameworks.

When investors react mainly through a specific type of concern, I consider a given asset a safe haven if the correspondent coefficient is negative (positive for the VIX). If such value is negative and not statistically significant, it is assumed as weak safe haven. If it is negative and statistically significant, it follows the role of a strong safe haven. Naturally, if the study yields positive (negative) results for such coefficients, the given asset loses value along the declining markets (increasing uncertainty).

5. Discussion

In this section, the results of the regression framework are analysed through 6 different tables, from Table 3a to 5b. Each of these focuses on b_t, c_t or d_t for both the S&P and VIX indexes. While the tables present the values for all frameworks, the ones mentioned in the discussion are average coefficients, so that we can associate a specific asset to just one value, which we will define as AC/ACs to avoid repetition. Besides that, as previously mentioned, the analysis here focuses on the statistical significance of the coefficients, as the consistency of such significance is what determines an asset's safe haven performance. In that sense, any statement regarding performance is mainly related to the consistency of such significance.

Economic

Starting with economic concerns in Tables 3a and 3b, commodities, despite their traditional association with safe haven properties, performed poorly. When analysed against the S&P Global 1200, such failure was consistent, particularly for silver, which significantly followed the market's decline through different frameworks. This is reflected in its AC of 0,4655, which confirms its poor performance during economic downturns. A possible reason for this could be its known industrial demand, as such downturns severely impact most economic activity, also aligning with Lucey & Li (2015), who fail to find significant evidence in favour of the relevance of economic factors.

This variability is enhanced during major events such as the GFC, which appears as one of the main overlapping periods between crisis intervals in both the returns and volatility-based definitions (Tables A1 and A2). Gold and platinum show relatively smaller movements when investors react to volatility spikes (as seen in the volatility-based frameworks for Table 3a),

contradicting the results found in the correlation analysis, that was neutral to any type of concern.

The regression analysis against the VIX goes along with the S&P's results, showing that commodities generally failed to hedge against heightened uncertainty. The magnitude and significance of their reactions decreased notably compared to the equity-based framework. Gold, for instance, almost approached uncorrelation with the VIX, with its AC at -0,0011, possibly presenting a weak safe haven option. Similarly, silver and platinum continued to lose value, with ACs of -0,0248 and -0,0194, respectively, further failing as investment options. These findings are consistent with Hood & Malik (2013), who argue for the inconsistent reaction to changes in the VIX, especially in the case of gold.

Table 3a
The table presents the regression results for the coefficients associated with economic nature concerns, so b_t, for all the different frameworks in relation to the S&P Global 1200 index. I first divide into crisis definitions by returns or volatility, then the use of maximum or weighted Z-Score in the values assigned to each concern and, finally, the use of a WZ or BA to produce weights or dummies.

	Crisis by Returns				Crisis by Volatility			
	Max Z-Score		Weighted Z-Score		Max Z-Score		Weighted Z-Score	
	WZ	BA	WZ	BA	WZ	BA	WZ	BA
Gold	0,2272***	0,3327***	0,2152***	-0,0034	0,2087*	0,1476**	0,2203***	0,0534
Silver	0,6922***	0,6793***	0,5335***	0,1293*	0,4853**	0,4576***	0,3732***	0,0684
Platinum	0,2810***	0,2245**	0,3751***	0,0525	0,0306	0,1117	0,3563***	-0,1040
US 10 Bond	-0,0576	-0,0418	**-0,0943****	-0,0341	**-0,1969*****	**-0,2061*****	**-0,1295****	0,0228
Germany Bond	0,0849**	0,0786**	0,0268	0,0376*	**-0,1090****	**-0,1916*****	-0,0055	-0,0076
Swiss Bond	-0,0304	-0,0042	-0,0493	-0,0456	-0,1211	-0,0706	-0,0606	0,0140
Japan Bond	-0,0210	-0,0278	-0,0093	-0,0119	-0,0101	-0,0038	0,0194	0,0180
USD	**-0,1246*****	**-0,0817*****	**-0,0829*****	**-0,0388*****	**-0,1908*****	**-0,1749*****	**-0,0668*****	-0,0139
JPY	**-0,2099*****	-0,0349	**-0,1272*****	**-0,0572****	**-0,1156***	-0,0257	-0,0476	0,0329
CHF	**-0,1129*****	-0,0427	**-0,1119*****	**-0,0626*****	**-0,0816***	0,0383	**-0,0952*****	0,0163

Statistical significance is represented by *, ** and *** at the 10%, 5% and 1% level respectively.

Government bonds show generally solid safe haven properties when accounting for economic concerns. The US case is the best example against both indexes. Against the equity market, it showed significant appreciation, as confirmed by its AC of -0,0922 and highlighting the previously mentioned "flight to quality" phenomenon. Such finding goes along with Liu (2020), who emphasize the attractiveness of this bond as an example of investors seeking assets secured by stable economies.

Table 3b

The table presents the regression results for the coefficients associated with economic nature concerns, so b_t, for all the different frameworks in relation to the VIX index. I first divide into crisis definitions by returns or volatility, then the use of maximum or weighted Z-Score in the values assigned to each concern and, finally, the use of a WZ or BA to produce weights or dummies.

	Crisis by Returns				Crisis by Volatility			
	Max Z-Score		Weighted Z-Score		Max Z-Score		Weighted Z-Score	
	WZ	BA	WZ	BA	WZ	BA	WZ	BA
Gold	0,0006	-0,0058	-0,0005	0,0066	-0,0039	-0,0076	-0,0022	0,0035
Silver	-0,0266**	-0,0154	-0,0306**	-0,0105	-0,0416***	-0,0123	-0,0426***	-0,0191*
Platinum	-0,0083	-0,0014	-0,0128	-0,0021	-0,0412***	-0,0216**	-0,0456***	-0,0211**
US 10 Bond	**0,0196*** **	**0,0128*** **	**0,0250*** **	**0,0184*** **	**0,0262*** **	**0,0165*** **	**0,0308*** **	**0,0210*** **
Germany Bond	**0,0059***	0,0019	**0,0070*** **	0,0027	**0,0118*** **	**0,0072*** **	**0,0124*** **	**0,0063*** **
Swiss Bond	0,0049	0,0004	0,0073	**0,0101*** **	**0,0111***	0,0055	**0,0122***	0,0070
Japan Bond	0,0010	0,0005	0,0003	0,0000	0,0014	0,0007	0,0004	-0,0002
USD	**0,0049*** **	0,0009	**0,0056*** **	**0,0031***	**0,0099*** **	0,0019	**0,0106*** **	**0,0052*** **
JPY	**0,0148*** **	0,0020	**0,0142*** **	**0,0058***	**0,0145*** **	0,0006	**0,0152*** **	**0,0099*** **
CHF	**0,0123*** **	**0,0069*** **	**0,0117*** **	**0,0064*** **	**0,0115*** **	**0,0048***	**0,0127*** **	**0,0063*** **

Statistical significance is represented by *, ** and *** at the 10%, 5% and 1% level respectively.

The German bond showed strong safe haven properties from a volatility standpoint (Crisis by Volatility in Table 3b), with opposite results in relation to equity declines across the different frameworks. This distinction may stem from the previously mentioned distribution of crisis intervals. Particularly for the volatility-based interval (Table A2), it concentrated around the ESDC, an event during which this instrument performed exceptionally well (De Santis, 2012).

The VIX-based analysis further strengthens the case for government bonds. Both the US and German cases showed significant consistency in appreciating when uncertainty spiked, solidifying their role as robust safe havens. The Swiss bond market displayed notable improvement under this framework, going from a weak safe haven in the equity-based analysis to an average-strength option, with ACs of -0,0460 (Table 3a) and 0,0073 (Table 3b). This result stands much closer to Switzerland's reputation for financial stability and neutrality. On a last note, the Japanese case remains a consistently weak option for a safe haven, underperforming its peers with ACs of -0,0058 (Table 3a) and 0,0005 (Table 3b).

Currencies appear then as the most solid asset class amid such concerns, with the USD and CHF standing out. When evaluated against the S&P Global 1200, the USD boasted the best performance with an AC of -0,0968, slightly outperforming its peers that remained as reasonably strong safe havens. Despite the results in the VIX framework supporting USD's strong safe haven properties, the magnitude of the correlation is consistently smaller than in the case of the equity index, aligning with the disparity seen in the correlation analysis.

In the case of the CHF, I denote consistent outperformance against its peers when reacting to uncertainty (AC of 0,0091, Table 3b) rather than equity declines (AC of -0,0519, Table 3a),

contradicting then the findings of Coudert et al. (2014). As I previously argued, the notorious appreciation of CHF against the EUR during and following the ESDC should influence these results, as this particular exchange rate represents a major portion of the CHF market. Additionally, the period during and after the ESDC appears in both crisis definitions for the VIX (Tables A3 and A4), highlighting the attractiveness of the CHF amid economic uncertainty within Eurozone institutions. Finally, the JPY presented reasonably strong safe haven properties in both indexes, with ACs of -0,7200 (Table 3a) and 0,0096 (Table 3b). Further analysis is needed to assert that these were not solely caused by the closure of carry-trades, which are typically triggered by significant news on economic topics such as interest rates.

In conclusion, amid economic concerns, currencies seem to be the safest investment option, with the US and German bonds also offering protection under certain circumstances. If crises are considered as equity declines (Table 3a), currencies, particularly the USD, are the certain option, while during uncertainty spikes (Table 3b), the CHF seems to be the most consistent safe haven along with the US bond. The latter is preferred to the CHF as it appreciates more significantly (higher coefficients) and presents the same consistency as a safe haven (same number of statistically significant coefficients).

Institutional

Considering institutional concerns, I refer to Tables 4a and 4b. In commodities, gold stands out by performing notably better compared to economic concerns, which aligns with Li & Lucey (2017) who argue in favour of institutional drivers as opposed to economic ones for the behaviour of this asset class. When analysed against the S&P Global 1200 (Table 4a), it demonstrated a significant ability to hedge against equity declines, much better than against volatility spikes. This reaffirms its historical reputation for safeguarding value as seen by an AC of -0,1250. Furthermore, the VIX-based framework (Table 4b) shows the same outcome (AC of 0,0121), strengthening gold's case and diverging from Hood & Malik (2013). Despite this, I highlight that its safe haven status depends heavily on how crises are defined—whether they manifest as market value downturns or heightened volatility.

Regarding other commodities, silver offers very mixed results against the S&P (AC of 0,0331, Table 4a) that even worsen against the VIX (AC of -0,0088, Table 4b). This points to its dependence on country-specific financial and political characteristics, whose solidity could seem less convincing in moments of high uncertainty. Finally, I denote that silver historically

presented behaviour closer to a safe haven when reacting to a decline in returns as opposed to increasing volatility. This difference is much more significant against the S&P, meaning, the different crisis intervals (Tables A1 and A2) point to institutional concerns outside the GFC and COVID-19 pandemic triggering good responses. Still, I conclude that its safe haven status within such concerns is too uncertain, while platinum consistently loses value, with ACs of 0,3293 (Table 4a) and -0,0256 (Table 4b).

Table 4a

The table presents the regression results for the coefficients associated with institutional nature concerns, so c_t, for all the different frameworks in relation to the S&P Global 1200 index. I first divide into crisis definitions by returns or volatility, then the use of maximum or weighted Z-Score in the values assigned to each concern and, finally, the use of a WZ or BA to produce weights or dummies.

	Crisis by Returns				Crisis by Volatility			
	Max Z-Score		Weighted Z-Score		Max Z-Score		Weighted Z-Score	
	WZ	BA	WZ	BA	WZ	BA	WZ	BA
Gold	**-0,1876****	**-0,3195*****	**-0,1876*****	0,0260	-0,0967	-0,1024	-0,1277	-0,0043
Silver	-0,1583	**-0,4164*****	-0,0020	0,1244	0,2375	-0,1348	0,3399**	0,2747***
Platinum	0,3370***	0,0802	0,2458**	0,2525***	0,6627***	0,2420***	0,3528***	0,4612***
US 10 Bond	**-0,2842*****	**-0,1275*****	**-0,2458*****	**-0,1345*****	-0,1233	0,0478	**-0,1901*****	**-0,1860*****
Germany Bond	**-0,2648*****	**-0,1744*****	**-0,2146*****	**-0,1252*****	**-0,0885***	0,1036***	**-0,1967*****	**-0,0851*****
Swiss Bond	**-0,1586*****	-0,0925	**-0,1314****	-0,0476	-0,0597	-0,0201	**-0,1204***	**-0,1027****
Japan Bond	-0,0001	0,0178	-0,0137	0,0043	-0,0137	-0,0054	**-0,0452***	-0,0262
USD	**-0,0605*****	-0,0167	**-0,1085*****	**-0,0607*****	-0,0437	0,0734***	**-0,1660*****	**-0,0966*****
JPY	**-0,1961*****	**-0,1825*****	**-0,2929*****	**-0,1569*****	**-0,2694*****	**-0,1746*****	**-0,3497*****	**-0,2302*****
CHF	**-0,0502***	-0,0397	**-0,0462***	-0,0227	-0,0671	**-0,1228*****	-0,0520	**-0,0983*****

Statistical significance is represented by *, ** and *** at the 10%, 5% and 1% level respectively.

Government bonds maintained their previously asserted strong safe haven status, with the German case appearing as a particularly reliable option. Its AC of -0,1307 (Table 4a) reflects significant negative correlations with both equity declines and volatility spikes in the S&P framework. This broad ability to protect value during moments of regulatory instability is consistent with De Santis (2012), who highlights the trust placed in Germany's fiscal and political institutions during periods of uncertainty.

The US bond also performed well, although its significance was relatively less consistent than in the economic context. With ACs of -0,1555 (Table 4a) and 0,0175 (Table 4b), I then conclude it to be an average-strength safe haven in the face of such concerns. Swiss bonds improved compared to the economic case, offering mixed but generally positive results, with ACs of -0,0916 (Table 4a) and 0,0102 (Table 4b). However, the Japanese bond continued to underperform its peers, showing little correlation during both equity declines and uncertainty spikes, with ACs of -0,0103 (Table 4a) and 0,0019 (Table 4b). A strong reason for this underperformance should be concerns over trade policy, which directly affects Japan's major

dependence on exports. I also highlight the partial contradiction with the results of Choudhury et al. (2022) for the COVID-19 pandemic, as the Japanese bond proved the weakest safe haven under such circumstances.

Table 4b

The table presents the regression results for the coefficients associated with institutional nature concerns, so c_t, for all the different frameworks in relation to the VIX index. I first divide into crisis definitions by returns or volatility, then the use of maximum or weighted Z-Score in the values assigned to each concern and, finally, the use of a WZ or BA to produce weights or dummies.

	Crisis by Returns				Crisis by Volatility			
	Max Z-Score		Weighted Z-Score		Max Z-Score		Weighted Z-Score	
	WZ	BA	WZ	BA	WZ	BA	WZ	BA
Gold	**0,0185****	**0,0188*****	**0,0171****	0,0053	0,0113	**0,0138***	0,0087	0,0029
Silver	-0,0010	-0,0001	-0,0015	-0,0078	-0,0119	-0,0178	-0,0148	-0,0152
Platinum	-0,0405***	-0,0281***	-0,0383***	-0,0298***	-0,0265**	-0,0193*	-0,0244**	-0,0255***
US 10 Bond	**0,0279*****	**0,0135*****	0,0219	0,0135	0,0208	0,0109	**0,0172*****	**0,0143*****
Germany Bond	**0,0143*****	**0,0092*****	**0,0132*****	**0,0098*****	**0,0105*****	**0,0061***	**0,0103*****	**0,0091*****
Swiss Bond	**0,0171*****	**0,0142*****	**0,0129****	0,0071	0,0082	0,0067	0,0072	**0,0082***
Japan Bond	0,0021	0,0010	0,0028	0,0018	0,0017	0,0013	0,0025	0,0022
USD	**0,0100*****	**0,0078*****	**0,0098*****	**0,0077*****	**0,0110*****	**0,0094*****	**0,0111*****	**0,0092*****
JPY	**0,0273*****	**0,0235*****	**0,0283*****	**0,0231*****	**0,0298*****	**0,0255*****	**0,0297*****	**0,0210*****
CHF	**0,0058***	0,0035	**0,0063****	**0,0065*****	**0,0068****	**0,0061****	**0,0060****	**0,0077*****

Statistical significance is represented by *, ** and *** at the 10%, 5% and 1% level respectively.

Currencies emerged once more as the most consistently reliable asset class in the face of institutional concerns. The JPY significantly stands out, with ACs of -0,2315 (Table 4a) and 0,0260 (Table 4b), consistently appreciating in all frameworks for both indexes. This behaviour reflects the yen's traditional role as a hedge against global political uncertainty, which Ranaldo & Söderlind (2010) attribute to repatriation flows by Japanese investors seeking to reduce foreign exposure during the early stages of major institutional events. While institutional uncertainty is often linked to economic concerns, I believe that the significance of the JPY's performance reinforces its strong safe haven status, apart from a carry funding role. Japan's notorious foreign exchange reserves provide much manoeuvrability to ensure that its currency's value remains stable and does not harm its export attractiveness.

While providing positive results, the USD and CHF fall short of the JPY's performance. The USD maintained ACs of -0,0599 (Table 4a) and 0,0095 (Table 4b), while the CHF reported values of -0.0732 (Table 4a) and 0.0061 (Table 4b), meaning both remained reasonably strong safe haven options. The CHF presented significantly better results in the VIX framework compared to the economic analysis, which I believe is due to the significant appreciation during and after the ESDC that I previously mentioned. However, here the results align with Coudert et al. (2014), as the JPY and USD slightly outperform the CHF in both indexes. Despite the link

between economic and institutional concerns, I find that an analysis that highlights the distinction between these is important, as the findings of works like Coudert et al. (2014) can be confirmed or contradicted depending on the nature of the most relevant topics at a specific point in time.

In conclusion, institutional concerns trigger the best responses from the JPY and German bond. During equity declines (Table 4a), these seem comparable in terms of consistency, while the JPY outperforms in terms of appreciation. During uncertainty spikes (Table 4b), the results are the same, while the USD and CHF strengthen the case for currencies but remain far from the appreciation offered by the JPY.

Geopolitical

Finally, I address the effect of major diplomatic conflicts through Tables 5a and 5b. I notice significant outperformance by commodities against all other asset classes when evaluated against the S&P Global 1200. Gold stands out as the best option by consistently appreciating, particularly in response to heightened volatility, with an AC of -0,3862 (Table 5a). Silver and platinum follow gold's behaviour, showing strong appreciation with ACs of -0,7175 and -0,4888, respectively. Their performance reflects their shared property as tangible assets, even though their industrial dependency relatively lowers their consistency. I conclude that the physical property of an asset represents an important factor when the safety and solidity of a nation's institutions are in jeopardy.

When analysed under the VIX framework (Table 5b), however, commodities present a different picture. The results suggest that gold, silver, and platinum failed to provide significant protection against spikes in uncertainty. They follow the role of weak safe haven options in an insignificant magnitude in most frameworks, strengthening the case of Hood & Malik (2013). The discrepancy between the results in the volatility definition for the S&P Global 1200 and the VIX framework could derive from the concentration of the VIX on the US market, as opposed to the global exposure of the S&P.

Government bonds showed mixed results across the two indexes. When assessed against the S&P Global 1200 (Table 5a), the US and German cases seem to inconsistently present weak safe haven properties, with ACs of -0,1784 and -0,0846, respectively. This inconsistency is evident in the contrast between returns and volatility-based crisis definitions, which I attribute

to the different samples used. By assessing Tables A1 and A2, it is clear that the volatility-based definition is much more concentrated on certain intervals that do not draw much interest from a geopolitical perspective, failing to encompass known events as the 9/11 attacks or Iraq War. As the returns-based definition encompasses a more diverse set of events (including the previous 2), I believe it stands much closer to the true response of US and German to geopolitical concerns, meaning these do not represent viable safe haven options.

The Swiss bond market demonstrated significant consistency as a weak safe haven, in line with findings by Grisse & Nitschka (2015), with ACs of -0,0676 (Table 5a) and 0,0068 (Table 5b). Despite focusing on the CHF, their argument in favour of the limited size and liquidity of the CHF-denominated assets could be relevant here. The Japanese case fails as well (AC of 0,0700, Table 5a), depreciating particularly under the volatility-based definition. I then conclude that the returns of bonds, whose value is assured by their respective nation's stability, notoriously suffer during events that concern investors' safety.

Table 5a

The table presents the regression results for the coefficients associated with geopolitical nature concerns, so d_t, for all the different frameworks in relation to the S&P Global 1200 index. I first divide into crisis definitions by returns or volatility, then the use of maximum or weighted Z-Score in the values assigned to each concern and, finally, the use of a WZ or BA to produce weights or dummies.

	Crisis by Returns				Crisis by Volatility			
	Max Z-Score		Weighted Z-Score		Max Z-Score		Weighted Z-Score	
	WZ	BA	WZ	BA	WZ	BA	WZ	BA
Gold	**-0,2658****	**-0,1199*****	**-0,2304****	**-0,1249*****	**-1,1852*****	**-0,2633*****	**-0,6542*****	**-0,2461*****
Silver	-0,3258	**-0,2376*****	-0,2607	**-0,1864****	**-2,4188*****	**-0,5104*****	**-1,2829*****	**-0,5172*****
Platinum	-0,2468	**-0,1699*****	-0,1856	**-0,1427****	**-1,6610*****	**-0,3923*****	**-0,7282****	**-0,3837*****
US 10 Bond	0,1243	0,0757**	0,0218	0,0184	**-0,8852*****	**-0,1290****	**-0,5751*****	**-0,0777***
Germany Bond	0,1054*	0,0728***	0,0579	0,0357*	**-0,4895*****	**-0,1065****	**-0,3023*****	-0,0504
Swiss Bond	-0,0040	0,0259	-0,0810	-0,0230	-0,2462	-0,0240	-0,1618	-0,0269
Japan Bond	0,0192	0,0168	0,0184	0,0120	0,2359**	0,0741***	0,1453**	0,0384*
USD	-0,0064	0,0440***	-0,0112	0,0342**	0,5194***	0,1148***	0,2873***	0,1341***
JPY	0,0667	0,1076***	0,0153	0,0795***	0,4466**	0,1232**	0,1990*	0,1219***
CHF	-0,0031	0,0208	-0,0306	0,0114	-0,0306	0,0310	-0,0497	0,0195

Statistical significance is represented by *, ** and *** at the 10%, 5% and 1% level respectively.

Table 5b
The table presents the regression results for the coefficients associated with geopolitical nature concerns, so d_t, for all the different frameworks in relation to the VIX index. I first divide into crisis definitions by returns or volatility, then the use of maximum or weighted Z-Score in the values assigned to each concern and, finally, the use of a WZ or BA to produce weights or dummies.

	Crisis by Returns				Crisis by Volatility			
	Max Z-Score		Weighted Z-Score		Max Z-Score		Weighted Z-Score	
	WZ	BA	WZ	BA	WZ	BA	WZ	BA
Gold	0,0072	0,0009	0,0140	0,0070	0,0238	0,0030	0,0225	0,0097
Silver	0,0242	0,0202	0,0292	0,0180	0,0445	0,0321	0,0386	0,0180
Platinum	0,0001	0,0048	0,0045	-0,0001	0,0270	0,0263	0,0158	0,0041
US 10 Bond	0,0023	-0,0071	0,0071	-0,0001	0,0140	0,0019	**0,0154***	**0,0158****
Germany Bond	-0,0010	-0,0033	0,0003	0,0005	0,0095	0,0052	0,0083	**0,0114****
Swiss Bond	0,0052	-0,0009	0,0108	0,0047	0,0121	0,0028	0,0111	0,0083
Japan Bond	-0,0020	-0,0010	-0,0017	-0,0008	0,0025	0,0005	0,0023	0,0020
USD	0,0004	-0,0014	-0,0002	-0,0002	-0,0120**	-0,0075**	-0,0084**	-0,0015
JPY	-0,0033	-0,0101**	-0,0004	-0,0035	0,0086	-0,0067	0,0100	0,0092
CHF	0,0052	0,0004	0,0065	0,0034	0,0096	0,0019	0,0089	0,0044

Statistical significance is represented by *, ** and *** at the 10%, 5% and 1% level respectively.

Under the VIX framework (Table 5b), the results seem to repeat themselves for the majority of cases. All bonds offer very mixed results in regard to the direction their returns follow and very rare significance. The Swiss case maintains then its weak safe haven status (AC of 0,0068), while still underperforming US and German bonds (ACs of 0,0062 and 0,0039, respectively). Japanese bonds, consistent with previous analyses, remained ineffective as a hedge (AC of 0,0002), showing little correlation with either equity declines or volatility spikes.

Currencies were notably the most impacted asset class during crises of such nature, with the lack of investors' confidence in national institutions affecting their performance. When assessed against the S&P Global 1200 (Table 5a), depreciation was significant and consistent, particularly for the USD and JPY, which reported ACs of 0,1395 and 0,1450, respectively. This reflects the previously noted trend of capital flight towards physical assets during conflicts. It also contrasts significantly with their performance in the face of economic and institutional concerns, where these often served as the most reliable hedges.

The results under the VIX approach (Table 5b) reinforce such a conclusion, with both the USD and JPY continuing to underperform, depreciating across several frameworks while presenting ACs of -0,0039 and 0,0005, respectively. The CHF slightly improved its status with an AC of 0,0050 compared to -0,0039 (Table 5a), remaining an overall weak safe haven option. Overall, currencies' safe haven properties seem to worsen as the involvement of their respective country in geopolitical conflicts increases. This result seems a natural conclusion, as the USD is the worst safe haven for both indexes, while the US appears significantly involved in the geopolitical conflicts that my sample encompasses (9/11 attacks, Iraq War, etc.). On the other

hand, Switzerland's political neutrality offers the least depreciation amid conflicts of such nature.

In conclusion, commodities, particularly gold, are the clear strongest safe haven during geopolitical conflicts, particularly when addressing equity declines (Table 5a). During uncertainty spikes (Table 5b), the results are mixed as the US and German bonds are the only assets with any significance, while commodities present higher appreciation and more consistently positive results. Here, the investment decision should depend on the general risk appetite, while the overall results clearly favour the case of commodities.

6. Limitations

Despite achieving meaningful results, it is important to acknowledge certain limitations that my data and methodological choices imply. One significant limitation lies in the categorization of concerns, where each topic was assigned to economic, institutional, or geopolitical types based on personal judgement which is subject to different interpretations. The main consequence here was the extension of economic and institutional concerns that incorporated many topics of quite differing nature. In that sense, crisis events with fundamentally different causes could assign the same relevance to economic or institutional concerns, while contrasting a lot on the specific topics. Future research should consider assessing the individual weight of each topic in investor decision-making not only to infer on how they influence safe haven behaviour but also if they actually prove to be relevant for investors.

Another important constraint stems from the use of a single format for each asset class and a single representation of the equity market. For commodities, I analyse USD-denominated prices that are consistent with standard practices in international markets. While this provides consistency and comparability, it limits insights into how these assets behave in relation to other currencies. As a result, my findings are subject to a potential "currency effect," meaning the lack of currency comparison makes it difficult to assess if my results are influenced by significant movements of the USD. For my findings, I could argue that the USD's significant appreciation against institutional concerns could improve gold's safe haven status in other currency-denominations, while imposing the opposite effect during geopolitical crises. As a practical implication, this means that amid market crises driven by geopolitical concerns, it is a better option to invest in commodities denominated in USD rather than others.

In the case of the equity market, the use of the S&P Global 1200 index ensures a global

representation of major stock movements. However, there are significant political and socio-economical differences between regions that could influence how safe haven assets are viewed across markets. This aligns with distinctions between developed and emerging markets noted by Baur & McDermott (2010). However, as the news-based indexes employed are associated to global concerns, I believe that, to individually study the reactions of different regions, such indexes would have to be produced on a regional basis as well.

Finally, regarding the methodology, I believe that considering the consistency of results among different frameworks should ensure the significance of my conclusions. However, I acknowledge that the frameworks used to assign each type of concern or determine its relevance were all mainly derived from personal judgement. The reason for this stems from the innovation in my approach, as there are no previous works that focus on the relevance of different topics in investors' decision-making. In that sense, there is no standardized method to assert the relevance of each concern or how it should be connected to movements of the market, which leaves the analysis to my interpretation. An alternate route could use a 1% tail instead of 5% in the crisis definition, which possibly provides more accurate results by focusing on events with a clear main nature, correcting the previously mentioned excessive extension of economic and institutional concerns.

7. Conclusion

This thesis examines the time-varying safe haven properties of a set of currencies, government bonds, and commodities across different crises characterized by economic, institutional, and geopolitical concerns. It offers a new perspective that integrates news-based indexes to measure investor sentiment and study how different topics are weighed during financial turmoil. Building on previous literature, it also details how each asset has behaved under periods of negative returns or extreme volatility in the post-2000, to fully assert the specific conditions under which they successfully act as safe haven options.

Under economic concerns as macroeconomic outlook or monetary policy, investors prioritize the security provided by the institutional stability of strong economies. The US stands out as a main example with its sovereign bond and currency outperforming their respective peers across several frameworks, reacting significantly to both market declines and uncertainty spikes. Additionally, significant foreign exchange reserves seem to be a main driver of currencies' safe haven properties, assuring investors of a country's ability to stabilize its

currency's value thus protecting the competitiveness of national exporters. The significance of such factor aligns with Habib & Stracca (2012), who find exposure to the foreign exchange market as the most relevant determinant of a currency's stability. On the other hand, commodities underperform during economic downturns as the industrial application of metals as silver and platinum closely links their value to declines in economic activity.

Institutional concerns as regulation or political governance seem to produce similar reactions from investors, as these are intrinsically linked to economic topics. While currencies and bonds offer significant protection, the improved performance of certain assets implies slightly different investment preferences in response to the alternate crisis nature. The JPY notably stands out as investors have historically sought protection in early stages of market downturns when government responses are uncertain (Ranaldo & Söderlind, 2010). Additionally, Swiss bonds improve as well, providing then a relatively strong safe haven option alongside the CHF due to Switzerland's political neutrality. Events as the ESDC highlight the appeal of such feature as the major appreciation of the CHF reflected investor flight from Eurozone's institutional uncertainty (Wong & Fong, 2017).

Lastly, geopolitical concerns differ a lot from the previous as diplomatic conflicts lead investors to doubt the integrity of political and economic institutions. In that sense, the tangible value of precious metals appears as the main determinant for the significant outperformance of such asset class particularly over currencies. The latter show significant depreciation that increases with the respective country's involvement, as the USD's documented underperformance amid geopolitical concerns highlights the negative impact of US participation in major conflicts covered in my sample. The behavioural contrast of commodities against other concerns aligns with the time-variability of safe haven properties described by Lucey & Li (2015), highlighting that their practical application makes their appeal very context-dependent.

These findings have significant implications for investors, policymakers and academics. Investors should employ tailored portfolio strategies adapted to the nature of a specific crisis, such as allocating greater weight to commodities like gold during geopolitical conflicts or to currencies as the CHF during periods of economic uncertainty. Policymakers and regulators could use news-based indexes as valuable indicators to monitor changes in investor priorities and implement measures to guarantee the stability of specific assets, as currencies during diplomatic conflicts. Additionally, future research could build on these insights to address certain limitations, such as the reliance on US-based indexes and the subjective categorization of crises, through the incorporation of regional analyses and focus on specific topics instead of

broader concern categories. In that sense, by aligning strategies with an extended study of my findings, interested parties can better safeguard against market declines of different natures.

This thesis contributes to the field of empirical finance by demonstrating the context-dependent nature of safe haven properties and highlighting the role of investor concerns in influencing asset performance. By integrating an innovative methodology and providing practical recommendations, this study offers a starting point for more adaptive financial strategies and policies. Ultimately, understanding the details of crisis-specific asset behaviour is critical for investors and policymakers involved in an increasingly volatile and complex global financial landscape.

Appendix

Table A1
The table presents the months including days that fall under the crisis definition of belonging to the 5% tail of lowest cumulative 30-trading days returns of the S&P Global 1200 Index. The rows represent the relevant years within my sample and the columns represent the months.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000								X	X			
2001		X	X	X				X	X	X		
2002					X	X	X	X	X	X		
2003	X	X										
2006					X	X						
2007							X	X				X
2008	X	X			X	X	X	X	X	X	X	X
2009	X	X	X									
2010				X	X	X						
2011						X	X	X	X			
2012				X	X	X						
2015							X	X	X			X
2016	X	X										
2018											X	X
2020	X	X	X	X								
2022	X	X	X	X	X	X	X	X	X	X		

Table A2
The table presents the months including days that fall under the crisis definition of belonging to the 5% tail of highest 30-trading days period volatility of the S&P Global 1200 Index. The rows represent the relevant years within my sample and the columns represent the months.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002						X	X	X	X	X	X	
2008								X	X	X	X	X
2009	X	X	X	X	X							
2010				X	X	X						
2011							X	X	X	X	X	X
2020	X	X	X	X	X							

Table A3
The table presents the months including days that fall under the crisis definition of belonging to the 5% tail of highest cumulative 30-trading days returns of the VIX Index. The rows represent the relevant years within my sample and the columns represent the months.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000			X	X				X	X	X		
2001							X	X	X	X		
2002					X	X	X	X				
2006				X	X	X						
2007	X	X	X			X	X	X		X	X	X
2008	X	X				X	X	X	X	X	X	
2010			X	X	X	X						
2011		X	X			X	X	X	X			
2013					X	X						
2015							X	X	X	X	X	X
2016	X	X			X	X			X	X	X	
2017						X	X	X				X
2018	X	X	X					X	X	X	X	X
2019						X	X	X				
2020	X	X	X	X								X
2021	X							X	X	X	X	X
2022	X	X	X	X	X			X	X			
2023									X	X		

Table A4
The table presents the months including days that fall under the crisis definition of belonging to the 5% tail of highest 30-trading days period volatility of the VIX Index. The rows represent the relevant years within my sample and the columns represent the months.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	X	X	X	X								
2008									X	X	X	X
2010			X	X	X	X						
2011						X	X	X	X			
2015							X	X	X	X		
2016					X	X	X					
2017							X	X	X			X
2018	X	X	X							X	X	
2019							X	X	X			
2020	X	X	X	X								X
2021	X	X	X							X	X	X
2022	X											

References

Baele, L., Bekaert, G., & Inghelbrecht, K. (2010). The determinants of stock and bond return comovements. *The Review of Financial Studies*, *23*(6), 2374-2428.

Baker, S. B., Bloom, N., Davis, S. J., & Kost, K. (2019). Policy news and equity market volatility. *NBER working paper*, *25720*.

Bank of International Settlements. Effective exchange rates. https://data.bis.org/topics/EER. Accessed on 04/10/2024.

Barberis, N., & Thaler, R. (2003). 'A Survey of Behavioural Finance.' *Handbook of the Economics of Finance, 1,* 1053-1128

Baur, D. G., & Glover, B. & (2012). Flight-to-quality and the Great Recession. Journal of Banking & Finance, 36(3), 945–964.

Baur, D. G., & Lucey, B. M. (2010). Is gold a hedge or a safe haven? An analysis of stocks, bonds and gold. *Financial review*, *45*(2), 217-229.Malik, F. M., & Hood, S. C. (2013). Gold, the VIX, and safe-haven assets. Journal of Financial Economics, 110(3), 697–706.

Baur, D. G., & McDermott, T. K. (2010). Is gold a safe haven? International evidence. *Journal of Banking & Finance*, *34*(8), 1886-1898.

Bloom, N. (2009). The impact of uncertainty shocks. *econometrica*, *77*(3), 623-685.

Caballero, R. J., & Krishnamurthy, A. (2008). Collective risk management in a flight to quality episode. *The Journal of Finance*, *63*(5), 2195-2230.

Caldara, D., & Iacoviello, M. (2022). Measuring geopolitical risk. *American Economic Review*, *112*(4), 1194-1225.

CBOE. CBOE VIX. https://www.cboe.com/tradable_products/vix/. Accessed on 03/10/2024.

Cho, D., & Han, H. (2021). The tail behaviour of safe haven currencies: A cross-quantilogram analysis. *Journal of International Financial Markets, Institutions and Money*, *70*, 101257.

Choudhury, T, Kinateder, H & Neupane, B 2022, 'Gold, bonds, and epidemics: a safe haven study', Finance Research Letters, vol. 48, 102978.

Coudert, V., Guillaumin, C., & Raymond, H. (2014). Looking at the other side of carry trades: Are there any safe haven currencies? CEPII Working Papers (No. 2014-03). CEPII research center.

De Santis, R. A. (2012). The euro area sovereign debt crisis: Safe haven, credit rating agencies and the spread of the fever from Greece, Ireland, and Portugal. European Central Bank Working Paper Series.

Grisse, Christian & Nitschka, Thomas, 2015. "On financial risk and the safe haven characteristics of Swiss franc exchange rates," Journal of Empirical Finance, Elsevier, vol. 32(C), pages 153-164.

Habib, M. M., & Stracca, L. (2012). Getting beyond carry trade: What makes a safe haven currency? Journal of International Economics, 87(1), 50–64.

Hasan, M. B., Hassan, M. K., Rashid, M. M., & Alhenawi, Y. (2021). Are safe haven assets really safe during the 2008 global financial crisis and COVID-19 pandemic?. *Global Finance Journal*, *50*, 100668.

Hood, M., & Malik, F. (2013). Is gold the best hedge and a safe haven under changing stock market volatility?. *Review of Financial Economics*, *22*(2), 47-52.

Hossfeld, O., & MacDonald, R. (2015). Carry funding and safe haven currencies: A threshold regression approach. *Journal of International Money and Finance*, *59*, 185-202.

Kim, S. J., Moshirian, F., & Wu, E. (2006). Evolution of international stock and bond market integration: Influence of the European Monetary Union. *Journal of Banking & Finance*, *30*(5), 1507-1534.

Kohler, M. (2010). Exchange rates during financial crises. BIS Quarterly Review, 2010(March), 39–52.

Kopyl, K. A., & Lee, J. B. T. (2016). How safe are the safe haven assets?. *Financial Markets and Portfolio Management*, *30*(4), 453-482.

Li, S., & Lucey, B. M. (2017). Reassessing the role of precious metals as safe havens–What colour is your haven and why?. *Journal of Commodity Markets*, *7*, 1-14.

Liu, W. H. (2020). Are gold and government bond safe-haven assets? An extremal quantile regression analysis. *International Review of Finance*, *20*(2), 451-483.

Lucey, B. M., & Li, S. (2015). Precious metals and safe-haven properties: A time-varying approach. Applied Economics Letters, 22(9), 736–740.

Paret, A. C., & Weber, A. (2019). *German Bond Yields and Debt Supply: Is There a "Bund Premium"?*. International Monetary Fund.

Ranaldo, A., & Söderlind, P. (2010). Safe haven currencies. *Review of finance*, *14*(3), 385-407.

Scruggs, J. T., & Glabadanidis, P. (2003). Risk premia and the dynamic covariance between stock and bond returns. Journal of Financial and Quantitative Analysis, 38(2), 295–316

S&P Global. S&P Global 1200. https://www.spglobal.com/spdji/en/indices/equity/sp-global-1200/#overview. Accessed on 03/10/2024.

Wong, W. K., & Fong, W. M. (2017). Revisiting the safe-haven properties of the Swiss franc and the Japanese yen. Journal of Risk Management, 15(2), 27–41.

Zhao, H., Ji, Q., & Zhang, D. (2020). Gold and the VIX: A dynamic investigation of their safe-haven roles. Resources Policy, 66, 101636.