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## **Abstract**

This thesis aims to identify various safe haven assets and their properties in order to study the structure and benefits of safe haven portfolios. A review of the existing literature, backed-up by an analysis of historical data, and the construction of two safe haven portfolios lead to the conclusion that a portfolio consisting of multiple safe haven assets can provide more steady returns during crises in financial markets, in contrast to an investment in a single safe haven asset.

## **Abstract (in German)**

Ziel dieser Arbeit ist es, Safe Haven Assets und deren Eigenschaften zu identifizieren, um den Aufbau und die Vorteile von Safe Haven Portfolios zu untersuchen. Eine Übersicht über bereits vorhandene Literatur, gestützt durch die Analyse historischer Daten, sowie die Erstellung zweier Safe Haven Portfolios führen zu der Schlussfolgerung, dass ein Portfolio, das aus mehreren Safe Haven Assets besteht, zu Zeiten von Finanzkrisen verlässlichere Erträge liefert, als Investitionen in einzelne Safe Haven Assets.

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# 1. Introduction and Definitions

It has long been common knowledge that diversification improves the risk-return profile of a portfolio and Forbes justifiably made it their number one “golden rule of investing” (Shorr, 2007). It makes sense that this golden rule is not only important in times of bull markets and low volatility, but even more so in times of economic crisis, when investors want to reduce their risk exposure. Such increases in risk aversion should therefore lead to increased capital flows as investors spread their portfolios. In contrast to theory, however, gross capital flows were found to decline in crisis episodes and investors tend to flock to assets known as “safe havens” (Habib & Stracca, 2015). This behaviour is characterized by “flights to quality” and “flights to liquidity” and means that investors in distress seek out assets with less risk and higher liquidity, respectively. US Treasuries, for example, can even cater to both, investors seeking low risk and liquidity (Beber et al., 2009).

To understand why investors tend to go after these assets, it is useful to specify what a “safe haven” is, and where to mark out the border to other types of assets. In times of market crises various assets start to move in tandem. As increased co-movement within a portfolio reduces the positive effect of diversification, investors are motivated to find assets which do not correlate, or negatively correlate with other assets in times of market turmoil. These assets are characterised as safe havens (Baur & McDermott, 2016).

It is important to note the difference to hedges, which are defined as assets which are negatively correlated or uncorrelated with other assets on average, but not necessarily in times of extreme market conditions. This means, in contrast to safe haven assets, hedges do not have to provide safety from losses in times of crisis (Baur & Lucey, 2010).

Further, safe haven assets must be distinguished from safe assets. The returns of safe assets never depend on new information, whereas the value of safe haven assets is related to news, expectations, and the value of other assets during crises. Of course, uncorrelated safe haven assets are also information-independent with respect to the market they do not correlate with,

but they only do so in turbulent periods. Consequently, safe assets always provide the investor with safety, whereas safe haven assets only do this in times of turmoil (Baur & McDermott, 2016).

Relating the “golden rule of investing” to safe haven assets invariably leads to the question of how a portfolio should be structured and which assets it should contain to provide the investor with a reliable safe haven in market crises. It is the purpose of this thesis to specify the range of available safe haven assets, define their properties and examine the characteristics and performance of a potential safe haven portfolio.

To lay the foundations of this analysis, chapter two provides an overview of the properties which need to be fulfilled by a safe haven asset. Then, chapters three to five measure these properties in gold, government bonds and currencies, respectively. Applying these insights, chapter six presents an exemplary safe haven portfolio and analyses its performance in comparison to individual safe haven assets. Finally, chapter seven concludes.

## 2. Safe Haven Properties

Investors essentially demand only two properties from a safe haven asset. The first has already been introduced above and is part of the definition of a safe haven, namely the protection from financial losses in times of market tumult. It is the consequence of safe haven assets not correlating, or negatively correlating with other assets. Therefore, the lack of correlation with other assets in specific periods is a main property of safe haven assets (Baur & McDermott, 2016).

This does not mean, however, that safe haven assets cannot be risky. A good example for this is gold. As discussed in the next chapter, gold is widely considered a safe haven asset, even though its returns are more volatile than e.g. the MSCI US stock index (which is usually not considered a safe haven). Hence, volatility is not applicable as a measure of the quality of a safe haven asset (McCown & Zimmerman, 2006). Instead, market risk, measured as the

CAPM's beta<sup>1</sup>, can be a helpful benchmark. As shown by McCown & Zimmerman (2006) gold earns part of its safe haven status due to its independence from market returns, which means that its beta is close to zero.

The second property investors want in a safe haven asset is liquidity. By analysing the European bond market, Beber et al. (2009) found most transactions in times of high uncertainty were based on flights-to-liquidity and not flights-to-quality. Accordingly, they conclude that, in these periods, investors care less about a bond's risk and more about how easily it can be traded or converted to cash. The reason for the high value of liquidity lies with the flexibility it provides. Liquid assets provide investors with a safety cushion, as they can be used to fund unexpected spending, whereas a forced sale of illiquid assets usually causes high transaction costs, which results in unfavourable selling prices. Especially during financial crises, investors are therefore motivated to hold liquid assets for sudden spending needs (Jaeger, 2009).

In addition to the two main properties, i.e. showing no correlation with the assets for which a safe haven is desired (in periods of market turmoil), and offering high liquidity, investors may also be influenced by properties of an emotional or subjective nature. These factors are difficult to measure and depend more on the investor than the examined asset. Especially gold investors offer good insight into these behavioural influences and will therefore be discussed below.

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<sup>1</sup> Kenton (2019). The beta factor measures an asset's response to movements in the total market. The Capital Asset Pricing Model (CAPM) uses this factor and the market's returns to calculate an asset's expected return.



## 3. Gold as a Safe Haven

### 3.1 Behavioural Aspects of Gold Investment

Gold's long history as a means of payment and store of value, as well as its image of luxury and wealth, designates it as one of the go-to assets for investors who want to reallocate their portfolios in a financial crisis. But its reputation also complicates its analysis as a safe haven, as investors may buy gold for rather emotional reasons, instead of acting according to facts. From a rational point of view, owning physical gold entails relatively high storage costs in comparison to (often even more liquid and less risky) fixed-income assets, like US Treasury bonds (Baur & McDermott, 2016).

But these disadvantages of gold may be neglected by investors as soon as decisions have to be made under stress, as it could happen in an economic crisis. Lighthall & Mather (2012) showed that stressed investors put a higher value on positive information, while playing down negative information. As a consequence, investors may focus on the positive associations with gold, e.g. past performance, while disregarding its costs and risks.

Stress can also lead to rash decision-making, before all available alternatives are evaluated (Keinan, 1987). In combination with the "local thinking" model, which states that we make decisions under stress by relating external information with "what comes to mind", this may lead investors to choosing gold as a safe haven just because it is one of the first alternatives they remember (Gennaioli & Shleifer, 2010).

Furthermore, Baur & McDermott (2016) consider that investors may be influenced by "gold's bright, shiny and thus positive image", and its tangibility, which builds trust when the financial system is in turmoil.

These biased behaviours could even lead to a self-fulfilling prophecy. If investors, who seek to invest in a safe haven, buy gold because they remember its satisfying performance in the last crisis, the increased demand could lead to an appreciation in the price of gold – thus validating its safe haven status (Baur & McDermott, 2016).

### 3.2 Safe Haven Property

There are, of course, also rational reasons to buy gold. Due to its independence from markets and counterparties, gold offers protection from currency and default risk, as well as inflation (Baur & McDermott, 2016). Like all physical assets, gold also has an intrinsic value because of its use in e.g. jewellery, dental medicine, and industrial processing (Baur & McDermott, 2010).

Moreover, gold has been confirmed by many studies to provide a safe haven to investors. In addition to their work on the behavioural influences on gold investment presented above, Baur & McDermott (2016) also analysed the correlation of gold and stock returns. They found that gold acts as a safe haven when stocks suffer from extremely negative shocks and reacts even stronger after “Black Swan” events have taken investors by surprise with bad and unpredictable news (e.g. the attacks of “9/11”). After 10 to 15 days, however, the safe haven property seems to disappear, which they explain in accordance with their behavioural analysis. They argue that investors hastily buy gold, due to a lack of information, and that they sell it again after understanding the circumstances of the shock (Baur & McDermott, 2016). In 2010, Baur & Lucey already declared the safe haven property of gold a short-run effect, which they explained with gold’s hedging property for stocks, which leads to a decrease in gold’s value as soon as stocks re-appreciate.

Flavin et al. (2014) analysed the interdependency of gold and the S&P 500 index and also came to the conclusion that gold should be classified as a safe haven, regarding its negative correlation with the US stock market in crisis periods.

Concurring research by Beckmann et al. (2015) further reinforces the argument for gold’s safe haven status against stocks, as their research shows that gold mostly either acted as a safe haven, or a hedge in 18 observed countries. Even more evidence for gold’s safe haven status was found by an examination of its performance as a zero-beta asset, which showed that gold bears no market risk at returns slightly above US Treasury bills, and identified gold as a favourable asset for an investor’s portfolio (McCown & Zimmerman, 2006).

To clarify if different types of gold assets exhibit different safe haven properties, Pullen et al. (2014) compared gold stocks, gold mutual funds, bullions and gold ETFs to each other and found that gold bullions provide the best safe haven against US equities amongst the four asset classes.

Further research also points out the boundaries of gold's safe haven property. While Baur and McDermott (2010) attest to gold's safe haven and hedge status in Europe, Switzerland and the US, they also point out that gold does not serve this purpose in other markets (BRIC, Japan, Australia, Canada). Furthermore, they discovered that gold can only be used as a safe haven up to a certain level of risk, as extreme uncertainty causes gold and stock markets to move in tandem again.

Changing the perspective from the protection of stock to currency fluctuations, Sakemoto (2018) found that gold possesses safe haven qualities benefitting investors with varying (G10) currency portfolio strategies. His research, however, also unveiled that gold's safe haven property has been in decline since 2000, which he links to gold's rising popularity with investors.

Also Ciner et al. (2013) argue that the safe haven property of gold versus equities has declined due to its increasing popularity and use as a financial instrument. Still, they found evidence for gold as a safe haven for the US dollar, US 10-year government bonds and the British pound, as well as hedging capabilities against the stock market.

But why would increased interest in gold result in a decrease in its safe haven property? Baur and Glover (2012) explain this problem with the help of a thought experiment. The experiment is divided into two scenarios. In scenario A, investors hold stocks and bonds, but hardly any gold. The "mainstream" has not yet discovered gold as an investment opportunity. In contrast, scenario B describes a period in which gold is not separated from other asset classes, but held by the average investor in a portfolio, like stocks and bonds. The reactions to a negative shock in the stock market are very different. Whereas, in scenario A, investors will sell their stocks, either early enough to avoid losses and buy safe haven assets like gold, or to pay for losses

already incurred, in scenario B, investors also have the possibility and sometimes the need to sell their gold. The authors identify four mechanisms that could motivate investors to sell their gold in the latter scenario.

Firstly, an investor who wants to keep the asset allocation of his portfolio constant would sell gold to rebalance his distribution of wealth, which is defined as the “cross-market rebalancing effect” (Kodres & Pritsker, 2002).

Secondly, a mechanism called the “wealth effect” (Kyle & Xiong, 2001) is used to describe the behaviour of investors who lost money on one asset and want to reduce their risk exposure in all their assets, which also affects their allocation in gold.

Thirdly, investors in need of cash suffer from the “liquidity shock effect” (Brunnermeier & Pedersen, 2009), which forces them to sell assets, not only in the market in which the shock occurred, but in various markets.

Fourthly, a bias called the “disposition effect” (Tversky & Kahneman, 1974), influences investors who do not want to sell assets which suffered losses, but prefer selling those assets of their portfolio which at least maintained their value.

Hence, according to the thought experiment of Baur and Glover (2012), these effects would put downward pressure on the price of gold after negative shocks in the stock market, if gold was a “mainstream” asset found in most investors’ portfolios.

To provide a quick overview of the research on gold's safe haven status, table 1 lists the authors and their findings discussed in this chapter.

<b>Author(s), Title and Date of Research</b>	<b>Timeframe</b>	<b>Variables</b>	<b>Results</b>
McCown & Zimmerman (2006) <i>Is Gold a Zero-Beta Asset?</i>	1970-2003	Month-end gold and silver spot prices, MSCI World and USA indices	Gold correlates with Swiss francs and has a beta close to zero. It increases portfolio performance. Silver does not share most of these characteristics. It is an inferior asset.
Baur & McDermott (2010) <i>Is Gold a Safe Haven?</i>	1997-2009	Daily, weekly and monthly gold prices and stock returns in G7 countries, the BRICs, Australia, and Switzerland	Gold has safe haven and hedging properties in euro countries, Switzerland and the US, but plays only a minor role in emerging markets. Gold is bought when investors panic.
Baur & Lucey (2010) <i>Is Gold a Hedge or a Safe Haven?</i>	1995-2005	Daily MSCI stock and bond indices, and gold closing prices	In the US and UK, gold acts as a safe haven for 15 days on average. Shocks must exceed a certain level to trigger gold's safe haven property.
Baur & Glover (2012) <i>The Destruction of a Safe Haven Asset?</i>	1970-2012	Daily data on gold and the MSCI world index	Thought experiment: Investors could destroy the safe haven property of gold. Empirical evidence: The safe haven behaviour of gold was more temporary in the recent crisis in 2009.

Ciner, Gurdgiev & Lucey (2013) <i>Hedges and Safe Havens: An Examination of Stocks, Bonds, Gold, Oil and Exchange Rates.</i>	1990-2010	Daily data on US and UK stock, gov. bond, currency, gold and oil prices; compare tails of distributions, instead of performance in pre-defined periods	Gold acts as a safe haven for the US dollar and the British pound. It is usually insignificantly correlated with US government bonds, but safe haven behaviour was observed when its price moves extremely (tails of price distribution). The paper cannot confirm that gold acts as a safe haven for equities.
Flavin, Morley & Panopoulou (2014) <i>Identifying Safe Haven Assets for Equity Investors Through an Analysis of the Stability of Shock Transmission.</i>	1980-2012	Weekly prices of gold, 10-year and 1-year US government bonds and the S&P 500 index	Gold and long-term US government bonds act as safe havens against the S&P 500 index, whereas gold offers higher returns at higher risk than 10-year US government bonds.
Pullen, Benson & Faff (2014) <i>A Comparative Analysis of the Investment Characteristics of Alternative Gold Assets.</i>	1987-2010 compared with 2005-2010	Daily data on gold bullion prices, gold mutual funds, gold stocks, gold ETFs and US equities	Gold bullions act as a safe haven in both time frames. Gold stocks and ETFs display safe haven properties inferior to bullions.
Beckmann, Berger & Czudaj (2015) <i>Does Gold Act as a Hedge or a Safe Haven for Stocks?</i>	1970-2012	Monthly gold prices and indices for 18 countries and 5 regions	Gold's safe haven and hedging functions were observed in many cases.
Baur & McDermott (2016) <i>Why is Gold a Safe Haven?</i>	1970-2013	Daily MSCI world, S&P 500, US 10-year gov. bond, gold, silver, commodities, Swiss franc, and US dollar prices	Behavioural aspects motivate investors to buy gold. Gold is a strong safe haven in "black swan events", i.e. in periods of sudden and unpredictable uncertainty. Swiss francs, US bonds and the US dollar (vs. S&P 500 only) also display safe haven properties.

Sakemoto (2018) <i>Do Precious and Industrial Metals Act as Hedges and Safe Havens for Currency Portfolios?</i>	1984-2017	Prices of S&P GSCI sub-indices for precious and industrial metals and G10-currencies	Gold is a weak hedge for all analysed currency portfolio strategies and a strong safe haven in most cases. Since 2000, the hedging and safe haven properties have been declining.
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*Table 1: Literature on the safe haven property of gold.*

### 3.3 Analysis of Historical Data

Using daily historical data, the following chapter tries to support the claims made by the studies presented above.

Following Habib & Stracca (2015), daily data on the VIX (a volatility index) and MSCI World (a global stock index) helped to find periods characterized by market tumult. The average value of the VIX between January 1990 and November 2018 was about 19. Accordingly, a threshold value of 25, which is shortly above the 80<sup>th</sup> percentile, was deemed appropriate to indicate unusually high expected volatility. Thus, a day was defined as critical, if two conditions were met:

1. The VIX exceeds a value of 25.
2. The MSCI World index exhibits negative returns.

Whenever these two conditions were met again within a week, the whole week was defined as tumultuous, even if some days did not exhibit both characteristics.

Tracking the daily gold spot price (XAU) within these periods allows for a more hands-on approach on depicting gold's safe haven property. In contrast to the more sophisticated measures (e.g. regression analyses) used by the studies presented earlier, the following analysis does not distinguish between gold price increases caused by market tumult and other factors. It is important to keep this distinction in mind, as the price for gold was increasing in many years of the analysed period, as figure 1 shows.



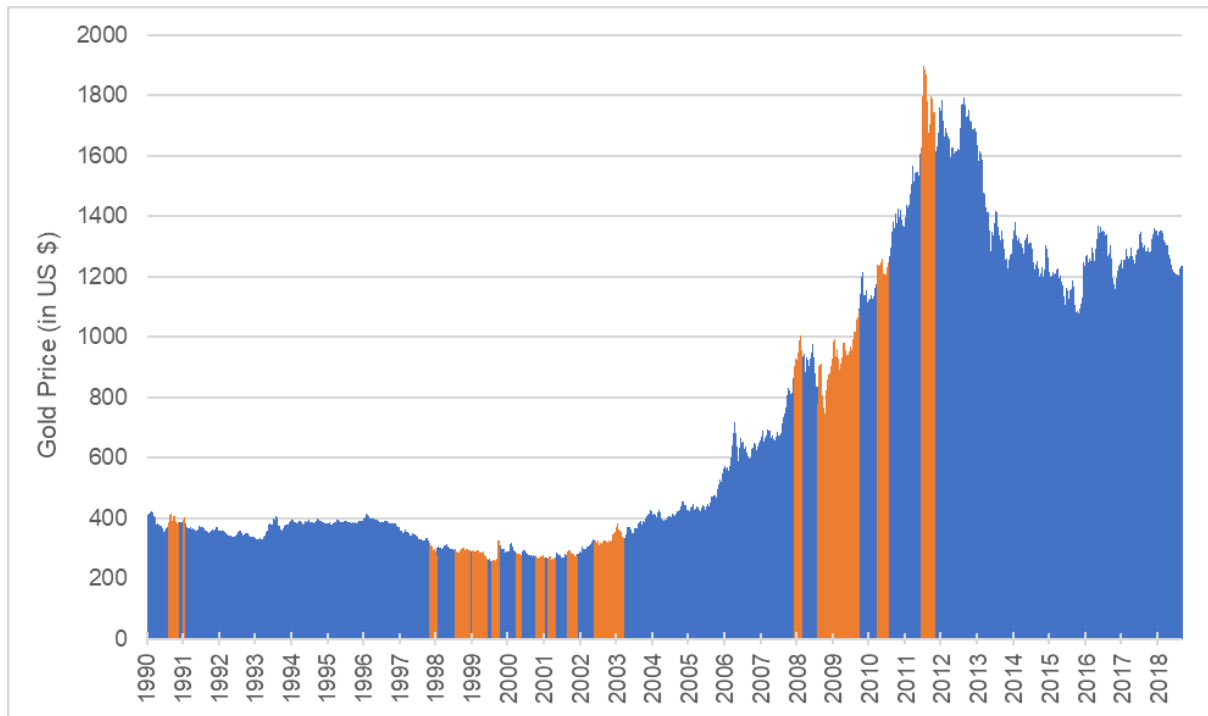


Figure 1: Closing price for one ounce of gold from 1990-2018. Market crisis periods are highlighted.  
(adapted from Cboe, 2019; Fusion Media, 2019; MSCI, 2018)

The crisis measure using VIX and MSCI World also marks “black swan” events as critical, like the days followed by the 9/11-terrorist attack. As figure 2 shows, market uncertainty causes a sharp increase in the price of gold. Between the opening and closing price on September 11, the price increased by 6.4%. It peaked on September 26, after increasing by 8.1% compared to the opening price before the attack and quickly returned to earlier levels afterwards.

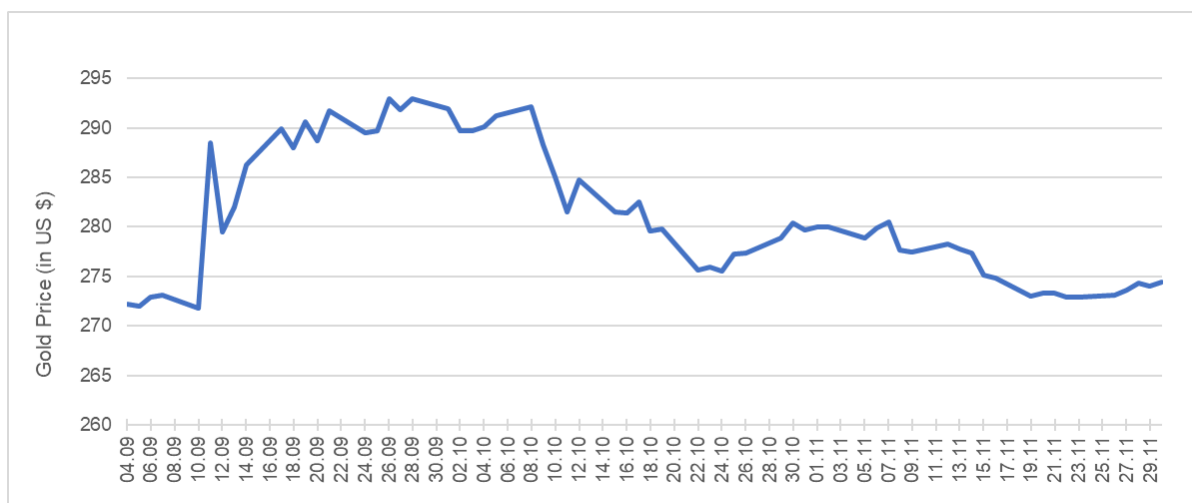


Figure 2: The gold price increases sharply after the terrorist attacks on September 11, 2001.  
(adapted from Fusion Media, 2019)

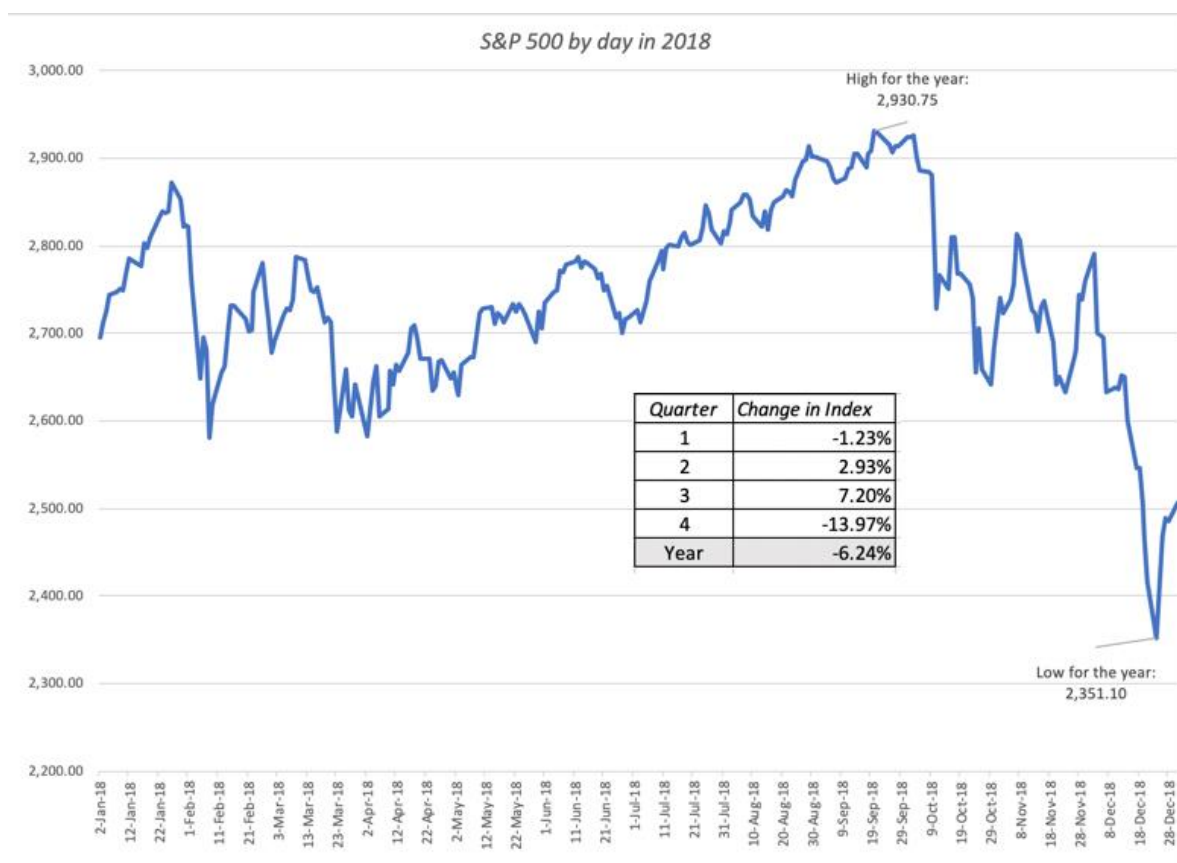


Figure 3: The sudden downturn of the S&P 500 index at the end of 2018 (Damodaran, 2019)

Further evidence for gold's safe haven behaviour can also be found in more recent data.

Whereas the stock market went through a correction at the end of 2018, which is captured by the S&P 500 index of US stocks (see figure 3), and perceived risk increased rapidly, which is expressed by the VIX (see figure 4), the price of gold steadily increased (see figure 5).

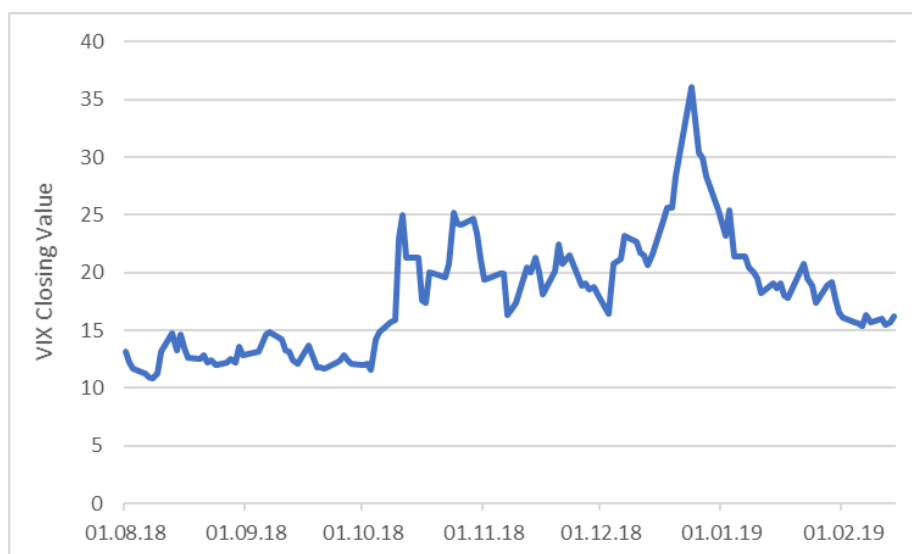


Figure 4: The VIX increases between October 2018 and February 2019 (adapted from Cboe, 2019)



*Figure 5: Steady increase of the gold price between October 2018 and February 2019 (adapted from Fusion Media, 2019)*

In conclusion, gold was found by many studies to exhibit safe haven properties. Most of these studies focussed on the protection gold can provide against losses in the stock market, but some studies also confirmed safe haven behaviour for currency and bond portfolios.

Compared to other precious and industrial metals, gold (especially in the form of bullions) is usually the superior asset, regarding not only its performance as a safe haven, but also its risk-return profile. This special status amongst commodities can be partly explained by emotional influences on investor behaviour. Gold's long history as a tangible store of value and means of payment, as well as its reputation as an object of luxury, give investors the impression that gold is reliable, even in times of crisis. This designates gold as one of the first assets investors flee to, when they are unsure about the market situation, thus creating a self-fulfilling prophecy. Consequently, as soon as investors regain insight into the new market situation, the gold price usually declines due to decreasing demand.

Many studies note, however, that the period until the gold price declines, has been shortening recently and try to explain this with the increasing popularity of gold with the "mainstream" investor. But even if the safe haven property of gold could decrease, or disappear in the future, recent evidence still supports its safe haven capabilities and various studies recommend its integration in investors' portfolios.

## 4. Government Debt as Safe Havens

*“On these rainy days, the safe haven of Treasuries gained in value as equities plunged and credit spreads widened to record levels” - McCauley & McGuire (2009)*

### 4.1 Safe Haven Property

As more and more investors fear the end of the recent bull market, also debt instruments begin to enjoy increased media coverage. Whereas some articles praise the increased safety some government bonds provide due to their high liquidity in the debt market (Villano, 2016), the author of the Bloomberg article “Classic Safe Haven Hides in Plain Sight”, Nir Kaissar (2018), argues that investors have always been attracted to bonds when the market became more risky and reminds them that, whenever the S&P 500 index declined by at least 20%, long-term US government bonds returned 5% on average.

It is important to note, though, that, unlike gold, government bonds can return money to the investor in two different ways. One way is through interest payments and repayments. These payments follow a schedule. Their occurrence is therefore considered safe as long as the debt-issuer does not default. Thus, market shocks or other information should have no impact on these payments. But most government bonds can also be resold to other investors instead of being carried to maturity. This secondary market price will, by contrast, depend on new information, which makes that kind of return more risky.

The distinction between characteristics of safe assets and safe haven assets (as discussed in chapter 1) plays a vital role. Accordingly, the following chapter will focus on the information-dependent aspects of government bonds and their performance during crises.

(Expected) interest and inflation rates are two important examples for information that influences bond prices. The fixed coupon payments offered by a bond become less attractive to investors, for instance, if interest rates of other assets are generally increasing. Expectations of rising inflation rates have the same effect, as inflation decreases the real returns of a bond (Beioley, 2018). Further, the debt issuer's credit worthiness, or credit rating influences the debtor's bond prices. Decreasing credit worthiness, for example, will usually decrease the secondary market price of related bonds (Chen, 2018).

Poghosyan (2014) tried to model equilibria for government bonds of 22 countries regarding determinants like government debt level, GDP and inflation. These "hard facts", however, were not sufficient to explain why bond levels deviated from their equilibria in times of market tumult. Also, Bernoth et al. (2012) found that yield spreads depend on government characteristics like deficits and indebtedness, but attest to the influence of crises on investors' perception of bond values. Their research suggests that the market crisis around 2009 made investors stricter regarding fiscal loosening, which resulted in safe haven flows to government bonds of the USA and Germany.

According to Balduzzi et al. (2001), news on procyclical announcements affect government bond prices negatively, whereas the opposite is true for countercyclical news. But not only the information conveyed through these announcements has an impact on the price of the analysed US Treasury securities, but also the surprise itself. Balduzzi et al. (2001) therefore argue that surprises are a main component of bond price volatility.

Further research on the price dynamics of government-issued bonds showed a mainly positive correlation with the stock market. But low inflation expectations, or high investor uncertainty, were found to invert this correlation rapidly (Andersson, et al., 2008). As negative correlation during times of market tumult is a main property of safe havens, the research of Andersson et al. (2008) strengthens the case for government securities (10-year bonds of Germany, the USA, and the UK were analysed) as safe haven assets. Also, Baele et al. (2018) analysed the correlation of stocks and 10-year government bonds and used it to design a model to

distinguish normal periods from “flights-to-safety” periods. During these periods, both investor stress (i.e. the VIX index) and the demand for US Treasury bonds increased.

Especially debt issued by the US government has been found by many to act as a safe haven. For example, Chan et al. (2011) confirm that the prices of US Treasury bonds behave countercyclically. Their results are reinforced by Flavin et al. (2014), Habib & Stracca (2015) and Baur & McDermott (2016). But also bonds issued by the United Kingdom seem to perform well during extreme declines in the equity market, according to research conducted by Ciner et al. (2013). Their comparison of return distributions of UK and US stock and bond markets confirmed that US and UK government bonds can act as safe havens, due to their negative correlation of returns with equities. Moreover, Ciner et al. (2013) found the UK bonds to be positively correlated with gold, whose safe haven status was already discussed in the previous chapter.

Interestingly, the research of Bernoth et al. (2012) on the influence of government indebtedness and other fiscal characteristics on bond prices found that Germany had gained a safe haven status it did not have before the crisis of 2009. De Santis (2014) analysed data on 2- to 10-year government bonds of various European governments and also supports the claim that debt of the German government has gained more importance as a safe haven since the latest crises. His research showed that the spreads of German government-issued securities versus other European sovereign bonds have been increasing since 2008, and that the prices of German government debt increased more than those of other comparably stable European countries. De Santis (2014) attributed these developments also to the safe haven status of German bonds and to their liquidity. Later, Ejsing et al. (2015) provided even more evidence for “safe haven flows” to German government debt.

In an effort to answer the question why so many investors consider, for example, the US Treasuries a safe haven, Krishnamurthy & Vissing-Jorgensen (2012) found that the extreme safety and liquidity of US government bonds are the main reasons for its safe haven status. They spotted similarities between money and US debt and conclude that, during a crisis, investors consider US Treasuries a “convenience asset”.

Analysing bonds directly issued by the US government along with bonds issued by the US government agency Refcorp. allows Longstaff (2002) to draw further conclusions. As the Refcorp. bonds carry a guarantee from the US government, they carry the same risk as US Treasuries and differ only in their liquidity on secondary markets. Longstaff (2002) discovered that the price of 2-10 year T-Bonds increases more than the price of these agency bonds, when markets become more stressed. He attributes this increase to the increasing demand for liquidity. Investors in European markets were also found to put a high value on the liquidity provided by certain government bonds (Beber et al., 2009).

Table 2 provides the research presented above in another way, to give more access to e.g. timeframes and variables used, and to make different publications more comparable.

<b>Author(s), Title and Date of Research</b>	<b>Timeframe</b>	<b>Variables</b>	<b>Results</b>
Balduzzi, Elton & Green (2001) <i>Economic News and Bond Prices: Evidence from the US Treasury Market</i>	1991-1995	Intraday prices, volumes and spreads of US Treasury bills, bonds and notes; economic announcements, survey on economic expectations	News on procyclical (countercyclical) announcements affect government bond prices negatively (positively). News widen spreads and increase traded volumes. Surprises are a main component of price volatility.
Longstaff (2002) <i>The Flight-to-Liquidity Premium in US Treasury Bond Prices</i>	1991-2001	Monthly yields of Treasury and Refcorp. zero-coupon bonds (Refcorp. is a US government agency); Consumer confidence index	When the consumer confidence index drops, the price of T-Bonds (2-10y.) increases more than the price for Refcorp. bonds, which indicates an increasing liquidity premium for gov. bonds.

Andersson, Krylova & Vähämaa (2008) <i>Why Does the Correlation Between Stock and Bond Returns Vary over Time?</i>	1991-2006	Daily data of the S&P 500, FTSE 100 and DAX indices, as well as the respective 10-year gov. bond price indices; monthly surveys on expected economic growth and inflation; Risk measures: VIX, VDAX and implied uncertainty of FTSE 100 index options	The correlation between government bonds and the respective analysed stock markets is usually positive, but changes in certain periods. Government bonds correlate negatively, or become uncorrelated with the stock market when <ul style="list-style-type: none"> <li>- inflation is expected to be low, or</li> <li>- investor uncertainty is high.</li> </ul> The correlation was also found to change very quickly.
Beber, Brandt & Kavajecz (2009) <i>Flight-to-Quality or Flight-to-Liquidity? Evidence from the Euro-Area Bond Market</i>	2003-2004	Intraday bond prices and data on transactions from inter-dealer markets of 10 European countries	In times of market stress, flows to bonds are rather induced by a hunt for liquidity, not quality (i.e. safety).
Chan, Treepongkaruna, Brooks & Gray (2011) <i>Asset Market Linkages: Evidence From Financial, Commodity and Real Estate Assets</i>	1987-2008	Markov switching model analysing two regimes (calm and crisis) and monthly data on the S&P 500 and 1-year Treasury bonds	Prices of US government bonds behave counter-cyclically, i.e. in periods of economic decline, Treasury bonds act as safe havens due to their increasing price.
Bernoth, von Hagen & Schulknecht (2012) <i>Sovereign Risk Premiums in the European Government Bond Market</i>	1993-2009	Issue spreads in DM (before EUR introduction), EUR and USD of government bonds of 15 European countries and the US	Yield spreads depend on government deficits, indebtedness and debt service ratios. The latest crisis made investors stricter regarding fiscal loosening, hence the effect grows stronger after 2009. They find that US gov. bonds are a safe haven and German gov. bonds also gained a safe haven status during the market crisis in 2009.



Krishnamurthy & Vissing-Jorgensen (2012) <i>The Aggregate Demand for Treasury Debt</i>	1919-2008 (various data sets)	Annual data on US - long-term corporate bonds - long-term Treasury bonds - Treasury bills - commercial paper and fiscal data of the US Federal Reserve	The low yield of US Treasuries can be explained by their extreme safety and liquidity. The authors find that US government debt has similarities to money and call it a “convenience asset”, which is preferred by investors during a crisis.
Ciner, Gurdgiev & Lucey (2013) <i>Hedges and Safe Havens: An Examination of Stocks, Bonds, Gold, Oil and Exchange Rates</i>	1990-2010	Daily data on US and UK stock, gov. bond, currency, gold and oil prices. Compare tails of distributions, instead of performance in pre-defined periods.	Government bonds act as safe havens for extreme declines in the equity market in the US and UK. UK government debt is positively correlated with gold.
De Santis (2014) <i>The Euro Area Sovereign Debt Crisis: Identifying Flight-to-Liquidity and the Spillover Mechanisms</i>	2006-2012	Daily 2, 3, 5, 7 and 10-year gov. bond yields of various European governments; country-risk measures	Spreads against German Bunds have been increasing since 2008. Further, the price of German government debt increased more than the prices of other stable European countries’ bonds. Suggests safe haven status of German government bonds and flights-to-liquidity affected bond pricing in Europe during the sovereign debt crisis.
Poghosyan (2014) <i>Long-Run and Short-Run Determinants of Sovereign Bond Yields in Advanced Economies</i>	1980-2010	Annual data on the determinants of gov. bond yields of 22 advanced countries (e.g. gov. debt/GDP and inflation ratios); VIX index	Bond levels deviate from their modelled equilibrium levels, if market tumult occurs. Flights to the safe haven of government bonds are not explainable by determinants, i.e. hard facts.

Baele, Bekaert, Inghelbrecht & Wei (2018) <i>Flights to Safety</i>	1980-2015	Daily returns of stocks and 10-year gov. bonds of 23 countries (US, Canada, 18 European countries, Australia, Japan, New-Zealand), as well as exchange rates of the USD, JPY and CHF	Create a model to find flights to safety by searching for periods in which returns of government bonds and stocks are negatively correlated. During these periods (never longer than 10 days), the markets exhibit heightened investor stress and higher demand for US Treasury bonds.
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Table 2: Literature on the safe haven property of government bonds.

## 4.2 Analysis of Historical Data

This section, as before, serves to visualize the research presented above. It is conducted in a similar way to the analysis of gold prices. The same measure to find crisis periods was used.

The government security most referred to as a safe haven was US government debt. The analysis will therefore begin with a graph depicting foreign demand for US Treasuries (see figure 6). It is obvious that the share of US public debt held by investors from other countries has been increasing during the last decades, even if the US current account balance shows a negative trend. Figure 6 thus delivers evidence for safe haven flows to the US, which neglect its weakening fiscal situation.

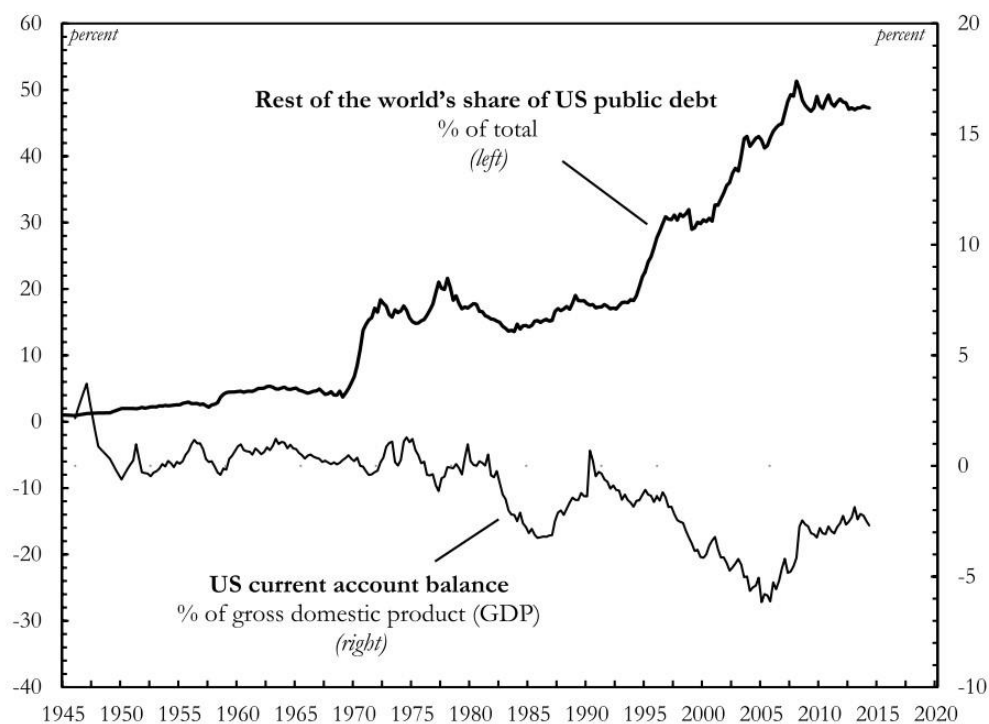


Figure 6: Foreign investment in US public debt and the US current account balance (1945-2016)  
(Hager, 2017)

Moreover, the graph shows that foreign demand for US debt peaks during some periods and normalises afterwards. One of those peaks can be found between 2007 and 2009, which indicates that foreign interest in US government bonds could have increased rapidly as a reaction to the market crisis.

To provide a comparison to the behaviour of gold after “black swan” events, figure 7 shows the reaction of US government bond prices (which move in the opposite direction of bond yields) to the terrorist attacks of 9/11.

No studies examining the price movements of government bonds after “black swan” events were found. However, these data, in tandem with the research on gold’s safe haven behaviour subsequent to such events (see Baur & McDermott, 2016), support the idea that US Treasuries may react similarly to gold.

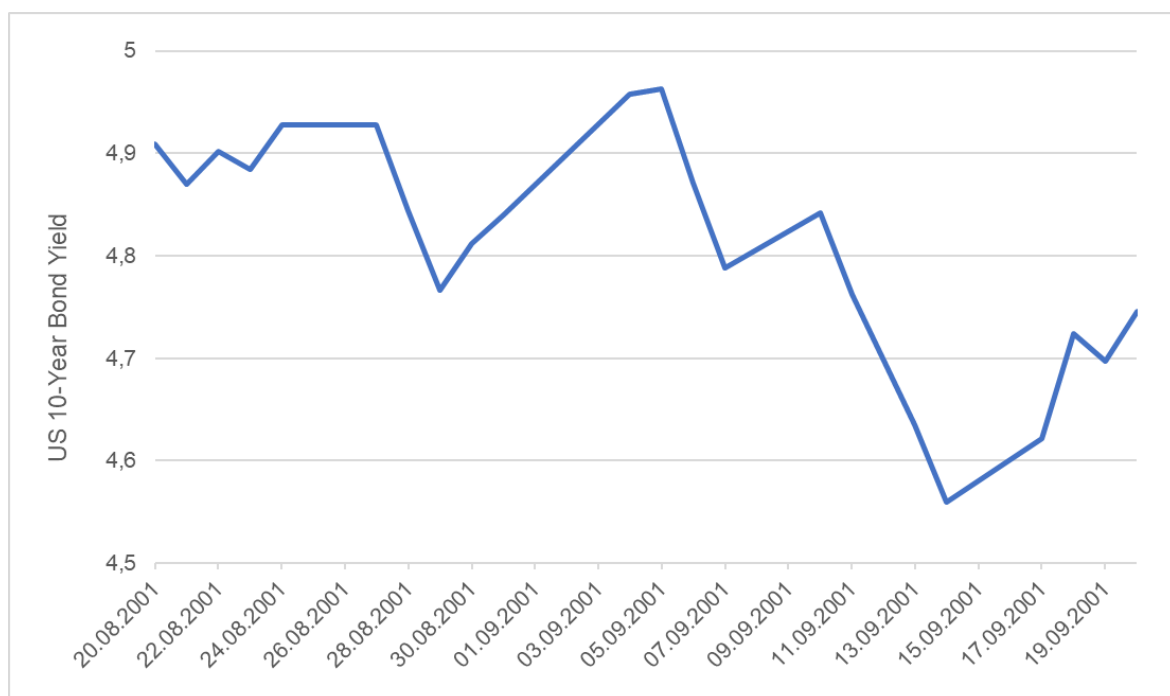


Figure 7: US government bond yields react negatively to the 9/11 terrorist attacks. (adapted from Fusion Media, 2019)

Several studies find that German government bonds gained importance as safe havens during the financial crisis between 2007 and 2009. To illustrate these findings, figure 8 compares the VIX index of expected volatility with the yield of German 10-year government bonds during this period. Not only does the conspicuous increase of the VIX at the end of 2008 parallel a drastic return in government bond yields, but also the VIX’s peaks between August 2007 and April 2008 fit the decreases of the bond yields nicely. As bond yields decrease, when their prices rise, the inverse movement between risk perception and German bond yields shows that their prices increase in periods of stress, which is evidence for safe haven behaviour.

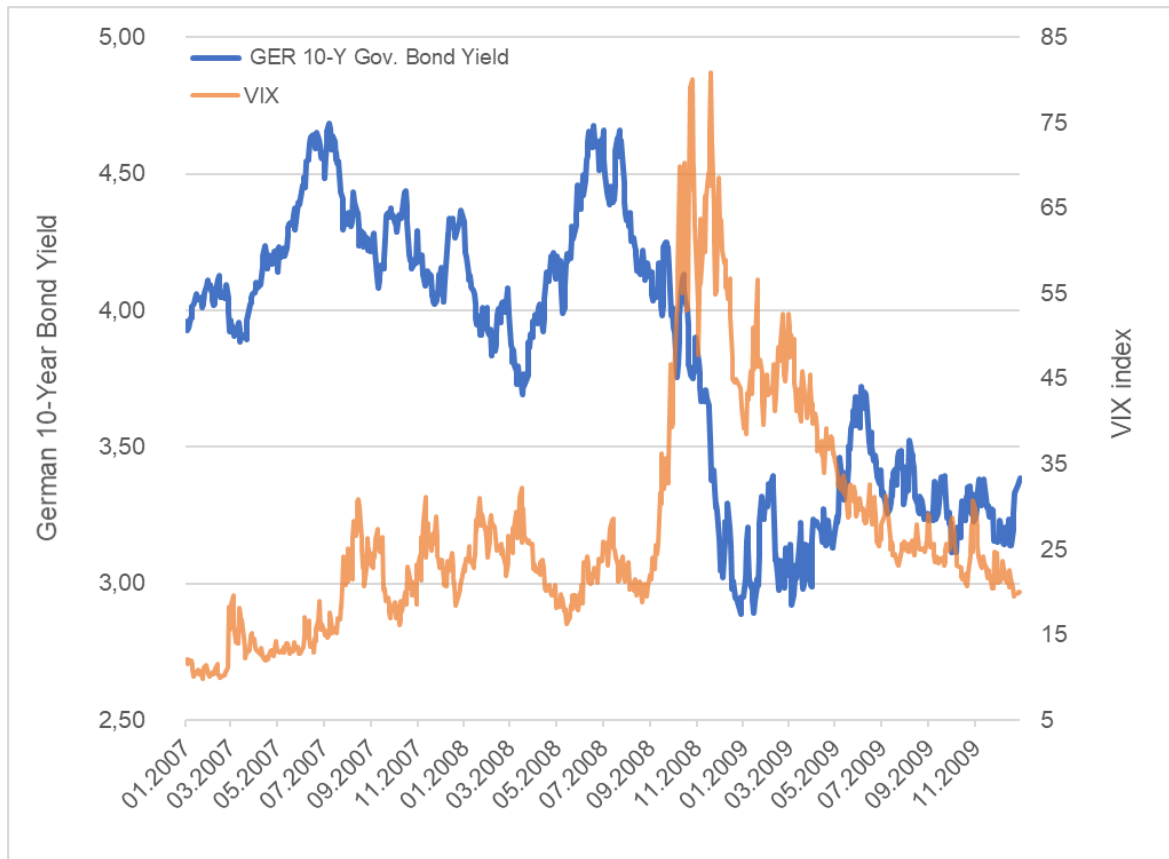


Figure 8: German 10-year government bond yields (left axis) and the VIX index (right axis) during the crisis of 2007-2009. (adapted from Fusion Media, 2019; Cboe, 2019)

Not all government bonds reflect this safe haven property. Italian government bond yields, for instance, do not react as noticeably as German government debt (figure 9). Analysing the development of Italian yields during the same period (2007-2009) shows that there was no pronounced decrease in the end of 2008. During October 2008, yields and VIX even co-moved, which indicates that prices of Italian sovereign bonds decreased sharply for a short time, while risk perception increased. As discussed during the last chapter, research shows that this difference can only partly be explained by the German and Italian fiscal situation.

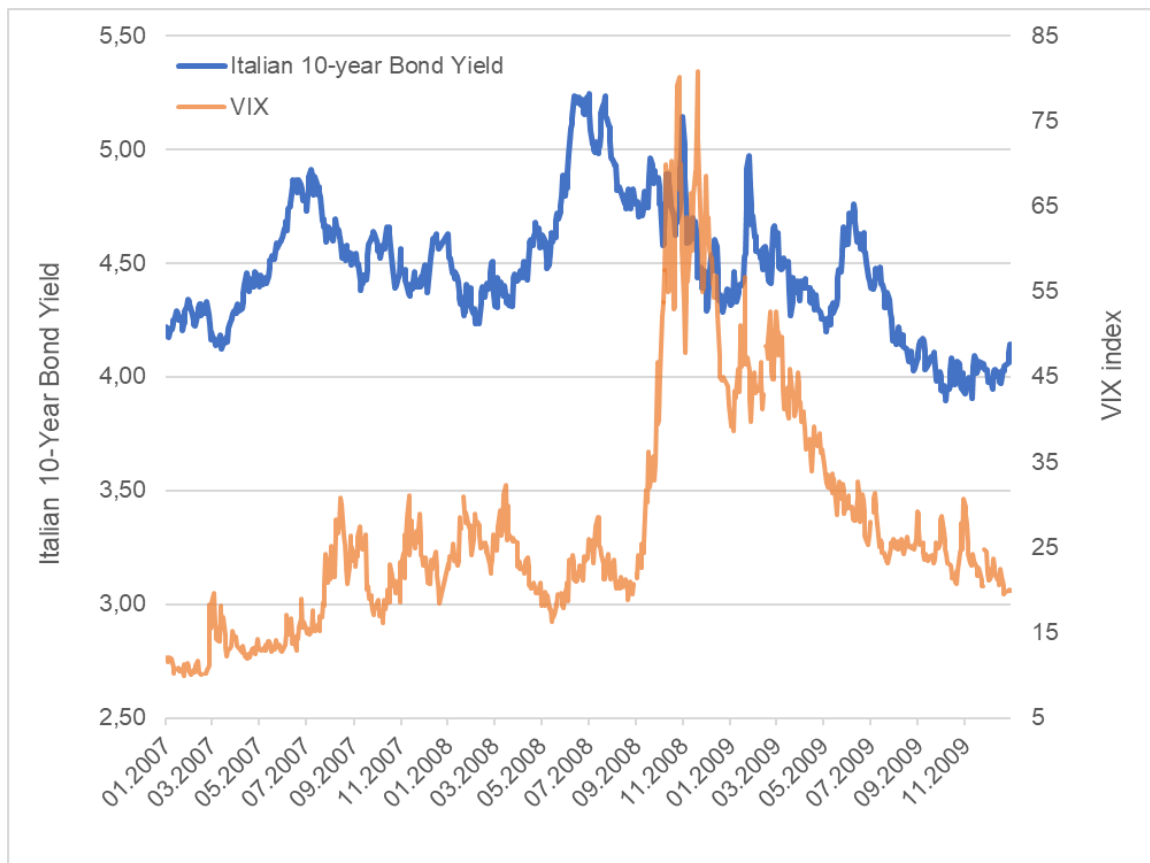


Figure 9: Italian 10-year government bond yields (left axis) and the VIX index (right axis) during the crisis of 2007-2009. (adapted from Fusion Media, 2019; Cboe, 2019)

Collectively, considerable evidence for the safe haven properties of government bonds was found. Especially German, British, and US sovereign debt sticks out. Yet, the characteristics of these countries do not suffice to explain their safe haven status. Most research shows that investors pay premiums on these assets due to their high liquidity on secondary markets.

As liquidity partly depends on the chance to readily find a buyer for an asset, other investor's beliefs may not only play a role for the safe haven status of gold, but also for government bonds. Indeed, research by He et al. (2016) exhibits that the US government's fiscal condition, e.g. its debt-to-GDP ratio, is worsening, whereas the yields of its bonds continue to decrease. Their model shows that the safe haven property is not connected to these variables, but depends on investors' trust in this asset. They state that "[s]afety is endogenous, and when investors believe an asset will be safe, their actions can make that asset safe".

## 5. Currencies as Safe Havens

### 5.1 Safe Haven Property

Investing in currencies can be similar to investing in gold. Both assets are very liquid, but unproductive, i.e. apart from the changes in their market value, they neither generate returns, nor do they grow. The similarities are even sufficient enough to trigger a debate about whether gold should be regarded as a monetary asset or a commodity (Ciner, et al., 2013).

In contrast to gold, currencies seem more susceptible to politics. Alongside news on political events like elections, or negotiations on trade deals or sanctions, the prices of currencies are often found to be affected. Luckily, most political events were found to influence currency values only for a short period (Mohammed, 2017). These price swings are mostly caused by investors reacting to the additional uncertainty. Hence, prices usually revert back to levels that better reflect the economic situation of the country/region, as soon as investors have processed the new information. In 2016, for instance, the UK's referendum to leave the EU caused high uncertainty about its future. Consequently, the pound fell to a record low (The Telegraph, 2017).

But through monetary policy, the value of a currency can also be influenced intentionally and for a longer period. The Swiss National Bank (SNB), for instance, tried to keep the exchange rate between the sought-after Swiss franc and the euro stable for many years. When the SNB suddenly stopped doing so in 2015, the Swiss franc's value increased rapidly against the euro (Shotter, et al., 2015). Recently, also the Chinese central bank PBOC announced it would try to stabilize its currency, after trade tensions with the US led to increased exchange rate fluctuations (Reuters, 2018). These political influences, however, do not seem to reduce the safe haven properties of certain currencies. Habib & Stracca (2015), for example, searched for the country that attracts most foreign investors during crises. They found that investors mainly flee towards US Treasuries and that the US dollar appreciates during market tumult.

Japan and Switzerland also come close, as their currencies appreciate, but demand for their securities does not increase.

During their research on the safe haven properties of gold, Baur & McDermott (2016) uncovered further evidence for the safe haven status of the US dollar and Swiss franc. As the franc reacts stronger to shocks of the MSCI World index, whereas the dollar shows stronger safe haven properties regarding the S&P 500 index, they conclude that the Swiss franc is sought out by global investors while the US dollar caters to US investors. Moreover, Baele et al. (2018) confirm the appreciation of the Japanese yen, US dollar and Swiss franc during “flight-to-safety” periods, which are characterised by heightened investor stress and a negative correlation of government bonds and stock markets of 23 countries.

In contrast, relatively little research was found on the performance of the euro, and while Hossfeld & MacDonald (2015) found no significant evidence for its safe haven property, Ranaldo & Söderlind (2010) described the euro as a weak safe haven. It is possible that their unequal results could either be explained with their different models, or their definition of safe havens. According to Hossfeld & MacDonald (2015), a safe haven is “significantly negatively related to global stock market returns”, whereas Ranaldo & Söderlind (2010) also define a non-correlation as a (weak) safe haven property.

Moreover, Campbell et al. (2010) analysed the interdependence of currencies and stock markets up to 2005 and discovered that the safe haven property of the euro has increased during the last years of their data. It is interesting to compare these results to the findings of Bernoth et al. (2012) and De Santis (2014), whose research showed that German bonds have recently gained a safe haven status among investors. This foreign demand for German bonds may also affect the value of the euro, as parallels can be drawn to earlier research, which found that a reason for the safe haven property of the US dollar is the high foreign demand for US Treasuries during times of stress (McCauley & McGuire, 2009).



Analysing why these currencies appreciate during crises, the same study by McCauley & McGuire (2009) revealed that the US dollar and Japanese yen serve as funding currencies for carry trades. This trading strategy is based on interest spreads between different currencies. Usually, an investor would therefore short-sell a low-interest currency (called funding currency) and invest this money in a high-interest (target) currency. As this strategy is very risky, many investors seek to unwind their positions during market crises, which leads to increased demand for funding currencies and downward pressure on target currencies (Hossfeld & MacDonald, 2015).

The impact of carry funding on exchange rates, especially of the Japanese yen, US dollar and Swiss franc, was confirmed several times (e.g. Kohler, 2010; Rinaldo & Söderlind, 2010; Hossfeld & MacDonald, 2015). And while Kohler (2010) finds that this impact has been increasing since 2007, other variables are still more reliable in predicting safe haven properties (Habib & Stracca, 2012).

To identify these variables, Cenedese (2015) created currency portfolios, which followed five different strategies: Currencies according to their interest rates (i.e. carry), good performance in the past (i.e. momentum), underpricing according to the purchasing power parity (i.e. value), and their respective countries' net international investment position (i.e. IIP) and current accounts (i.e. CA). Not surprisingly, optimal strategies changed, when the market entered a crisis period. Whereas balanced portfolios performed best in tranquil markets, the value and momentum portfolios delivered the best returns during market crises. Furthermore, the analysis showed it is best to unwind positions in currencies with high-interest rates and currencies of countries with weak balances (i.e. the CA and IIP portfolios).

For a simpler overview on the research on currency safe havens, see table 3.

Author(s), Title and Date of Research	Timeframe	Variables	Results
McCauley & McGuire (2009) <i>Dollar Appreciation in 2008: Safe Haven, Carry Trades, Dollar Shortage and Overhedging</i>	2007-2009	Monthly exchange rates of various currencies against the US dollar	Found several reasons for the dollar appreciation: <ul style="list-style-type: none"> <li>- European banks bought more dollar assets during the crisis in 2008, resulting in a dollar shortage</li> <li>- The dollar and Japanese yen act as funding currencies for carry trades. Hence, demand increases in crisis episodes.</li> <li>- US Treasuries act as safe havens. Foreign investors therefore change their own currency against the US dollar to buy this US public debt.</li> </ul>
Campbell, Serfaty-De Medeiros & Viceira (2010) <i>Global Currency Hedging</i>	1975-2005	Monthly data on stock returns, exchange rates, interest rates and bond yields of 7 developed economies	Explain the negative correlation of the US dollar, euro and Swiss franc with global stock markets with their status as safe havens. The safe haven property of the euro and Swiss franc has increased compared to the US dollar.

Kohler (2010) <i>Exchange Rates During Financial Crises</i>	1997-1998 2007-2009	Monthly exchange rates and currency options of various currencies of emerging markets and small developed countries against the USD, JPY and CHF; VIX	Interest rates explain a bigger part of the exchange rate fluctuations during the crisis of 2007-2009 than in the earlier two crises analysed (Asian and Russian crisis). This change could be explained by higher carry-trading activity. The reversal of currency rates to “normal” levels became faster. Now, it takes rates on average one year to normalize, whereas it took several years in earlier crises. The Swiss franc, yen and US dollar are found to be safe haven currencies.
Ranaldo & Söderlind (2010) <i>Safe Haven Currencies</i>	1993-2008	High-frequency data on spot exchange rates between the USD, CHF, DEM, EUR, JPY and GBP, as well as the S&P 500 index, 10-year US Treasuries, VIX, TED spread and FX volatility	Currencies with higher interest rates are “anti-safe havens”. Analysing frequencies ranging from intraday data up to data spanning several days, the Swiss franc and Japanese yen display high performance when US stock prices decrease and US bond prices and market volatility measures increase. Also the euro is a safe haven, but performs weaker.
Habib & Stracca (2012) <i>Getting Beyond Carry Trade: What Makes a Safe Haven Currency?</i>	1986-2009	Monthly exchange rates of 51 currencies versus the US dollar; monthly VIX values and institutional, economic and financial data (e.g. inflation, public debt levels,...)	Carry trades influence safe haven currencies, but other variables are more important. Especially, the impact of self-fulfilling prophecies (i.e. “momentum”) and a country’s net foreign asset position were found to predict safe haven behaviour.

Ciner, Gurdgiev & Lucey (2013) <i>Hedges and Safe Havens: An Examination of Stocks, Bonds, Gold, Oil and Exchange Rates.</i>	1990-2010	Daily data on US and UK stock, gov. bond, currency, gold and oil prices. Compare tails of distributions, instead of performance in pre-defined periods.	No safe haven property of the US dollar was found regarding the other US assets. The British pound, however, was found to provide a safe haven versus gold, UK bonds and UK equities.
Cenedese (2015) <i>Safe Haven Currencies: A Portfolio Perspective</i>	1983-2011	Daily spot and 1-month forward exchange rates of 48 currencies against the US dollar	Created five kinds of portfolios, according to: <ul style="list-style-type: none"> <li>- Currency interest rate (carry portfolio)</li> <li>- Past currency performance (momentum portfolio)</li> <li>- Currency undervaluation relative to values suggested by the purchasing power parity (value portfolio)</li> <li>- Country net international investment position (IIP portfolio)</li> <li>- Country current account (CA portfolio)</li> </ul> The optimal strategy changes with market stress. During a market crisis, it is best to invest in the value or momentum portfolio, and unwind positions in currencies with high interest rates or weak country balances (i.e. CA and IIP portfolios).

De Bock & de Carvalho Filho (2015) <i>The Behavior of Currencies during Risk-off Episodes</i>	2000-2011	Weekly exchange rates of the JPY, CHF and USD versus various emerging market and G-10 currencies; VIX	During “risk-off episodes”, i.e. when the VIX index increases by more than 10% of its 60-day average, only the Swiss franc and Japanese yen increase against the US dollar. The US dollar itself increases against most other currencies during periods of stress. Since 2007, the impact of interest rates on currency prices during “risk-off episodes” has increased.
Habib & Stracca (2015) <i>Is There a Global Safe Haven?</i>	1990-2015	Monthly foreign investors’ net purchases of debt instruments and exchange rates; monthly VIX and MSCI World values	Search for countries which become more attractive during risky periods. The US seems most attractive to foreign investors, as both the demand for US Treasuries and the value of the US dollar increase during these periods. Japan and Switzerland only have appreciating currencies, but no increased demand for their securities.
Hossfeld & MacDonald (2015) <i>Carry Funding and Safe Haven Currencies: A Threshold Regression Approach</i>	1986-2012	Monthly exchange rates of the USD against the currencies of 9 other developed countries; Monthly VXO and VIX, 1-month Libor and MSCI World values	The Swiss franc correlates negatively with global stocks during times of market crisis and is also a hedge on average. The USD is (only) a safe haven, whereas the JPY’s value mainly appreciates due to carry funding. No evidence for the safe haven status of the euro was found.

Grisse & Nitschka (2015) <i>On Financial Risk and the Safe Haven Characteristics of Swiss franc Exchange Rates</i>	1990-2011	Monthly exchange rates of the Swiss franc versus 11 other countries; monthly VIX values, spreads between Italian and German bonds, and spreads between 3-month Treasuries and the eurodollar	Define safe haven as an asset that acts as a hedge on average and during crisis periods. The Swiss franc satisfies these conditions against most currencies, but not the USD, GBP and JPY, as these currencies provide better average hedging properties. Importantly, the franc's safe haven property becomes stronger during crises.
Baur & McDermott (2016) <i>Why is Gold a Safe Haven?</i>	1970-2013	Daily MSCI world, S&P 500, US 10-year gov. bond, gold, silver, commodities, Swiss franc, and US dollar prices	The US dollar and Swiss franc both act as safe havens. For the franc, the reaction is stronger for shocks of the MSCI World index. The dollar shows stronger safe haven properties regarding shocks of the S&P 500 index. This difference indicates that the Swiss franc is a safe haven for global investors, whereas the US dollar caters to US investors.
Fatum & Yamamoto (2016) <i>Intra-Safe Haven Currency Behavior during the Global Financial Crisis</i>	1999-2012	Daily data on exchange rates of the CHF, JPY, GBP, EUR, CAD and SEK versus the USD, and on the 3-month Libor and the VIX	During the crisis between 2007 and 2009, the Swiss franc and Japanese yen increased due to uncertainty, while all other observed currencies decreased.

Baele, Bekaert, Inghelbrecht & Wei (2018) <i>Flights to Safety</i>	1980-2015	Daily returns of stocks and 10-year gov. bonds of 23 countries (US, Canada, 18 European countries, Australia, Japan, New-Zealand), as well as exchange rates of the USD, JPY and CHF	Create a model to find flights to safety by searching for periods in which returns of government bonds and stocks are negatively correlated. During these periods (never longer than 10 days), the markets exhibit heightened investor stress and appreciations of the US dollar, Japanese yen and Swiss franc.
Tachibana (2018) <i>Safe-Haven and Hedge Currencies for the US, UK, and Euro Area Stock Markets: A Copula-based Approach</i>	1999-2016	Weekly S&P 500, FTSE 100 and Euro Stoxx 50 values, as well as exchange rates of the USD, GBP, EUR, CHF and JPY	Based on a copula model that compares stock returns and exchange rates, the author finds that there are no safe haven currencies for the UK stock market, whereas the CHF and USD provide a safe haven to the European stock market. The JPY is a hedge and safe haven for US equities.

Table 3: Literature on the safe haven property of currencies.

## 5.2 Analysis of Historical Data

As displayed above, there is a vast amount of evidence backing the safe haven property of the US dollar. To follow the advice of Cenedese (2015) to back out of currencies of countries with weak balances during crises, however, would also include selling the dollar. Figures 10 and 11 show that the United States' current account balance and its international investment position (both per GDP) are negative and outperformed by many countries.

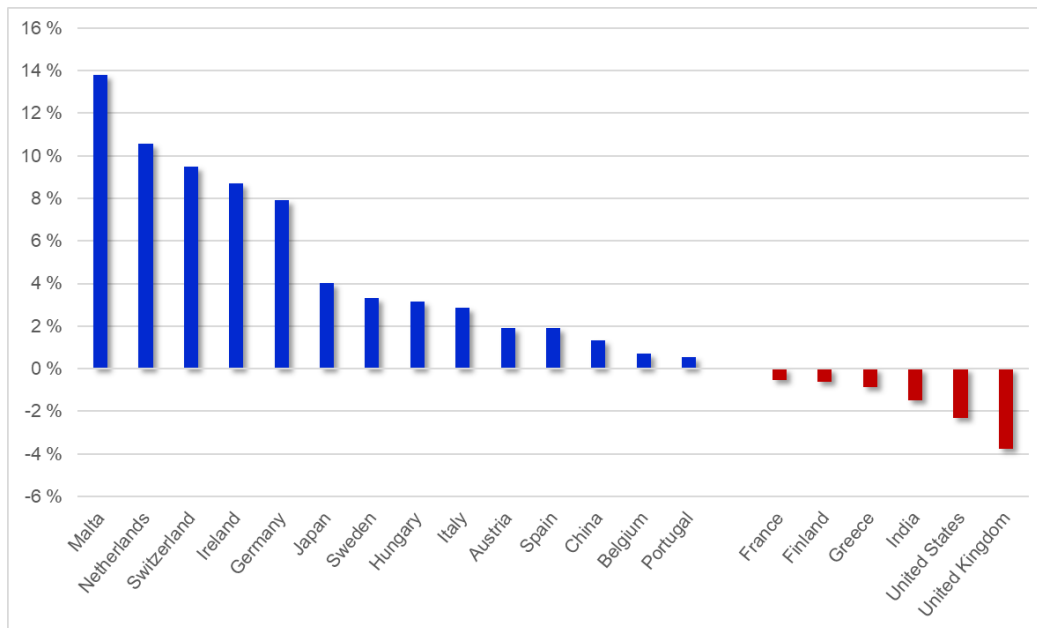


Figure 10: Current account balances of various countries against their GDPs. Data as of 2017. (adapted from World Bank, 2018)

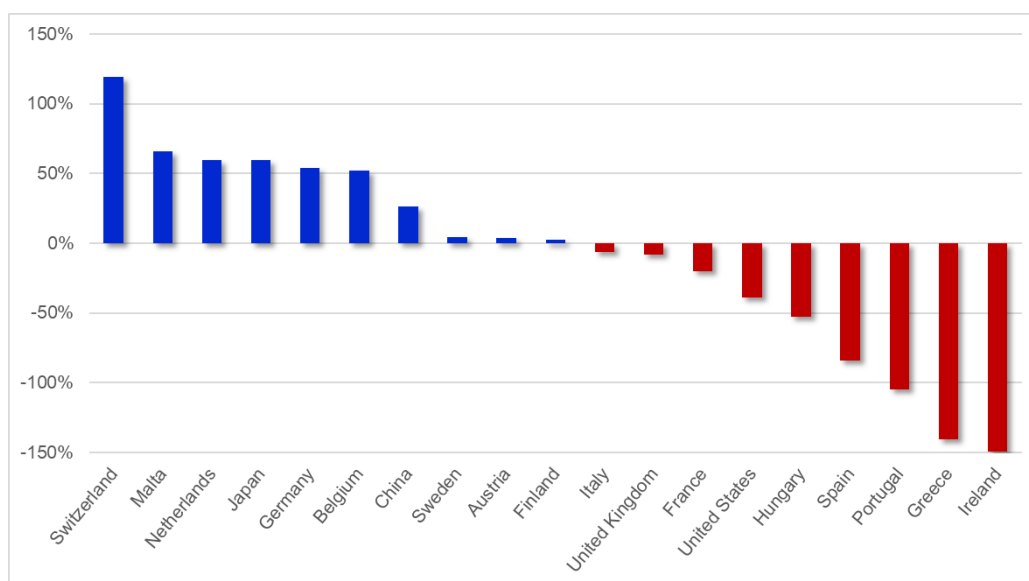


Figure 11: Net international investment position of various countries against their GDPs. Data as of 2017. (adapted from IMF, 2018; Eurostat, 2018; Bureau of Economic Analysis, 2019a; Bureau of Economic Analysis, 2019b)



One possible explanation for the safe haven performance of the US dollar is therefore a self-fulfilling prophecy. Habib & Stracca (2012) argue that the past-performance, or momentum, of a currency is a good proxy for the expectations investors have with respect to its performance in the next crisis period. Their analysis shows a significant correlation between this proxy and actual performance, thus supporting the idea that the increased demand, due to high expectations, itself causes the intended results. On the other hand, the charts of figures 10 and 11 also stress the strong balances of the Swiss and Japanese governments, which support their currencies' safe haven properties.

To ensure data comparability, the test of currency safe haven behaviour during “black swan” events will also be based on the 9/11 attacks.

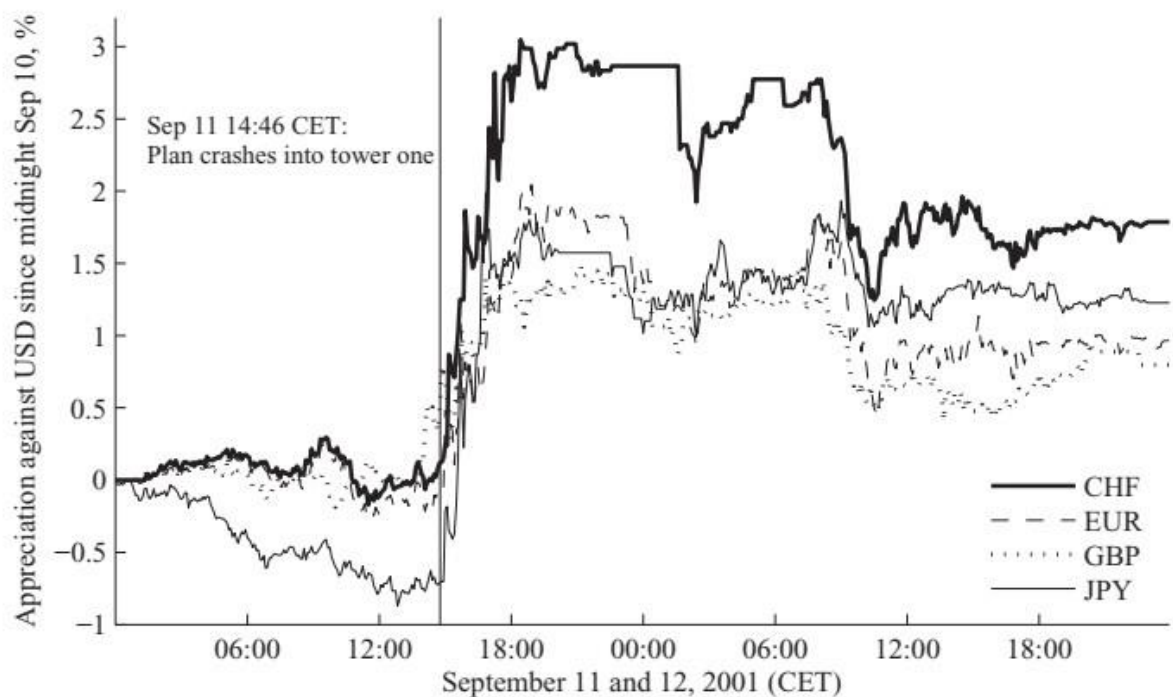


Figure 12: The impact of the 9/11 terrorist attacks on the values of the CHF, EUR, GBP and JPY. (Rinaldo & Söderlind, 2010)

As figure 12 clearly depicts, the euro, the British pound, the Japanese yen and, especially, the Swiss franc reacted quickly to the attacks. Within two hours, for example, the franc increased its value against the dollar by 3%. The prices began to normalise already on the next day, which fits nicely to the observations made on gold and bonds.

The financial crisis between 2007 and 2009 had a more prolonged effect on the exchange rate of the euro to Japanese yen (EUR/JPY), as figure 13 shows. Kicked-off by a “black swan” event, namely the bankruptcy of Lehman Brothers, on September 15, 2008, the yen’s value increased against the euro for several years (Elliott, 2011).

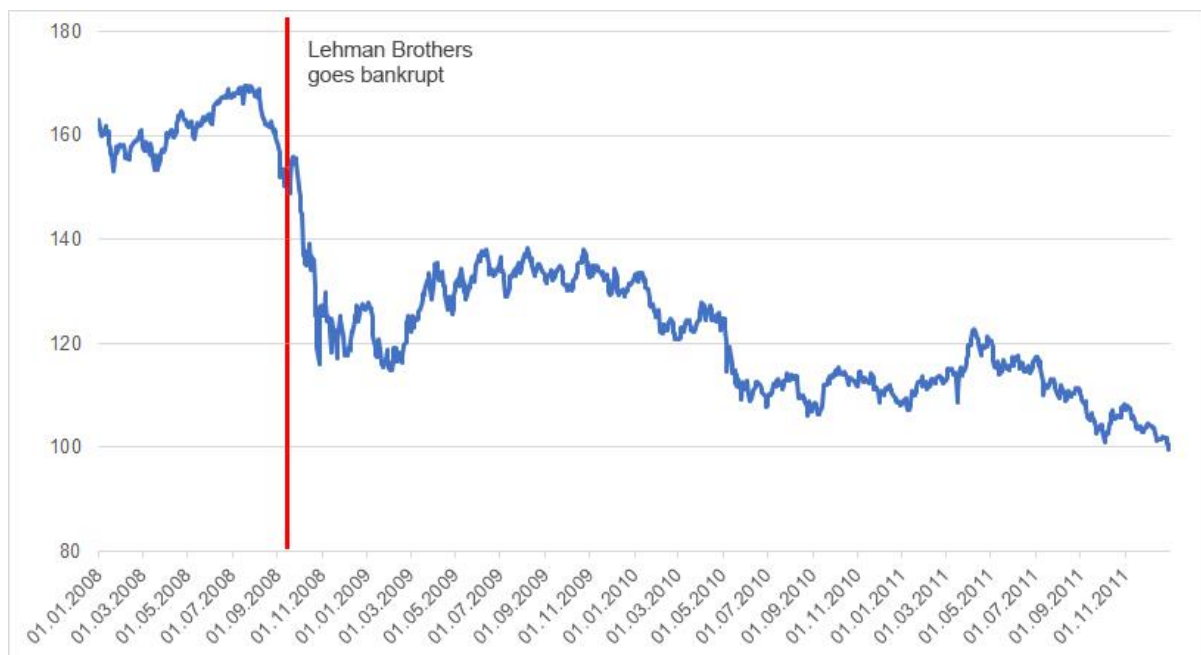


Figure 13: The EUR/JPY exchange rate decreases sharply during the financial crisis of 2007-2009 (adapted from Fusion Media, 2019)

As the value of a currency can only be displayed in relation to another asset or currency, it is difficult to find a representative pair of currencies for “the” investor. According to figure 13, a European investor would have profitted from investing in the Japanese yen the day Lehman Brothers went bankrupt. It should be noted, though, that this relation tells us nothing about the value of the Swiss franc, for instance, or whether a Swiss investor should have invested in the yen, too.

Furthermore, it is interesting to compare the current accounts and international investment positions of China and the US, depicted in figures 10 and 11. Research presented above would suggest that Chinas financial situation would promote safe haven behaviour of its currency.

Also, Fatum et al. (2017) emphasize that the renminbi is very liquid, which is a main property investors demand for a safe haven. Their research, however, could not find significant evidence for its safe haven behaviour.

Therefore, the safe haven status of a currency is connected to the characteristics of the country, or region, where it is legal tender, but it is also influenced by investors' expectancy towards its performance. And even though the safe haven property depends on the currency with which an investor conducts his usual business, the Swiss franc, the Japanese yen and, to a lesser extent, the euro were found to increase their value against the US dollar during crises. As the dollar itself increased in value compared to almost all other currencies which were analysed by the researchers presented above, also the franc, yen and euro acted as safe havens for most currencies.

## 6. Safe Haven Portfolios

### 6.1 Method

As the research on gold, bonds and currencies has shown, these assets can provide an investor with significant safe haven properties. But following Forbes's "golden rule of investing" (Shorr, 2007) leads to considerations about diversification between these assets.

It is therefore assumed that investors prefer a safe haven portfolio, which provides more reliable returns during crises, to a single safe haven asset, which could provide better returns in total, but may also confront the investor with negative returns in some years. The main goal of a safe haven portfolio is therefore to provide positive and reliable returns during all crises.

These crisis periods were found by marking days characterised by heightened VIX values above the threshold of 25, and decreasing MSCI World index levels. If two of these crisis days were not more than a week apart, also the days between them were included in the crisis period.

Excel pivot tables were then used to analyse the performance of gold, currencies and bonds during these periods. The Excel Solver was employed to find the optimal portfolio weights. Its objective was to maximise the average return of a portfolio, while keeping the annual returns during the crises of each analysed year non-negative (i.e. “reliable”).

In order to avoid problems with the bilateral nature of exchange rates, the perspective of a European investor was chosen.

## 6.2 Data

As before, daily exchange rates of the US dollar, the Japanese yen and the Swiss franc were obtained from [www.investing.com](http://www.investing.com). This time, however, they were all measured against the euro (i.e. USD/EUR, JPY/EUR, and CHF/EUR were used, respectively). The same procedure was also applied to the gold rate (XAU/EUR).

The monthly ICE index of 10-20 year US Treasury bonds (IDCOT10) served as a proxy for US Treasury prices and was downloaded from the index owner’s homepage ([www.theice.com](http://www.theice.com)). Similarly, the daily REX 10-year index of the Frankfurt Stock Exchange was used to track prices of German government bonds and was obtained from the exchange’s homepage ([boerse-frankfurt.de](http://boerse-frankfurt.de)). Due to limited access to historical data on these bond indices, the timeframe of the analysis covers the period since December 2005.

Within this period, the crisis measure presented above delivered 563 crisis days characterised by an average decrease of the MSCI World index by 0.08% and an average VIX index level of 35. Even though the data extends to 2005, the first crisis day was defined as January 8, 2008.

## 6.3 Results

The analysis was conducted in two ways. One portfolio was based on average historical returns during all crisis days, whereas the other portfolio regards only the highest possible return of the safe haven assets in each crisis period. Hence, the latter portfolio shows the profits investors could have made if they had invested their money on the first day of a crisis period and perfectly timed the divestment of each safe haven asset to sell it for the highest available price during this period.

Both portfolios were subject to the same conditions. The Excel Solver aimed for the highest-possible average total return over all crises, while keeping the returns per crisis and year above zero to increase the portfolios' reliability. To achieve these goals, the Excel Solver had to drop some safe haven assets. The asset mix in both portfolio versions therefore does not consist of all available safe havens.

The portfolio based on average returns consists mainly of gold (73 percent), but also includes investments in the Japanese yen (15 percent) and long-term US government bonds (12 percent). This allocation results in an average positive return of 0.28% during crises. As Flavin et al. (2014) mentioned, gold is a more volatile safe haven than US Treasuries. Combining gold with less volatile assets therefore makes good sense and offsets negative returns a gold investor would have incurred during the short crisis periods in 2015 and 2016.

Its higher volatility also puts gold in a favourable position in the second ("perfect timing") portfolio. If the constraints merely demand non-negative returns during all periods, the resulting portfolio is based on gold only and provides the investor with an average return of 13 percent during crises. Increasing the constraints' relevance by setting it to a level where at least an average return of 0.50% in each crisis is required, increases the weights of the US dollar (20 percent) and German government bonds (37 percent), while decreasing the portfolio weight for gold to 44 percent. This comes at a cost in terms of the portfolio's total average return, which declines to 8.64 percent. This allocation is a consequence of gold's decreasing returns

in recent crisis periods (i.e. 2015 and 2016), compared to the rather continuous returns of the US dollar and German bonds.

However, the performance of the second portfolio cannot be achieved by a real investor. Its only use is to help us to deduct the theoretical returns that could have been made by an agent with perfect a priori knowledge about the development of prices. The perfect timing portfolio consequently only serves as a benchmark showing us the upper bounds of our portfolios performance and the loss incurred due to imperfect timing. It is interesting to observe, however, that (at least in the past) gold alone would have sufficed to produce constant and high returns under these perfect timing conditions. Here, only investors who demanded strictly positive returns ( $\geq 0.50\%$ ) in all crises, would have added the US dollar and German government bonds to their portfolios.

The big difference between the returns on the average-return portfolio and the benchmark portfolios seems implausible at first sight. It should be clarified, however, that the first portfolio's average returns also include all the days on which a price normalisation has happened. These price declines show up in the portfolio's average total return of 0.28 percent. The fact that its return is still positive hence confirms its safe haven property.

The best-case portfolio, by contrast, only picks the one best return an investor could have made in each crisis period. It therefore neglects the price downswings happening within a crisis, but incorporates only the one biggest upswing into its returns, which leads to a preference for risky assets. In consequence, it caters to more aggressive investors. The average-return portfolio, on the other hand, also takes negative returns into account and can therefore be described as a more defensive investment.

Both portfolios display extreme cases and it stands to reason that an investor's actual returns would likely be smaller than those of the benchmark (i.e. best-case) portfolio and higher than the returns of the average-return portfolio. But despite their differences, they both demonstrate that safe haven portfolios can produce more steady and safe returns than single safe haven assets.

## 7. Conclusion

This thesis provides an extensive analysis of the topic of safe haven assets. It presents relevant literature on various asset classes and illustrates these findings with market data. Further, two safe haven portfolios were constructed to demonstrate the positive influence of diversification on the investment in safe haven assets.

The literature review produced vast evidence for the safe haven properties of gold, US and German government bonds, the US dollar, Swiss franc and Japanese yen. Even though most research focussed on the assets' safe haven properties versus equity markets, there was also evidence for safe haven effects within these asset classes (especially intra-currency safe haven properties), and correlations with investors' risk perception.

This analysis showed that the value of safe haven assets is a result of partly rational and irrational decision making. For instance, rational drivers of an asset's value during crises were found to be related to high liquidity, or the financial stability of the asset's country of origin. Sometimes, however, investors' decisions also depend on feelings, or wishful thinking, based on e.g. past performance. These expectations can later turn into self-fulfilling prophecies and induce further demand for safe haven assets.

These results were also illustrated with data samples, which served two purposes. Firstly, they allow for better comparison between the asset classes in crisis periods or after "black swan" events. Secondly, the data provides a more direct view of the pace and strength of the markets reaction and gives examples of feasible profits made during a crisis period, whereas the literature usually focusses on correlation values. The data analysis showed further evidence for the safe haven properties of all analysed asset classes.

Since the data suggest that the safe haven property of an asset varies over time, it is reasonable to test if portfolios help to diversify this risk. Analysing data from the last eleven years showed that the construction of safe haven portfolios indeed increased the reliability of safe haven returns during times of market turmoil.

Yet, there are various ways in which this analysis could be extended. First, it could be interesting to see if the results change with other data frequencies. Most of the data in this thesis was based on daily values. Higher-frequency data, for example, could help to better capture the market's reaction to news on "black swan" events, or changing expectations about future economic developments.

Second, more sophisticated approaches to the portfolio analysis could allow for conclusions about the results' significance, or enable varying portfolio weights depending on the timeframe or severity of a crisis.

Third, some safe haven assets were found to gain importance recently, whereas others seem to become less attractive. Therefore, an analysis about the development of the optimal safe haven portfolio during the last decades could be interesting, as it could unveil safe haven trends.

Fourth, it could also prove fruitful to further categorise crises into different types, and assess their impact on the performance of gold, bonds, currencies and other potential safe haven assets.



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