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Perceptual Safe Havens –

A study of Gold, Oil, Palladium, Wheat, Bonds, USD, and Stocks

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Abstract

Title:	Perceptual Safe Havens - A study of Gold, Oil, Palladium, Wheat, Bonds, USD and Stocks
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Key Words:	Safe Haven, Black Swan, Financial Turmoil, Hedge, and Crises Characteristics
Purpose:	The purpose of this paper is to examine how assets that are normally viewed as safe havens act in time of market distress, and how different types of crisis affect different assets.
Methodology:	The report was based on the deductive process presented by Bryman & Bell (2003). The quantitative research conducted was divided into two parts, first a hedge or haven analysis, and secondly an asset behavior analysis.
Theoretical perspectives:	The literature used was mainly scientific articles; however, due to the fact that there have been few studies on the subject, previous research regarding safe haven investments is somewhat inconclusive.
Empirical foundation:	The results from our research are presented crisis-by-crisis leading up to a general discussion of our findings.
Conclusions:	The report shows that safe haven investments do exist; however, it does not exist one single safe haven for all crises. The characteristics of a crisis determine whether an asset becomes a safe haven, e.g. US Dollar acts like a safe haven during Non-Financial Black Swan crises, while gold acts like it during Market and Aftermath crises.

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1. Preface

In this chapter the reader will be introduced to the complexity of the problem, and some relevant theories as well as the market background will be presented.

1.1 Introduction

There has always been a quest to find a safe investment, and this has especially been interesting during times of financial uncertainty. This has caused researchers to speculate if there are any assets that can be considered safe; furthermore, gold has had a reputation of being a safe haven asset against turbulent market returns (Joy, 2011). Baur and McDermott investigated the potential role for gold as a safe haven from losses in financial markets (Baur & McDermott, 2009); however, there are other assets that have had this reputation, for example, US Treasury bonds are still believed to be safe haven assets, even though they have been downgraded by Standard & Poor's (King, 2011). There has been a few researches done in analyzing the recent financial crisis, and it is clear that gold has had a strong negative correlation towards stock returns; however, in a longer run the results are not as strong (Baur, 2010). Dicle, Levendis, and Alqotob also reached the conclusion that during the latest global economical crisis investors have focused their attention to safe assets, and the most predominant are gold and US Treasuries (Dicle, Levendis & Alqotob, 2011).

So far, researchers have not reached a one clear definition of a safe haven asset, and this is probably one of the reasons why the results are fluctuating so much. Therefore, our essay has first defined what a safe haven asset it, and thereafter compared gold, palladium (another precious metal), US Treasury bonds, oil, wheat, and a basket of currencies compared to the US Dollar, to a world market index consisting of the S&P index, DAX index, Nikkei index, and NASDAQ index to see how these have acted in uncertain times. Also, this thesis will contribute in a new field within safe haven investments; furthermore, there has not been any discussion whether or not the different types of crisis have an effect on the

different assets. So, our research will also test if there is a relationship between different types of crisis and the assets.

1.2 Purpose

The purpose of this paper was to examine how assets, which are normally viewed as safe havens, have acted in times of market distress, and how different types of crisis affected different assets.

1.3 Problem Discussion

There were two major reasons for conducting this research. First of all, there was a lack of a standard definition of a safe haven asset, and secondly, to study if different types of financial crisis have had a different impact on the safe haven assets. Since there was not one standard definition, all current results have differ; moreover, some have viewed the suggested assets as hedges instead of safe havens, e.g. Joy (2011), while others have argued that safe havens do exist, e.g. Baur & Lucey (2009). So, our definition of a safe haven has had a great impact on the thesis and future findings. Also, as was mentioned before, gold and US Treasuries, amongst other assets, have often been associated with that it being a safe haven; however, there have been few studies actually testing this hypothesis (Baur, 2009). Finally, none of the previous studies have examined if the type of crisis also determines which asset(s) that become a safe haven investment. The aforementioned research discussed assets as safe haven investment during all crises; however, this paper offers the research a new perspective as it was aimed to assess how effective assets are as safe havens during different types of market instabilities. We believe that it was important to know how safe haven assets have been affected depending on what type of financial stress it is. Therefore, we gathered the crises that have similar characteristics into categories, and this was to see if the assets acted comparable within the different categories. The previous research has never examined whether different types of economic turmoil affected asset behavior differently. However, we believe that investors tend to react differently depending on the origin of the crisis, and therefore depending on what type of economical uncertainty will have an effect on the perceptual safe havens. Consequently, our

research has added a new dimension to the safe haven discussion. Through this we came up with two hypotheses:

1 – Safe haven investments exist.

2 – Different types of crisis have an affect on the efficiency of a safe haven.

1.4 Market Background

In the past decade there has been a few very large market disturbances and many small with different characteristics. Some of these are the dot-com bubble that burst early in 2000, the September 11 attacks 2001, and the global financial crash in 2008. The dot-com bubble caused uncertainty on the marked due to the failure of many internet-based companies; therefore, there was a major loss in wealth on the large international markets, which caused the index to drop severely. The market disturbance caused by the global financial crisis, which started in 2007, was triggered by the property-bubble bursting, which eventually led to liquidity shortage on the market. The Lehman Brother crash in September 2008 sent major ripples on markets around the world, and was a major reason for the large market uncertainty that followed (I, CBSNEWS). Also, the terrorist attacks on the World Trade Center in 2001, and the earthquake in Tokyo in early 2011 has triggered turbulent markets. These are some of the many market uncertainties that have been seen on the market since the beginning of 2000.

1.5 Definition

In this section we have given our definition of safe haven assets and crises. We have also discussed what time periods in our time frame we have considered the market to be uncertain.

1.5.1 Safe Haven Definitions

There are few literary pieces on the topic of safe havens; therefore, there has not been one standard definition of a safe have. So, the first step in our thesis was to define safe haven; moreover, this was very important since it was the foundation of the entire essay. Also, since safe havens and hedges are very similar, it was extremely important to distinguish the difference between these. According to Joy "the definitional difference between a hedge and a haven is subtle but important: an asset that functions as a haven is uncorrelated or correlated

negatively with y [any other asset, A/N] in times of stress only, and not necessarily on average" (Joy, 2011). Dirk G. Baur and Brian M. Lucey defined a safe haven asset as an asset that was, "uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil" while a hedge was defined as, "an asset that is uncorrelated or negatively correlated with another asset or portfolio on average" (Baur & Lucey, 2009). Fei and Adibe (2010) came with another hypothesis, they claimed that a safe haven asset "is closely related to the negative-beta-asset hypothesis." Thereafter, they defined the negative-beta-asset-hypothesis, "to be those whose returns are negatively correlated with macroeconomic performance, measured by monthly return of S&P 500" (Fei & Adibe, 2010). Baur (2009) had another definition of safe haven assets, together with McDermott they concluded that, "a safe haven asset must therefore be some asset that holds its value in 'stormy weather' or adverse market conditions. Such an asset offers investors the opportunity to protect wealth in the event of negative market conditions" (Baur & McDermott, 2009).

Since the word "safe haven" was defined as a place of protection or refuge we have decided to define safe haven assets as an asset that in times of stress (the definition of stress will be discussed in section 1.5.2 Crises Definition) will retain its value or increase its value. Moreover, the upside to safe havens compared to hedges is that during bull markets, safe havens will also have the chance to follow the market upwards whilst hedges will, on average, be correlated negatively with the market. A safe haven offers the investor an escape from declining markets to protect their wealth. It was important to mention that if an asset is considered to be a safe haven it will have a positive beta on average compared to the market, while if the asset is considered to be a hedge it will have a negative beta on average compared to the market. A safe haven asset cannot be considered a hedge due to the fact that we have defined safe haven as something that holds or increases in value during uncertain markets, and during stable markets has the ability to increase in value.

1.5.2 Crises definition

The second step was to define, or rather agree upon, when it was bear-market and when it was bull-market. Especially during the latest global crisis the market has been very stressful and uncertain. Baur and McDermott discussed this and according to them, "the role of uncertainty in the decisions of economic agents has rarely appeared more pertinent" (Baur & McDermott, 2009). Since safe haven assets are supposed to retain or increase its value during periods of market stress, then it has to be decided upon when these market uncertainties occur. We have decided that market uncertainty or market stress is when there is large market disturbances, or decreases in the market over a short period of time. In order to help us to determine times of uncertainty we graphed a world market index over the time period as well as the VIX index (will be described more elaborate later in the report). This made it simpler to determine when there was market stress on the world market. We decided to use a world index to compare our assets against, and this will be described more later on in the report. The world index was created using market prices from S&P 500, DAX, Nikkei, and the NASDAQ Composite to create an average. Since the perceptual safe haven assets are traded with world market prices, we thought that it would be more accurate to have a world market index.

1.6 Limitations

There are some important limitations in our paper that have to be mentioned. First of, we had a time limitation of twelve years, 2000-01-01 to 2011-12-31. The limitation means that we have a relatively small number of observations in our research; however, during the twelve years a large number of crises have been identified and we therefore feel that our time span was sufficient. The second limitation was regarding the assets we have chosen to include in our research. We needed to make a choice about which assets we wanted to include in our study. The most natural approach when choosing the assets was to include those mentioned in previous research. There also existed some other limitations, e.g. the markets and currencies chosen, that will be discussed later on.

2. Theory

In this chapter we shortly have discussed theories in previous literature, and thereafter we have summarized the conclusions of these articles in a table. This has given us the necessary framework that was used to analyze our data.

2.1. Previous Literature

Due to the fact that there has been few studies about safe haven assets, there are also few books and articles on the subject. The "financial media regularly refer to gold as a "safe haven asset", the claim has rarely been tested in the literature" (Baur & McDermott, 2009) and "market reports often refer to gold as a safe-haven asset. But very few academic studies have addressed the role of gold as a safe-haven asset (Joy, 2011). Therefore, these articles, amongst others, helped us conclude that there are areas to where our thesis can add to something new and different to the discussion of safe haven assets. The literature used was mainly scientific articles. In these articles they often concluded that safe haven assets are negatively correlated or not correlated at all against a specific market, and with this definition there were many different conclusions. For example Baur and McDermott (2009) established that, "gold is not a safe haven for extreme levels of global uncertainty" while Dicle, Levendis & Alqotob (2011) derived at "we find that both gold and US Treasuries offer safe-haven from equity market volatility". The previous research regarding the assets that we have chosen to include in our paper will be discussed now.

2.1.1 Gold as a Safe Haven

Gold is probably the most discussed asset in terms of a safe haven. Historically gold has been viewed as a safety asset; however, the research regarding gold as a safe haven is not one-sided.

Joy (2011) argued that during the past 23 years gold has acted like a hedge against the US dollar and has performed poorly as a safe haven. Joy uses a multivariate GARCH of dynamic conditional correlations model to conclude that the changes in gold price and US dollar price is mostly negative. The negative correlation has become increasingly significant during the last seven years. Joy

also came to the conclusion that gold does not act as a safe haven towards market distress.

In their article, "Is Gold a Safe Haven? International Evidence" (2009), Baur & McDermott found that gold acted as a safe haven in most developed country's stock markets. Their research also show that the safe haven effect is strongest on daily data, which Baur & McDermott chose to interpret as "gold can be seen as a panic buy in the immediate aftermath of an extreme negative market shock". They also found that gold acted better as a safe haven in developed markets. In emerging markets gold can be seen as a weak safe haven at best. Baur & McDermott also concluded that gold was not a safe haven in periods of extreme global market uncertainty, where gold actually co-moved with the market.

Baur & Lucey (2009) found that gold ordinarily acted like a hedge towards stock markets, but acted like a safe haven during extreme stock market uncertainty. Moreover, their research showed that gold does not act as a safe haven longer than 15 days. If the investors keep their money in gold for more than 15 days after an extreme negative shock they will lose money.

Baur & McDermott (2012) came to the conclusion that gold acted as a strong safe haven when a black swan event occured, such as the attack on World Trade Center. In conformity with Baur & Lucey (2009) Baur & McDermott (2012) came to the conclusion that gold is a short-term safe haven; however, these effects are more long-term if there is an extreme market shock.

2.1.2 Oil as a Safe Haven

As Sari, Hammoudeh, and Soytas mentioned in their report "Dynamics of oil price, precious metal prices, and exchange rate" there has been plenty of discussion of oil, along with precious metals, compared to the USD/Euro exchange rate as a safe haven asset due to the rising prices and synchronized movement. The authors continue by saying that the USD/Euro exchange rate is interchangeably used in portfolios containing precious metals and oil. Nevertheless, they could not find any proof of oil acting as a safe haven (Sari,

Hammoudeh & Soytas, 2009). There has been a vast amount of literature focused on the relationship between oil price and stock markets, and this is probably because of the speculation of oil being a long-term hedge against equities. Nevertheless, Ciner, Gurdgiev & Lucey concluded that oil did not act as a long-term hedge or a safe haven against stocks. Thereafter, they stated that the reason for this was probably due to that oil is more of a commodity than gold for example, and therefore, more likely to be affected by supply and demand chocks than that of financial chocks. However, the authors did find that oil acted as a safe haven during specific time periods. For example, around 1990, 2000, and after the recent financial crisis in 2007-2009 oil acted as a safe haven (Ciner, Gurdgiev & Lucey 2010).

2.1.3 US Treasuries as Safe Haven

US Treasuries (UST) have, for a long time, been viewed as a safe investment. However, recently Standard & Poor's downgraded the long-term US Treasury from the highest, AAA, to AA+. Will this have an impact of investor's view of the asset? According to Min Zeng it will still be viewed as a safe haven investment by global investors, despite the downgrade (Zeng, 2011). In "Safe Haven Assets and Investor Behaviour under Uncertainty" the authors claimed that UST acted as a safe haven following a stock market crisis; moreover, they go on to say that during market uncertainty bonds act as a safe haven (Baur & McDermott, 2012). In Taipei Times they also stated that despite the downgrade they do not view it as an immediate threat to Treasuries being a safe harbour status, and still viewed them as a safe investment for large investors, The Taipei Times (2011).

According to Karen Brettelll at Reuters, US Treasuries still reign when looking for safe haven investments (Brettell, 2011); while, Lewis Braham at Bloomberg said that US Treasuries are a "risky ride", and investors should gradually add to cash investments.

Ciner, Gurdgiev & Lucey have examined how and under what circumstances five major financial asset classes may act as a hedge or haven. Their conclusion when

discussing US treasuries was that UST acts as a safe have for equities (Ciner, Gurdgiev & Lucey, 2010).

2.1.4 US Dollar as a Safe Haven

Many researches have been done in order to determine whether or not US Dollars can be considered a safe haven investment. Beck & Rahbari (2008) argued that the US dollar is a hedge and not a safe haven. In their studies they found that dollar serves as a better hedge (compared to the Euro) for sudden stops. Kohler (2010) came to the conclusion that the US dollar acts like a safe haven. Kohler also commented about the dollars role as a safe haven during the recent financial crisis "During the most recent crisis, however, safe haven effects led to capital flows into some of the countries most affected by the crisis." i.e. US dollar acts like a safe haven even though USA is one of the most affected countries.

2.1.5 Palladium as a Safe Haven

There has been little research of palladium acting as a safe haven asset. Therefore, there have been very few articles and other literature about how palladium acts compared to other assets or markets. Sari, Hammoudeh, and Soytas (2009) included palladium as one of the precious metals tested as being a safe haven in their report. They claimed that the rise in gold price leads to parallel movement of other precious metals. In their conclusion they mention that in the short-run precious metals might be linked with the USD/Euro exchange rate, however, palladium is lagged compared to platinum, and is more likely to play catch up. They claim that if platinum goes up, it should be viewed as a sign that palladium will see a rise in a short period of time (Sari, Hammoudeh & Soytas, 2009). Therefore, it is not likely to be classified as a safe haven asset.

2.1.6 Wheat as a Safe Haven

There was no prior literature about wheat being a safe haven asset. We included wheat due to the fact that it has a permanent demand, and therefore, a reason for having safe haven characteristics.

Table 1 ***Summarization of previous research***

Author(s) and Year	*Assets Discussed*	*Conclussions*
Dicle, Levendis & Alqotob (2011)	Gold & US Treasuries	Both gold and US Treasuries offer safe-haven from equity market volatility
Baur & McDermott (2012)	Gold & US Treasuries	Both act as safe-haven, but gold is the stronger and more immediate safe haven
Sari, Hammoudeh & Soytas (2009)	Oil, Precious Metal & US/Euro Exchange rate	Some precious metals are considered safe havens
Ciner, Gurdgiev & Lucey (2010)	Stock, Bonds, Oil, Gold & US Dollar	Gold and oil have safe haven characteristics
Baur & McDermott (2009)	Gold	Gold is a safe haven for most devloped markets during the recent financial crisis; however, not for extreme levels of global uncertainty
Baur & Lucey (2009)	Gold	Gold is a safe haven in extreme stock market conditions
Joy (2011)	Gold	Gold is a poor safe haven
Baur (2010)	Gold	Gold recently evolved as a safe haven asset
Fei & Adibe (2010)	Gold	Not a safe haven asset

2.2 Hedge or Safe Haven

It is important to differentiate between if assets act as a hedge or a safe haven. For example, Baur and Lucey (2009) investigated if gold acts as a hedge or haven compared to stocks and bonds on the US, UK and German market. In their conclusion, they stated that gold is a hedge against stocks on average; nevertheless, it is also a safe haven against extreme stock market conditions (Baur & Lucey, 2009).

2.3 VIX

The Chicago Board Options Exchange (CBOE) introduced VXO, a volatility index, in 1993. In the beginning this index measured the implied volatility of a theoretical at-the-money option with 30 days to expiration. It measured the implied volatility based on trades on the S&P 100 market. However, on September 22, 2003, CBOE made two key enhancements to the VXO index. First of all, the new VIX was based on S&P500s options, and secondly, the calculation has been altered to make VIX a better index for investors who manage risks associated with the growing markets for volatility and variance swaps. This was done by taking into account a broader range of options for only at-the-money that was used in the VXO index; and, with the VIX index different strike prices are

weighted with at-the-money having the most weight (I, Chicago Board Options Exchange). It is said that the VIX index measures the investor's mood; moreover, if there is high volatility it usually means that investors are uncertain about the market. For instance with a VIX index above 30 is associated with a large market uncertainty, and with a VIX value of bellow 20 means that the market is fairly stable (I, Market Volume).

3. Data

In the following chapter we have discussed the overall data collected, this includes the different choices of market uncertainty and assets. How the data was collected and processed is also included in the chapter.

3.1 Asset choice

Since the research regarding perceptual safe havens is somewhat inconclusive, we needed to make a choice of which assets to include in our study. Some were more obvious then others, e.g. Baur & Lucey (2009) discussed bonds, gold, and stock as potential safe havens, while Ciner, Gurdgiev & Lucey (2010) also included oil as well as the US dollar. Our choice fell on gold, US treasury bonds, oil, the US dollar, palladium, and wheat as safe havens in relation to a world market index consisting of S&P 500, DAX, Nikkei, and NASDAQ. The reason for adding both palladium and wheat into the safe haven discussion is to introduce new potential safe havens. Palladium was chosen to compare gold with another noble metal, whilst wheat was chosen for its assumed permanent demand.

3.2 Choice of Markets

When deciding on which markets to include in our study, we thought it to be important that the markets are large and international, and this because it is important that when an incident occurs on one market it affects the rest of the world. We also wanted to include a few markets that are included in our currency basket; this because when there is uncertainty about a currency it leads to uncertainty on that market. The reason for including S&P 500, DAX, NASDAQ Composite, and Nikkei in the market index was that they all are large international markets. Therefore, they represent and cover market uncertainty

all over the world. Furthermore, the markets we have concluded have been discussed in "Is Gold a Safety Asset" by Dicle, Levendis & Alqotob (2011). So, we believe that the world index we created is well representative, and will give us a more accurate result.

3.3 Choice of time-span

Since this paper examines the behavior of safe haven asset during financial turmoil it is important to have substantial amount of data. As a consequence we choose to include data form 2000-01-01 until 2011-12-31. The data is collected daily and gives us over 3000 observations per asset. During these twelve years the market has gone through both bear and bull periods, where the bear periods are of significant interest.

3.4 Data Collection

A significant part of the data used in this paper is collected from Thomson Reuters DataStream. DataStream is a large financial database that covers a wide range of historical different economical data. They collect data from many different sources including Reuters, International Monetary Fund, and Organisation for Economic Cooperation and Development (OECD). It has been used to retrieve information about all the proposed safe have assets along with the market index, and as well as the US Treasuries. Data has been collected from each asset and each market everyday from the first of January 2000 to the last of December 2011. This gives us roughly 3000 occasions per asset to study the effects on the different resources compared to the 3000 occasions on each of the markets. It is of utter most importance to have a large sample size in order to consider the research relevant; furthermore, for our thesis it was essential that the timespan covered both stable times as well as times in stress.

In order to compare the value of the US dollar over time we had to construct a currency basket. This so we could observe how the US dollar reacted in times of stress compared to several other currencies. The currencies that made up the basket are, the British Sterling Pound, Canadian Dollar, Swedish Krona, Argentine Peso, Brazilian Real, Indian Rupee, Swiss Franc, Euro, and Japanese Yen. The currencies included in the basket were chosen because they represent a

significant part of the world economy and are considered as strong currencies. However, we chose to exclude some currencies from our basket such as the Chinese Yuan Renminbi since it co-vary with the US dollar, or it was tied to the US dollar.

3.5 Choice of Crisis

As our definition states that safe havens have a stable or increasing value during times of uncertain market, the need of identifying different crisis is substantial. Some crises are more obvious than others, such as the Dot-com bubble that climaxed in March 2000, and the global financial crisis in 2008. However, so that our research contains depth and credibility we needed to determine during which periods of time that we believe that the safe haven assumption should hold. In order to get the necessary depth in our paper we needed to identify different economic crisis, and the reasons behind them. We have identified ten crises during the twelve years timespan. Examining a chart of how the world index performed during these twelve years helped us recognize the crises, see Appendix – Index Performance. We chose to include the periods with the most severe economic downturn as well as periods were we knew that something had shaken the world economy. The reasons behind the economic crisis vary widely from terrorist attack, to nature disasters, to more logical explanations. Below you will find all periods of economic uncertainty that we chose to include in our research and why they occurred. Since we are examining how the assets act during different crises we need to define different categories of crises. The categories were divided in to different groups based on their crisis origin:

1 – *Non Financial Black Swan* – a crisis that start with an event that is not related directly to the financial market.

2 – *Financial Black Swan* – we have defined this as financial turmoil that begins with a shock in the financial market.

3 – *Market crisis* – a long period of economic uncertainty leading up to a significant drop in the market value.

4 – *Aftermath crisis* – a drop in market value when the global community is still recovering from a recent crisis.

According to Nassim Nicholas Taleb, a black swan event is an event that is a surprise to the observer and has a great impact. Furthermore, a black swan event has three characteristics, it is an outlier, carries an extreme impact, and thirdly after an observation it is explanatory and predictable (Taleb, 2007). With this definition in mind we decided to name two of our crisis periods after the Black Swan theory. It was done so since category one and two are based on events that are sudden and not predicted, and they can either have a financial starting point or not, but both have affected the global financial market.

In order to make sure that the identified periods are in fact crises, we have compared the implied volatility during the crises with the implied volatility of the entire time-span. Since VIX measures the implied market volatility, it is a good measurement to compare the market reaction with the investor's mood; hence, a high volatility in the VIX index indicates panic and large uncertainty on the market. The VIX index was collected from the Chicago Board Options Exchange, and thereafter the numbers were inserted into Excel (I, Chicago Board Options Exchange).

3.5.1 Dot-com bubble

The Dot-com bubble was created by a rapid growth in the Internet segment during the period of 1995-2000. The growth peaked in March 10, 2000, and after just 10 days NASDAQ had lost approximately 10% of its value. Goldfarb, Kirsch and Miller (2006) identified four major reasons behind the Dot-com bubble:

1. The appropriate business strategy for Internet companies was "Get Big Fast".
2. "The rise and fall of VC investment sizes and total investments was most prominent in the internet and other technology sectors. While overall VC investment fell after the stock market decline in 2000, internet-related VC investments fell more and internet-related IPOs virtually ceased."
3. The survival rate of internet/technology firms is greater in comparison with other emerging industries.
4. "Firm survival is independent of private equity funding."

We have defined the Dot-com bubble as a type 2 crisis, this due to the fact that after the market peaked the losses were substantial and quick.

3.5.2 Aftermath 2001

In the aftermath of the Dot-com bubble the market struggled to recover. During certain periods of time the drops were quit substantial, but the most severe was the one in March 2001. We believe that this crisis is a type 4 crisis. The drop in market value was an affect of a long period of financial uncertainty that had its origin in the Dot-com bubble.

3.5.3 World Trade Center

Just as the financial market was about to reach full recovery the attack on World Trade Center took place. The stock exchange reopened after the attack September 17. Even though the Federal Reserve lowered the rate from 3,50% to 3,00% Dow Jones, NASDAQ, and S&P500-index suffered from significant value drops, almost 7%, (Makinen, 2002). Three weeks after the attack the Fiscal Policy Institute (2001) completed a report on the financial impacts of the terrorist attack. They projected a 2,4% loss in employment within the first month and that the total cost of the attack would reach $16,9 billion. The attack on World Trade Center is classified as a type 1 crisis.

3.5.4 Aftermath 2002

The financial uncertainty that hit the world in July 2002 can be seen as a part of a longer period of bear market and/or a combination of different events leading up to the dramatic drop in July 2002. Firstly, the market was still uncertain from the effects of the Dot-com bubble. Secondly, there were a large number of accounting scandals that forced companies to restate earnings, e.g. Enron, WorldCom. Thirdly, the terrorist attack of September 11 continued to have an impact on the global financial situation. Since the aftermath crisis in 2002 occurred as a result of a previous economic downturn, we believed that the economic uncertainty in July 2002 was a type 4 crisis.

3.5.5 Subprime Mortgage crisis

The real estate market in the US peaked during 2007. This caused the value of securities tied to the real estate market to plunge, which effected financial

institutions worldwide. The main reason behind the housing bubble is that the house prices had increased dramatically in the US over a 10-year period. As an effect homeowners took out second mortgages, secured by the increased value. The debt as a percentage of personal income rose to 127% in 2007, which can be compared to 77% in 1990, The Economist (2008). The loan-to-value ratio also increased dramatically, which worsened the economic conditions. We believe that the subprime mortgage crisis is a type 3 crisis. The signs of a coming financial turmoil were substantial and there wasn't one triggering event.

3.5.6 Aftermath 2008

This crisis is a mixture of the subprime mortgage crisis and the global financial crisis. The aftermath from the subprime crisis hadn't settled yet and early signs of the financial crisis could be seen. This was an affect of the subprime mortgage crisis and is therefore a type 4 crisis.

3.5.7 Global Financial Crisis

The global financial crisis cannot be explained by just one single event, contrary it has a vast amount of explanatory factors. First of, the aftermath of the subprime mortgage crisis were still uncertain. Secondly, all over the world there were substantial deregulations, which jeopardize the overall economic stability. The economic instability created by the reasons fore mentioned forced Lehmann Brothers into bankruptcy September 15th 2008 along with other US based financial firms (Armanious, 2011). According to Douglas W. Arner the crisis that caused the collapse of several US based financial firms can be explained by "broad based excessive borrowing and lending were fuelled by excessive investment from a wide range of investors around the world", and that it was "not limited to the United States; they were truly global, impacting almost every market and asset class" (Arner, 2009). Even though one single event can't explain the global financial crisis it can be traced back to the collapse of the Lehman Brothers. This makes it a type 2 crisis.

3.5.8 Japanese Tsunami

On March 11 2011 an earthquake with a magnitude of 9.0 was recorded in northern Honshu (Benz & Ransom, 2011). During the next few days a tsunami hit

the costal line of Japan, causing a meltdown in the Fukushima reactor. The World Bank estimated the total costs related to the earthquake could reach $235 billion, they also stated that the effects would be felt across the economies in East Asia (Kim, 2011). The market reacted negatively, with Nikkei-index plunging almost 5%, The Telegraph (2011). The Japanese tsunami was a natural disaster and is therefore categorized as a type 1 crisis.

3.5.9 European sovereign debt crisis

The crisis can be traced back to the global financial crisis; the basic problem is that some countries within the Eurozone are unable to refinance their government debt. It involves many different countries, most notably Greece, Italy, Portugal, and Ireland. What have caused this crisis are the previous years of high-risk lending and the real-estate bubble that troubled the EU during 2008-2009. Moreover, the fiscal policy of some countries (especially Greece) has also been a large contributor to the sovereign debt crisis (De Santis, 2012). We have classified the European sovereign debt crisis as a type 3 crisis.

Table 2 ***Categorization of the crisis***

Categories of crises	*Type*	*Crisis*
Non Financial Black Swan	1	World Trade Center, Japanese Tsunami
Financial Black Swan	2	Dot-com bubble, Global Financial Crisis
Market Crisis	3	Subprime Mortgage crisis, European Sovereign Debt Crisis
Aftermath Crisis	4	March -01, July -02, June -08

4. Methodology

In this chapter, the methods used for research and the choice of information will be evaluated. In order to investigate the thesis, we have chosen to make a quantitative as well as a theoretical analysis regarding the risks of safe haven investments.

4.1 Research Approach

The report was based on the deductive process presented by Bryman & Bell (2003: p. 23), where the theory and hypothesis dictate the data collection and the result. Furthermore, the report required a big portion of historical data, i.e. a quantitative approach was undertaken. According to Bryman & Bell (2003: p. 40)

a quantitative and deductive research is based in positivism as well as objectivism, as was this research.

The quantitative research can be divided into two parts, the "hedge or safe haven" analysis, and the asset behavior analysis. The results from the parts were independent of each other; however, in order to compose a viable analysis the parts were essential to our research.

4.2 Material

In this part we discuss our data procedure. By explaining in detail our course of action we make it easier for others to replicate our study.

4.2.1 Asset Behavior Analysis

Asset behaviour analysis describes our data approach associated to the data related to the behaviour of the assets during period of crisis.

4.2.1.1 Market Index

All the data about the different market values that was collected from DataStream was gathered in Excel. Thereafter, all the market values were graphed against each other, this so we could decide on when there was market uncertainty (as will be discussed later). The next step was to combine all the markets to create a world market index, and thereafter decide upon the time periods of stressful markets. By calculating the average value per day from all markets a world market was produced.

Equation 1

$$\text{Index} = (M_1+M_2+M_3+M_4)/n$$

M = Market index return

n = Number of markets

The market indexes included in the world index are S&P 500, NASDAQ, DAX 30, and Nikkei. First we calculated the return of each of the indexes, which we later combined to a world index. We chose to view the indexes as equally important and not regarding the market capitalization. Since we weighted the indexes

equally regional shocks, e.g. the Japanese Tsunami, has the same impact on the global market index wherever it occurs.

4.2.1.2 Currency Basket

The currency basket consists of 1 UK £, 1 Canadian $, 1 Swedish Krona, 1 Argentine Peso, 1 Brazilian Real, 100 Indian Rupee, 1 Swiss Franc, 1 €, and 100 Japanese Yen, all compared to 1 US $. We added up the currencies, which we later divided by the number of currencies.

Equation 2

$$CB = (C_1+C_2+C_3+C_4+C_5+C_6+C_7+C_8+C_9)/n$$

CB = Currency Basket

C = Currency

n = Number of currencies

4.2.1.3 Asset comparison

In order to compare the return of the assets to each other as well as to the INDEX we used the formula:

Equation 3

$$R_{asset} = (P_t-P_1)/P_1$$

R_{asset} *= Return on Asset*

P_t *= Period of time*

P_1 *= First day in comparison*

Since we wanted to compare the value of the assets compared to the first day of the crisis we used P_1 in the equation; moreover, this gave us the percentage change compared to the first day, and this was done because we wanted to investigate if the assets retained or increased their value during stressful markets. The results were later compiled into a graph, this due to the fact that it was easier to compare the different assets to each other as well as to the world market index. Thereafter, we constructed a table that showed the affect on the

assets during changing time periods, for example what happened to the assets during Day 1, Day 3, Day 5, Day 10 etc. This gave us a better overview of how the value of the assets along with the market index value evolved over time. By doing this for each crisis we can hopefully see how the safe haven assets behave under different time periods during different crisis. Since our definition states that a safe haven should retain or increase its value during financial turmoil we only needed to examine the asset returns during the financial crises. We have conducted another test where we compare our original definition; where an asset has to retain or increase its value during the entire time period, with allowing the assets a 10% decrease of the total market decline during the stressful market. The test is done for two reasons, first, due to the fact that some of the asset fluctuations may not depend on the current market uncertainty, and secondly, to test the strength of our definition of safe haven.

4.2.1.4 T-test

In order to make any conclusions from our results we need to test if they are statistically significant. By doing a T-test we receive a P-value. The test was conducted in Excel using the formula =TTEST. The test was constructed with two tails, and the formula used was:

Equation 4

$$T = (\bar{x}-\mu)/(\sigma/\sqrt{n})$$

T = *T-value*

$\bar{x}$ = *Mean of sample*

μ = *Mean of population*

σ =*Standard deviation*

n = *Number of samples*

In order to get a better understanding of the formula we will use the example of oil during the Aftermath II. The average return of oil, $\bar{x}$, during the sample period was 0,012 with a standard deviation of 0,02. Since we wanted to measure the asset movement in relation to 0, μ = 0. Aftermath II has 12 number of

observation, which gives us the following formula, $(0{,}012-0)/(0{,}02/\sqrt{12})=2{,}1$. In order to interpret the T-value correctly we needed to transform 2,1 into a P-value. This was done by using a T-distribution table using a degree of freedom of n-1 (12-1=11). To get the P-value of 2,1 we had to interpolate and eventually reached a value of 5,90%.

4.2.1.5 VIX Index

To further prove that the market was uncertain during the crisis we decided upon, we used the VIX index. The VIX index was inserted into Excel; thereafter, we graphed it against the world market index we created (Appendix 9.2). This so we easily could compare the periods of stress on the world market to how the VIX index reacted.

4.2.2 Hedge or Safe Haven Analysis

In the following part we will discuss our course of action when handling the data related to the hedge or haven analysis.

4.2.2.1 Regression Analysis

In order to examine whether the assets acted like safe havens or are in fact hedges we performed a simple regression analysis. First, the daily returns for the entire twelve years were calculated using the formula P_t/P_{t-1}-1. Secondly, to be able to perform a regression analysis we used the program StatPlus, which is an add-in in Excel. StatPlus gave us the assets regression, residual, coefficients, etcetera. In order to examine whether the assets were safe havens or hedges we used the Beta-value. The Beta-value were calculated by the following formula (Körner & Wahlgren, 2006):

Equation 5

$$Y_t = \alpha + \beta x_t + \varepsilon_t$$

Y_t = Expected return on asset

$\alpha + \beta x_t$ = the dependable variable's inducted expected value

ε_t = random variable with the expected mean of zero

The Beta-value of a safe haven asset and a hedge is quite different; a safe haven asset has a positive average value and a negative value during crises, whilst hedges have a negative average value. In order to get the assets average Beta-value we conducted a regression analysis on all the gathered data.

4.3 Credibility

Even though the topic of our research is fairly un-documented, there are a few different descriptions and findings of safe havens. According to Bryman & Bell (2011) in order for the public to accept the findings the research and analysis has to be credible. So, in order for our thesis to be as credible as possible there are three different criteria that have to be taken into account, they are the reliability, the validity, and the replication.

4.3.1 Reliability

When basing your conclusion on past events, there is always a probability that your findings are wrong. Moreover, Taleb stated, "One single observation can invalidate a general statement derived from millennia of confirmatory sightings" (Taleb, 2007). Since, our findings are based on data collected during past events, there is always a possibility that our findings can be invalidated by a single observation that has not showed up on our data. However, this can be mitigated through having a large sample group. Since we have collected data on a daily bases over a twelve year time period, we have included many different times of market uncertainty, and this has increased the reliability of our thesis. By doing a T-test we can determine if the results are statistically significant, and this shows how reliable the results are. So, with a high statistically significance the reliability is high.

4.3.2 Validity

According to Bryman & Bell one of the most important criterions in research is its validity. Since we have defined a safe haven asset differently compared to the literature we have read, it is important that our graphs and calculations actually measure our definition of safe haven at the time periods we have defined.

4.3.3 Replication

Being able to replicate the research and coming up with the same results is a very important step when writing a credible report. By describing where our data is collected, and in detail explain how our calculations and graphs have been designed, the replication of our thesis is possible. Since anyone else can re-do our calculations and graphs, and reach the same results as we have, it leads to our report becoming more credible.

5. Results

The results from our research will first be presented type-by-type leading up to a general discussion of our findings.

5.1 Non Financial Black Swan

As previously stated, a non-financial black swan crisis starts with an event that is not related directly to the financial market. We have identified two such crises during our sample period, the attack on World Trade Center and the Japanese Tsunami.

5.1.1 World Trade Center

In order to prove that the attack on World Trade Center caused a financial crisis we will present the results of the findings related to VIX. The average VIX during the twelve-year research period is 22,31. The chart shows that VIX never dropped below 31 in the days following the attack. The highest point was reached September 20th, with a VIX of 43,74.

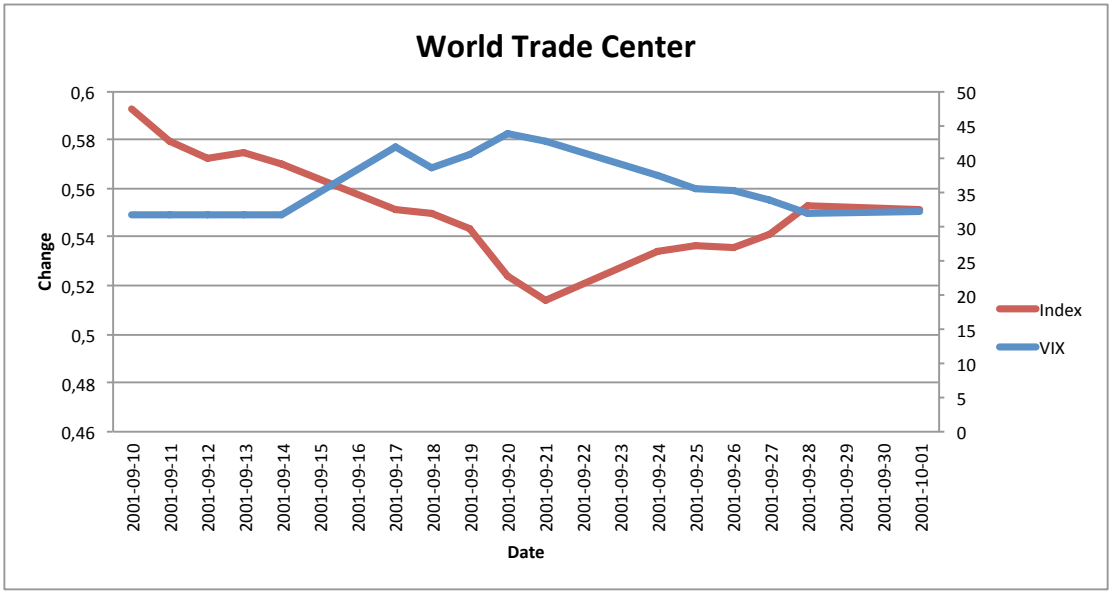

Figure 1 ***VIX and Index movement following the attack on World Trade Center.***

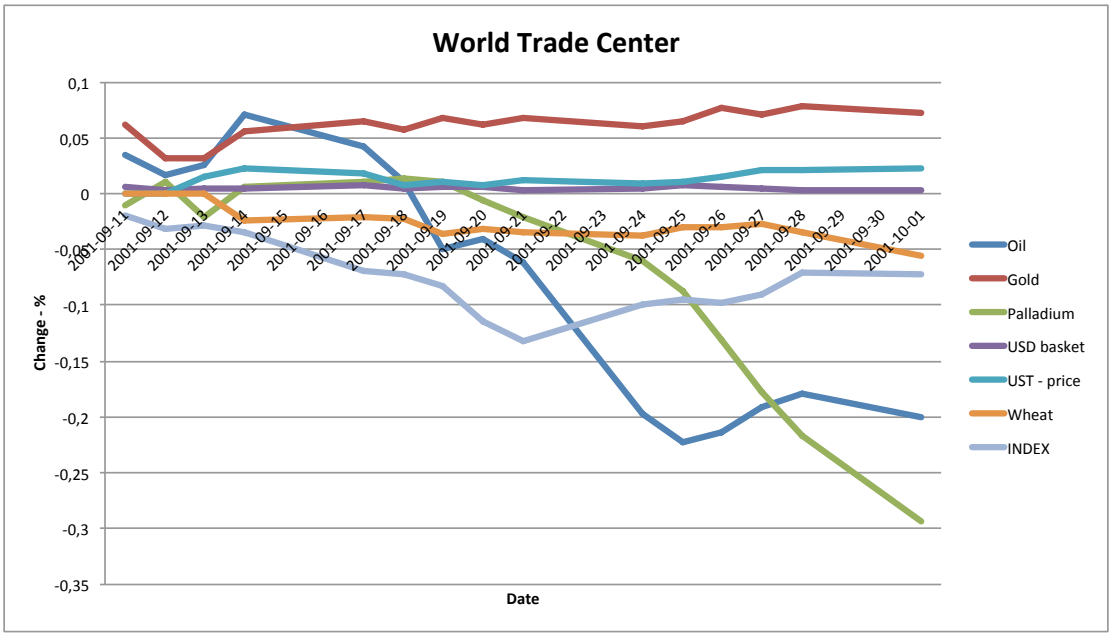

Figure 2 ***Assets and Index performance following the attack in World Trade Center.***

Table 3 ***Assets and Index performance following the attack in World Trade Center***

Days	Oil	Gold	Palladium	USD basket	UST - price	Wheat	INDEX
1	3,40%	6,13%	-1,09%	0,57%	0,00%	0,00%	-1,88%
3	2,62%	3,11%	-2,17%	0,43%	1,56%	0,00%	-2,92%
5	4,15%	6,51%	1,09%	0,71%	1,84%	-2,06%	-6,97%
10	-19,76%	6,09%	-6,09%	0,49%	0,93%	-3,71%	-9,88%
15	-20,03%	7,25%	-29,35%	0,28%	2,33%	-5,61%	-7,26%
P-value*	1,70%	0,00%	2,10%	0,00%	0,00%	0,00%	n/a
* Test conducted on day 15							

The attack on World Trade Center took place September 11th 2001. Since both Dow Jones and NASDAQ remained closed until September 17th the effects on the American market are difficult to examine; however, this might explain the INDEX drop day five. The impact that the attack on World Trade Center had on the safe haven asset is hard to quantify; nevertheless, some assumptions could be made. The price of the UST has fluctuated a bit but the asset has increased in value throughout the entire crisis period. The gold price reacted by increasing rapidly in value and maintaining the new value during the time of uncertainty. The currency basket remained relatively stable throughout the entire period of time. Wheat started of keeping its value, which can be explained with that the Wheat index used is traded on the US market that was closed the days after the attack. When the trade opened wheat plummet in value. Palladium had an extreme

reaction to the World Trade Center attack, with a result of losing nearly a third of its total value. The most interesting reaction can be contributed to oil. At first oil acted similar to gold but after ten days the oil price had dropped nearly 20%. When looking at the P-value, it is clear that all the results can be considered statistically significant.

5.1.2 Japanese Tsunami

The global financial impact of the tsunami was fairly limited. When looking at the implied volatility it is close to the overall average of 22,31; however, when looking at the days following the tsunami VIX reached a maximum of 29,4. The global market recovered quickly and VIX fell to normal levels

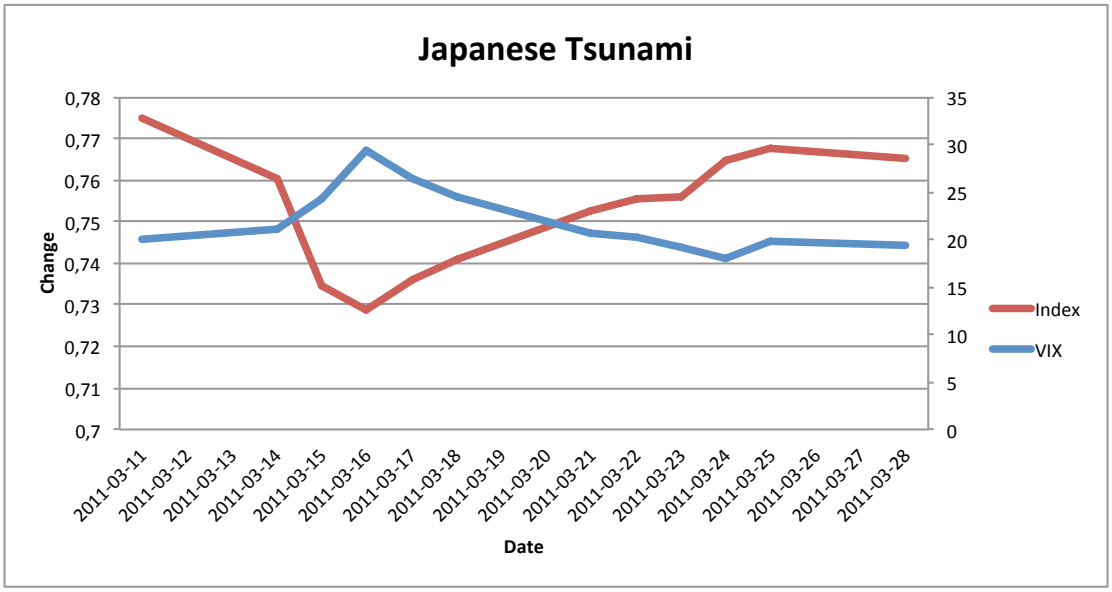

Figure 3 *VIX and Index movement following the attack on World Trade Center.*

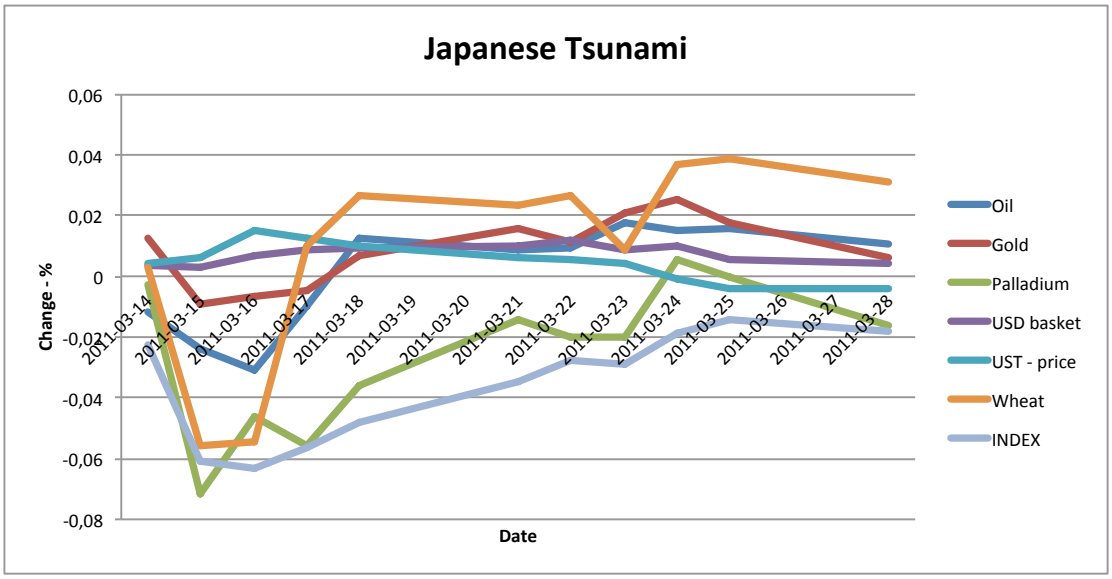

Figure 4 ***Assets and Index performance following the Japanese Tsunami.***

Table 4 ***Assets and Index performance following the Japanese Tsunami***

Days	Oil	Gold	Palladium	USD basket	UST - price	Wheat	INDEX
1	-1,20%	1,22%	-0,27%	0,37%	0,41%	0,30%	-2,24%
3	-3,10%	-0,69%	-4,64%	0,66%	1,52%	-5,44%	-6,32%
5	1,25%	0,65%	-3,58%	0,92%	1,01%	2,67%	-4,83%
10	1,58%	1,74%	0,00%	0,55%	-0,40%	3,89%	-1,44%
11	1,09%	0,59%	-1,59%	0,43%	-0,43%	3,10%	-1,79%
P-value*	82,98%	3,19%	0,66%	0,00%	2,45%	41,68%	n/a
* Test conducted on day 11							

The days following the Japanese tsunami the Index took a deep plunge; however, it recovered quite rapidly. The oil price dropped as a result of the tsunami, but reached its pre-crisis value within five days. Oil's movement gives a P-value of 82,98% after the T-test, and this is extremely far from being statistically significant, and the results can almost be considered irrelevant. Gold's reaction to the Japanese tsunami was limited. During day two and three the value of gold was beneath the original value. Gold recovered and increased its value during the crisis period. The P-value shows that the reaction of gold is statistically significant to a 97% level. The next asset, palladium, has a significant reaction towards the tsunami. It follows the Index downwards and upwards during the entire crisis, see chart 5.4. The palladium result is also statistically significant. The only asset that can be seen as a safe haven asset during the tsunami catastrophe is the US dollar. Throughout the entire crisis the US dollar have a stable growth compared to the pre-crisis value. The P-value also shows that the

result is statistically significant to a 100% level. US Treasuries reacts by first increase in value and later lose in value in relation to its pre-crisis value. The statically significance of US Treasuries reaction is close to 98%. The last asset is wheat. The day after the tsunami wheat actually increased in value, but the next day wheat took a huge plunge and lost over 5% in value. However, wheat recovered quite rapidly and reached a better value than prior the crisis day four. Nonetheless, the reaction of wheat is not statistically significant.

5.2 Financial Black Swan

As was mentioned earlier in the report, financial black swan events are characterized by a sudden and unpredictable financial event that creates turmoil on the financial market. There are two events that can be considered financial black swan events, and they are the Dot-com bubble and the Global financial crisis.

5.2.1 Dot-com Bubble

The VIX index value reached 35, and compared to the average of 22,31 it is considered high. This reflects the downfall on the world index value; hence the drastic drop around the 13th of April in 2000. Overall, the VIX and market index match each other fairly well, and therefore, can be called a stressful market.

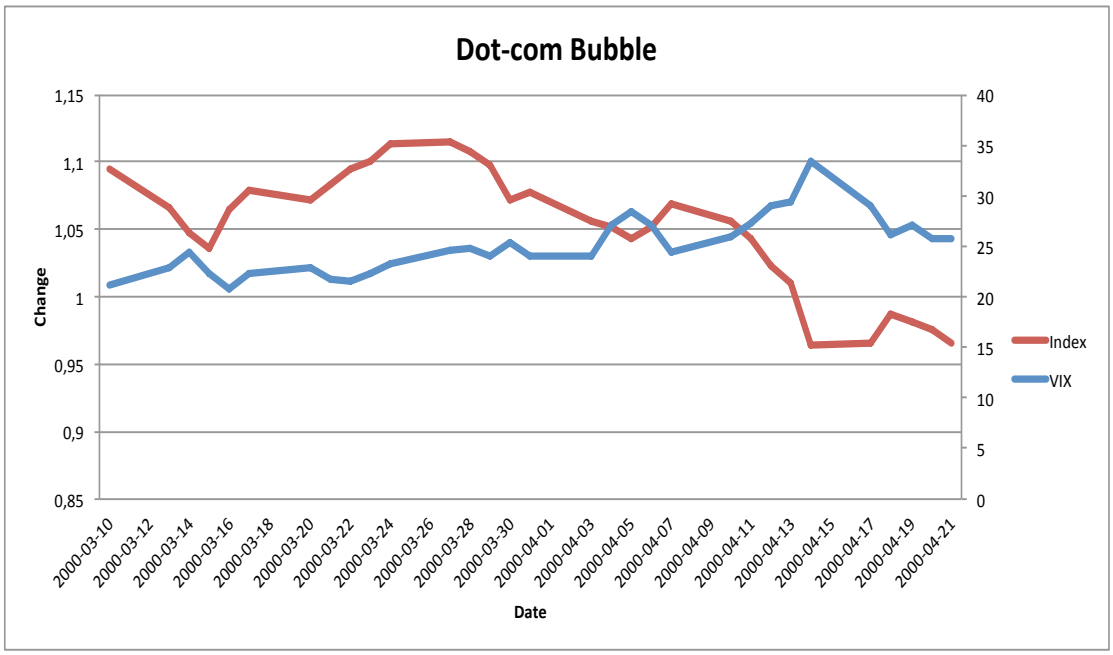

Figure 5 *VIX and Index movement following Dot-com Bubble.*

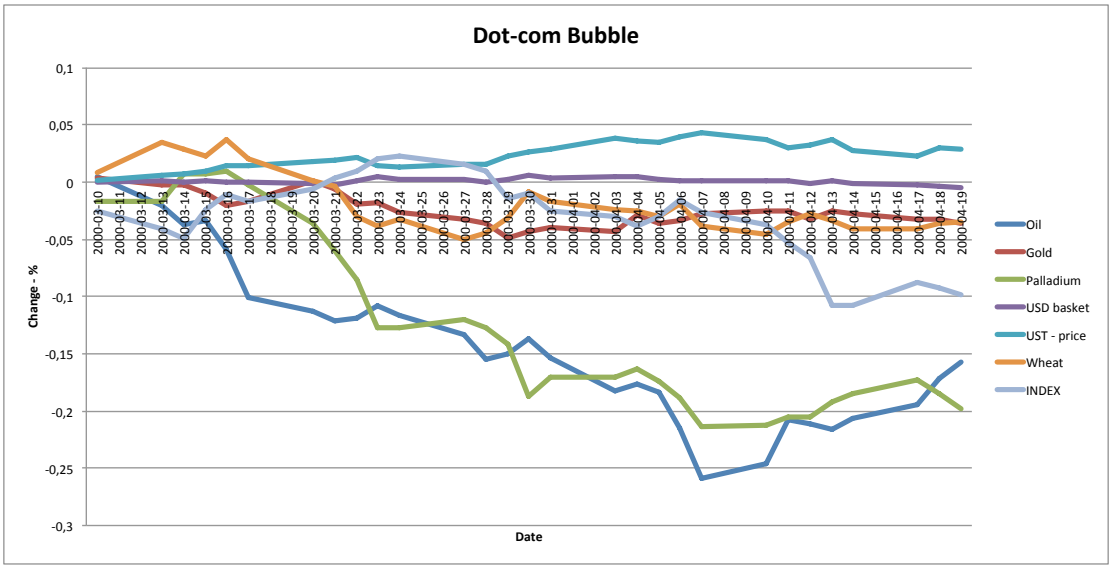

Figure 6 ***Assets and Index performance during Dot-com Bubble.***

Table 5 ***Assets and Index performance during Dot-com Bubble***

Days	Oil	Gold	Palladium	USD basket	UST - price	Wheat	INDEX
1	0,46%	0,41%	-1,70%	0,04%	0,15%	0,87%	-2,50%
3	-3,74%	-0,28%	0,71%	0,03%	0,71%	2,85%	-4,97%
5	-5,83%	-2,00%	0,99%	-0,03%	1,39%	3,72%	-1,06%
10	-10,84%	-1,83%	-12,77%	0,45%	1,43%	-3,81%	2,08%
15	-13,63%	-4,34%	-18,72%	0,60%	2,66%	-0,86%	-0,94%
20	-21,47%	-3,38%	-18,87%	0,13%	3,90%	-1,90%	-1,59%
29	-15,75%	-3,55%	-19,86%	-0,51%	2,91%	-3,54%	-10,71%
P-value*	0,00%	0,00%	0,00%	20,47%	0,00%	0,03%	n/a
* Test conducted on day 29							

The financial turmoil succeeding the Dot-com bubble started March 10th 2000. At first it seemed as the markets recovered quit rapidly, as it reached its pre-crisis value after just ten days. However, in the middle of April the market plunged and it decreased nearly 10% over a month. The performance of our safe haven assets during this period of time varies quite a lot. Palladium and oil are the two assets with the weakest development with a loss of 19,86% and 15,75% respectively. In this period palladium seems to be relative stable during the first five days; thereafter, it drastically decreases in value. Given the table above one can also see that wheat and gold acted similar. Although, wheat increased its value in the first 5 days, but thereafter dropped; and, this compared to Gold that had a steady decline in value from day 3. When examining the results from the T-test (given by the P-value) it is obvious that the result of gold can be viewed as statistically

significant, along with the performance of oil, palladium, UST. However, the USD receives a P-value of 20,47%, which is fairly high.

5.2.2 Global Financial Crisis

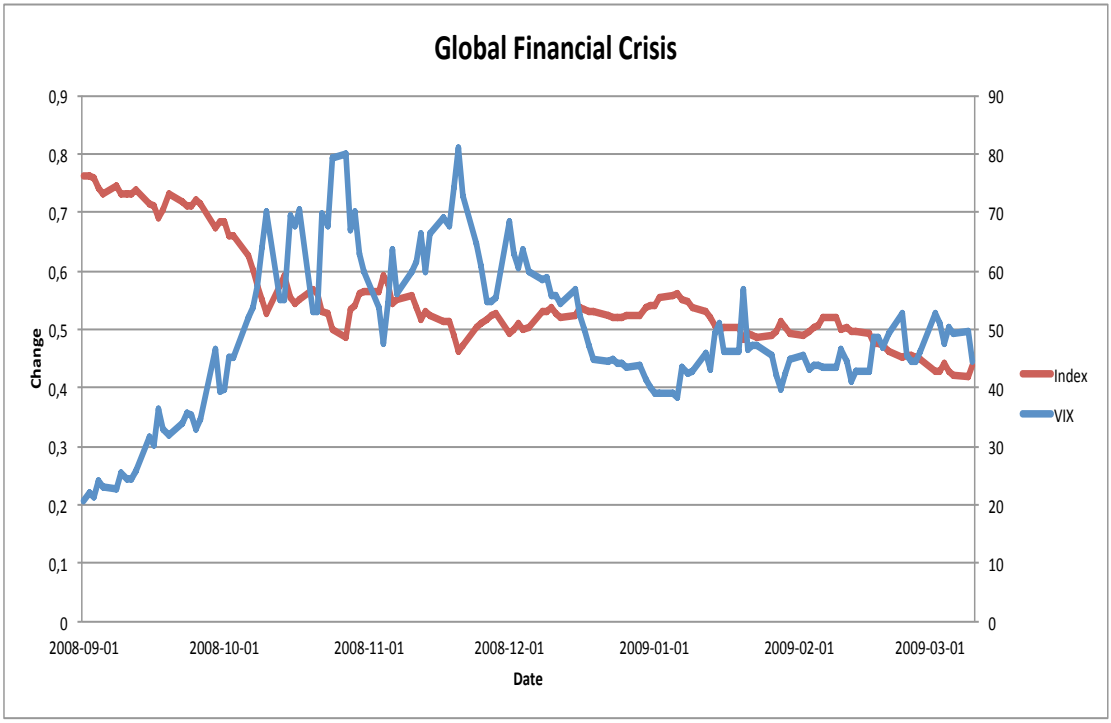

Figure 7 *VIX and Index movement in the Global Financial Crisis.*

As can be seen in chart 5.5, the VIX index was extremely high with a peak of 80,86. Lehman Brother's filed for bankruptcy on the 15th of September 2008, and the graph shows that the VIX index increased rapidly after that. Also, the market index took an extreme downward turn during and around that time period. The market was tremendously uncertain during this entire time period, and it reflects in both the VIX index as well as the world market value.

When examining chart 5.6 and table 5.3 it is obvious that this was a financial crisis of biblical terms. The world market Index declined in value with almost 43% during the six months that the market was stressful. The assets oil, palladium, USD, and wheat also saw their value decline in value. Worst was oil that lost 60,40% in value compared to the day the financial turmoil started, while palladium and wheat declined with 35% and 33% respectively, and the USD almost 14%. During the measured time gold acted strangely. Moreover, first it declined in value, then it increased dramatically, and thereafter it dropped fast in

value. After about 80 days it started to climb, and finally landed on an increase with 9,32% over the time period. The US Treasury held or increased its value during, almost, the entire time, and at the end of the crisis had increased by 8,22%. According to the T-test, all the results can be considered statistically significant. This since all the assets have a P-value of 0%, except gold that has 0,04%, but that is considered statistically significant.

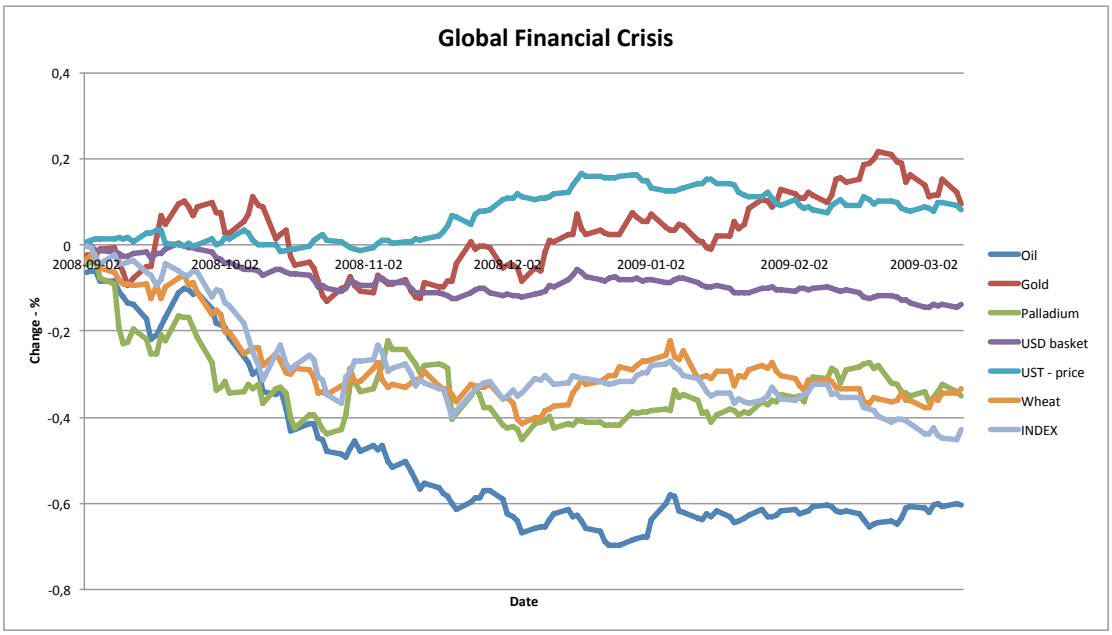

Figure 8 *Assets and Index performance during the Global Financial Crisis.*

Table 6 *Assets and Index performance during the Global Financial Crisis*

Days	Oil	Gold	Palladium	USD basket	UST - price	Wheat	INDEX
1	-6,27%	-2,51%	-4,67%	-0,44%	0,58%	-3,37%	-0,36%
3	-6,06%	-2,61%	-3,33%	-1,24%	1,37%	-2,44%	-3,13%
5	-8,38%	-0,80%	-9,00%	-1,70%	1,24%	-6,52%	-2,35%
10	-17,28%	-5,02%	-22,00%	-1,64%	2,81%	-9,05%	-6,34%
15	-11,24%	9,38%	-16,67%	0,28%	-0,12%	-7,80%	-6,14%
20	-14,71%	9,82%	-27,33%	-1,77%	1,52%	-16,02%	-12,01%
30	-34,77%	1,38%	-33,33%	-5,84%	-0,14%	-25,28%	-25,14%
40	-48,51%	-10,21%	-43,00%	-10,68%	0,74%	-32,76%	-36,73%
50	-50,35%	-8,22%	-24,33%	-8,85%	0,57%	-32,95%	-27,76%
60	-59,68%	0,80%	-35,00%	-11,00%	4,87%	-32,23%	-34,72%
70	-65,97%	-5,43%	-41,67%	-11,32%	10,34%	-40,01%	-31,09%
80	-66,53%	3,53%	-41,33%	-7,93%	15,91%	-31,62%	-31,78%
90	-60,24%	3,92%	-38,00%	-8,78%	12,55%	-25,48%	-27,72%
100	-63,26%	2,09%	-38,00%	-10,10%	14,25%	-29,33%	-34,40%
110	-61,35%	11,93%	-35,50%	-10,83%	10,35%	-31,19%	-36,17%
120	-62,39%	15,28%	-28,33%	-10,96%	9,15%	-33,46%	-35,59%
130	-61,04%	14,03%	-34,00%	-14,41%	8,79%	-37,65%	-43,75%
136	-60,40%	9,32%	-35,00%	-13,95%	8,22%	-33,46%	-42,76%
P-value*	0,00%	0,04%	0,00%	0,00%	0,00%	0,00%	n/a
* Test conducted on day 136							

5.3 Market crisis

The market crisis time period has been defined as a long period of economic uncertainty leading up to a significant drop in the market value. Moreover, there have been two events in our time frame that have been included in the market crisis category, and these are the Subprime mortgage crisis and European sovereign debt crisis.

5.3.1 European sovereign debt crisis

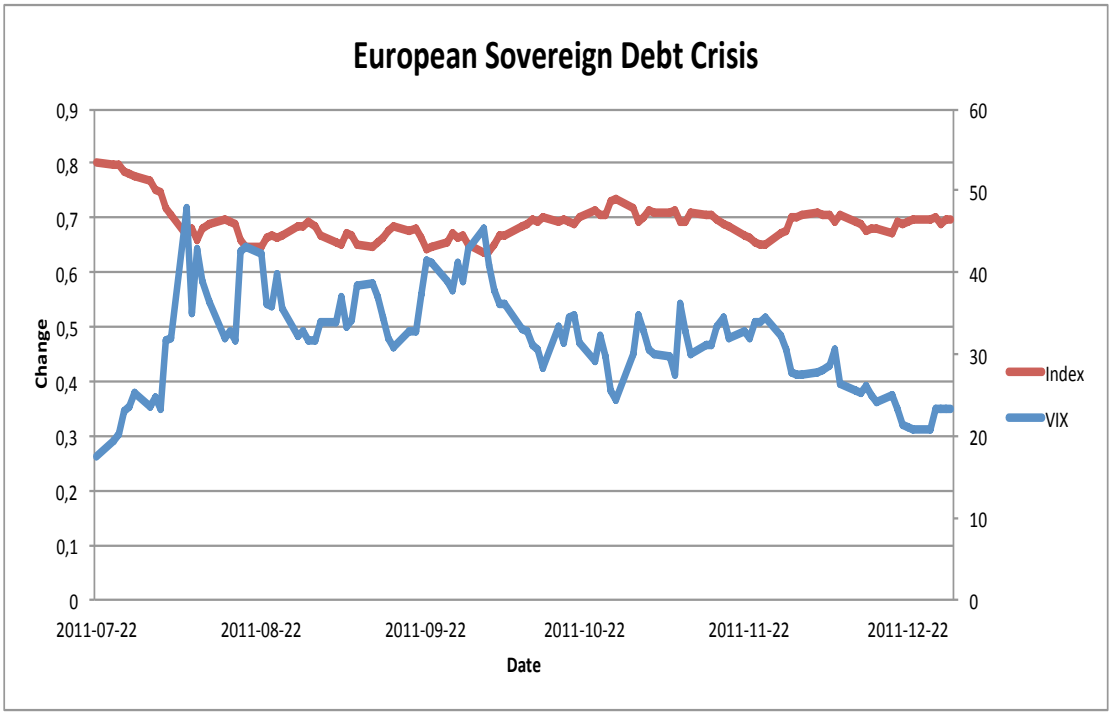

Figure 9 *VIX and Index during sovereign debt crisis in Europe.*

During the European sovereign debt crisis, the market all around the world was very unstable. This can be seen on the VIX and the market index movement on chart 5.8. During the five-month period the VIX index was almost always over 30 with many peaks over 40, and some even reached 50. When compared to the total average of 22,31 it shows that the time period was very uncertain, and the investor's fear was very high.

When looking at chart 5.9 and table 5.5 one can clearly see that the uncertainty effected most assets; moreover, the volatility was high for almost all assets. The uncertainty caused many of the assets we have examined to decline in value.

Palladium was the one asset that declined most, and during the worst time reaching almost –30%, but then recovered and ended up on –21,93%. Wheat was very unstable with both increases and decreases in the beginning; nevertheless, at the end of the time period it had declined 12,18% in value. The USD had the same characteristics as wheat however not so extreme, and finished with a -9,28%. Up until the last week gold held or increased its value, but then started to loose a little in value. However, during the drastic fall in the market index, gold increased plenty in value, and when the market recovered a little gold declined in value. This can be seen through out the time series, and is an interesting observation. US Treasury is the only asset that has been relatively stable through out the entire time period. However, during the first three days it saw a small decrease in value, but then recovered fast and finally ended up increasing 10,38% in value. The results from the T-test are clear as well, for they are all 100% statistically significant.

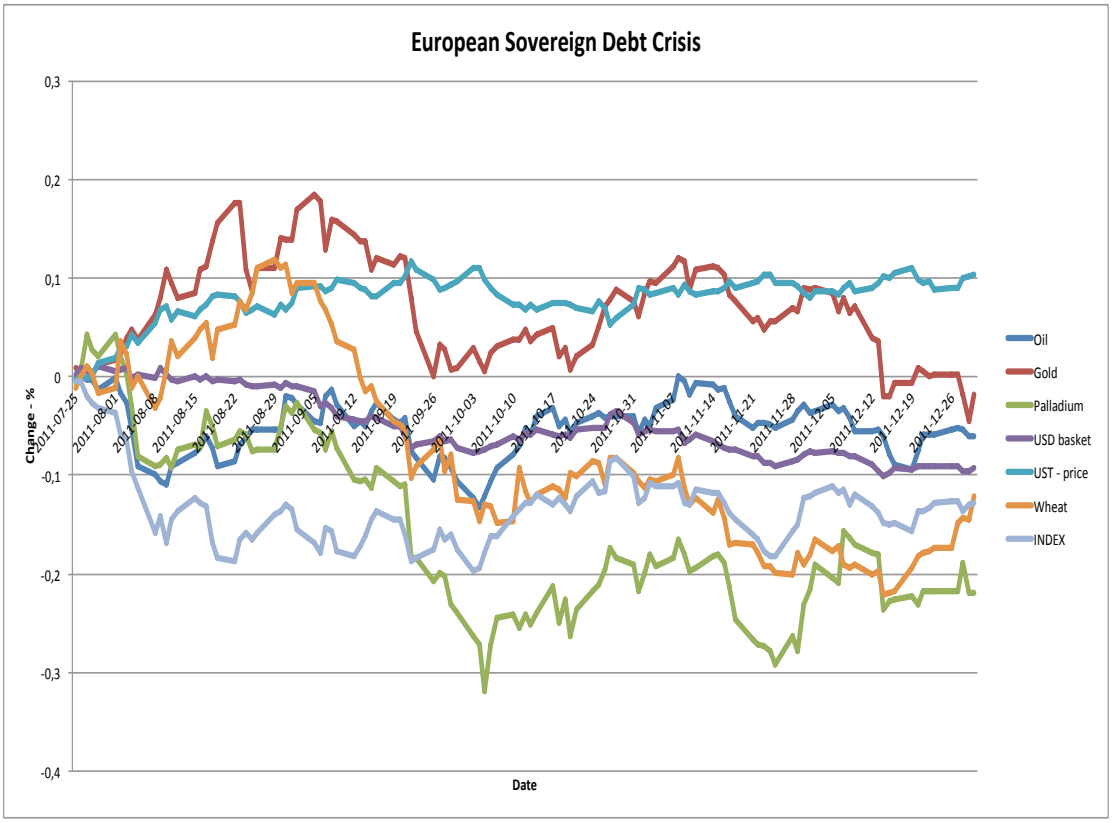

Figure 10 ***Assets and Index Movement during European Sovereign Debt Crisis.***

Table 7 *Assets and Index Movement during European Sovereign Debt Crisis*

Days	Oil	Gold	Palladium	USD basket	UST - price	Wheat	INDEX
1	-0,29%	0,84%	-0,56%	0,25%	-0,34%	-1,22%	-0,42%
3	-0,22%	0,87%	4,34%	0,49%	-0,12%	1,06%	-2,03%
5	-1,30%	1,28%	2,11%	0,99%	1,34%	-1,67%	-3,19%
10	-9,11%	3,74%	-8,05%	0,15%	3,47%	0,03%	-11,34%
15	-8,67%	7,90%	-7,43%	-0,44%	6,66%	2,05%	-13,57%
20	-9,06%	15,60%	-7,06%	-0,25%	8,24%	4,85%	-18,42%
30	-2,89%	16,95%	-2,73%	-1,02%	8,95%	9,48%	-15,51%
40	-2,61%	12,01%	-9,29%	-4,13%	8,22%	-2,46%	-13,58%
50	-10,64%	0,92%	-23,92%	-7,18%	9,60%	-12,42%	-17,61%
60	-4,09%	4,29%	-23,92%	-5,39%	6,72%	-11,98%	-11,96%
70	-3,97%	8,78%	-18,34%	-3,56%	6,02%	-8,19%	-8,19%
80	-0,57%	10,77%	-19,33%	-5,83%	8,26%	-12,37%	-11,41%
90	-5,22%	5,53%	-29,12%	-9,13%	9,53%	-19,90%	-18,24%
100	-5,46%	7,05%	-16,98%	-8,03%	8,63%	-18,98%	-12,03%
110	-5,88%	0,23%	-21,81%	-9,14%	8,85%	-17,33%	-12,81%
115	-6,08%	-1,78%	-21,93%	-9,28%	10,38%	-12,18%	-12,85%
P-value*	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	n/a
* Test conducted on day 115							

5.3.2 Subprime Mortgage Crisis

The subprime mortgage crisis started in mid July 2007 and lasted nearly six months. The financial uncertainty can be shown using the VIX index. When looking at the chart, it is clear that VIX fluctuated quite a bit during the six months. The average VIX of the subprime mortgage crisis was close to the average VIX of the entire twelve years. However, during the six months VIX reached a level above 30 no less than four times. The unusual low VIX figures in mid July smoothens the result whit a result of an average of 22,54.

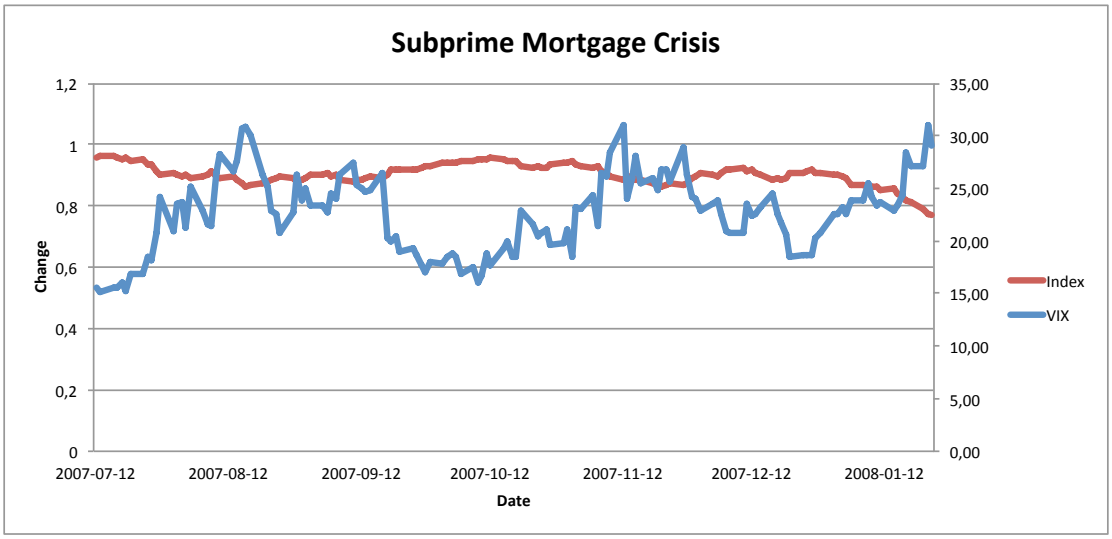

Figure 11 *VIX and Index movement during the Subprime Mortgage Crisis.*

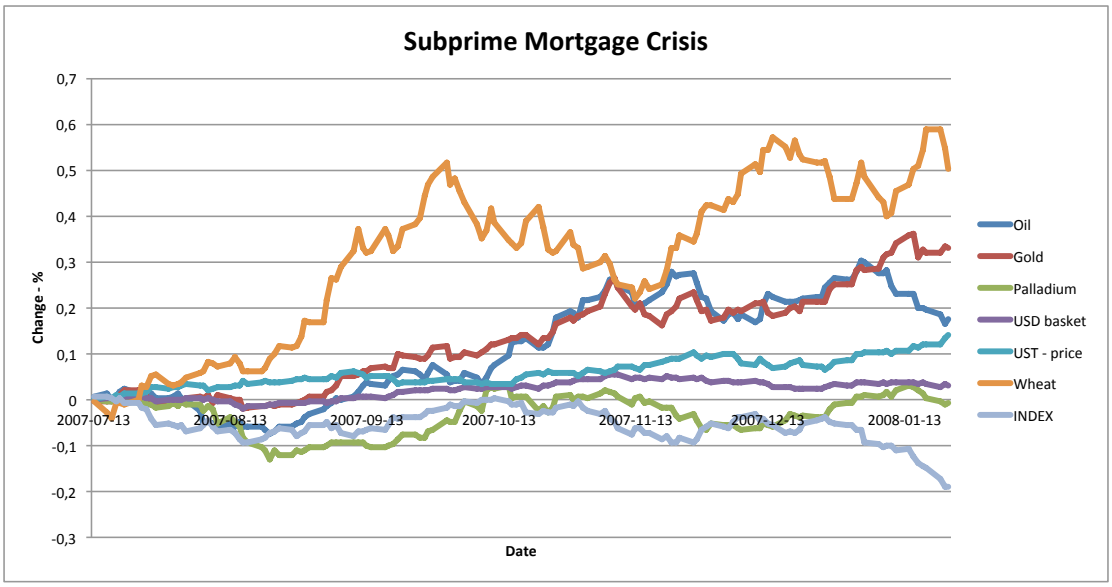

Figure 12 *Assets and Index performance during the Subprime Mortgage Crisis.*

Table 8 *Assets and Index performance during the Subprime Mortgage Crisis*

Days	Oil	Gold	Palladium	USD basket	UST - price	Wheat	INDEX
1	0,74%	-0,39%	0,00%	0,08%	0,09%	-0,33%	0,60%
3	-0,10%	-0,34%	-0,54%	0,29%	0,32%	-4,09%	0,40%
5	1,76%	1,02%	0,27%	0,33%	0,72%	-0,70%	0,25%
10	1,28%	-0,05%	-1,09%	0,15%	2,71%	4,99%	-4,08%
15	0,29%	-0,69%	-0,54%	0,06%	2,89%	3,85%	-5,39%
20	-5,14%	-0,59%	-2,17%	-0,15%	2,45%	7,85%	-5,87%
30	-6,80%	-1,35%	-11,14%	-0,99%	3,84%	10,03%	-6,86%
40	0,19%	3,13%	-9,51%	-0,25%	4,80%	26,06%	-5,67%
50	5,31%	9,96%	-8,70%	1,67%	3,42%	33,29%	-4,08%
60	3,99%	9,36%	-2,45%	2,35%	4,56%	45,43%	-1,36%
70	12,76%	14,19%	0,82%	2,97%	4,77%	34,09%	-0,85%
80	21,75%	18,40%	0,54%	4,27%	5,93%	28,57%	-1,86%
90	20,91%	18,70%	-0,68%	4,35%	7,58%	25,72%	-7,13%
100	21,98%	19,54%	-6,66%	4,23%	9,49%	42,46%	-5,90%
110	23,15%	19,07%	-5,71%	3,33%	7,48%	54,53%	-5,06%
120	25,61%	24,07%	-2,04%	3,14%	7,23%	48,40%	-4,79%
130	24,87%	31,97%	0,54%	3,64%	9,95%	40,54%	-10,09%
139	17,68%	32,97%	-0,82%	3,07%	14,09%	50,09%	-19,12%
P-value*	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	n/a
* Test conducted on day 139							

The subprime mortgage crisis affected the global financial market during a long period of time. During this period both the Index and the assets fluctuated quite a bit. The Index ended up losing almost 20% of its initial value. The period can almost be divided in to two different sub-periods, period 1 (day 1 – day 70) and period 2 (day 71 – day 139). Oil was fairly stable the first 15 days; nevertheless, at the end of 30 days it had almost lost 7% of its initial value. However, oil recovered and when the second downturn, period 2, started, oil was very stable and showed an extremely stable increase compared to its initial value. The value of gold also started of by dropping even though it was fairly close to the original value. But, when the second market started, gold increased tremendously in value, and thereafter has a constant increase. Palladium followed the Index throughout the entire period, with an exception of the last 20 days, when it became more stable. US Dollar started of with increasing in value the first 15 days, later on; during a few days the value dropped bellow the initial value. However, the drop is not great and the USD recovered the lost value. The 10-year US Treasury bond started of with a small increase, and thereafter its value grew steadily and ended with a 14% increase in value. During the first few days' wheat lost some of its value, which it later regained. When looking at the value coming in to the second period wheat gained 34%. The following 20 days wheat lost 12 of those 34 per cent; however, from day 90, wheat increased in value and ended with a 50% growth.

5.4 Aftermath crisis

Since we discovered that the market usually was very uncertain after large crisis we decided to create a category named aftermath crisis. Moreover, it is defined as a drop in market value when the global community is still recovering from a recent crisis. There are three crises that can be included in this category, the aftermath after the Dot-come crisis, the aftermath called 2002, and the aftermath after the Subprime mortgage crisis

5.4.1 Aftermath I

During the years following the Dot-com bubble the global financial market struggled to recover. Some periods suffered from greater uncertainty than others, and the one with the most volatility was March 2001. VIX had an average of 28,79, which is 6,48 above average, and in late March VIX reached 32,84. The Index dropped during the entire period and lost approximately 10% of its initial value.

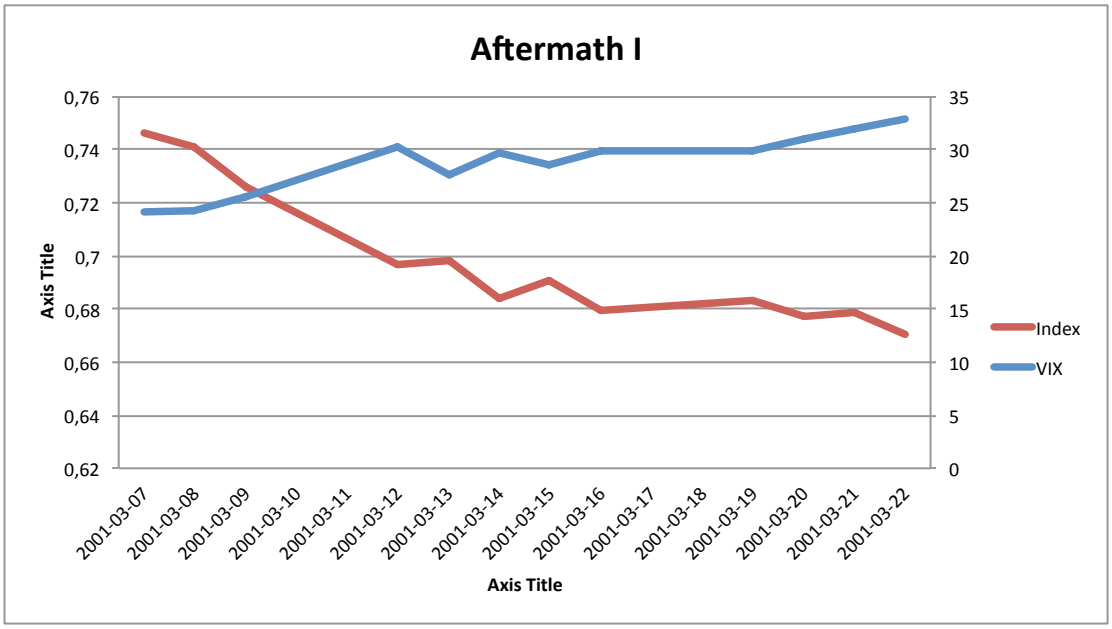

Figure 13 *VIX and Index movement during Aftermath I.*

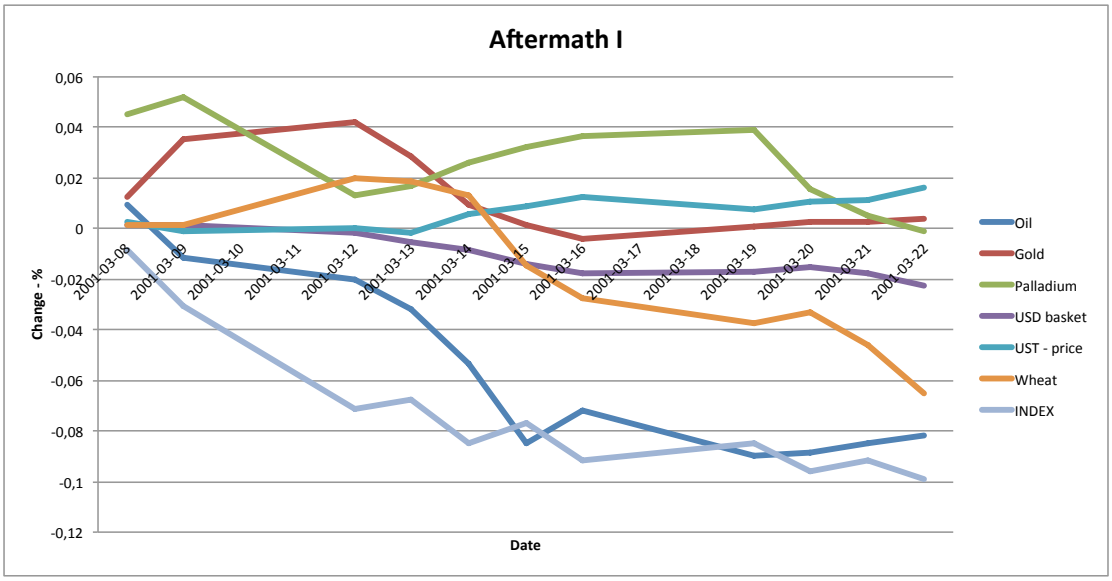

Figure 14 *Assets and Index performance during Aftermath I.*

Table 9 *Assets and Index performance during Aftermath I*

Days	Oil	Gold	Palladium	USD basket	UST - price	Wheat	INDEX
1	0,92%	1,24%	4,52%	0,15%	0,23%	0,15%	-0,86%
3	-2,01%	4,19%	1,29%	-0,18%	-0,02%	2,00%	-7,11%
5	-5,35%	0,94%	2,58%	-0,86%	0,56%	1,31%	-8,47%
10	-8,52%	0,25%	0,52%	-1,78%	1,12%	-4,62%	-9,16%
11	-8,16%	0,34%	-0,13%	-2,27%	1,58%	-6,54%	-9,91%
P-value*	0,04%	2,76%	0,06%	0,19%	0,50%	10,35%	n/a
* Test conducted on day 11							

As mentioned, above the Index lost close to 10% of its value during eleven days in March 2001. The first few days were the most drastic, and after just three days the Index had lost more than 7%. Oil followed the Index quite closely and ends up with an 8% lose. The behaviour of oil is statistically significant at a 99,96% confidence interval. Gold started of with a tremendous increase in value, and it is also interesting that the increase came at the same time as the biggest drop in the Index value. Gold lost some of its momentum, but still has increased its value compared to the first day of the stressful market. When looking at Table 5.7, one can see that Gold's movement was also statistically significant. Palladium started of by reacting strongly positive to the initial Index drop. Palladium almost retained its initial value throughout the crisis period; however, the last day it fell below the initial value. The statistically significance of palladiums movement was close to 100%. Dollar has a relatively smooth movement and lost roughly 2% of its value at the end of the period. Dollar's movement is also statistically

significant at almost 100%. The 10-year US Treasuries held its value throughout the crisis except for day 3 (-0,02%). The result of US Treasuries is statistically significant at a 99,5% confidence interval. The last asset to examine is wheat. One can see that the asset was stable during the first days, but the effects wore of, and wheat ended up losing 6,54% of its initial value. The statistically significance of wheat's movement was 90%.

5.4.2 Aftermath II

The aftermath to the terrorist attack in September 2001, and the account scandals causing Enron and Worldcom to go into bankruptcy sent chock waves on the market, and the investor's fear increased drastically. As can be seen in chart 5.13, the VIX was not once under 25 and steadily kept on climbing until the end of the time period when it reached just above 45. One can also see that the market index had a steady decline, and this shows that the market was under plenty of stress. When the VIX index peaked, the market index was at its worst point, which is proof that the market and investors were uncertain about how the market was acting.

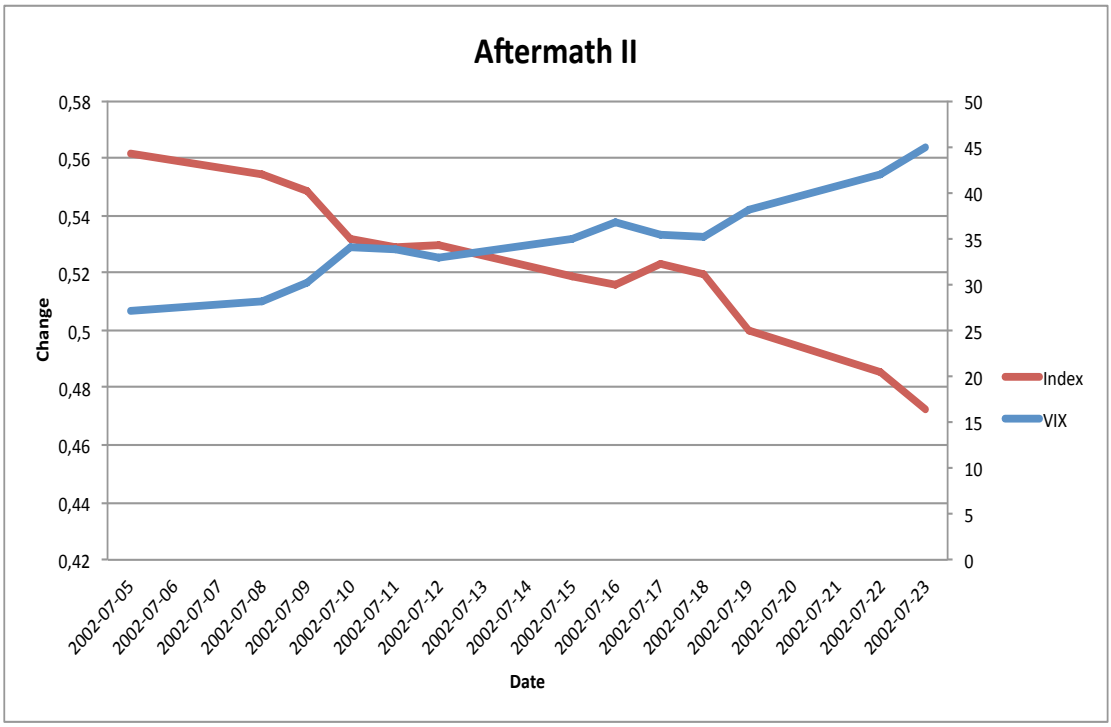

Figure 15 *VIX and Index movement during Aftermath II.*

The world market index had a steady decrease in value from day one and lost 15,43% in value, which can be seen in table 5.7 and chart 5.14. Many assets were stable during the stressful market. The asset that climbed the most in value was wheat; nevertheless, the first day it lost value, but thereafter it rose to a positive 7,82%. Oil was volatile with both positive and negative numbers, and ended up loosing 0,68% in value. Palladium was close to retaining its value throughout the series, but on the last day ended with a – 0,93%. Gold and US Treasury had similar characteristics; moreover, they had a steady incline from day one, and that resulted in 2,35% and 3,31% increase in value respectively. US Dollars retained its value; hence, it landed on + 0,85%, and during the entire time period it was stable at close to 0. Gold, palladium, USD, and UST all received a P-value of 0% on the T-test, so they are considered statistically significant. Wheat can also be considered statistically significant with a P-value of 0,04%; though, oil had 5,90% which is almost at the 95% confidence interval, and can be considered fairly good.

Table 10 ***Asset and Index movement during Aftermath II***

Days	Oil	Gold	Palladium	USD basket	UST - price	Wheat	INDEX
1	-1,52%	0,48%	0,62%	0,83%	0,37%	-0,44%	-1,40%
3	-0,24%	1,25%	0,93%	1,02%	1,65%	2,51%	-5,30%
5	2,24%	1,41%	0,31%	1,19%	2,06%	1,11%	-5,48%
10	3,60%	3,84%	0,93%	2,06%	2,25%	6,34%	-10,54%
12	-0,68%	2,35%	-0,93%	0,85%	3,31%	7,82%	-15,43%
P-Value*	5,90%	0,00%	1,87%	0,00%	0,00%	0,04%	n/a
* Test conducted on day 12							

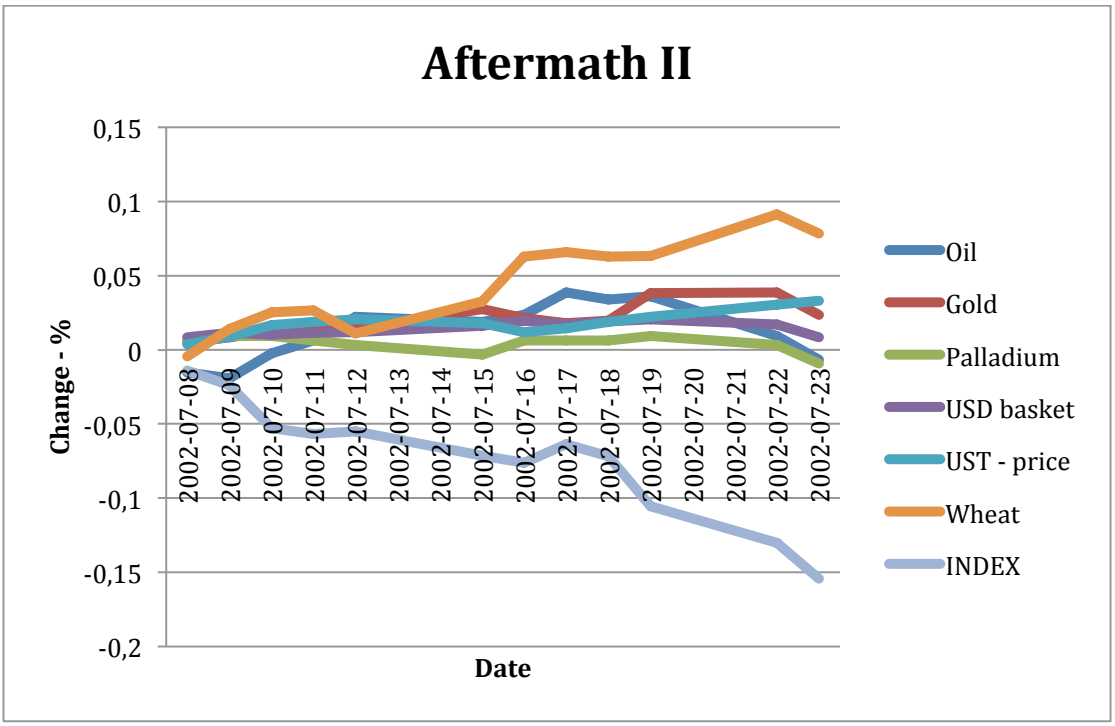

Figure 16 *Asset and Index movement during Aftermath II.*

5.4.3 Aftermath III

During 2008 the global community were struck by a number of uncertain periods. One of them was in the summer, aftermath III. VIX shows that the implied volatility increased and at the same time the Index decreased. VIX had an average of 23,86, which is slightly above the overall average; however, VIX reached 28,54 July 15th. With an increasing VIX and a declining market it is fair to say that the global community yet again stood in front of a market uncertainty.

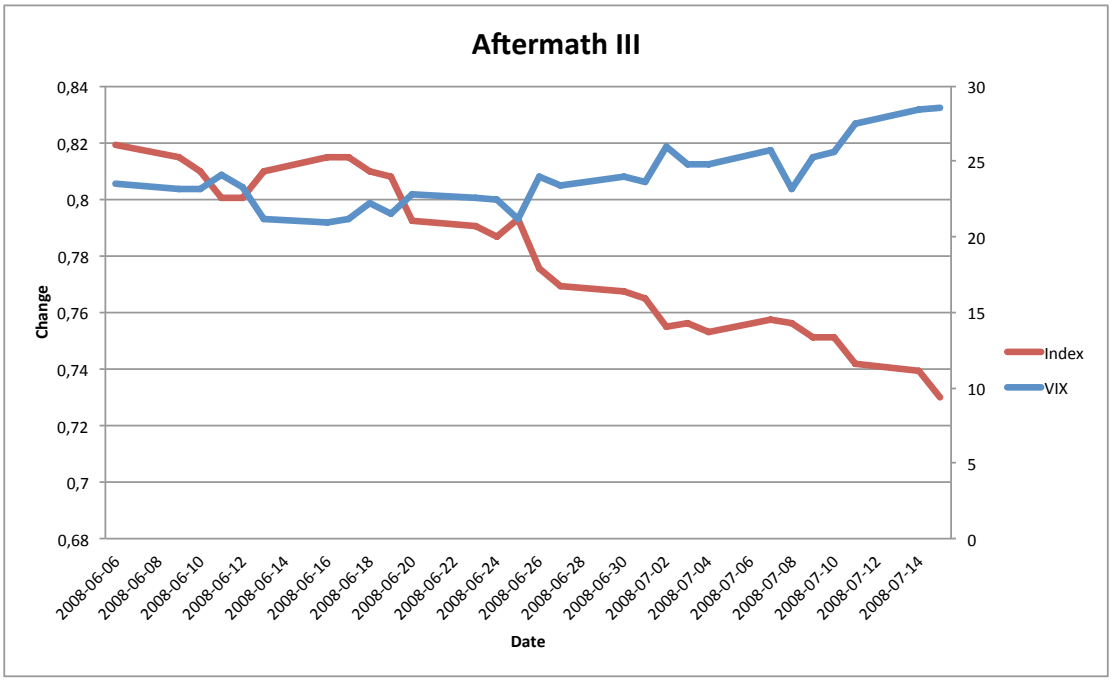

Figure 17 *VIX and Index movement during Aftermath III.*

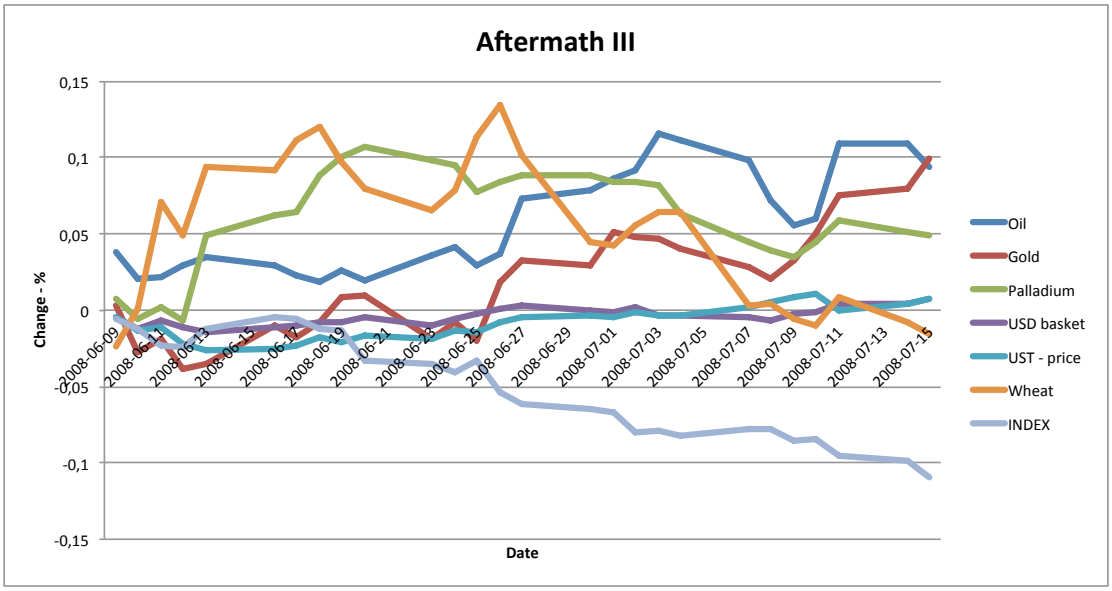

Figure 18 *Asset and Index movement during Aftermath III.*

Table 11 *Asset and Index movement during Aftermath III*

Days	Oil	Gold	Palladium	USD basket	UST - price	Wheat	INDEX
1	3,77%	0,28%	0,70%	-0,40%	-0,45%	-2,37%	-0,62%
3	2,20%	-1,85%	0,23%	-0,70%	-1,09%	7,07%	-2,37%
5	3,50%	-3,52%	4,90%	-1,48%	-2,62%	9,38%	-1,25%
10	1,94%	0,99%	10,72%	-0,48%	-1,61%	7,98%	-3,25%
15	7,30%	3,22%	8,86%	0,28%	-0,42%	10,19%	-6,15%
20	11,13%	3,99%	6,29%	-0,36%	-0,31%	6,38%	-8,22%
27	9,43%	9,96%	4,90%	0,74%	0,76%	-1,58%	-10,94%
P-value*	0,00%	1,97%	0,00%	0,07%	0,07%	0,00%	n/a
* Test conducted on day 27							

The financial uncertainty that hit the global financial market in June 2008 made the Index drop close to 11% during a short period of time. The effects on oil were instant and the first day oil's value increased by 3,77%. Oil continued to have a positive movement and ended up with a 9,43% increase in value. The result is statistically significant at a 100% level. Gold reacted negatively to the financial shock at first. Later on gold recovered its lost value and actual increased its value by almost 10%. When looking at Table 5.8, the P-value shows that gold's movement is statistically significant at a 98% level. Palladium also acted similar to oil; moreover, it increased in value throughout the entire crisis and ended up with increasing its pre-crisis value by 4,90%. It is important to mention that the steep incline wore of, and after ten days palladium decreased in value. Palladium's reaction is also statistically significant at a 100% confidence interval. The dollar instantly reacted by declining in value. USD recovered from the instant drop and ended up with a marginally increased value. The USD result is statistically significant at a 100% level. The 10-year US Treasuries actually followed the currency basket, which means an instant drop and a late recovery. Precisely as USD, the results from the USTs are statistically significant at a 100% level. The last asset was wheat and it reacted strangely towards the market uncertainty. The value dropped by 2,37% the first day, and then it quickly recovered and increased its pre-crisis value by 7,07% day 3. After the rapid increase wheat ended up decreasing 1,58% in value.

5.5 Hedges or Havens?

Up till this point our results have focused on whether the assets acts as a safe haven or not during financial turmoil. As mentioned before, a hedge cannot act like a safe haven during the entire time period; for, it is the average movement that tell them apart. A hedge is supposed to assume a position opposed to the market, while safe havens only assumes the opposite position during financial market uncertainty. In order to make sure that our assets can be classified as safe havens and are not in fact hedges we conducted a regression analysis. Since we are looking for a safe haven towards the world market index we used the

Beta-value to investigate whether the assets are hedges or safe havens. The results are presented in the table below.

Table 12 ***The Beta-value of the assets***

	Oil	Gold	Palladium	USD basket	UST - price	Wheat
β-value	0,21	-0,02	0,32	0,07	-0,16	0,21
Standard Error	0,03	0,02	0,03	0,01	0,01	0,03
Min β-value	0,19	-0,03	0,29	0,07	-0,17	0,19
Max β-value	0,24	0,00	0,36	0,08	-0,15	0,24
Range	0,05	0,03	0,07	0,01	0,01	0,05

The results presented in the table above shows that at least four assets can be classified as potential safe havens. Oil, palladium, US Dollar, and wheat all have positive Beta-values, which means that they have on average moved in the same direction as the market. The only two assets with negative Beta-values are gold and US Treasuries. However, the standard error of gold's Beta-value is 0,02 (same as gold's Beta-value), which means that gold cannot be classified as a hedge or haven, and it cannot be dismissed from either as well. The results of US Treasuries shows that it is a hedge, even if it is a weak hedge.

6. Analysis

In this part we have discussed the findings of our research. We have discussed how the assets have behaved, and their potential as safe haven investments.

6.1 General Discussion

Our definition states that a safe haven asset should retain or increase its value during financial instability. The research presented evidence that such assets do exist. Still, it is important to distinguish between safe haven assets and hedges. As can be seen in Table 6.1 most of the assets have Beta values that correspond to that of safe haven assets. However, US Treasuries behaved more like a hedge than that of safe haven; nonetheless, we have not exclude the findings from our analysis. Also, gold cannot be considered either a hedge or safe haven. This due to the fact that it has a -0,02 Beta but with a standard error of 0,02, and this makes is difficult to determine the assets characteristics. Therefore, this has proven our first hypothesis, safe haven investments exist, correct. The second hypothesis states that different types of crisis have an affect on the efficiency of a safe haven. In order to prove our hypothesis we need to discuss the type of crises separately. We have also compared our definition, where the asset should retain or increase its value, with allowing the asset a decrease of 10% of the decline in the market value.

Table 13 ***Safe haven or hedge***

	Oil	Gold	Palladium	USD Basket	UST- price	Wheat
Safe Haven	Yes	Yes*	Yes	Yes	No	Yes
Hedge	No	Yes*	No	No	Yes	No

* Since Gold has a Beta value of -0,02 and a standard error of 0,02 it cannot be exclude from being a hedge or safe haven

6.2 Non-financial Black Swan

Table 14 *Comparison between the original definition with allowing the asset a 10% decrease during Non-Financial Black Swan crises*

Asset\Crises	Non-Financial Black Swan			
	World Trade Center		Japanese Tsunami	
	-10%	0%	-10%	0%
Oil	NO	NO	NO	NO
Gold	**YES**	**YES**	NO	NO
Palladium	NO	NO	NO	NO
USD Basket	**YES**	**YES**	**YES**	**YES**
UST - price	**YES**	**YES**	**YES**	NO
Wheat	NO	NO	NO	NO

A non-financial black swan is a crisis that starts with an event that is not related directly to the financial market. As mentioned before non-financial black swan included the attack on World Trade Center and the Japanese Tsunami. When looking at our definition where an asset should at least retain its value the entire crisis, there is only one asset that definitely can be viewed as a safe haven, the US Dollar. The USD increased slight during both the World Trade Center attack and the Japanese Tsunami. US Dollar's result is a clear indicator that USD is a safe haven during non-financial black swan crises. The results of gold and 10-year US Treasuries are somewhat inconclusive; both of them increased in value in the aftermath of the World Trade Center attack, but dropped below its pre-crisis value during the Japanese Tsunami. However, if you allow a 1% decrease in value both gold and 10-year US Treasuries can be viewed as safe havens. Gold only drops in value day 3 of the Japanese Tsunami crisis and actually ended up increasing 0,59% in value throughout the entire crisis. The other assets oil, palladium, and wheat did not act like safe haven assets despite allowing a 1% decrease in value. During the Japanese Tsunami all three reacted heavily and dropped between 3-5% the first few days. Oil and wheat recovered and increased in value 1,09% respectively 3,10%. Palladium followed the market throughout the crises. In the aftermath of the World Trade Center attack wheat lost 5,61% in value. Palladium's value decreased throughout the crisis with a tremendous drop ten days after the attack. Palladium ended up losing nearly

30% of its pre-crisis value. One interesting observation is that oil actually started of with a significantly increase in value the days closest to the attack. The value later dropped substantially and ended up losing approximately 25% during ten days. One explanation might be that as a result of the attack investors fled the highly liquid stock market in order to secure as much value as possible. Later when the actual effects of the attack were analysed investors realized that oil would probably lose its value.

6.3 Financial Black Swan

Table 15 *Comparison between the original definition with allowing the asset a 10% decrease during Financial Black Swan crises*

Asset\Crises	Financial Black Swan			
	Dot-com Bubble		Global Financial Crisis	
	-10%	0%	-10%	0%
Oil	NO	NO	NO	NO
Gold	NO	NO	NO	NO
Palladium	NO	NO	NO	NO
USD Basket	**YES**	NO	NO	NO
UST - price	**YES**	**YES**	**YES**	**YES**
Wheat	NO	NO	NO	NO

The Financial Black Swan category is categorized by a financial turmoil that begins with a shock in the financial market, and we have decided that two crisis can be represented in this category. These two crises are the dot-com bubble and the global financial crisis.

In the dot-com crisis, US Treasuries was the only asset that acted as a safe haven during the entire time period. Nevertheless, wheat during the first five days also acted as a safe haven, but thereafter it declined in value. During the dot-com crisis the US Dollar was stable and very close to retaining its value. The USD was close to a 0% change through out the time, but had a couple days of -0,03% decrease, and the last day decreased with a half a percent (-0,51%). With the second definition of allowing the assets a 1% decrease through out the time period, then USD had safe haven characteristics. It is important to mention that

the USD was only statistically significant at about 80%; so one cannot draw the conclusion that it was a safe haven for this crisis.

The global financial crisis caused tremendous uncertainty on the financial market. Most assets had a large decline in value compared to pre-crisis; for example, oil lost 60% while wheat and palladium lost over 30%. None of the assets we have examined managed to retain or increase its value from day one until the end of the crisis; however, UST was extremely close with just a few days with losses of about 0,1%. So, when allowing the assets a maximum decline in value of 1% then UST can be considered a safe haven asset for that crisis. After about 80 days gold started to act as a safe haven asset when allowing a maximum of 1% decrease in value. This is an interesting observation, but we have no logical explanation to why this occurred since gold did not have the same characteristics in the dot-com crisis.

In conclusion, the only asset that had safe haven characteristics was the UST. This is probably due to the fact that during a long time it has had a reputation of being a safe haven. In both crises the t-test showed a 100% statistically significance, which proves that it wasn't a coincident. Although, it will be interesting to see how investors react in the next crisis since Standard & Poor's have downgraded US Treasuries. Will they still consider the asset safe and invest when there are financial black swan events?

6.4 Market Crisis

Table 16 ***Comparison between the original definition with allowing the asset a 10% decrease during Market crises***

Asset\Crises	Matket Crises			
	European Sovereign Debt		Subprime Mortgage	
	-10%	0%	-10%	0%
Oil	NO	NO	NO	NO
Gold	**YES**	NO	**YES**	NO
Palladium	NO	NO	NO	NO
USD Basket	NO	NO	**YES**	NO
UST - price	**YES**	NO	**YES**	**YES**
Wheat	NO	NO	NO	**YES**

A market crisis is defined as a long period of economic uncertainty leading up to a significant drop in market value. The crises included are European Sovereign Debt Crisis and Subprime Mortgage Crisis, which is divided in two parts. Three of the assets, palladium, wheat, and oil, can be written off as safe haven even if we allow 1% decrease in value. Palladium has two major drops during the subprime mortgage crisis, one per part. During the European sovereign debt crisis palladium lost more than the market index. Wheat had a positive start during the European sovereign debt crisis, but midway through something happened and wheat's value plunged. During the subprime mortgage crisis wheat started of with a small decrease in value, which later transformed into a huge increase. Apart from the 4% drop wheat acted like a safe haven during the first part of the subprime mortgage crisis. The reaction of wheat during the second part was similar to the first, a small drop in the beginning with a recovery later on. Oil followed the market index during the European sovereign debt crisis and can therefore not be seen as a safe haven. During the subprime mortgage crisis oil fluctuated throughout the entire crisis. The results of gold and the US Dollar were rather inconclusive. Both gold and USD acted like safe havens during the second part of the subprime mortgage crisis. If you allow a 1% decrease gold acted like a safe haven during the European sovereign debt crisis, while USD can be viewed as a safe haven investment during the first part of the subprime mortgage crisis. Gold is extremely close to reach the 1% border since it only lost 1,35% during the first part of the subprime mortgage crisis. USD acted similar to the Index through the European debt sovereign crisis, and can therefore be dismissed as a safe haven for market crises. The 10-year US Treasury cannot be viewed as a safe haven when we assumed that the value should be retained throughout the entire crisis. UST lost some of its value in the European sovereign debt crisis. However, when we allowed a 1% decline in value UST acted like a safe haven throughout all the market crises. We can therefore conclude that 10-year US Treasury bond acts like a safe haven during long period of market uncertainty. Since gold only drops 0,35% from the target value the likelihood of gold being a safe haven for market crises is fairly substantial.

6.5 Aftermath

Table 17 *Comparison between the original definition with allowing the asset a 10 % decrease during Aftermath crises*

Asset\Crises	Aftermath Crises					
	Aftermath I		Aftermath II		Aftermath III	
	-10%	0%	-10%	0%	-10%	0%
Oil	NO	NO	**YES**	NO	**YES**	**YES**
Gold	**YES**	**YES**	**YES**	**YES**	NO	NO
Palladium	**YES**	NO	**YES**	NO	**YES**	**YES**
USD Basket	NO	NO	**YES**	**YES**	NO	NO
UST - price	**YES**	NO	**YES**	**YES**	NO	NO
Wheat	NO	NO	**YES**	NO	NO	NO

Usually during a large market shock, there is an aftershock. During our time period from the beginning of 2000 to the end of 2010 we have noticed three such events. The first one occurred in early 2001, the second one in early 2002, and the third one after the global financial crisis in 2008.

There was market-stress after events such as the dot-com bubble. Gold was the only asset that held its value from the start of this uncertainty to the end. However, when conducting the t-test gold only had a statistically significance of 97,24%. This could have two meanings, first of all, with a larger sample, gold could be a more stable safe haven, or that with a larger sample it is not a safe haven at all. UST almost held its value compared to the pre-crisis value, and this is true for palladium as well. During a few days the assets dropped in value, but only -0,2% for UST and -0,13% for palladium at the most. Other than that they were stable assets, so when allowing a 1% decrease in value they can be considered safe haven assets. Both of the observations can be considered statistically significant, for when doing the t-test palladium had 99,94% and UST had 99,5%. Wheat held its value during the first five days, but since it was only 89,65% statistically secured we cannot draw any conclusions from this.

The accounting scandals with Enron and WorldCom along with the terrorist attacks caused major ripples on the markets. Nevertheless, gold, US Treasuries, and the US Dollar were a safe haven for investors during this time. They all increased their value compared to before the crisis, and they all were statistically

significant at 100%. If one was to tolerate a 1% drop in value, then palladium and wheat could also be considered safe haven investments. Furthermore, both received over 98% (98,13% for palladium and 99,96% for wheat) when a t-test was conducted. Palladium has a strong statistical significant, however there is room for marginal errors.

The third aftermath was caused by the subprime mortgage crisis. After about half way in to this crisis the market started to become very uncertain, and this can be seen in the VIX index (Figure 17). An interesting observation is that gold starts to increase drastically in value about the same time when the market becomes very uncertain. So, one could argue that when there was a lot of stress on the market investors fled to gold. However, oil and palladium acted as safe haven investments the entire time period. They both recorded 100% on the t-test while gold only received 98,03%. But that is probably due to the slow start when the market wasn't as volatile as it became about half way in.

In conclusion the only asset that can be considered safe, when allowing a 1% drop in value, is palladium; nonetheless, it is significant to mention gold. This since during the two first aftermaths it was a safe haven, and during the second half of the third aftermath, when the market became very uncertain, it acted as a safe haven again.

6.6 Conclusion

As stated above our purpose of this paper was to examine how assets that are normally viewed as safe havens act in times of market distress, and how different types of crisis affects different assets. Through this we came up with two hypotheses:

1 – Safe haven investment exist
2 – Different types of crisis have an affect on the efficiency of a safe haven

According to our findings safe haven investments do exist; however, the effectiveness of the asset as safe haven varies from crisis to crisis. Our findings

conclude that no single asset acts like a safe haven throughout the nine defined crises. 10 year US Treasuries is the asset that resembles safe havens the most; however, USTs' are hedges and not havens, and are supposed to act contrary the market. Our findings regarding UST do not correspond with the previous research. This due to the fact that many previous studies, e.g. Zeng (2010), Baur & McDermott (2012), have concluded that UST are safe haven investments. This might be explained by our definition of safe haven compared to Zeng's and because Baur & McDermott allows assets to be both havens and hedges.

Oil is one of the assets discussed most frequently in previous research and has had a reputation of being a safe haven investment. However, our results regarding the behaviour of oil states that it is not a safe haven since it fails to retain its value during the different types of crisis. Our findings regarding oil as a safe haven actually correspond with previous research, such as Ciner, Gurdgiev, & Lucey (2010) who also concluded that oil does not act as a safe haven or a long-term hedge against equity markets.

Palladium and wheat are seldom discussed as safe haven investment. As a result previous research is hard to come by. Palladium was discussed along with other precious metals as safe haven investments by Sari, Hammoudeh, & Soytas (2009). They conclude that it is highly unlikely that palladium can be classified as a safe haven. Our research shows that palladium only acted like a safe haven during one of the nine defined crisis, and it can therefore be rejected as a safe haven. Wheat has never been included in any previous safe haven research. Our findings conclude that wheat cannot be viewed as a safe haven investment since it only acts contrary to the market on one occasion.

In previous research, US dollar has been debated whether or not it can be considered a safe haven investment. Kohler (2010) concluded that the US dollar could be considered a safe haven asset; moreover, he stated that the USD has especially acted as a safe haven asset during the recent financial crisis. According to Beck & Rahbari (2008) US dollar behaves more like a hedge than a safe haven. They also argue that USD is a better hedge compared to the Euro when there are

sudden disturbances on the market. Nevertheless, in the research we conducted USD has more characteristics of a safe haven than that of a hedge. However, we cannot see clear evidence that USD acted as a safe haven during the last financial crisis as Kohler concluded. When looking at the results from the research conducted, there is strong indication that USD acts as a safe haven during Non-Financial Black Swan events. During both the World Trade Center attacks and the Japanese Tsunami the asset was very stable. One cannot conclude that USD was a safe haven asset during any other type of crisis. However, during Aftermath II the USD was stable. This can probably be explained by the fact that the market was uncertain during this time period partly due to the WTC attacks and the Dot-com Bubble. Since the US dollar acted as a safe haven during the WTC attacks and when allowing a 10% decrease it was also a safe haven asset during the Dot-com Bubble, it is probably the reason why USD was a safe haven only during Aftermath II and not the other Aftermath crisis.
So, a conclusion that can be drawn from this research is that US dollar is a safe haven asset during Non-Financial Black Swan crisis.

Gold is probably the asset that is most discussed when in terms of safe haven investments. Joy (2011) argued that gold is a hedge instead of a safe haven, and has been so for the past 23 years. While Baur & McDermott (2009) claimed that gold acts as a safe haven towards most developed stock markets; however, they concluded that gold is not a safe haven during periods of extreme global market uncertainty. Baur & McDermott (2012) did nonetheless state that gold acts as a strong safe haven when a black swan event occurs, such as the terrorist attack on World Trade Center. In our research there is an indication that gold was a safe haven during the WTC attack, but not during the other Non-Financial Black Swan Crises. So, we cannot come to the conclusion that gold is a safe haven asset during that type of crises. However, when allowing the asset a 10% decrease of the market value drop, gold is a safe haven investment during Market Crises. In both the Subprime Mortgage Crisis and the European Sovereign Deb Crisis gold was the strongest when the market Index was the weakest. Also, gold was a strong safe haven investment during Aftermath I and II; however, during the first few days in the Aftermath III crisis it did not act as a safe haven, but during the

last 18 days it acts as a very strong safe haven. This is when the market was at its most uncertain point during this crisis. Therefore, we consider gold to be a safe haven asset during Aftermath Crises as well as during Market Crises.

Our findings show that the first hypothesis, safe haven investments do exist, is true. However, it does not exist one single safe haven for all crises. The second hypothesis is different types of crisis have an affect on the efficiency of a safe haven, i.e. the characteristics of a crisis determine which asset that becomes a safe haven. This hypothesis can also be accepted; USD acts like a safe haven during Non-Financial Black Swan crises but not during other categorize. Gold can be viewed as a safe haven during aftermath crisis and, when allowing a small value decrease, also during market crisis.

7 Reflections and Suggestions of Future Studies

During the process of writing this master thesis, we have discovered new areas that can be of interest to explore to further understand safe haven investments.
First of all, throughout the research process we have learnt that there are other assets that can have safe have characteristics such as platinum, which is another precious metal, along with other commodities. An interesting research would be the investment in high-priced wine as a safe haven investment.
Secondly, investigating if safe haven investments are a self-fulfilling prophecy. That is, is the public's attitude towards an asset enough for the asset to become a safe haven investment; moreover, is the concept of safe haven investments the driving force behind safe haven assets existing?
Thirdly, is there a chance that, due to public speculations, during long financial turmoil that the safe haven investments becomes risky bubbles?
One reflection that we have made during the research process is that there is a need for a standard definition of safe haven investments along with a definition of market uncertainty. This due to the fact that most of the researches about safe havens differ from each other since there is not one standard definition of either safe havens or market uncertainty. This leaves too much room for the author's subjectivity, which is not good for the credibility of the research.

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In this section we will present and give credit to the information we have gathered. This includes scientific articles as well as other publications.

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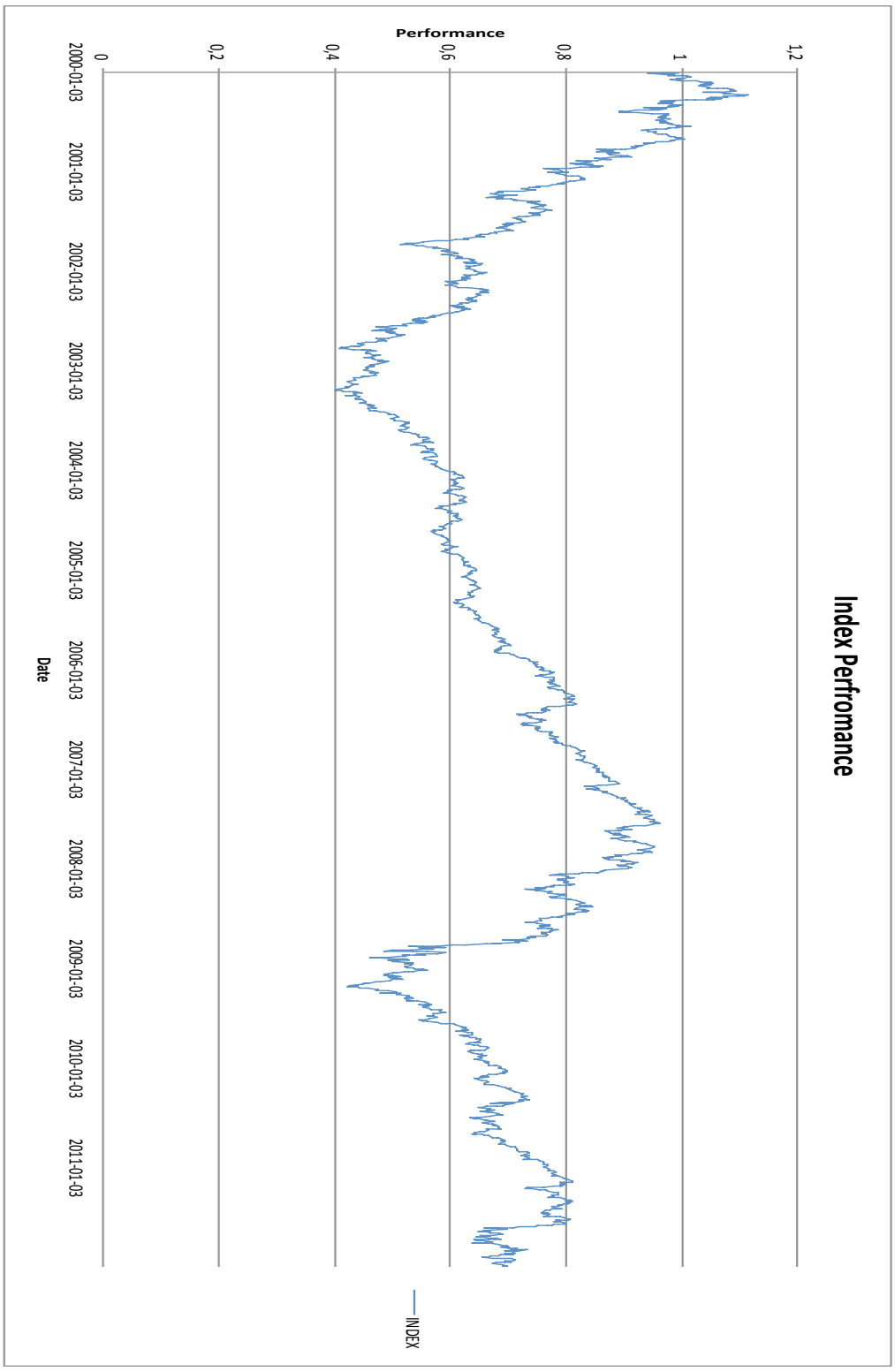
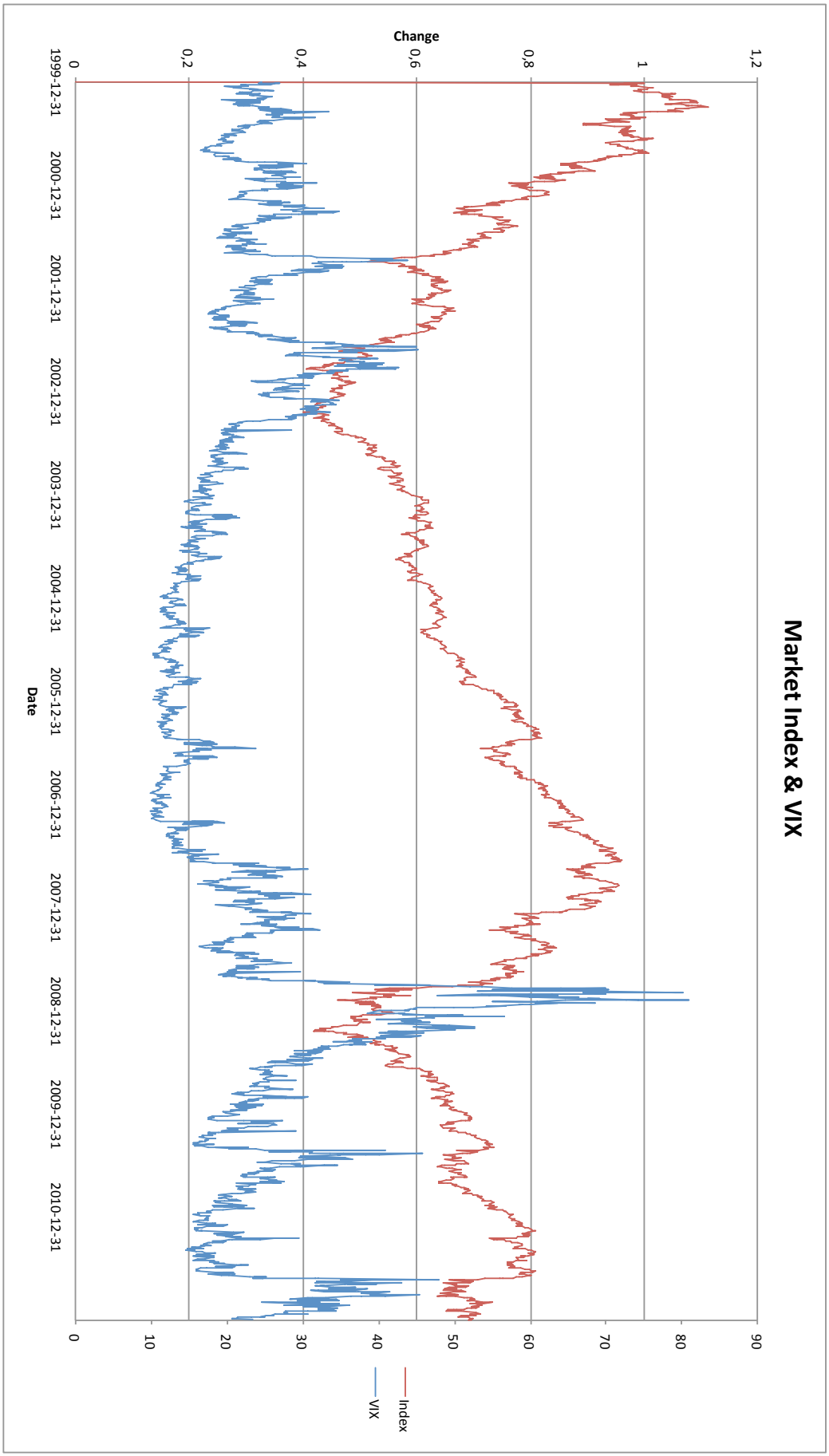
9 Appendix

9.1 Appendix – Index Performance



9.2 Appendix – Market Index & VIX performance



9.3 Appendix – VIX performance, crisis by crisis

Crisis	*VIX*	*Difference*	*High*	*Low*
Average	22,31	n/a	n/a	n/a
Dot-com Bubble	25,12	2,81	33,49	20,77
Aftermath I	28,79	6,48	32,84	24,12
World Trade Center	35,87	13,56	43,74	31,84
Aftermath II	34,90	12,59	44,92	27,11
Subprime Mortgage Crisis	22,54	0,23	31,09	15,15
Aftermath III	23,86	1,56	28,54	20,95
Global Financial Crisis	49,18	26,87	80,86	20,65
Japanese Tsunami	21,92	-0,38	29,4	18
European Sovereign Debt Crisis	31,71	9,41	48	17,52

9.4 Appendix – Result Summary

Asset\Crises	Non-Financial Black Swan				Financial Black Swan				Market Crises				Aftermath Crises			
	World Trade Center		Japanese Tsunami		Dot-com Bubble		Global Financial Crisis		European Sovereign Debt		Subprime Mortgage		Aftermath I		Aftermath II		Aftermath III	
	-10%	0%	-10%	0%	-10%	0%	-10%	0%	-10%	0%	-10%	0%	-10%	0%	-10%	0%	-10%	0%
Oil	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	YES	YES
Gold	YES	YES	NO	NO	NO	NO	NO	NO	YES	NO	YES	NO	YES	YES	YES	YES	NO	NO
Palladium	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	YES	NO	YES	YES
USD Basket	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	YES	YES	NO	NO
UST - price	YES	YES	YES	NO	YES	YES	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	NO	NO
Wheat	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO	YES	NO	NO	NO

10 Article

Perceptual Safe Havens –

A study of Gold, Oil, Palladium, Wheat, Bonds, USD and Stocks

Do safe haven investments exist? Do different types of crisis effect which asset that acts as a safe haven? These are two of the hypothesis discussed in our master thesis " Perceptual Safe Havens- A study of Gold, Oil, Palladium, Wheat, Bonds, USD and Stocks".

Introduction

There has always been a quest to find a safe investment, and this has especially been interesting during times of financial uncertainty. So far, researchers have not reached a one clear definition of a safe haven asset, and this is probably one of the reasons why the results are fluctuating so much. Therefore, our essay has first defined what a safe haven asset it, and thereafter compared gold, palladium (another precious metal), US Treasury bonds, oil, wheat, and a basket of currencies compared to the US Dollar, to a world market index consisting of the S&P index, DAX index, Nikkei index, and NASDAQ index to see how these have acted in uncertain times. We defined safe haven assets as an asset that in times of stress will retain its value or increase its value. The periods of stress, that were determined through observations on the world market index and the VIX index, were divided into four different types of crisis. These different types of crisis were: Non Financial Black Swans, Financial Black Swans, Market Crisis and Aftermath Crisis.

Process

In our results we saw that our definition of a safe haven was very ridged; therefore, we also decided to allow a 10% decrease of the value lost on the world market index. This due to the fact that it seems fair to allow the assets a 1,5% decrease, if the market declines with 15%. Also, it is important to distinguish between a hedge and a safe haven. A hedge is an asset that is negatively correlated with the world index on average, while a safe haven only is negatively correlated during market uncertainty. Therefore, we conducted a regression analysis where we investigated the beta for each asset. The beta tells us how the asset is correlated with the world market index.

Results

With our research we concluded that oil does not act as a safe haven during any of the different types of crisis. Palladium had safe haven characteristics during one of the nine time periods of market distress; however, this is not enough to be considered a safe haven investment. Wheat is another asset that cannot be considered a safe haven. US Dollar can be considered a safe haven investment during Non Financial Black Swan events. This due to the fact that it was stable

during both the terrorist attacks on September 11 and during the Japanese tsunami. Gold is another asset that has safe haven characteristic; moreover, when allowing a 10% decrease it is clear that gold acted as a safe haven during the different Market Crisis. We also consider gold to be a safe haven asset during Aftermath Crisis. Finally, US Treasuries have shown signs of being a safe haven investment; nonetheless, when we conducted a regression analysis it was clear that the UST was a hedge and not a safe haven.