

https://dspace.org/

The relationship between investor sentiment and unit trust alpha on the JSE

Matlou, Koena

2022
https://hdl.handle.net/10539/35566

Downloaded from a DSpace repository. https://dspace.org/

SCHOOL OF ECONOMICS AND FINANCE
FACULTY OF COMMERCE, LAW AND MANAGEMENT



WITS
UNIVERSITY

The relationship between investor sentiment and unit trust alpha on the JSE

Koena Matlou

Supervisor: Prof. Yudhvir Seetharam

A research report submitted to the Faculty of Law, Commerce and Management, University of the Witwatersrand in partial fulfilment of the requirements for the degree of Master of Commerce (50%) in Finance.

Johannesburg, South Africa

28 September 2021

The relationship between investor sentiment and unit trust alpha on the JSE

Abstract

When examining the returns of a fund, there is a general consensus that risk adjusted measurements are standard tools to assess performance. Some popular examples would be the Sharpe and Treynor ratios. Alpha, which measures the difference between the expected return of a fund and the actual return based on a benchmark model, such as the Capital Asset Pricing Model (CAPM) is also used. The interpretation of a positive alpha is that a fund has performed better than the market. Traditional benchmark models such as the CAPM and its asset pricing variants are also used to understand the reason behind the occurrence of alpha. In classical asset-pricing models, only risk should be able to predict stock returns; however, numerous variables, without any clear association with risk, have been documented to predict stock returns. As such, factors that are non-traditional or not fully rational, such as investor sentiment which stem from behavioural finance, are usually not considered in these models. This study investigates whether there is a link between investor sentiment and unit trust alpha by using a macro-economic asset pricing factor model with two investor sentiment proxies (the Twitter Economic Uncertainty Index and Economic Policy Uncertainty Index) in South Africa between 2011 and 2020. The results show that investor sentiment is a statistically significant variable in an asset pricing model. The implication is that, after finding that investor sentiment is significant, a manager that fails to consider investor sentiment is likely to achieve inferior results to a manager that does.

Declaration

I, Koena Matlou declare that this research paper is my own work and that I have correctly acknowledged the work of others. It is submitted to fulfil the requirements for the degree of Master of Commerce in Finance at the University of the Witwatersrand, Johannesburg. I declare that this research paper has not been submitted for any other degree or examination in this or any other institution.

Koena Matlou

28 September 2021

Acknowledgements

“*MOSHITO O TSWELA PELE*”

I would like to express my gratitude to:

- God - for His grace and mercy upon my life and for giving me the strength to complete this research. All the glory belongs to Him.
- Prof Yudhvir Seetharam (Supervisor) - Thank you for your time and patience. Thank you for being generous with your knowledge and for being a mentor throughout the journey. Thank you for the random and sometimes lengthy calls we had. You have inspired me since the first time I came to your office as an undergrad to consult on EBV and you continue to inspire me.
- My parents - for understanding me when I decided to continue with my studies. For providing moral support and for praying for me.
- My siblings – for inspiring me to want to be a good role model by demonstrating the art of starting something and seeing it until completion even when it becomes difficult to do so.
- My friends - for the moral support and for sometimes reassuring me that I could do this.

Table of Contents

Declaration ii
Acknowledgements iii
List of Tables v
Definition of abbreviations, terms and symbols vi
1. **INTRODUCTION** 1
1.1 Background 1
1.2 Research gap and objectives 1
1.2.1 Motivation of the study 1
1.2.2 Knowledge gap 4
1.2.3 Research objective(s) and question(s) 5
1.2.4 Potential benefits 7
1.2.5 Hypotheses testing 7
1.3 Structure of the study 8
2 **LITERATURE REVIEW** 9
2.1 Efficient Market Hypothesis 9
2.2 Asset Pricing 9
2.3 Passive and Active Management 11
2.4 Investor Sentiment 12
2.5 Summary of literature review 16
3 **Data and Methodology** 17
3.1 Data 17
3.2 Methodology 17
3.3 Pooled OLS and the Generalised method of moments 20
3.4 Summary 21
4 **RESULTS** 23
4.1 Descriptive Statistics 23
4.2 Regression results 24
4.3 Discussion of results 38
4.4 Summary 43
5 **CONCLUSION** 44
5.1 Limitations 45
5.2 Areas of future research 45
REFERENCES 46
Appendix A: Unit Root Tests 51

List of Tables

Table 4. 1: Descriptive statistics for the key variables used (With EPU) 23
Table 4. 2: Descriptive statistics for the key variables used. (With TEU) 24
Table 4. 3: The relationship between Investor sentiment and unit trust alpha (OLS) 26
Table 4. 4: The relationship between Investor sentiment and unit trust alpha (OLS) 27
Table 4. 5: The relationship between investor sentiment and unit trust alpha (GMM) 28
Table 4. 6: The relationship between investor sentiment and unit trust alpha (GMM) 29
Table 4. 7: The relationship between the level of investor sentiment and the level of unit trust alpha (OLS) 30
Table 4. 8: The relationship between the level of investor sentiment and the level of unit trust alpha (GMM) 31
Table 4. 9: The relationship between investor sentiment and unit trust alpha (OLS) 32
Table 4. 10: The relationship between investor sentiment and unit trust alpha (OLS) 33
Table 4. 11: The relationship between investor sentiment and unit trust alpha (GMM) 34
Table 4. 12: The relationship between investor sentiment and unit trust alpha (GMM) 35
Table 4. 13: The relationship between the level of investor sentiment and the level of unit trust alpha (OLS) 36
Table 4. 14: The relationship between the level of investor sentiment and the level of unit trust alpha (GMM) 37

Table A. 1: Levin, Lin and Chu tests (2011-2018) 51
Table A. 2: Levin, Lin and Chu tests (2011-2020) 52

Table B. 1: Correlation Matrix (2011-2018) 53
Table B. 2: Correlation Matrix (2011-2020) 53

Definition of abbreviations, terms and symbols

APT: Arbitrage Pricing Theory - An asset pricing model theory that states that the returns of an asset can be explained by a linear function of different macroeconomics or microeconomic factors.

CAPM: Capital Pricing Asset Model - A model that explains the relationship between the expected return and risk of a stock.

EMSI: Equity Market Sentiment Index - A proxy for investor sentiment that uses publicly available data to measure the willingness of the market to accept risks inherent to an equity market at a given point in time.

EPU: Economic Policy Uncertainty - Uncertainty about the monetary, fiscal, tax or regulatory structures of a country or region.

FF: Fama French - The developers of an asset pricing model that uses the market, size and a book value to market value factor to explain the relationship between the expect return and risk of a stock.

FEARS: Financial and Economic Attitude Revealed by Search - An internet-based measure of investor sentiment that uses google trend data to aggregate search words that are related to the economy.

GMM: Generalised Method of Moments - a generic method for estimating parameters in a statistical model.

JSE: Johannesburg Stock Exchange - A South African platform that provides a market where securities can be traded.

OLS: Ordinary Least Squares - a statistical tool that is used in regression analysis to estimate unknown parameters in a linear model.

TEU: Twitter Economic Uncertainty - an internet-based measure of investor sentiment that uses tweets to gather information about investors 'feelings.

1. INTRODUCTION

1.1 Background

The Efficient Market Hypothesis (EMH) is the foundation upon which most financial concepts are built. According to this hypothesis, all relevant information pertaining to stocks is already reflected in the prices of those stocks (Fama, 1970). The implication is that stocks trade at their fair value and as a result, bargains and profits from trading stocks become virtually impossible because the market is "right". In layman terms, it is said that one cannot beat the market. A firm supporter of this hypothesis would advocate that an investor must hold a passive portfolio as opposed to an active portfolio.

1.2 Research gap and objectives

1.2.1 Motivation of the study

The key point from the EMH is that no one can consistently beat the market and as a result, the conventional wisdom has been that it is better to adopt a passive strategy as opposed to an active strategy. A passive strategy is a strategy where an investor buys and holds onto an investment for the long term with the goal of building wealth over time. According to Anadu, Kruttli, McCabe and Osambela (2020), passive investing refers to the usage of rules-based investing, generally to track an index by holding all of its constituent assets or a representative sample of those assets that is automatically selected. An active strategy is a strategy where an investor is constantly buying and selling with the aim to make quick gains with favourable market fluctuations. Authors such as Malkiel (2003) have shown that following an active strategy is not a worthwhile path to take as this is associated with high transaction costs and does not generally lead to returns that are higher than the returns offered by a passive strategy. Jensen and Bennington (1970) state that a deviation from a passive strategy, such as following trading rules (which requires one to study past price patterns), does not lead to returns which are higher than a buy and hold strategy after transaction costs are taken into consideration.

Despite the literature on the EMH and the support by many financial practitioners that investors cannot consistently beat the market, some researchers have shown that there are fund managers who have consistently generated positive alpha over longer periods. Generating alpha is a reflection that active trading has occurred, despite the common

findings in the literature that active strategies do not consistently outperform passive strategies in the long run. Managers who consistently generate positive alpha are said to have good investment skills and managers who consistently generate negative alpha are said to have poor investment skills. According to Stark (2019), alpha can be generated from mutual funds that are actively managed as a result of decisions regarding the types and weights of securities to invest in. The author states that if mutual fund alpha can be decomposed into different channels, a more educated judgement can be made with regard to the skills of a fund manager.

In addition to the literature about managers being able to achieve positive alpha, Kosowski, Timmermann, Wermers and White (2006) state that good performance by managers is not solely attributable to luck or sampling variability. It seems that stock picking skills do contribute to assisting managers to achieve positive alpha. This, amongst other reasons, is why even though many studies show that it does not reward to seek the services of an active manager, most investors continue to do so with the belief that active managers possess good stock picking skills.

Alpha is a measure which takes into account the capital asset pricing model (CAPM) Jensen (1968). The CAPM is the paradigm for estimating alpha and for developing modified asset pricing models. The occurrence of alpha has prompted many studies to develop other models for explaining returns as it has been documented that the CAPM is not fully adequate in explaining returns. Fama and French (1993) (hereafter, FF) developed a model that incorporates three factors through which they show that in addition to the market return, returns are also affected by a size and a book value to market value factor. Their model fares better in explaining alpha as it shows that the variables of size and book-to-market equity, are adequate in explaining the cross-section of average returns.

There have been several other models, including the one by Carhart (1997), who incorporated the momentum factor to the FF three factor model. The model by Carhart (1997) fares better in explaining alpha than the CAPM and the FF three factor model, as it shows that besides other factors, momentum is a statistically significant factor in explaining returns. Benchmark models are not perfect in explaining why alpha occurs and one of the reasons for that is perhaps the omission of some factors.

The APT framework introduced by Ross (1976) allows for many different factors to be used to explain returns. These factors could either be micro-economic or macro-economic in nature. Chen, Roll and Ross (1986) developed the idea that asset prices are affected by economic factors. They appreciate that congruous with the ability of investors to diversify, modern theory has concentrated on systematic influences as the likely source of investment risk but generally speaking, there has not been a focus on the identification of systematic state variables which are likely to influence all assets. Since stock prices can be seen as responding to external factors, they state that to some degree, all economic factors are endogenous variables. With the diversification argument that is implied by capital market theory, only general economic state variables will have an effect on large stock market aggregates. If there is a systematic variable that influences the economy's pricing operator or that influences dividends, it would influence stock market returns as well. Also, any variable that is required to complete the description of the state of the economy will also form part of the description of systematic risk. In their study, Chen, Roll and Ross (1986) state that macro-economic factors such as industrial production, changes in the risk premium, changes in the yield curve, measures of anticipated inflation and changes in expected inflation are key in explaining returns. According to Uwubanwem and Obaygbona (2012), in the Nigerian stock market, money supply and oil prices are important factors in stimulating stock returns in the short run. They state that in the long run, sustained increases in oil price and industrial production could cause stock returns to rise over time. van Rensburg (2000) adopted the Chen, Roll and Ross (1986) prespecified variable perspective to priced arbitrage pricing theory factor identification on the JSE. He finds that Rand gold prices, the rate on long bonds, the Dow-Jones Industrial Index and the level of gold and foreign exchange reserves together with the Industrial and All-Gold residual market factors represent priced source of risk within the framework of the macro-APT.

One can say that there seems to be a gap in factors considered in the literature. Factors that are often looked at are termed *traditional*, in the sense that they have been normalised, made familiar with practitioners in the finance world and their behaviour is understood. The introduction of behavioural finance though has brought another perspective in how financial markets should be seen. For example, the idea that investors are not always rational which Kahneman and Tversky (1979) discussed is not something that has been previously viewed as traditional. To bring this idea to how assets are priced, the only factors that have been considered are traditional factors. What if financial markets are driven by factors that are non-traditional or cannot be observed? It would be difficult to accurately quantify a natural disaster

or the feelings of an investor about a product. Among the non-traditional factors, one can state that investors' feelings have been studied (and perhaps understood) extensively. It is formally referred to as investor sentiment and this study takes a keen interest in determining whether investor sentiment is factored into unit trust alpha. While the lines between asset management asset pricing can be blurry at times, this is not an asset pricing study. It is also not a rational vs irrational study nor is it an active vs passive management. This is an asset management study which seeks to investigate the reason behind the occurrence of alpha. While it also acknowledged that the performance of unit trusts is defined by the performance of their components assets (usually stocks), the fundamental nature of this study being about portfolios as opposed to individual stocks means that interest becomes about the relationship between investor sentiment and alpha of portfolios as opposed to the relationship between investor sentiment and alpha of individual stocks.

1.2.2 Knowledge gap

Despite the body of work which documents the occurrence of unit trust alpha, it is still attributable to what financial practitioners would call traditional factors. Recent developments in this strand of finance literature discuss concepts such as momentum, herding behaviour, overconfidence and investor sentiment, amongst others. It is argued that some of these factors affect asset returns and as a result, should be incorporated into asset pricing models. The implication is that these factors should play a role in asset management since asset pricing models are used in asset management. Since asset management utilises traditional asset pricing models, this means that non-traditional factors (which could be important) are ignored in most cases. Failing to recognise some of these factors can lead to inadequate measurement of the skills of a fund manager. For alpha to reflect the pure skills of a fund manager, it is perhaps critical to extend models to include these non-traditional factors (in fact, this has already started with the development of some models such as the Carhart, 1997, model which incorporates momentum). Investor sentiment is one factor that has not received much attention in asset management - there is generally no place for investor sentiment in the traditional finance sense. Perhaps failure to acknowledge it can lead to errors in the assessment of the skills of a fund manager. It is possible that investor sentiment is a component of alpha, thus paying particular attention to it could give a clearer perspective about alpha. Investigating whether alpha is explained by traditional factors only or whether non-traditional factors such as investor sentiment play a role in the occurrence of alpha will enhance the body of knowledge when it comes to understanding alpha.

1.2.3 Research objective(s) and question(s)

1.2.3.1 Primary objective

To determine the relationship between unit trust alpha and investor sentiment

1.2.3.2 Secondary objective

To determine the relationship between the level of unit trust alpha and the level of investor sentiment

1.2.3.3 Problem statement

Investor sentiment refers to the general attitude or perception that investors have towards a particular asset. These attitudes or perceptions may be driven by market and non-market factors. It has been documented by Kahneman and Tversky (1979) that people place more weight on outcomes that are certain in relation to outcomes that are probable. This is one of the starting points for investor sentiment research in that investors do not necessarily behave rationally as it is assumed in the traditional financial models. Dempsey (2013) has an interesting way of analysing traditional models, like the CAPM. He states that in using the CAPM, we are deciding to encounter the market on our own terms of rationality rather than that of the market. This means that models like the CAPM do not necessarily capture the truth about how markets behave but rather how we think markets behave and as a result, they could have inaccuracies. De Bondt and Thaler (1985) state that investors have a tendency to overreact to unexpected and dramatic news events. They also found that there exists a tendency whereby stocks which are doing well and stocks which are not doing well in a particular period both experience reversals in the succeeding period.

In most cases, investor sentiment has been studied in relation to stock returns. Baker and Wurgler (2006) argue that investor sentiment significantly affects the value of stocks which are highly subjective and difficult to arbitrage. They find that low investor sentiment is associated with low returns for stocks that are small, young, highly volatile, unprofitable, non-dividend paying, extreme growth and distressed. In traditional finance theory, where investors are seen to be rational, it is said that changes to the relevant risk is due to the movement in fundamental factors (Rupande, Muguto & Muzindutsi, 2019). The authors' hypothesis is that some of the movements in risk are due to the volatility related to noise trader activity whose forms are not linked with changes in fundamental factors. By utilising a daily sentiment index and a GARCH (Generalised AutoRegressive Conditional Heteroscedasticity) model on the

Johannesburg Stock Exchange (JSE), they find that there exists a relationship between investor sentiment and stock returns. Thus, elements of behavioural finance can be used to explain how stock returns behave on the Johannesburg Stock Exchange. Solanki and Seetharam (2018) apply investor sentiment as a risk factor in an APT model to determine if it is an important variable in explaining returns. They use the FEARS index (described more in Section 2.3) as a proxy for investor sentiment in South Africa. It is found that investor sentiment is a statistically significant variable, and the implication is that it plays a role in explaining asset prices and their associated returns. In another study, Solanki and Seetharam (2014) investigated whether a causal relationship exists between investor sentiment and the JSE performance. By using the Granger Causality test and consumer confidence as a proxy for investor sentiment, they find that consumer confidence can be seen as a predictor of JSE performance with a lag of 9 or 12 months.

In their investigation of how the market reacts to macro-economic news that are prescheduled and how investor sentiments affect these, Chen and Lien (2017) find that investors are active to economic announcement days more than other trading days when investor sentiment is bullish. They find that the Volatility Index - which is used as a proxy for investor sentiment, has a negative relationship with a return difference between announcement days and non-announcement days. This supports the notion that the macroeconomic announcement effect is significant when investors are bullish.

As it can be seen from the above-mentioned studies, most authors have only focused on the relationship between investor sentiment and stock returns. Alpha is a measurement of performance and indicates whether or not a portfolio manager has been able to beat the market over a certain period. Bu (2020) states that there is a positive relationship between mutual fund alpha and investor sentiment in the US. He states that investor sentiment plays a notable role in the value and occurring probability of alpha; and the probability of earning alpha increases when investor sentiment increases. He further suggests that incorporating investor sentiment into benchmark models can reduce the occurrence of alpha. One should not take that to imply that fund managers for funds that have lower alphas once investment sentiment has been taken into account have lower skills because another manager could achieve a similar return by holding shares which are highly sensitive to investor sentiments. Such a view would discredit the availability of the skills of a fund manager during periods where investor sentiment levels are high. In fact, one can say that the skills of a fund manager are very important during periods

where investor sentiment is high because high investor sentiment levels come with a lot of "noise" in market prices. It follows from here that the extent to which the skills of a fund manager are valuable can be tested during high investor sentiment periods where there is a lot of noise in the market and as a result when it becomes difficult to identify profitable stocks. The positive relationship between alpha and investor sentiment does however suggest that managers should probably not get much praise for picking up stocks with a high sensitivity to investor sentiment. If all managers recognise this relationship and are able to reap benefits by using it, then one cannot really say that they have special skills in that regard. It would be interesting to investigate such a relationship on the JSE. That will give a perspective as to whether investors and financial practitioners should still rely on traditional models or not when they are evaluating the performance of funds.

1.2.4 Potential benefits

This study is important to academics as it will add to the body of knowledge on investor sentiment and unit trust alpha when it comes to the JSE, as there has been little to no research in that regard. This study can also help investment managers to better understand the role of investor sentiment in the market so that they can be better positioned to make decisions that best maximise the value to investors

1.2.5 Hypotheses testing

Primary Hypothesis

H_0: Investor sentiment is not a statistically significant variable in an asset pricing model, thereby being captured by unit trust alpha

H_1: Investor sentiment is a statistically significant variable in an asset pricing model, thereby being captured by unit trust alpha

Secondary Hypothesis

H_0: The level of investor sentiment does not affect the level of unit trust alpha

H_1: The level of investor sentiment affects the level of unit trust alpha

1.3 Structure of the study

This research is structured in five chapters and will proceed as follows: **Chapter 2** reviews the literature on asset pricing, asset management and investor sentiment. **Chapter 3** describes the data, variables, hypotheses and methodology followed. **Chapter 4** shows the empirical results of the study. **Chapter 5** concludes.

2 LITERATURE REVIEW

The first section of the literature review looks at the efficient market hypothesis as well as different asset pricing models which includes the CAPM and APT models. The focus is then shifted to reviewing portfolio management theory. The literature review concludes by unpacking investor sentiment.

2.1 Efficient Market Hypothesis

According to Fama(1970), an efficient market is one in which security prices fully reflect all available information at any time. The efficient market hypothesis holds that when new information comes into the market, it is immediately reflected in stock prices; neither technical analysis (the study of past stock prices in an attempt to predict future prices) nor fundamental analysis (the study of financial information) can help an investor generate returns greater than those of a portfolio of randomly selected stocks. This becomes important to be mentioned because the occurrence of alpha is a violation of the efficient market hypothesis which is the rock upon which most finance theory is developed.

2.2 Asset Pricing

Understanding alpha requires one to first understand asset pricing. One important question in finance is how the risk of an investment should affect expected returns. Classical finance theory relies on a model called the CAPM to explain this relationship. The CAPM is built upon the premise that asset returns are not necessarily affected by all risks - in fact, the only risk deemed to be affecting returns is known as systematic or undiversifiable risk. The CAPM was introduced at a time where theoretical foundations underpinning how people make decisions under uncertainty were vague. Thus, in general, one can say that we did not (formally) know the relationship between risk and return as it relates to financial theory (Sharpe, 1964). This model builds on the work by Harry Markowitz who observed that there are correlations between movements in the economy and different risks. If investors hold a portfolio which is well diversified, they can eliminate some, but not all of, the risk of the portfolio.

The CAPM refers to a variable called beta and states that beta is sufficient to explain the difference in returns between assets. It further states that there is a positive relationship between beta and returns. The alternative models to the CAPM are usually referred to as multi-factor models, as they utilise more than one risk factor to explain returns as opposed to a single risk factor by the CAPM. In that

regard, Ross (1976) introduced the framework for a multifactor model that can be used to explain returns, formally known as Arbitrage Pricing Theory (APT). He argues that there is a linear relationship between returns and the different risk factors. However, the framework by Ross (1976) does not identify the particular risk factors and it does not specify how many of such factors should be included in the model for explaining returns. As a result, this opens an opportunity for various factors to be explored in the model. Modern finance theory emphasises the importance of pervasive or state variables in explaining returns. This led to Chen, Roll and Ross (1986) developing a macro-economic APT model. They provided the insight that returns are affected by economic factors, particularly macro-economic factors. They find that factors such as industrial production, changes in the risk premium, twist in the yield curve, measures of unanticipated inflation and changes in expected inflation are significant in explaining returns. According to Yilmaz, Mubeen and Bulut (2014), "stock returns are exposed to systematic economic news that they are priced in accordance with their exposure". According to Dolinar, Orsag and Duman (2015), pricing models intended for developed capital markets, like the U.S stork market, can be used in an emerging market. However, their success in explaining the relationship between risk and return cannot be so easily duplicated from one market to another. Emerging capital markets come with their own specifics that need to be considered when applying existing or developing new pricing models. They state that in that context, Chen, Roll and Ross (1986) lay a logical starting point when it comes to testing macro-economic factors.

The fact that there is no consensus as to which risk factors must be included in the APT models imply that the usage and the expansion of the already existing models like the one by Fama and French (1993) and Chen, Roll and Ross (1986) is more of an art than a science. The realm of behavioural finance gives insights and foundations to some concepts and ideas which can be explored and possibly be incorporated in asset pricing models such as the APT.

It can be argued that if one is to expand on an already existing APT model - in particular the micro-economic model by Fama and French (1993) and the macro-economic model by Chen, Roll and Ross (1986) by adding a non-traditional factor, one must first determine whether the factor is micro-economic or macro-economic. Carhart (1997) expanded on the Fama and French (1993) by adding a momentum factor, which is a firm specific factor. Fama and French (2015) follow the same logic by adding an investment factor and a profitability factor. Investor sentiment can be looked at from a micro-level, but several studies have looked at investor sentiment from a macroeconomic perspective. This is seen by the fact that, usually, proxies for investor sentiment are linked to the general market as opposed to being firm specific. This can be seen from the fact that investor sentiment is usually

gauged by a measure like a volatility index and as a result, it makes sense for one to use a macro-economic APT model such as the one by Chen, Roll and Ross (1986) if one wants to incorporate investor sentiment in a pricing model. Macro-economic investor sentiment proxies have been more prevalent in finance literature than micro-economic investor sentiment proxies.

An understanding of asset pricing models helps us understand the concept of alpha of a stock. An alpha of a stock is the return that a stock generates in excess of the return that is predicted by a benchmark, but it is important to note that this study is focused on portfolios as opposed to individual stocks and thus alpha here refers to the outperformance of a portfolio over the market.

2.3 Passive and Active Management

In portfolio management, there are usually two schools of thought. The first is referred to as passive investing and the second, active investing. Broadly speaking, passive investing is a buy and hold strategy for long term investments horizons with minimal trading in the market. The term passive investing, and indexing are generally used interchangeably in the finance world even though indexing specifically refers to strategies that are intended to reproduce the performance of benchmark indexes such as S&P 500 and the FTSE 100.

Indexing is the purest form of a more general idea: passive investing. According to Anadu, Kruttli, McCabe and Osambela (2020), passive investing refers to the usage of rules-based investing, generally to track an index by holding all of its constituent assets or a representative sample of those assets that is automatically selected. Unlike indexing, however, passive investing can include making an investment in a changing set of market segments that are selected by way of the portfolio manager. A passive portfolio is therefore constructed by holding stocks from a particular benchmark index according to their proportion in the benchmark index. If the composition of a benchmark model does not change, maintaining a passive investment strategy becomes somewhat easy in that it does not require trading. It is interesting that Lo (2016) introduces the concept of dynamic indices where he states that a portfolio strategy that is completely transparent, is investable and systematic (it is based on rules and does not involve judgement or unique investment skills) should be considered an index.

The purpose of this study though does not require an intricate definition of indexes. Looking at indexes such as the S&P 500, as they have come to be traditionally known, is appropriate for this study. In order for one not to blur the line between passive investing and indexing, it is important to know that passive investing broadly refers to a type of fund management strategy while indexing is a

type of strategy within passive management. It is also important to note that since passive investing generally revolves around certain stock indexes which may change from time to time, this means that if a stock is removed from an index and replaced, managers will have to follow suit. This however does not mean that the fund is no longer passive.

Active investing is a strategy that involves actively buying and selling assets in the hope of making profits and outperforming a benchmark or an index. The implication here is a hands-on approach to decision making. The aim is to beat the stock market's average returns and to take advantage of short-term price fluctuations. There are various justifications for both active investing and passive investing. Passively managed funds are investment vehicles that produce diversified and low-fee portfolios. Carosa (2005) challenges the notion that everyone should invest in the market portfolio because it takes the need for judgement out of the decision making, comes with less costs and increases tax efficiency. He argues that most investors do not invest to avoid making decisions and certainly most investors do not invest merely to maximise tax efficiency. He further states that the choice between an active and passive strategy should depend on the specific strategy's ability in aiding the investor to achieve his goals. On the other hand, since actively managed funds aim to have returns above a benchmark through discretionary security selection or trading in anticipation of market turning points, an active strategy is associated with high trading costs and needs compensation for active managers which goes hand in hand with higher fees (Sushko and Turner, 2018).

Portfolio management theory reveals that a portfolio's abnormal returns is linked to many different factors. Since this study is concerned with investor sentiment as one of the possible factors that could have an impact on abnormal returns or alpha, it becomes important to unpack the theory around investor sentiment.

2.4 Investor Sentiment

While academics usually talk strictly about asset pricing and explaining the cross section of stock returns, in the eyes of the practitioners, these usually fall under "stock picking". If behavioural biases among investors cause mispricing of stocks in a predictable fashion, then active managers may have the scope to beat the market by using strategies based on these sources of mispricing. Unit trust alphas have still not "disappeared" even after modifications to asset pricing models. Most of the alterations are generally to factors which are firm-specific, such as size and profitability. It then becomes worthwhile to look at non-traditional factors, one of which is called investor sentiment. Investor sentiment refers to investors' expectations about future cash flows not justified by fundamentals. It is generally referred to as greed and fear (Sturm, 2014). Bu (2020) states that a benchmark model

adjusted for investor sentiment can significantly reduce the occurring probability of fund alpha. Lee (2013) states that with limit to arbitrage, variation in individual stock investor sentiment may be an important variable in determining cross sectional asset returns. The author states that abnormal returns in a broad set of financial market anomalies depends on the level of individual stock investor sentiment. Liston (2016) states that individual and institutional investor sentiments are priced factors in sin stock returns. The author states that the evidence suggests that there is a consistent positive contemporaneous relationship between sin stock returns and both types of investor sentiment. More importantly, after controlling for the effects of investor sentiment on the sin portfolio, the abnormal returns found in previous studies vanish. "This suggests that the abnormal performance found in previous studies might be due to model misspecification, not to norm-neglect, as posited." According to Sturm (2014), technical analysis seeks to explain investors' behaviour but the weak evidence supporting technical analysis methods have necessitated a thorough investigation of these methods. In an attempt to link investor sentiment with technical analysis, he finds that the turning point method is able to effectively measure investor sentiment and furthermore, it is able to quantify the changes in investor sentiment. There are various proxies for investor sentiment, which will be discussed below.

Bandopadhyaya and Jones (2006) developed a measure called the Equity Market Sentiment Index (EMSI) using publicly available data. This measure links the class of a stock's riskiness to the class of its return thereby directly determining the market's pricing of the risk return trade-off. They find that this measure is able to capture news events reported by financial publications and has a correlation with the Massachusetts Bloomberg Index[1]. Importantly, daily price movements in the Massachusetts Bloomberg index are significantly related to investor sentiment. The unobservable nature of investor sentiment has prompted authors to use different proxies. One should acknowledge that the various proxies used by different authors could make for different interpretations about the role of investor sentiment in the financial markets. Chan, Durand, Khuu and Smales (2017) argue that various investor sentiment measures should be correlated if they indeed capture investor sentiment accurately.

Da, Engleberg and Gao (2015) constructed a Financial and Economic Attitudes Revealed by Search (FEARS) to measure investor sentiment by aggregating the volume of queries related to household concerns. They show that the FEARS index predicts aggregate market returns. Particularly, they show that the FEARS index is correlated with low returns today and predicts high returns tomorrow – a

[1] The Bloomberg Massachusetts Index is a price-weighted index designed to measure the performance of the Massachusetts economy. The index was developed with a base value of 100 as of December 30, 1994. The index is published daily in The Boston Globe.

reversal pattern that is in line with sentiment induced temporary mispricing. In addition to that, they show that this effect is stronger on stocks that are favoured by sentiments investors and are difficult to arbitrage. Also, the FEARS index has a strong link to the transitionary component of daily volatility, and it is also correlated with volatility index futures returns. They also show that daily mutual fund flows out of equity funds into bond funds are triggered by increases in the FEARS index.

Baker, Bloom and Davies (2012) state that uncertainty arising from economic policy has been an important issue since the 2007 to 2009 financial crisis. It is argued that uncertainty over future policies with regard to taxation and spending, health care reform, and regulations made the recession longer and hindered a recovery. They developed an Economic Policy Uncertainty (EPU) index based on a variety of policy-related uncertainty indicators. The index encapsulates forecaster disagreement over the future path of consumer price inflation and federal government purchases, the number of tax code provisions set to expire in coming years, and the rate of occurrence of news articles about policy-related economic uncertainty. It shown that an increase in this index is linked with declines in the GDP, private investment and aggregate employment.

According to Makololo and Seetharam (2020), EPU is an attribute of the market that brings changes in prices and returns and because of this, investors and policymakers should be cognisant of it to prevent any negative effects. Their study looked at the way in which firms rationalise making leverage financing decisions during times of economic policy uncertainty and if so, whether herding is present in these decisions. The implication of their results is that when leverage decisions are made, the political climate and the data from competitors must be taken into consideration in determining the "ideal'' capital structure of a firm. Baker, Bloom, Davies and Renault (2021) developed a Twitter Economic Uncertainty (TEU) index based on counting tweets relating to the economy and uncertainty. They hold the belief that Twitter allows one to capture the convictions and feelings of a wide cross-section of social media users instead of, say, writers or specialists. They state that tweets come with an exact timestamp and cannot be altered- this aspect about Twitter is vital in constructing high frequency indicators and in linking tweet-based measures to developments and responses in the market that are happening at the same time.

Wang and Chen (2013) used a vector auto-regression model to determine whether market momentum can be attributed to investor sentiment and macroeconomic factors. Their investor sentiment proxies consist of the volatility index, the volume of margin purchase and consumer trust index which is a predictive variable for future purchase. Their study focused on the stock market in Taiwan. They find that margin purchase affects the market momentum and conclude that market momentum is not only

affected by macro-economic factors but also investor sentiment. Benhabib, Liu and Wang (2016), assess how the financial sector can affect the real economy through the information channel. They state that, investor sentiment affects financial market prices which in turn influence real activities. They state that a two- way feedback between financial sector and the real sector can result in the amplification of a small investor sentiment shock and this can have an impact on the real economy. This has implications for non-linear asset prices, discontinuity in asset prices, cross-country co-movements in asset prices and real output. In the presence of informational frictions, the way investor perceive synchronization across economies can lead to actual synchronization. When the economy is dynamic, sentiment driven fluctuations can also generate persistence in business cycles and have cross-sectional and time series implications for asset prices over the business cycle.

Shen, Yu and Zhao (2017) investigated the pricing of macroeconomic factors in the cross section of returns. They explore different pervasive macro-related variables such consumption growth, inflation and others. They use a market wide investor sentiment proxy to show that high risk firms have higher returns than low risk firms following periods where investor sentiment is low. In contrast, when investor sentiment is high, it appears that mispricing also has a role to play, and it is therefore critical to include investor sentiment in economic theory in future work.

A study by Schmeling (2009) tests the relationship between investor sentiment and future stock returns for 18 countries and find that investor sentiment plays a significant role in predicting expected returns on average across countries. The proxy used for investor sentiment was the Consumer Confidence Index. The predictive power of investor sentiment is more significant for short- and medium-term periods of one to six months and slowly disappears over longer periods of 12 to 24 months. He also finds that the impact of investor sentiment on returns is higher for countries where there is a higher possibility of herd-like investment behaviour and for countries where there are poor market regulations.

The literature about macroeconomic proxies of investor sentiment in South Africa is scant. Solanki and Seetharam (2018) incorporated investor sentiment as one of the risk factors in a macro-economic APT model. By using the FEARS index as a proxy for investor sentiment in South Africa, they find that investor sentiment is a statistically significant variable in explaining asset prices and their associated returns. Looking at the property market in South Africa, Lowies, Hall and Cloete (2015) find that investor sentiment plays a small role in investment decisions. Investment managers pay more attention to market fundamentals and financial management techniques to make their investment

decisions. This implies that not everyone in the financial market takes investor sentiment into consideration in their investment decision making.

2.5 Summary of literature review

Understanding alpha requires an understanding of asset pricing fundamentals and this includes the need to have a good grasp of asset pricing models. The CAPM which built upon ideas by Harry Markowitz has historically been at the centre of explaining the relationship between risk and return as this is the fundamental question that is at the core of asset pricing. The CAPM is built on the premise that the only risk that matters when it comes to explaining returns is undiversifiable risk. With time, financial practitioners and academics established that the CAPM has some shortcomings and proposed models that incorporate more than one risk factor, and these are known as multifactor models.

The study takes a keen interest in the macro-economic APT by Chen, Roll and Ross (1986) who provided the insight that returns are affected by economic factors, particularly macro-economic factors. Understanding these models becomes particularly important to asset managers who want to perform well and realize alpha. Active managers aim at beating the market and as the literature documents, some have been able to realise alpha. The occurrence of alpha even after the modification of the various asset pricing models present a challenge in the literature as this contradicts the work by Fama (1970) which imply that no one can beat the market. Such contradictions give rise to an opportunity to venture into non-traditional territories such as behavioural finance. One of the recently explored concepts in behavioural finance is investor sentiment which refers to the general attitude or perception that investors have towards a particular asset. Different studies have introduced various ways of measuring investor sentiment and some of the proxies include the FEARS index, the Economic Uncertainty Policy index, Twitter Economic Uncertainty, the Equity Market Sentiment index and others. Studies such as Solanki and Seetharam (2018) have shown that investor sentiment is a statistically significant variable in explaining returns. The availability of an investor sentiment proxy that is macro-economic in nature gives one an opportunity to expand on the framework by Chen, Roll and Ross (1986) by incorporating investor sentiment in asset pricing model in seeking to understand the intricacies around the occurrence of alpha.

3 Data and Methodology

Chapter 3 provides an overview of the empirical data used in this study and of the research approach applied. The process followed to select the data will be described in *Section 3.1*. The methodology will be described in *Section 3.2* while *Section 3.3* will discuss the types of regressions used which are the pooled OLS method and the Generalised Method of Moments method.

3.1 Data

The study will look at unit trusts listed on the JSE, sourced from Bloomberg. The sample period is from 2011 to 2020 and of a monthly frequency. Attention will not be paid to any particular unit trust style. Every unit trust will be sourced provided that it has monthly return information throughout the whole sample period. The data for the EPU as used in Hlatshwayo and Saxegaard (2016) was obtained from the personal website of the authors and the TEU data by Baker *et al.* (2021) is available at http://www.policyuncertainty.com.

3.2 Methodology

The APT framework by Ross (1976) gives one an opportunity to use various risk factors in a model for explaining returns. A testament of that is the micro-economic model by Fama and French (1993) and the macro-economic model by Chen, Roll and Ross (1986). The investor sentiment proxy in this study is of a macro-economic nature and that gives one an opportunity to incorporate the proxy in a Chen, Roll and Ross (1986) macro-economic APT model. As a result, this study will not use Fama and French (1993) and its extensions because of the micro-economic nature of the models. This study will utilise a method by Solanki and Seetharam (2018) where an APT model with macro-economic variables as risk factors was found to have the ability to explain stock returns on the JSE. The model by Solanki and Seetharam (2018) is an adaptation of the model by Chen, Roll and Ross (1986). However, the focus here is on unit trusts thus the method used by Solanki and Seetharam (2018) will be applied to unit trusts as follows:

$$R = \alpha + \sum \beta \boldsymbol{r} + \varepsilon \qquad (1)$$

Where R is the return of a fund minus the risk-free rate, α which is the intercept, is the alpha of the fund. The representation of the loading of different risk factors is the vector $\mathbf{r}$. The different risk factors considered will be the monthly growth in industrial production, monthly inflation, real interest rate, risk premium and term structure and oil price. Industrial production is the percentage change in

a country's Producer Price Index. Inflation refers to a percentage change in a country's Consumer Price Index. Risk premium refers to the difference between the return on the high yield bond index and the return on 10-year government bonds. Term structure refers to the difference between the return on a 10- year government bond and the return on a 1-year government bond. Real interest rate refers to the difference between the treasury bill rate and inflation. Oil price refers to changes in the price of crude oil. β is a representation for the coefficients of the different risk factors. The first step is to determine if Equation 1 can explain alpha. In the second step, the investor sentiment proxy will be added to the regression in (1) and a comparison will be made between regression (1) and regression (2), so as to check if the inclusion of the investor sentiment proxy has any impact. The statistical significance for the investor sentiment proxy will also be assessed. Equation 2 will take the form:

$$R = \alpha + \sum \beta r + \beta IS + \varepsilon \qquad (2)$$

where IS is the proxy for investor sentiment. Since the study will be utilising two different investor sentiment proxies, equations 1 and 2 will be rerun using the different proxy. The next step will be to check for the relationship between the levels of investor sentiment and unit trust alpha. A dummy variable representing the level of investor sentiment will be created and regarding this, a low investor sentiment level will be allocated a value of 0 whereas a high investor sentiment level will be allocated a value of 1. The distribution of the investor sentiment proxy across the whole period will be used to define the high and the low threshold of the investor sentiment level. Specifically, a value falling within the top (bottom) fifth percentile of the distribution will be regarded as high and a value falling in between will be regarded as low. The value for the investor sentiment level will then be added to equation 3 to investigate the relationship between the level of investor sentiment and unit trust alpha. The equation will be as follows:

$$R = \alpha + \sum \beta r + D * IS + \varepsilon \qquad (3)$$

Where D is the dummy variable for the level of investor sentiment.

The investor sentiment proxies to be used are the Twitter Economic Uncertainty and the Economic Policy Uncertainty Index. The Twitter Economic Uncertainty looks at key words which are related to uncertainty and the economy. The Economic Policy Uncertainty Index aggregates different elements such as monthly information from media coverage, information about tax code provisions and information about economic forecasters with regards to inflation and government expenditure. As much as there are many proxies for investor sentiment, the study will use the two mentioned because

they look at investor sentiment from different angles. The two different angles are that the Economic Policy Uncertainty is an aggregation of various elements which include media coverage about policy uncertainty, the list of tax code provisions set to expire in the next 10 years and economic forecasters about inflation while the Twitter Economic Uncertainty is an internet-based measure for investor sentiment and uses tweets to gather information about investors 'feelings. These two measures were also chosen due to the framework provided by previous authors with regard to these sentiment indexes, especially in a South African context.

The Twitter Economic Uncertainty (TEU) is constructed by extracting all messages which were sent on Twitter that have keywords which are linked to uncertainty and keywords which are linked to the economy. Some examples of words which are related to uncertainty include words such as "uncertain", "uncertainly", "uncertainties" and some examples of words which are related to the economy includes words such as "economic", "economical", "economically" and "economists".

According to Makololo and Seetharam (2020), the Economic Policy Uncertainty (EPU) is formed by constructing three types of elements and aggregating them. The first element encapsulates monthly data, information and news articles from media coverage of policy uncertainty, mainly from 10 largest newspapers containing 'uncertain' or 'uncertainty', 'economic' or 'economy' and terms that are applicable to policy. The raw monthly count of articles that meet the search criteria is scaled by to the number of articles in the same paper enclosing the word today. From these papers, a normalised index is then created inclusive of all monthly news articles conversing about EPU. The second element shows the list of tax code provisions set to expire over the next 10-year period. This element uses data on the projected revenue impact of the scheduled expirations. This element gives the direction that the tax codes will take in the future as a measure of level of uncertainty and has become an essential source of uncertainty for businesses and households. The third element reflects the differences among economic forecasters about inflation and government expenditure. This is achieved by taking the differences between professional forecasters' predictions about where the levels of the Consumer Price Index, Government Expenditures, and state and local expenditure will be in the future. In order to obtain an index of EPU, all the three elements are aggregated, giving a 50% weight to the news-based element, as it is the most extensive measure amongst all three elements. The remaining 50% is shared equally in weights between the other two elements.

3.3 Pooled OLS and the Generalised method of moments

There are various methods for handling panel data (data that has both cross-sectional and time series elements) and most studies in the field of asset pricing and asset management have applied the pooled OLS. In instances where there are no individual effects like cross sectional or time specific, pooled OLS gives efficient and constant parameter estimates. Pooled OLS is a pooled linear regression which does not have fixed effects and/or random effects. It makes the assumption that that intercepts and slopes stay the same regardless of group and time period. Page and Auret (2019) used a pooled OLS method in their analysis of the explanatory power of factor premiums on the JSE and to describe it, they state that pooled OLS simply pools data without taking into consideration the potential contrasts across individuals or periods that may cause the coefficient estimates to be biased. As a start, this study applies the pooled OLS method.

As stated above, pooled OLS makes various assumptions and as a result, it becomes necessary to look at another method which allows one to relax the assumptions made in pooled OLS in order for a study to be more critically engaging. One example of such a method is called the Generalised Method of Moments (GMM). According to Zsohar (2012), it is good to utilise an estimation method whose implementation does not require one to impose additional restrictions to the data generating process beyond those implied by the economic model. If it occurs that in order for one to get these estimates one has to put into place restrictions and make more assumptions and these are found not to be justifiable according to theory or inappropriate for the data, then there exists a risk that the invalidity will undermine the inferences to come regarding the area if interest. It would be good to use a method of estimation that complements and suits well the kind of information obtained from one's economic model. In most cases, restrictions implied by the economic theory take the form of what is classified as population moment conditions.

According to Woolridge (2001), the concept of a moment is important to the description of features of a population. For example, the mean of a population, which usually has the symbol μ is the moment that measures central tendency. If the population of an intersect is described by a random variable y, the population mean can also be written as $E(y)$ which is the expected value or the mean of y. The mean of y is also referred to as the first moment of y. The variance of the population, $VAR(y)$, is called the second moment of y centred about its mean. The variance which is also referred to as the second central moment is used universally to measure spread in a distribution. Information on an

entire population is rarely obtained and because of this, population moments are estimated by utilising a sample from the population.

The GMM refers to a class of estimators constructed from the sample moment counterparts of population moment conditions (Hansen, 2010). GMM is used because its estimators present large sample properties, and this makes the process of characterising them easy. A group of such estimators can be studied at the same time in ways that make it simple to compare the asymptotic efficiency. The GMM also allows for a natural way to create tests which take into consideration both sampling and estimation error. Researchers appreciate the fact that for one to construct GMM estimators, one does not need to specify the full data generating process. This aspect has been utilised in the analysis of partially specified economic models, studying potentially mis-specified dynamic models designed to match target moments, and coming up with stochastic discount factor models that link asset pricing to sources of macroeconomic risk.

When dealing with panel data by utilising a fixed effects estimator, there are certain assumptions such as constant variance and no serial correlation which are made to make the calculation of standard errors simple. In the presence of heteroskedasticity or serial correlation, using the GMM method can be more efficient than using a fixed effects estimator. The assumption that the covariates in all time periods are assumed to be uncorrelated with each time-varying error makes room for extra moment conditions.

The versatility of the GMM method can also be seen when there is an estimation of interesting extensions of the basic unobserved model. The GMM is mostly used in unobserved effects models when the explanatory variables are not strictly exogenous even after accounting for an unobserved effect (Woolridge, 2001).

3.4 Summary

The relationship between investor sentiment and unit trust alpha is determined by using an APT macro-economic model by Solanki and Seetharam (2018) under a pooled OLS and the GMM approach. Two proxies for investor sentiment will be used to get more than one perspective and these are the Twitter Economic Uncertainty index and the Economic Policy Uncertainty index. The sample period is from 2011-2018 when the Economic Policy Uncertainty index is used as the proxy and 2011-2020 when the Twitter Economic Uncertainty is used as the proxy. A dummy variable taking

on values 0 or 1 will be created for the purpose of determining the relationship between the level of investor sentiment and the level of unit trust alpha. The data consists of unit trusts on the JSE from the period 2011 to 2020 on a monthly basis.

4 RESULTS

This section presents descriptive statistics for the data followed by the regression results and a discussion

4.1 Descriptive Statistics

The Economic Policy Uncertainty Index was available from 2011 to 2018 and the Twitter Economic Uncertainty was available from 2011 to 2020 and as a result, the data was split into two groups.

2011-2018

Table 4.1 below shows that there are 10 488 observations looking at the variables shown as Returns, industrial production, inflation, real interest rate, risk premium, term structure, oil price and EPU. The data shows that all the variables except for industrial production, inflation, oil price and term structure are skewed to the right. The distribution for inflation, real interest rate and term structure have tails that are shorter and thinner and thus they are platykurtic. The distribution for industrial production, risk premium, oil price, returns and EPU have tails that are longer and fatter and thus these distributions are leptokurtic. The Jarque-Bera tests suggest that the distributions for all the variables are not normally distributed.

Table 4. 1: Descriptive statistics for the key variables used (With EPU)

	Returns	**Industrial Production**	**Inflation**	**Real Interest Rate**	**Risk Premium**	**Term Structure**	**Oil Price**	**EPU**
Mean	0.0079	0.005	0.0137	0.0476	-0.0339	0.0232	0.0032	-0.0961
Median	0.0089	0.0046	0.0135	0.0460	-0.0344	0.0233	0.0087	-0.1720
Maximum	0.1897	0.0173	0.0231	0.0667	0.1652	0.0359	0.1565	2.9757
Minimum	-0.1198	-0.0119	0.0023	0.0302	-0.1660	0.0125	-0.276	-2.2622
Std.Dev.	0.0301	0.0045	0.0053	0.0106	0.0642	0.0059	0.076	0.8927
Skewness	0.1633	-0.2111	-0.0524	0.2715	0.6161	-0.0296	-0.8521	0.6
Kurtosis	3.3015	4.7124	2.4963	1.6743	3.5524	2.0920	4.5106	6.3254
Jarque-Bera	86.403	1359.410	115.6921	896.8168	796.7950	361.812	2266.31	5461.86
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sum	83.1369	51.6536	143.3348	499.4314	-355.0872	242.8428	33.4428	-1008.149
Sum Sq.Dev.	9.5337	0.2091	0.2918	1.1890	43.2634	0.3689	60.521	8357.401
Observations	10488	10488	10488	10488	10488	10488	10488	10488

2011-2020

Table 4.2 below shows that there are 13 110 observations looking at the variables shown as Returns, industrial production, inflation, real interest rate, risk premium, term structure, oil price and TEU. All the variables except for term structure are skewed to the left. The distribution for inflation is mesokurtic, otherwise the distributions for all the variables except for real interest rate are leptokurtic meaning that they have longer and fatter tails. The distribution for real interest rate is platykurtic meaning that it has shorter and thinner tails. The Jarque-Bera tests for all the variables suggest that the variables are not normally distributed.

Table 4. 2: Descriptive statistics for the key variables used. (With TEU)

	Returns	**Industrial Production**	**Inflation**	**Real Interest Rate**	**Risk Premium**	**Term Structure**	**Oil Price**	**TEU**
Mean	0.0063	0.0045	0.0127	0.0495	-0.0439	0.0245	-0.0035	-0.0299
Median	0.0084	0.0043	0.0131	0.048	-0.0354	0.0229	0.0094	-0.0074
Maximum	0.1980	0.01733	0.0231	0.0669	0.1652	0.0652	0.2975	0.7219
Minimum	-0.2830	-0.0119	-0.0026	0.0207	-0.2909	0.0125	-0.4953	-1.6224
Std.Dev.	0.0367	0.0049	0.0058	0.0115	0.0719	0.0092	0.1014	0.3131
Skewness	-0.4501	-0.2886	-0.2706	-0.0797	-0.1377	1.9938	-1.5288	-1.2144
Kurtosis	7.4795	3.9782	2.9227	1.7980	4.2562	8.4216	8.7387	8.0700
Jarque-Bera	11403.83	704.557	163.2822	803.083	903.435	24742.22	23096.31	17263.95
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sum	82.0997	58.8347	165.8078	648.494	-576.1674	320.6364	-45.2663	-392.600
Sum Sq. Dev.	17.6410	0.3224	0.4385	1.7321	67.8767	1.10369	135.0480	1285.238
Observations	13110	13110	13110	13110	13110	13110	13110	13110

4.2 Regression results

The OLS estimation will serve as the foundation for the analysis and the GMM estimation will follow. Variable differentiation is considered resulting in a reduction of time observations. Before running regressions, the Levin-Lin -Chu tests are run on all the dependent and independent variables. This is to test whether the variables are stationary by using a unit root test. For this test, the null hypothesis is that the variables have a unit root, and the alternative hypothesis is that the variables do not have a unit root.

During the period of 2011 to 2018, Appendix A shows that all the variables except for Risk premium are stationary. Risk premium was found to be stationary at first difference. Over the 2011 to 2020 period, all of the variables except for the real interest rate, risk premium and term structure are stationary. The real interest rate, risk premium and term structure were found to be stationary at first difference.

Using stationary data, panel data regressions are run to determine the relationship between unit trust alpha and investor sentiment.

Table 4.3 shows the OLS estimations for the period 2011 to 2018. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure and oil price. The results show that all the variables are statistically significant. Industrial production, risk premium and oil price have a positive relationship with unit trust returns meaning that an increase in these variables lead to an increase in unit trust returns. Inflation, real interest rate and term structure have a negative relationship with unit trust returns meaning that a decrease in these variables lead to an increase in unit trust returns. The model has a poor goodness of fit and this is seen by a low R-squared value of 9% which implies that the model is able to explain 9% of the unit trust returns. The F-statistic which is significant at the 1% level of significance indicates that the model has good significance. The Durbin-Watson statistic is slightly higher than 2 and this indicates that the model might suffer from some negative autocorrelation.

Table 4. 3: The relationship between Investor sentiment and unit trust alpha (OLS)

Variable	Coefficient	t-statistic	Probability
C	0.0745	17.6888	0.0000* * *
Industrial Production	0.2589	3.4119	0.0006* * *
Inflation	-1.1575	-15.3132	0.0000* * *
Real Interest Rate	-0.8111	-17.4286	0.0000* * *
Risk Premium	0.1177	16.0172	0.0000* * *
Term Structure	-0.5915	-8.2181	0.0000* * *
Oil Price	0.0789	18.8983	0.0000* * *
R-squared	0.0911		
Adjusted R-squared	0.0905		
F-statistic	173.0857		
Prob (F-statistic)	0		
Durbin-Watson Stat	2.4476		

Note: This table presents the OLS estimations for the macroeconomic APT. The effect of investor sentiment on unit trust alpha is analysed on the sample period from February 2011 to September 2018. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.4 shows the OLS estimations for the period 2011-2018. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure oil price and EPU. The results show that all the variables including the variable of interest which is EPU are statistically significant. Industrial production, risk premium and oil price have a positive relationship with unit trust returns meaning that an increase in these variables lead to an increase in unit trust returns. Inflation, real interest rate, term structure and EPU have a negative relationship with unit trust returns meaning that a decrease in these variables lead to an increase in unit trust returns. The model has a poor goodness of fit and this is seen by a low R-squared value of 9% which implies that the model is able to explain 9% of the unit trust returns. Furthermore, the addition of EPU as a variable to the macroeconomic APT does not improve the model. The F-statistic which is significant at the 1% level of significance indicates that the model has good significance. The Durbin-Watson statistic is slightly higher than 2 and this indicates that the model might suffer from some negative autocorrelation.

Table 4. 4: The relationship between Investor sentiment and unit trust alpha (OLS)

Variable	Coefficient	t-statistic	Probability
C	0.0739	17.5205	0.0000* * *
Industrial Production	0.298	3.8801	0.0001* * *
Inflation	-1.1957	-15.6376	0.0000* * *
Real Interest Rate	-0.8024	-17.2195	0.0000* * *
Risk Premium	0.1178	16.0263	0.0000* * *
Term Structure	-0.5714	-7.9131	0.0000* * *
Oil Price	0.0792	18.9675	0.0000* * *
EPU	-0.001	-3.2492	0.0012* * *
R-squared	0.0919		
Adjusted R-squared	0.0914		
F-statistic	150.0041		
Prob (F-statistic)	0		
Durbin-Watson Stat	2.4526		

Note: This table presents the OLS estimations for the macroeconomic APT with EPU as the investor sentiment variable. The effect of investor sentiment on unit trust alpha is analysed on the sample period from February 2011 to September 2018. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.5 shows the GMM estimations for the period 2011 to 2018. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure and oil price. The results show that all the variables are not statistically significant. The J-statistic is indistinguishable from zero, implying that the equation is correctly specified. As the J-statistic is also not large, this implies that the moment conditions underlying GMM are satisfied. The Durbin-Watson statistic is almost 2 and this indicates that the model does not suffer from autocorrelation. The model is inconsistent with its OLS counterpart in that all the variables are found to be statistically insignificant.

Table 4. 5: The relationship between investor sentiment and unit trust alpha (GMM)

Variable	Coefficient	t-statistic	Probability
C	-0.3098	-0.8689	0.3849
Industrial Production	10.538	1.049	0.2942
Inflation	22.2216	1.0382	0.2992
Real Interest Rate	0.6861	0.4526	0.6509
Risk Premium	-6.7089	-1.0464	0.2954
Term Structure	-3.0472	-1.1296	0.2586
Oil Price	-1.8387	-1.0663	0.2863
R-squared	-115.7094		
Adjusted R-squared	-115.7777		
J-statistic	2.39E-19		
Durbin-Watson Stat	1.9999		

Note: This table presents the GMM estimations for the macroeconomic APT. The effect of investor sentiment on unit trust alpha is analysed on the sample period from February 2011 to September 2018. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.6 shows the GMM estimations for the period 2011 to 2018. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure, oil price and EPU. The results show that all the variables except for industrial production are statistically significant. Inflation and EPU have a positive relationship with unit trust returns meaning that an increase in these variables lead to an increase in unit trust returns. Real interest rate, risk premium, term structure and oil price have a negative relationship with unit trust returns meaning that a decrease in these variables lead to an increase in unit trust returns. The J-statistic is indistinguishable from zero, implying that the equation is correctly specified. As the J-statistic is also not large, this implies that the moment conditions underlying GMM are satisfied. The Durbin-Watson statistic is almost 2 and this indicates that the model does not suffer from autocorrelation.

Table 4. 6: The relationship between investor sentiment and unit trust alpha (GMM)

Variable	Coefficient	t-statistic	Probability
C	-0.0688	-0.8663	0.3863
Industrial Production	5.1771	1.5701	0.1164
Inflation	13.03724	1.7983	0.0721*
Real Interest Rate	-0.7612	-1.8884	0.0590*
Risk Premium	-3.735	-1.8167	0.0693*
Term Structure	-3.8122	-2.0032	0.0452* *
Oil Price	-0.9423	-1.8214	0.0686*
EPU	0.028	1.777	0.0756*
R-squared	-37.2011		
Adjusted R-squared	-37.2272		
J-statistic	7.72E-21		
Durbin-Watson Stat	1.9958		

Note: This table presents the GMM estimations for the macroeconomic APT with EPU as the investor sentiment variable. The effect of investor sentiment on unit trust alpha is analysed on the sample period from February 2011 to September 2018. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.7 shows the OLS estimations for the period 2011 to 2018. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure, oil price and EPU. The dummy variable is also included as part of the independent variables. The results show that all the variables except for industrial production are statistically significant. Risk premium and oil price have a positive relationship with unit trust returns meaning that an increase in these variables lead to an increase in unit trust returns. Inflation, real interest rate, the dummy variable, term structure and EPU have a negative relationship with unit trust returns meaning that a decrease in these variables lead to an increase in unit trust returns. Although the model has a poor goodness of fit as seen by a low R-squared value of 11% which implies that the model is able to explain 11% of the unit trust returns, adding a dummy variable to the macroeconomic APT which has EPU as one of the independent variables increases the explanatory power of the model by 2%. The F-statistic which is significant at the 1% level of significance indicates that the model has good significance. The Durbin-Watson statistic is slightly higher than 2 and this indicates that the model might suffer from some negative autocorrelation.

Table 4. 7: The relationship between the level of investor sentiment and the level of unit trust alpha (OLS)

Variable	Coefficient	t-statistic	Probability
C	0.0753	18.0408	0.0000* * *
Industrial Production	0.0999	1.2863	0.1983
Inflation	-1.1382	-15.0214	0.0000* * *
Real Interest Rate	-0.8493	-18.3723	0.0000* * *
Risk Premium	0.1184	16.2714	0.0000* * *
Term Structure	-0.4544	-6.3195	0.0000* * *
Oil Price	0.0772	18.6742	0.0000* * *
EPU	-0.0001	-2.5704	0.0102* * *
Dummy	-0.0128	-14.7625	0.0000* * *
R-squared	0.1107		
Adjusted R-squared	0.1099		
F-statistic	161.2421		
Prob (F-statistic)	0		
Durbin-Watson Stat	2.4519		

Note: This table presents the OLS estimations for the macroeconomic APT with EPU as the investor sentiment variable. The effect of the level of investor sentiment on the level of unit trust alpha is analysed on the sample period from February 2011 to September 2018. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.8 shows the GMM estimations for the period 2011 to 2018. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure, oil price, EPU and the dummy variable. The results show that all the variables except for industrial production are statistically significant. Inflation and EPU have a positive relationship with unit trust returns meaning that an increase in these variables lead to an increase in unit trust returns. Real interest rate, risk premium, term structure, the dummy variable and oil price have a negative relationship with unit trust returns meaning that a decrease in these variables lead to an increase in unit trust returns. The J-statistic is indistinguishable from zero, implying that the equation is correctly specified. As the J-statistic is also not large, this implies that the moment conditions underlying GMM are satisfied. The Durbin-Watson statistic is 2 and this indicates that the model does not suffer from autocorrelation.

Table 4. 8: The relationship between the level of investor sentiment and the level of unit trust alpha (GMM)

Variable	Coefficient	t-statistic	Probability
C	-0.0014	-0.0322	0.9743
Industrial Production	1.8757	1.0463	0.2954
Inflation	10.4981	2.1279	0.0334* *
Real Interest Rate	-1.3407	-3.4418	0.0006* * *
Risk Premium	-3.1107	-2.1674	0.0302* *
Term Structure	-3.0727	-2.3644	0.0181* *
Oil Price	-0.5177	-1.9522	0.0509*
EPU	0.0267	2.174	0.0297* *
Dummy	-0.051	-2.614	0.0090* * *
R-squared	-23.9016		
Adjusted R-squared	-23.921		
J-statistic	2.05E-20		
Durbin-Watson Stat	2.0056		

Note: This table presents the GMM estimations for the macroeconomic APT with EPU as the investor sentiment variable. The effect of the level of investor sentiment on the level of unit trust alpha is analysed on the sample period from February 2011 to September 2018. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.9 shows the OLS estimations for the period 2011 to 2020. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure and oil price. The results show that all the variables except for industrial production and real interest rate are statistically significant. Risk premium and oil price have a positive relationship with unit trust returns meaning that an increase in these variables lead to an increase in unit trust returns. Inflation and term structure have a negative relationship with unit trust returns meaning that a decrease in these variables lead to an increase in unit trust returns. The model does not have much explanatory power as indicated by an R-squared of 23% which implies that the model is able to explain 23% of the unit trust returns. The F-statistic which is significant at the 1% level of significance indicates that the model has good significance. The Durbin-Watson statistic is slightly higher than 2 and this indicates that the model might suffer from some negative autocorrelation.

Table 4. 9: The relationship between investor sentiment and unit trust alpha (OLS)

Variable	Coefficient	t-statistic	Probability
C	0.0188	25.5441	0.0000* * *
Industrial Production	-0.1092	-1.6323	0.1026
Inflation	-0.8761	-15.7483	0.0000* * *
Real Interest Rate	0.0622	0.9929	0.3212
Risk Premium	0.2316	31.87996	0.0000* * *
Term Structure	-2.6311	-33.7829	0.0000* * *
Oil Price	0.0849	25.8703	0.0000* * *
R-squared	0.2313		
Adjusted R-squared	0.2309		
F-statistic	651.4313		
Prob (F-statistic)	0		
Durbin-Watson Stat	2.4506		

Note: This table presents the OLS estimations for the macroeconomic APT. The effect of investor sentiment on unit trust alpha is analysed on the sample period from February 2011 to August 2020. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.10 shows the OLS estimations for the period 2011-2020. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure, oil price and TEU. The results show that all the variables except for real interest rate are statistically significant. Risk premium and oil price have a positive relationship with unit trust returns meaning that an increase in these variables lead to an increase in unit trust returns. Inflation, term structure, industrial production and TEU which is the variable of interest have a negative relationship with unit trust returns meaning that a decrease in these variables lead to an increase in unit trust returns. The model does not have much explanatory power as indicated by an R-squared of 23% which implies that the model is able to explain 23% of the unit trust returns furthermore, the addition of TEU to the macroeconomic APT does not increase the explanatory power of the model. The F-statistic which is significant at the 1% level of significance indicates that the model has good significance. The Durbin-Watson statistic is slightly higher than 2 and this indicates that the model might suffer from some negative autocorrelation.

Table 4. 10: The relationship between investor sentiment and unit trust alpha (OLS)

Variable	Coefficient	t-statistic	Probability
C	0.0178	24.0799	0.0000* * *
Industrial Production	-0.2016	-2.9726	0.0030* * *
Inflation	-0.7928	-14.0284	0.0000* * *
Real Interest Rate	-0.0324	-0.5098	0.6101
Risk Premium	0.2229	30.3903	0.0000* * *
Term Structure	-2.6676	-34.2693	0.0000* * *
Oil Price	0.0792	23.641	0.0000* * *
TEU	-0.0078	-7.8143	0.0000* * *
R-squared	0.2349		
Adjusted R-squared	0.2344		
F-statistic	569.6751		
Prob (F-statistic)	0		
Durbin-Watson Stat	2.4759		

Note: This table presents the OLS estimations for the macroeconomic APT with TEU as the investor sentiment variable. The effect of investor sentiment on unit trust alpha is analysed on the sample period from February 2011 to August 2020. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.11 shows the GMM estimations for the period 2011 to 2020. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure and oil price. The results show that all the variables except for inflation and term structure are statistically significant. Oil price and risk premium have a positive relationship with unit trust returns meaning that an increase in these variables lead to an increase in unit trust returns. Real interest rate and industrial production have a negative relationship with unit trust returns meaning that a decrease in these variables lead to an increase in unit trust returns. The J-statistic is indistinguishable from zero, implying that the equation is correctly specified. As the J-statistic is also not large, this implies that the moment conditions underlying GMM are satisfied. The Durbin-Watson statistic is 2.48 and this indicates that the model might suffer from some negative autocorrelation.

Table 4. 11: The relationship between investor sentiment and unit trust alpha (GMM)

Variable	Coefficient	t-statistic	Probability
C	0.0116	2.4031	0.0163* *
Industrial Production	-1.2011	-3.1418	0.0017* * *
Inflation	0.0102	0.0232	0.9814
Real Interest Rate	-0.8057	-3.198	0.0014* * *
Risk Premium	0.5259	9.417	0.0000* * *
Term Structure	-0.321	-0.2406	0.8098
Oil Price	0.0546	3.2141	0.0013* * *
R-squared	0.0423		
Adjusted R-squared	0.0419		
J-statistic	6.48E-26		
Durbin-Watson Stat	2.4873		

Note: This table presents the GMM estimations for the macroeconomic APT. The effect of investor sentiment on unit trust alpha is analysed on the sample period from February 2011 to August 2020. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.12 shows the GMM estimations for the period 2011 to 2020. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure oil price and TEU. The results show that industrial production, real interest rate and risk premium are statistically significant. TEU which is the variable of interest is not statistically significant. Risk premium has a positive relationship with unit trust returns meaning that an increase in this variable leads to an increase in unit trust returns. Real interest rate and industrial production have a negative relationship with unit trust returns meaning that a decrease in these variables lead to an increase in unit trust returns. The J-statistic is indistinguishable from zero, implying that the equation is correctly specified. As the J-statistic is also not large, this implies that the moment conditions underlying GMM are satisfied. Furthermore, adding TEU to the macroeconomic APT does not improve the explanatory power of the model. The Durbin-Watson statistic is 2.48 and this indicates that the model might suffer from some negative autocorrelation.

Table 4. 12: The relationship between investor sentiment and unit trust alpha (GMM)

Variable	Coefficient	t-statistic	Probability
C	0.0114	0.7208	0.471
Industrial Production	-1.199	-4.1483	0.0000* * *
Inflation	0.0219	0.0189	0.9849
Real Interest Rate	-0.8066	-2.7436	0.0061* * *
Risk Premium	0.5248	4.4531	0.0000* * *
Term Structure	-0.2779	-0.0735	0.9414
Oil Price	0.054	1.1527	0.249
TEU	-0.0007	-0.0157	0.9874
R-squared	0.0412		
Adjusted R-squared	0.0407		
J-statistic	5.51E-26		
Durbin-Watson Stat	2.4787		

Note: This table presents the GMM estimations for the macroeconomic APT with TEU as the investor sentiment variable. The effect of investor sentiment on unit trust alpha is analysed on the sample period from February 2011 to August 2020. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.13 shows the OLS estimations for the period 2011 to 2018. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure and oil price and TEU. The dummy variable is also included as part of the independent variables. The results show that all the variables except for the real interest rate are statistically significant. Risk premium and oil price have a positive relationship with unit trust returns meaning that an increase in these variables lead to an increase in unit trust returns. Inflation, industrial production, the dummy variable, term structure and TEU have a negative relationship with unit trust returns meaning that a decrease in these variables lead to an increase in unit trust returns. The model has a poor goodness of fit as seen by a low R-squared value of 24% which implies that the model is able to explain 24% of the unit trust returns, adding a dummy variable to the macroeconomic APT which has TEU as one of the independent variables increases the explanatory power of the model by 1%. The F-statistic which is significant at the 1% level of significance indicates that the model has good significance. The Durbin-Watson statistic is slightly higher than 2 and this indicates that the model might suffer from some negative autocorrelation.

Table 4. 13: The relationship between the level of investor sentiment and the level of unit trust alpha (OLS)

Variable	Coefficient	t-statistic	Probability
C	0.0184	24.8677	0.0000* * *
Industrial Production	-0.1994	-2.9619	0.0031* * *
Inflation	-0.7283	-12.9361	0.0000* * *
Real Interest Rate	0.0468	0.7366	0.4614
Risk Premium	0.2161	29.6127	0.0000* * *
Term Structure	-2.6908	-34.8097	0.0000* * *
Oil Price	0.0726	21.5623	0.0000* * *
TEU	-0.0103	-10.226	0.0000* * *
Dummy	-0.013	-13.7702	0.0000* * *
R-squared	0.2459		
Adjusted R-squared	0.2454		
F-statistic	529.4071		
Prob (F-statistic)	0		
Durbin-Watson Stat	2.4963		

Note: This table presents the OLS estimations for the macroeconomic APT with EPU as the investor sentiment variable. The effect of the level of investor sentiment on the level of unit trust alpha is analysed on the sample period from February 2011 to August 2020. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Table 4.14 shows the GMM estimations for the period 2011 to 2020. The model is estimated using returns as the dependent variable. The independent variables are industrial production, inflation, real interest rate, risk premium, term structure, oil price, TEU and the dummy variable. The results show that all the variables are not statistically significant. The J-statistic is indistinguishable from zero, implying that the equation is correctly specified. As the J-statistic is not large, this implies that the moment conditions underlying GMM are satisfied. The Durbin-Watson statistic is almost 2 and this indicates that the model does not suffer from autocorrelation. The model is inconsistent with its OLS counterpart in that all the variables are found to be statistically insignificant.

Table 4. 14: The relationship between the level of investor sentiment and the level of unit trust alpha (GMM)

Variable	Coefficient	t-statistic	Probability
C	-0.0432	-0.4982	0.6183
Industrial Production	1.3945	0.2611	0.794
Inflation	2.2008	0.6427	0.5204
Real Interest Rate	0.1546	0.0654	0.9479
Risk Premium	0.9654	0.9079	0.3639
Term Structure	19.082	0.5838	0.5593
Oil Price	-0.2415	-0.4719	0.637
TEU	-0.0613	-0.652	0.5144
Dummy	0.0842	0.5247	0.5998
R-squared	-5.8395		
Adjusted R-squared	-5.8437		
J-statistic	8.86E-23		
Durbin-Watson Stat	2.1344		

Note: This table presents the GMM estimations for the macroeconomic APT with EPU as the investor sentiment variable. The effect of the level of investor sentiment on the level of unit trust alpha is analysed on the sample period from February 2011 to August 2020. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Due to the macroeconomic nature of the variables, a correlation analysis (shown is appendix B) was conducted to assess the potential correlation between various variables to get a sense of variables that may lead to spurious results. The results show that there are no variables with a high correlation. The correlation matrix included all variables for the period 2011-2018 and for the period 2011-2020.

4.3 Discussion of results

The GMM regression for the period 2011 to 2018 shows that there is a positive relationship between inflation and unit trust returns. In general, inflation is inversely related to interest bearing assets and thus to interest bearing mutual funds. This is primarily because of the eroding effect of inflation on value. However, in the past, equity diversified mutual funds have been immune to this eroding effect (Gyimah, Addai and Asamoah, 2021). In the eyes of the investor and the lender, this eroding effect can be transferred to borrowers, raising the returns on interest bearing assets and as a result, interest bearing mutual funds. This assertion is supported by Panigrahil, Karwa and Joshi (2020) who find that inflation positively affects mutual fund returns in a study that looks at the macroeconomic factors that affects mutual fund performance in India. They say that although risk will increase with the rise in inflation rate, the performance of mutual funds tends to be enhanced by this. Contrary to this, in the case where inflation is found to be statistically significant, all the OLS regressions show that there is a negative relationship between inflation and unit trust returns. Dalimunthe and Lestari (2019) state that a negative relationship between inflation and mutual fund returns is associated with the fact that an increase in interest rates prompts investors to seek for alternative investments which give them higher interest rates. Due to this, equity and bonds instruments will be sold, and this will lead to a decline in the prices of bonds, stocks and mutual funds. A converse to this is lower interest rates will prompt investor to seek investments that give them higher returns than deposits. In this case, stocks and bonds will be preferred and as a result, the demand for stocks, bonds and mutual funds will be on the rise. It is in this sense that an increase in inflation can lead to a poor performance in mutual funds and vice versa.

The negative relationship between inflation and returns implies that a fund manager in South Africa seeking to realise a positive alpha might need to create a fund that can benefit from such a relationship and such a fund can be one that is not overly concentrated on equities and bonds as the prices for these decline during periods where inflation is high. Krishnamurty, Pelletier and Warr (2018) also find a negative relationship between inflation and mutual fund returns. Their study focused on mutual funds in the USA, and they state that this relationship is partly due to the inflation illusion hypothesis. The hypothesis is that investors raise the discount rate used in the valuation of stocks when inflation is high, but they do not account for the effect of inflation when they calculate the nominal growth rate of cash flows. The impact of this is that investors will have the tendency to put less value on stocks when inflation increases, and this will prompt them to shift their assets away from equities.

In their study where they investigate the relationship between macroeconomic variables and stock returns, Chen, Roll and Ross (1986) find that several macroeconomic factors such as inflation rate and interest rate affect returns while a factor such as oil price is not a reward risk factor. In this study, where oil price is statistically significant, it is found to have a positive relationship with unit trust returns except for one GMM regression with EPU. This would be in line with a study by Basher and Sadorsky (2006) who investigated a relationship between oil price and returns in emerging countries such as Brazil, Russia, India and China and find that there is a positive relationship between oil price and returns. It would be reasonable for one to expect the South African market to behave in the same manner as it is also classified as an emerging country and usually grouped with these countries under the BRICS umbrella. The link between oil price and returns is not apparent and often requires a deeper analysis. Given the conventional finance wisdom that the present value of a firm is calculated by discounting its future cashflow at a discount rate, this has implications that the returns will be affected by market wide movements in expected future cash flow as well as the discount rates. It follows that when oil prices increase or decrease, the impact of this is that the cashflow of the firm can be positive or negative and this will be determined by whether a firm is a consumer of oil or a producer of oil (Mohanty et al, 2011). In the same way, when the oil price increases, this can have an impact on discount rates which results in the hurdle rate increasing. A hurdle rate that is high can have a negative effect on the stock price of a firm and thus its returns. Essentially, how oil price affects the returns of a firm is dependent on the net effects that emerge as a result of changes in expected cashflow and expected discount rates. From this one can say that the impact of oil price on returns can be better understood when one is looking at similar firms or funds that invest in similar firms. This is where diversification can become important for fund managers. In a South African context, a fund manager would not want to be managing a fund that is overly exposed to similar types of firms. In this sense, it would not be a good idea for a fund to be overly exposed to firms that are either net consumers of oil or net producers of oil. A manager should seek to hold a balance between the two because an unfavourable movement in the oil price can negatively impact the returns and thus alpha if the fund is overly exposed to stocks that are not benefiting from the movement of oil price. Shabbir, Kousar and Batool (2020) state that fluctuations in oil prices can cause changes in stock prices. They state that "inefficient market oil price and stock price are contemporaneously correlated" and thus if oil prices rise, this will cause the share prices of companies who are oil consumers to fall.

Regarding the real interest rate, the study finds that it is negatively related to unit trust returns. Intuitively, rising interest rates makes it more expensive to borrow and due to this, investors find it less desirable to borrow when interest rates are rising. Debt instruments are the most likely to be

affected by raising interest rates and an example would be that when interest rates are high, bond prices will decline so as to make the yields on the bonds more attractive and compete for investors. Mutual funds that have bonds with longer maturities as part of their asset classes are the most likely to be affected by rising interest rates since prices for the bond asset classes may decrease as interest rates increase.

The study also finds a negative relationship between returns and term structure. Lockwood (1999) states that is due to mutual fund managers shifting to assets which have shorter terms and lower betas as the capital markets see an increase in the maturity risk aversion between investors. There are few studies that look at term structure in relation to returns but several studies like Rjoub, Tursoy and Gunsel (2009) and Leite and Cortez (2009) find a positive relationship between term structure and returns in Europe. In the case where risk premium is found to be statistically significant, the study finds that there is a positive relationship between risk premium and returns in the majority of the regressions. Risk premium is an important consideration for any investor because it plays a role in the saving and spending behaviour and especially in the asset allocation decision when an investor must choose between investing in a riskless asset, a risky asset or a combination of both. Industrial Production was also found to be statistically significant, but the study is inconclusive regarding the relationship between industrial production and unit trust returns.

The nature of the study makes it important to discuss the investor sentiment proxies used in the study. Economic Policy Uncertainty was found to be statistically significant in explaining unit trust returns in all of the regressions where it was included as an independent variable. It is not a far-fetched idea for one to want to consider the Economic Policy Uncertainty Index when one is dealing with a model for explaining returns which has macroeconomic factors. One can argue that economic policies are most likely to have a link with market regulations and since market regulations can affect a firm depending on how the regulation affects the operating model of the firm, one would expect investors to constantly be aware of market regulations or policies because these can have a direct impact on their portfolios. Although this is a South African study one can bring the point across by looking at a country like China which has recently (2021) passed regulations which are meant to be against monopolies in the technology sector. This move saw Chinese technology stocks performing poorly. Around the same time China also passed policies which banned businesses whose models are based on private teaching or private education and this again brought about a poor performance by stocks in the education sector. These examples are highlighted so as to make the point that economic policies and market regulations are intertwined and thus one would expect an index that captures sentiments about economic policies and market regulations to have an impact on returns. If one were to look

explicitly at South Africa, it is a country that has been recently clouded by discussions of land reform and in some cases, nationalisation of mines and banks. It would not be unreasonable for one to expect uncertainties around these policies to reflect in returns.

Another point that relates to the Economic Policy Uncertainty is that upward and downward movements in the business cycle are a key contributor to the movements in stock markets. According to Liu and Zhang (2015), EPU can aid in predicting recessions and other business cycle movements. One can say that the ability to predict something as significant as a recession can be a useful tool for fund managers as it can aid them in making key investment decisions such as moving towards stocks that are inelastic during recession times. This study finds that EPU is statistically significant in explaining unit trust returns but is inconclusive as to how the relationship between EPU and unit trust returns is. Li (2020) attempts to explain the rationale of a positive relationship between EPU, and mutual fund returns and states that fund managers are determined to increase their risk levels when the uncertainty around policies is high. He states that the motivation behind raising risk levels is because managers want to attain the limited money in the markets when the market sentiment is pessimistic and from this there is a postulation that high risk levels are usually associated with returns. Contrary to this, Chen, Jiang and Tong (2017) state that EPU is negatively related to returns which is in line with several studies involving behavioural asset pricing models as "high uncertainty amplifies behavioural biases and generates speculative mis-pricing under short sales constraints".

The other investor sentiment proxy used in the study was the Twitter Economic Uncertainty index and this was found to be statistically significant. The relationship between Twitter Economic Uncertainty and returns was found to be negative. This is not a surprising result and is in line with several studies. Internet based measures for investor sentiment have been used in studies such as Solanki and Seetharam (2018) who found that FEARS is a statistically significant variable in an asset pricing model in a South African context. As Twitter is a communication platform, it is likely to capture how people feel about topics such as the economy and the financial markets. It follows that how people invest and/or trade is likely to be affected by how they feel. Kahneman and Tversky (1979) stated that people have a tendency to be loss-averse and as a result they place more significance on losses than on gains. Due to this, investors are more likely to prefer stocks that are perceived to have performed good in the past as opposed to stocks that are perceived to have performed bad in the past. This can lead to a preference in particular stocks, funds or asset class thus leading to a demand for those particular stocks, funds or asset classes. A high demand for a particular stock can influence fund managers to make asset allocation decisions that do not necessarily allows for optimal diversification. This analysis becomes particularly important for fund managers as they have to make

capital allocation decisions. Fund managers should be cognisant of the fact that when stock prices do not properly mirror fundamental values, allocation of capital in a manner that is not efficient may occur (Smales, 2017).

A high value for the Twitter Economic Uncertainty proxy implies that investors are highly uncertain about the economy and as Chen, Jiang and Tong (2017) state, periods of high uncertainty are associated with behavioural biases among investors, and this can lead to speculative mispricing of assets. The study shows that both the proxies used for investor sentiment are statistically significant and this comes with some implications. If there are other various factors such as investor sentiment that affect unit trust returns beside factors prescribed by the macroeconomic APT, it means that alphas analysed using the traditional macroeconomic APT do not reflect the pure skills of a fund manager. If the alpha is reduced after investor sentiment is taken into account, one can say that perhaps there is an aggrandisement of the skills of the fund manager because another manager could achieve the same alpha by holding stocks that are highly sensitive to investor sentiment.

It becomes important to mention that the statistically significant variables mentioned above are not found across all regressions and even when they are found within the GMM or OLS framework, there is no uniformity with regard to how different variables behave. The OLS regressions where EPU is used as an investor sentiment variable suggests that the macroeconomic APT is a poor model and this is seen by a low R-squared value. The GMM regressions are all characterized by low R-squared values suggesting that the macroeconomic APT does not do a good job at explaining unit trust returns. The negative r squared value for GMM regressions could mean that GMM is not a suitable regression method to be used for this study. The OLS regressions where TEU is used as the investor sentiment proxy have a slightly higher R-squared values as compared to the models previously mentioned although the R-squared values are still low. It would not be far-fetched to say that this model shows some signs that the macroeconomic APT can be used to explains returns. Adding the investor sentiment proxies to the macroeconomic APT does not generally seem to improve the explanatory power of the macroeconomic APT and this is for both the GMM and OLS regressions. The R-squared increases by very small amounts under the OLS framework for both the EPU and TEU and the increments are by 1% and 2% respectively. The key taking from these results is that investor sentiment as measured by TEU and EPU is a statistically significant variable in an asset pricing model and thus it is not captured by alpha. Under the OLS framework, the addition of the dummy variable which was used to define the levels of the investor sentiment variable showed that high levels of investor sentiment are associated with high levels of unit trust returns and vice versa even though the R-squired increments associated with the addition of the dummy variables are very small. One can

say that this evidence is not enough to properly postulate a relationship between the level of investor sentiment and the level of unit trust returns. A slightly higher improvement of the R-squared values when the dummy is added to the macroeconomic APT would imply that fund managers have higher chances for generating alpha when investor sentiment levels are high but an improvement by 1% and 2% for the EPU and TEU respectively is not compelling enough for one to make that argument.

Overall, the study shows that investor sentiment is a statistically significant variable in an asset pricing model. Although all the two proxies used in the study are statistically significant, the results are inconclusive as to the nature of the relationship between EPU and unit trust returns while TEU was shown to have a negative relationship with unit trust returns. It is better understood to say that EPU and TEU are important factors in explaining unit trust returns and thus are not captured by unit trust alpha.

4.4 Summary

The OLS and GMM regressions show different results with regard to the relationship between various macroeconomic variables and unit trust returns. Various macroeconomic variables including term structure and inflation show statistical significance under the OLS framework and GMM framework. The variables of interest which are the EPU and the TEU show statistical significance, but TEU is only statistically significant under the OLS framework. The study does not show enough evidence to conclude on the relationship between the level of investor sentiment level and the level of unit trust alpha.

5 CONCLUSION

In the world of investments, skilled managers are characterised by their ability to generate positive alpha. Alpha is the difference between the expected return of a fund and the actual return of a fund based on a benchmark model. The immediate question is are these managers who are deemed to be skilled, really skilled or does alpha capture some unexplained factors that do not necessarily amount to skill? Most of the models used to calculate alpha assume investor rationality and an example of such a model is the CAPM and extensions of the CAPM. Studies such as De Bondt and Thaler (1985) have argued that investors have a tendency to overreact to dramatic events thus showing that investors are not inherently rational. The implication is that models like the CAPM are based on flawed assumptions and should be used cautiously.

Seeing that the CAPM can be somewhat inadequate, several studies have proposed the macro-economic and micro-economic APT as appropriate to be used as a benchmark model. These models give room for various factors to be considered as risk factors. This study takes a keen interest in exploring the feelings and emotions of investors as a possible risk factor, recognising the fact that factors used in these benchmark models can be classified to be traditional factors. Investor sentiment is not a traditional factor and is generally not considered in these models which are used to explain alpha. If investor sentiment is a significant factor, investors that do account for investor sentiment exhibit a greater level of skill than those who don't, because it is shown that investor sentiment is a significant deterministic factor of portfolio returns.

The study attempted to understand the relationship between investor sentiment and unit trust alpha by investigating two questions. The first one is whether invest sentiment is a statistically significant factor in an asset pricing model thereby being captured by alpha. The second question is whether the level of investor sentiment affects the level of alpha. The study that finds that when EPU is used as a proxy for investor sentiment, it is found that investor sentiment is a statistically significant variable and when TEU is used as a proxy for investor sentiment, it is also found to be a statistically significant factor. With regard to the second question, the evidence is not strong enough to say that the level of alpha is high when the investor sentiment level is high or vice versa. From this, the reader can take away the fact that the analysis of unit trust alpha by only using traditional models do not tell a full story and perhaps models that incorporate investor sentiment can give an enhanced picture about alpha.

5.1 Limitations

The study used the macro-economic APT model which is not by any means the standard model used in asset management (although there is no consensus as to which model is accurate for use). For this reason, the study might not be comparable to other studies in asset management. Secondly, the development of an investor sentiment proxy is a work in progress in the finance literature and thus it is possible that EPU and TEU as used in this study, do not fully capture investor sentiment. Thirdly, due to the availability of data, the sample is only limited to South African unit trusts and as result, the analysis might give a myopic picture about the relationship between investor sentiment and unit trust alpha because of the narrow focus. The study may suffer from survivorship bias in that only funds with complete return information were included in the study.

5.2 Areas of future research

The process of forming a portfolio usually involves classifying assets into various classes such as equity, bonds and others. This distinction is important because different asset classes offer different risk and return prospects. For example, bonds are seen to be relatively less risky as compared to stocks and thus an investor with a lower risk preference might prefer bonds to stocks. Equally so, there are other several ways to form portfolios and one of the ways is called style investing where portfolios are formed according to various styles. Some of the known styles include value, momentum and quality. An interesting area of future research would be to investigate whether investor sentiment can be used as a style that can produce superior returns in the short term and in the long term.

REFERENCES

Anadu, K., Kruttli, M., McCabe, P., & Osambela, E. (2020). The Shift from Active to Passive Investing: Risks to Financial Stability?. *Financial Analysts Journal*, 1.

Baker, S. R., Bloom, N., & Davis, S. J. (2012). Measuring economic policy uncertainty. Stanford mimeo.

Baker, S. R., Bloom, N., Davis, S. J., & Renault, T. (2021). Twitter-Derived Measures of Economic Uncertainty.

Baker, M., & Wurgler, J. (2006). Investor sentiment and the cross-section of stock returns. *The journal of Finance*, *61*(4), 1645-1680.

Bandopadhyaya, A., & Jones, A. L. (2006). Measuring investor sentiment in equity markets. *Journal of Asset Management*, *7*(3-4), 208-215.

Basher, S. A., & Sadorsky, P. (2006). Oil price risk and emerging stock markets. *Global finance journal*, *17*(2), 224-251.

Benhabib, J., Liu, X., & Wang, P. (2016). Sentiments, financial markets, and macroeconomic fluctuations. *Journal of Financial Economics*, *120*(2), 420-443.

Bu, Q. (2020). Mutual Fund Alpha: Is It Managerial or Emotional?. *Journal of Behavioral Finance*, 1-10.

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of finance*, *52*(1), 57-82.

Carosa, C. (2005). Passive Investing: The Emperor Exposed?. *Journal of Financial Planning*, *18*(10).

Chan, F., Durand, R. B., Khuu, J., & Smales, L. A. (2017). The validity of investor sentiment proxies. *International Review of Finance*, *17*(3), 473-477.

Chen, J., Jiang, F., & Tong, G. (2017). Economic policy uncertainty in China and stock market expected returns. *Accounting & Finance*, *57*(5), 1265-1286.

Chen, N., Roll, R., & Stephen, A. (1986). Ross, 1986, Economic forces and the stock market. *Journal of Business*, *59*(3), 383-403.

Chen, H. K., & Lien, C. T. (2017). Market reaction to macroeconomic news: the role of investor sentiment. *Asia-Pacific Journal of Financial Studies*, *46*(6), 853-875.

Da, Z., Engelberg, J., & Gao, P. (2015). The sum of all FEARS investor sentiment and asset prices. *The Review of Financial Studies*, *28*(1), 1-32.

Dalimunthe, I. P., & Lestari, A. D. (2019). Effect of Inflation and Price Index on Equity Assets. *Economics and Accounting Journal*, *2*(1), 42-51.

De Bondt, W. F., & Thaler, R. (1985). Does the stock market overreact?. *The Journal of finance*, *40*(3), 793-805.

Dempsey, M. (2013). The capital asset pricing model (CAPM): the history of a failed revolutionary idea in finance?. *Abacus*, *49*, 7-23.

Dolinar, D., Orsag, S., & Suman, P. (2015). Test of the Chen-Roll-Ross macroeconomic factor model: Evidence from Croatian stock market. *UTMS Journal of Economics*, *6*(2), 185-196.

Fama, E.F (1970). Efficient capital markets: a review of theory and empirical work. *Journal of finance*, *25*(2), 383-417.

Fama, E., & French, K. (1993). Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics*, *33*(1), 3-56.

Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. *Journal of financial economics*, *116*(1), 1-22.

Gyamfi Gyimah, A., Addai, B., & Asamoah, G. K. (2021). Macroeconomic determinants of mutual funds performance in Ghana. *Cogent Economics & Finance*, *9*(1), 1913876.

Hansen, L. P. (2010). Generalized method of moments estimation. In *Macroeconometrics and Time series Analysis* (pp. 105-118). Palgrave Macmillan, London.

Hlatshwayo, S., & Saxegaard, M. M. (2016). *The consequences of policy uncertainty: Disconnects and dilutions in the South African real effective exchange rate-export relationship*. International Monetary Fund.

Jensen, M. C. (1968). The performance of mutual funds in the period 1945-1964. *The Journal of finance*, *23*(2), 389-416.

Jensen, M. C., & Benington, G. A. (1970). Random walks and technical theories: Some additional evidence. *The Journal of Finance*, *25*(2), 469-482.

Kosowski, R., Timmermann, A., Wermers, R., & White, H. (2006). Can mutual fund "stars" really pick stocks? New evidence from a bootstrap analysis. *The Journal of finance*, *61*(6), 2551-2595.

Lee, E. P. K. (2013). Individual stock investor sentiment, stock issuance, and financial market anomalies.

Leite, P. A., & Cortez, M. C. (2009). Conditioning information in mutual fund performance evaluation: Portuguese evidence. *The European Journal of Finance*, *15*(5-6), 585-605.

Li, Z. (2020). Economic Policy Uncertainty and Mutual Fund's Risk Adjusting Behavior in China. *Modern Economy*, *11*(3), 609-619.

Liston, D. P. (2016). Sin stock returns and investor sentiment. *The quarterly review of economics and finance*, *59*, 63-70.

Liu, L., & Zhang, T. (2015). Economic policy uncertainty and stock market volatility. *Finance Research Letters*, *15*, 99-105.

Lo, A. W. (2016). What is an index?. *The Journal of Portfolio Management*, *42*(2), 21-36.

Lockwood, L. J. (1996). Macroeconomic forces and mutual fund betas. *Financial Review*, *31*(4), 747-763.

Lowies, G. A., Hall, J. H., & Cloete, C. E. (2015). The role of market fundamentals versus market sentiment in property investment decision-making in South Africa. *Journal of Real Estate Literature*, *23*(2), 297-314.

Malkiel, B. G. (2003). Passive investment strategies and efficient markets. *European Financial Management*, *9*(1), 1-10.

Makololo, P., & Seetharam, Y. (2020). The effect of economic policy uncertainty and herding on leverage: An examination of the BRICS countries. *Cogent Economics & Finance*, *8*(1), 1821482.

Mohanty, S. K., Nandha, M., Turkistani, A. Q., & Alaitani, M. Y. (2011). Oil price movements and stock market returns: Evidence from Gulf Cooperation Council (GCC) countries. *Global Finance Journal*, *22*(1), 42-55.

Page, D., & Auret, C. (2019). A panel-data analysis of the explanatory power of factor premiums on the Johannesburg Stock Exchange (JSE). *Investment Analysts Journal*, *48*(2), 102-113.

Panigrahi, A., Karwa, P., & Joshi, P. (2019). Impact of macroeconomic variables on the performance of mutual funds: a selective study. Economic Policy and Research, 15(1), 29.

Rjoub, H., Türsoy, T., & Günsel, N. (2009). The effects of macroeconomic factors on stock returns: Istanbul Stock Market. *Studies in Economics and Finance*.

Roll, R. (1977). A critique of the asset pricing theory's tests Part I: On past and potential testability of the theory. *Journal of financial economics*, *4*(2), 129-176.

Ross, S. (1976). The arbitrage theory of capital asset pricing. *Journal of Economic Theory*, *13*(3), 341-360.

Rupande, L., Muguto, H. T., & Muzindutsi, P. F. (2019). Investor sentiment and stock return volatility: Evidence from the Johannesburg Stock Exchange. *Cogent Economics & Finance*, *7*(1).

Schmeling, M. (2009). Investor sentiment and stock returns: Some international evidence. *Journal of empirical finance*, *16*(3), 394-408.

Shabbir, A., Kousar, S., & Batool, S. A. (2020). Impact of gold and oil prices on the stock market in Pakistan. *Journal of Economics, Finance and Administrative Science*.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The journal of finance*, *19*(3), 425-442.

Shen, J., Yu, J., & Zhao, S. (2017). Investor sentiment and economic forces. *Journal of Monetary Economics*, *86*, 1-21.

Smales, L. A. (2017). The importance of fear: investor sentiment and stock market returns. *Applied Economics*, *49*(34), 3395-3421.

Solanki, K., & Seetharam, Y. (2014). Is consumer confidence an indicator of JSE performance?. *Contemporary Economics*, *8*(3), 257-274.

Solanki, K., & Seetharam, Y. (2018). Is investor sentiment a relevant factor in determining asset prices?. *Investment Analysts Journal*, *47*(3), 243-257.

Stark, J. R. (2019). Decomposing mutual fund alpha into security selection and security weighting. *Journal of Empirical Finance*, *52*, 76-91.

Sturm, R. R. (2014). A turning point method for measuring investor sentiment. *Journal of Behavioral Finance*, *15*(1), 30-42.

Sushko, V., & Turner, G. (2018). The implications of passive investing for securities markets. *BIS Quarterly Review, March*.

Tversky, A., & Kahneman, D. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*(2), 263-291.

Uwubanmwen, A. E., & Obayagbona, J. (2012). Tests of the arbitrage pricing theory using macroeconomic variables in the Nigerian stock market. *Ethiopian Journal of Economics, 21*(1), 1-18.

Van Rensburg, P. (2000). Macroeconomic variables and the cross-section of Johannesburg Stock Exchange returns. *South African Journal of Business Management, 31*(1), 31-43.

Wang, M. S., & Chen, T. Y. (2012). Market momentum, macroeconomic factors, and investor sentiment: Using the VAR model to evidence from Taiwan stock exchange. *Journal of Statistics and Management Systems*, *15*(1), 119-156.

Wooldridge, J. M. (2001). Applications of generalized method of moments estimation. *Journal of Economic perspectives*, *15*(4), 87-100.

Yilmiz, M. H., Mubeen, M., & Bulut, E. (2014). Economic Forces and Stock Markets under Arbitrage Price Theory: Empirical Evidence from Turkey. *Journal of Poverty, Investment and Development*.

Zsohar, P. (2012). Short introduction to the generalized method of moments. *Hungarian statistical review*, *16*, 150-170.

Appendix A: Unit Root Tests

Table A. 1: Levin, Lin and Chu tests (2011-2018)

Variable	**t-statistic**
Returns	0.0000***
Industrial Production	0.0000***
Inflation	0.0000***
Real Interest Rate	0.0000***
Risk Premium	0.9711
Term Structure	0.0010***
Oil Price	0.0000***
EPU	0.0000***

Note: This table presents the Levin, Lin and Chu tests for all the variables for the period 2011-2018. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level. Risk Premium was found to be stationary at first difference.

Table A. 2: Levin, Lin and Chu tests (2011-2020)

Variable	**t-statistic**
Returns	0.0000***
Industrial Production	0.0000***
Inflation	0.0000***
Real Interest Rate	0.9325
Risk Premium	0.9222
Term Structure	0.9332
Oil Price	0.0000***
TEU	0.0000***

Note: This table presents the Levin, Lin and Chu tests for all the variables for the period 2011-2020. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level. Real Interest Rate, Risk Premium and term structure were found to be stationary at first difference.

Appendix B: Correlation Results

Table B. 1: Correlation Matrix (2011-2018)

Covariance Analysis: Ordinary

Sample: 2011M02 2018M09
Included observations: 10488

Correlation Probability	EPU	INDUSTRIA...	INFLATION	OIL_PRICE	REAL_INTE...	RETURNS	RISK_PREM...	TERM_STR...
EPU	1.000000 -----							
INDUSTRIAL_PRO...	0.146605 0.0000	1.000000 -----						
INFLATION	-0.182630 0.0000	0.309554 0.0000	1.000000 -----					
OIL_PRICE	0.059290 0.0000	0.404787 0.0000	0.228668 0.0000	1.000000 -----				
REAL_INTEREST_...	0.095663 0.0000	-0.237707 0.0000	-0.593283 0.0000	-0.071925 0.0000	1.000000 -----			
RETURNS	-0.009043 0.3545	0.094695 0.0000	0.005073 0.6035	0.193285 0.0000	-0.119914 0.0000	1.000000 -----		
RISK_PREMIUM	0.066506 0.0000	-0.167863 0.0000	-0.058724 0.0000	-0.019792 0.0427	0.059217 0.0000	0.050600 0.0000	1.000000 -----	
TERM_STRUCTURE	0.087843 0.0000	0.347243 0.0000	0.192093 0.0000	0.151666 0.0000	-0.652459 0.0000	0.089086 0.0000	-0.268820 0.0000	1.000000 -----

Table B. 2: Correlation Matrix (2011-2020)

Covariance Analysis: Ordinary

Sample: 2011M02 2020M08
Included observations: 13110

Correlation Probability	RETURNS	INDUSTRIA...	INFLATION	REAL_INTE...	RISK_PREM...	TERM_STR...	OIL_PRICE	TEU
RETURNS	1.000000 -----							
INDUSTRIAL_PRO...	0.021291 0.0148	1.000000 -----						
INFLATION	-0.088324 0.0000	0.381925 0.0000	1.000000 -----					
REAL_INTEREST_...	-0.067183 0.0000	-0.310163 0.0000	-0.598833 0.0000	1.000000 -----				
RISK_PREMIUM	0.113771 0.0000	-0.018758 0.0317	0.123767 0.0000	0.015597 0.0741	1.000000 -----			
TERM_STRUCTURE	-0.023665 0.0067	0.156507 0.0000	-0.047379 0.0000	-0.506520 0.0000	-0.465618 0.0000	1.000000 -----		
OIL_PRICE	0.229595 0.0000	0.351171 0.0000	0.119584 0.0000	-0.157849 0.0000	0.206433 0.0000	0.068799 0.0000	1.000000 -----	
TEU	-0.192554 0.0000	-0.141933 0.0000	0.170833 0.0000	-0.014918 0.0876	-0.118763 0.0000	-0.007984 0.3607	-0.279265 0.0000	1.000000 -----