Zurich University of Applied Sciences
ZHAW

School of Management and Law
Department Banking, Finance, Insurance

Bachelor of Science in Business Administration – Major Banking and Finance

Bachelor's Thesis

Value versus Growth: Style factors during extraordinary times

Author:
Tia Oreskovic

Supervisor:
Dr. Marc Weibel
Lecturer in Data Science

Winterthur, May 31, 2023

Management Summary

Value and growth investing have long been the subject of debate among investors due to their distinct characteristics and performance patterns. Growth stocks, driven by high sales and earnings growth rates, often command premium valuations based on expectations of future price appreciation. In contrast, value stocks trade at lower multiples and include companies facing economic challenges or declining popularity. The COVID-19 pandemic and the Ukraine-Russia conflict served as extreme market conditions, shedding light on the performance of these investment styles. This study critically examined their performance during these periods, aiming to uncover any significant differences between them amidst market turmoil. Additionally, the study explored the potential benefits of constructing a portfolio that combined value and growth strategies. By linking the portfolio weights to the US Purchasing Managers' Index, the goal was to generate higher returns. The investigation explored whether overweighting or underweighting the two styles within a portfolio can surpass the performance of individual style investments. Employing a mixed-method approach, the study included a literature review, quantitative analysis of the S&P500 Value Index and S&P500 Growth Index, and portfolio construction. The aim was to identify the drivers of performance, compare index returns, and assess the advantages of combining value and growth in a portfolio. During the COVID-19 pandemic, growth investing generally outperformed value investing due to the favorable positioning of growth companies in technology and healthcare sectors. The increased demand for digital services and remote work technologies, coupled with advancements in healthcare solutions, contributed to the positive performance of growth stocks. In contrast, value stocks faced challenges in industries heavily affected by the pandemic, such as energy, retail, and travel. The study acknowledged that the performance of value and growth investing can vary across different market conditions and timeframes. Notably, during the Ukraine-Russia conflict, value investing exhibited notable outperformance compared to growth investing. These findings emphasize the importance of considering the specific market conditions and timeframes when evaluating the performance of value and growth investing. The thesis underscores the complexity involved in timing market factors and highlights the need for careful analysis and assessment when constructing investment portfolios. Overall, the thesis emphasizes the significant divergence in performance between value and growth investing across different periods.

Table of Contents

List of Tables

List of Figures

1. Introduction

1.1. Initial situation

The eternal battle between value and growth investing continues to fascinate investors worldwide. For decades, these two investment styles have been pitted against each other in a never-ending debate over which approach is superior (Ferber, 2017). Both have a proven track record over time. However, they are based on very different investment philosophies, have unique advantages and disadvantages, and perform very differently in different market environments (Chan & Lakonishok, 2004, p. 71).

Growth stocks, which include companies with higher sales and earnings growth rates relative to the expected economic growth rate, are associated with premium valuations. This is primarily due to investors' anticipation of share price appreciation corresponding with the company's remarkable growth trajectory (Marks, 2021, p. 3).

Value stocks are characterized by their tendency to trade at lower multiples of earnings or book value than growth stocks, often below market averages. This group includes businesses that are facing a decline in popularity or have been negatively affected by the current economic situation (Marks, 2021, p. 4). Bellone et al. (2019, p. 6) suggest that value strategies perform well when interest rates rise, such as in the aftermath of economic and financial crises characterized by significant risk premia. In addition, value styles tend to excel during periods of rising inflationary expectations, such as during commodity booms or in the later stages of the economic cycle when there is a greater likelihood of rising real interest rates (Bellone, 2019, p. 6). On the other hand, growth stocks can offer significant upside potential during periods of strong economic growth and favorable market conditions.

The recent market crises, triggered by the COVID-19 pandemic and the Ukraine-Russia conflict, showed how different investment styles can perform in extreme market conditions (Gambarini, 2023). During the initial market crash in March 2020, growth stocks outperformed value stocks as investors rushed to buy shares in companies expected to benefit from the pandemic-induced shift towards remote working and online shopping. Value stocks suffered significant losses, particularly in the energy and financial sectors (Bickford, 2020). The outbreak of conflict between Russia and Ukraine immediately and profoundly impacted global markets. The beginning of the war caused energy prices to increase suddenly, which impacted consumers and industries with high energy expenses (Boungou & Yatié, 2022, p 1). This was especially true for countries that rely heavily on energy imports from Russia. In addition, this spike exacerbated an already precarious inflationary scenario stemming in part from the implementation of highly expansionary fiscal and monetary policies at the height of the COVID-19 crisis (Menges & Rabattu, 2022).

1.2. Problem definition and relevance of the topic

In the challenges posed by the COVID-19 pandemic and the Ukraine-Russia conflict, the central issue revolves around comprehending the performance of value and growth investment strategies. The current market situation is marked by heightened volatility, uncertainty, and an economic downturn. Consequently, effective investment strategies need to be embraced by investors in order to navigate these uncertain times, safeguard their capital, and generate favorable returns. The ongoing debate surrounding the advantages of *Value versus Growth* investing amplifies the significance of this aim.

1.3. Objectives and research questions

This paper critically examines the performance of value and growth investing during the COVID-19 pandemic and the Ukraine-Russia conflict. The study aims to answer the following research questions:

1. How did value and growth investing perform during these two exceptional situations of i) the COVID-19 pandemic and ii) the Ukraine-Russia conflict, characterized by high volatility and uncertainty in financial markets? Were there any significant performance differences between the two styles during these periods of market turmoil?
2. Is it possible to construct a portfolio that combines the two strategies by linking the respective portfolio weights to the US Purchasing Managers' Index (PMI) to generate higher returns? In particular, can overweighting or underweighting the two styles within a portfolio lead to better performance than investing in each style separately?

By answering these research questions, this study aims to contribute to the existing literature on the *Value versus Growth* debate and provide insights for investors who wish to allocate their assets within the framework of value and growth investing.

1.4. Methods

The methods used in this thesis include both qualitative and quantitative approaches. First, a comprehensive literature review is conducted to summarize the current state of research on factor investing and the two styles, value and growth. This will help to identify the key performance drivers and the reasons for the performance differences between the two styles.

Second, a quantitative analysis of the performance of the S&P500 Value Index (SVX) and S&P500 Growth Index (SGX) during the COVID-19 pandemic and the Ukraine-Russia conflict is performed. This is done by comparing the time series of daily returns of the two indices. This analysis will provide insights into which of the two styles performed better.

Third, a portfolio is constructed with an initial allocation of 50% in the SVX and 50% in the SGX. In order to determine whether the portfolio should be overweight or underweight in one of the two indices going forward, the US PMI data for the same period is used as an indicator. The returns of this newly formed portfolio are then compared with the performance of the two individual styles.

Overall, the thesis uses a mixed-method approach to provide a comprehensive analysis of the performance of *Value versus Growth* investing during the COVID-19 pandemic and the Ukraine-Russia conflict. The quantitative analysis will provide empirical evidence to support the findings from the literature review. In contrast, the portfolio construction will provide insights into the potential benefits of combining the two styles in a portfolio.

1.5. Limitations

The purpose of this paper is to analyze the performance of *Value versus Growth* using only the SVX and SGX indices. The two S&P500 indices that focus on different styles, namely value and growth, are the focus of this study, although there are many other style indices. While investment performance is influenced by economic indicators, it is important to recognize that performance is influenced by multiple indicators rather than a single one. The analysis in this paper focuses specifically on assessing the suitability of the US PMI as an indicator for constructing portfolios in these two styles. However, it is important to remember that future performance cannot be guaranteed on the basis of past performance alone. Therefore, statements made in this paper should be treated with caution.

1.6. Structure of the thesis

This study is divided into seven chapters. Chapter One explains the problem, research questions, and methodology. Chapter Two provides an overview of existing literature on the performance of value and growth investing, followed by the theoretical foundations in Chapter Three. Chapter Four describes the data used in the analysis, including the methodology of the SVX and SGX and the US PMI data. Chapter Five explains the methodological approach, including the performance indicators, portfolio construction, and regressions' specifications. In Chapter Six, the results are analyzed, explained, and summarized. Chapter Seven answers the research questions, interprets the results, and recommends action. Finally, there is a critical appraisal of the work, implications for practice, and an outlook for further research.

2. Literature Review

The literature review examines the current research on the performance of value versus growth investing using past studies and literature.

2.1. Current State of Research

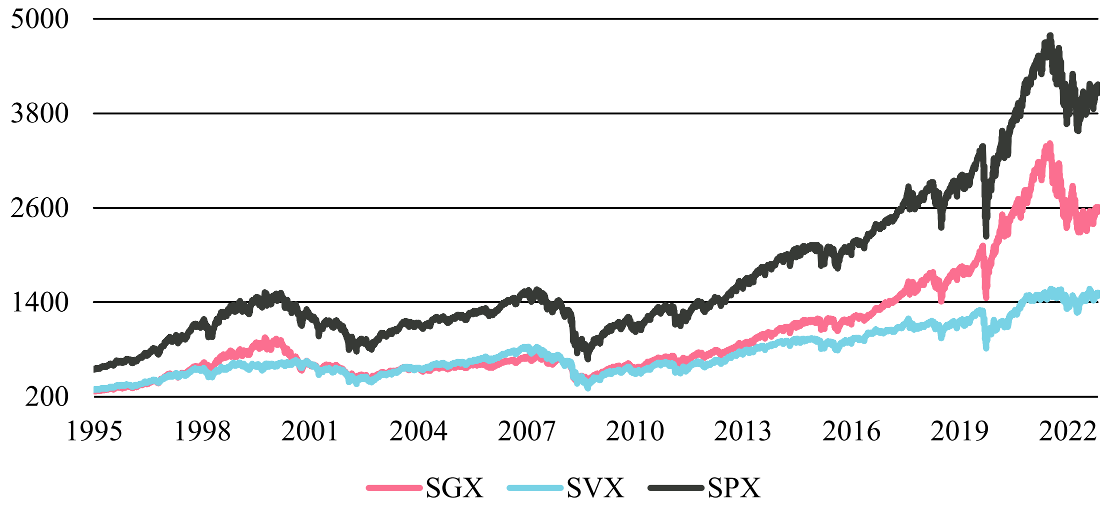

Figure 1: price evolution since inception of SGX and SVX

Investors following the principles of the value strategy have underperformed over the past years (Roth, 2019).

From 1970 until the Great Financial Crisis, value investing outperformed growth investing consistently (Athanassakos, 2009, p. 109), and this phenomenon was reported by most studies. The outperformance recorded can be attributed to several influential factors that shaped the performance of value stocks during this period.

One crucial factor was the prevailing trend of rising interest rates and inflation that characterized the post-World War II era through the 1970s (Gambarini, 2023). According to Weng and Butler (2022, p. 3), industries such as energy, financials, and traditional manufacturing, which are prominent in the value category, thrived in this particular economic climate. Their study explains that higher interest rates made value stocks' discounted future cash flows comparatively more attractive than growth stocks. Another contributing factor was the relatively robust economic growth during this period (Weng & Butler, 2022, p. 3). Value stocks, which are more sensitive to the overall economic cycle, benefited from favorable economic conditions. Value investing strategies, which focus on identifying undervalued companies with solid fundamentals and strong cash flows, performed exceptionally well during periods of economic expansion (Marks, 2021, p. 4).

During the Great Financial Crisis 2008, a notable shift in investor sentiment led to a transition from value to growth investing. The financial crisis, characterized by a severe economic downturn and market turmoil, profoundly impacted the investment landscape (Licsauer, 2023). As a result, value stocks, particularly those related to the financial sector, experienced significant price declines. In contrast, growth stocks, particularly those in the technology sector, gained prominence and attracted considerable attention from investors. According to Weng and Butler (2022, p. 4), these growth stocks were characterized by offering innovative products, services, and technologies, such as Internet-based businesses and digital platforms. Their resilience and strong growth potential were evident even in the midst of the crisis. In addition, the low-interest rate environment that followed the financial crisis played a crucial role in reinforcing the preference for growth stocks (DiCiurcio, Lepigina, Kresnak & Davis, 2021, p. 2).

Central banks implemented monetary policies to stimulate the economy, particularly by lowering interest rates to historically low levels. This deliberate lowering of interest rates led to cheaper borrowing costs, thereby facilitating capital inflows into growth companies (Bai & Schubert, 2022). As growth-oriented companies often rely on external financing for expansion and development, the availability of affordable capital added to the attractiveness of growth stocks (Gambarini, 2023). In 2020, growth stocks reached their highest level of performance due to the pandemic's impact on global economic growth and central banks' actions. With the world shifting online, growth stocks benefited from increased innovation and disruption, leading to rapid changes that would have taken much longer. Unfortunately, many sectors that rely on value saw their revenues vanish almost overnight (Weng & Butler, 2022, p. 3).

The outbreak of the COVID-19 pandemic led to a significant shift from growth to value stocks, marking a significant turning point in the investment landscape. The pandemic caused widespread economic disruption, market volatility, and uncertainty, prompting investors to reevaluate their investment strategies (Yousaf, Patel, and Yarovaya, 2022, p. 1). The period of growth has consequently come closer to its finale.

Initially, as the pandemic unfolded, there was a surge in demand for growth stocks, particularly in the technology and digital sectors. Increased reliance on digital services, e-commerce platforms, and innovative solutions for lockdown measures and remote working contributed to the strong performance of these growth stocks (Roach, 2020).

However, as the world gradually adapted to the pandemic and vaccination efforts gained momentum, a change in market dynamics became evident. Positive news about the development and distribution of the COVID-19 vaccines created optimism about global economic recovery and a return to normalcy. This shift in sentiment led investors to reassess their portfolios and seek opportunities in sectors that had been hard hit by the pandemic but had the potential to rebound. As a result, value stocks, which had underperformed for an extended period, began to gain traction (Markowicz, 2021). Sectors such as travel, hospitality, energy, and traditional manufacturing, which had suffered significant declines during the pandemic, became attractive options for investors anticipating an upturn in economic activity (Solberg, 2022).

These undervalued value stocks offered the potential for significant price appreciation as the global economy recovered. In addition, the expectation of rising inflation and the implementation of reflationary policies contributed to the increased interest in value stocks. As economies reopened and demand picked up, concerns about inflationary pressures emerged. Value stocks, known for their performance during inflationary periods, were seen as potential beneficiaries of rising prices. In addition, the historically low-interest rate environment and fiscal stimulus measures introduced by governments worldwide played a role in the shift to value. The prospect of infrastructure spending, increased government investment, and economic stimulus plans created a favorable environment for value stocks, as these sectors tend to benefit from government spending and economic expansion (J.P. Morgan, 2022).

Since pharmaceutical company Pfizer announced that it had successfully developed a vaccine for COVID-19 in November 2020, the beginning of a comeback for value strategies was ultimately triggered. Since then, high inflation across many economies has been driven by supply chain disruption and spiraling energy prices, which stemmed from Russia's invasion of Ukraine (Licsauer, 2023). According to MSCI (2023), the global stock indices were impacted significantly negative by the Ukraine-Russia war from January 22, 2022, to March 24, 2022.

3. Theoretical Framework

This section describes the evolution of factor investing, with focus on value and growth, explains the periods under investigation and outlines the market conditions that favor either one of the styles. Afterwards, the data and methods used in the screening process of *Value versus Growth* in the US during the COVID-19 and Ukraine-Russia conflict are outlined.

3.1. Factor Investing

Factor investing has become omnipresent in the world of investing, explains Kim (2022, p. 1567). In financial markets, factors refer to an investment's fundamental attributes or characteristics that can affect its risk profile. Academic research has studied and discussed various factors, and investors have used many in their investment strategies (Pappas & Dickson, 2015, p. 2).

Bellone et al. (2019, p. 2) study examines two types of factors: The first type is macro factors, which are considered the most well-known and fundamental sources of risk associated with the global economic environment. These factors are often referred to as beta because they determine the absolute returns of an asset class (Kahn & Lemmon, 2016, p. 15). For example, the macro factor of Economic Growth, which indicates the risk of an economic slowdown, explains the returns of stocks, bonds, and other asset classes. Real interest rates and inflation are other macro factors that tend to explain the returns of bonds and commodities.

Styles are the other type of factor. Unlike macro factors, they determine the relative returns of assets. For example, style factors do not explain equity returns but can help explain why US stocks underperform emerging market stocks, or Swiss bonds underperform Italian bonds (Bellone et al., 2019, p. 2).

Instead of spreading their investments across the entire market, factor investors concentrate on a specific group of stocks that possess certain traits, like appealing absolute or relative valuations. This method has become more popular over the past few decades, leading to the creation of indices that enable style investors to measure their performance accurately and offer them passive tools to replicate the returns of active investors (Pappas & Dickson, 2015, p. 3).

The S&P Global Style Series alone consists of more than twenty style indices, which divide the total market value of a benchmark index into growth and Value components. In addition, more focused pure-style indices within the series include stocks with the most pronounced growth or value characteristics (S&P Dow Jones Indices, 2022). According to Van Gelderen et al. (2019, p. 1), funds that use factor investing techniques to focus on equity asset pricing anomalies, like the value effect, produce much higher alphas than conventional actively managed funds.

The roots of factor investing can be traced back to the Capital Asset Pricing Model (CAPM). William Sharpe introduced the CAPM in the 1960s as a portfolio management tool to explain the relationship between risk and return. The model assumes that investors are rational, risk-averse, and can hold diversified portfolios to reduce risk. The CAPM states that an asset's expected return can be calculated by adding the risk-free rate to a risk premium proportional to the asset's beta. The beta measures the asset's sensitivity to market risk, as explained by Sharpe (1964, p. 439).

During the 1990s, Eugene Fama and Kenneth French (1992) expanded on the CAPM model by introducing the Fama-French three-factor model. This model incorporated market beta, size, and value as significant factors influencing stock returns. Market beta captures general market movements and a stock's sensitivity to them, while size captures the impact of a company's market capitalization on its returns. According to Fama & French (1992, p. 4), value refers to the extra benefits gained from investing in stocks that are believed to be undervalued compared to their true worth. Since then, the factor investing landscape has expanded to include many other factors beyond the original Fama-French factors. Factor investing has become a mainstream approach, with a wide range of passive and active investment products available to investors. Asset managers offer factor-based index funds, exchange-traded funds, and actively managed strategies focusing on specific factors (Kim, 2022, p. 1567).

3.2. Value

Marks (2021, p. 4) identifies *Value Investing* as a strategy used for investing by, identifying investments that are undervalued. This is done by believing that sometimes the market misprices their actual worth. This mispricing creates opportunities for astute investors to acquire these assets at prices below their intrinsic value. Value investing seeks to spot those undervalued assets and retain them for an extended period, anticipating that the market will eventually recognize their actual worth and drive their prices up (Licsauer, 2023). Value investors nowadays usually employ quantitative analysis and fundamental research to pinpoint undervalued securities in the investment landscape (MSCI, n.d., p. 2). They focus on companies with strong financial fundamentals and high dividend yields. Value investors also pay due attention to qualitative factors such as a company's competitive position, the quality of its management, and the dynamics of the industry in which it operates (Nicholas, 2020).

The investment philosophy of value investing was created by Benjamin Graham and David Dodd in the late 1920s. It involves a unique approach to investing. In a world of speculation and euphoria, they sought a rational and disciplined approach to investing. Their book "Security Analysis" laid the foundation for one of the most influential investment strategies ever. Graham and Dodd (2008, p.xiii) emphasized the importance of fundamental analysis, focusing on a company's intrinsic value rather than short-term market fluctuations. They believed that market prices often deviated from a company's true value, providing opportunities for astute investors to identify undervalued assets. Their principles influenced generations of investors and set the stage for subsequent advances in the field. As financial markets evolved, value investing continued to adapt and thrive, leaving an indelible mark on the investment landscape.

Warren Buffett is one highly respected value investor known for his successful investment approach and track record. As Chairman and CEO of Berkshire Hathaway, he has acquired the moniker "The Oracle of Omaha" (Nasdaq, 2022). Buffett's investment philosophy focuses on identifying undervalued companies with strong fundamentals and long-term growth potential (Rajablu, 2011, p. 1).

3.2.1. Key characteristics

Value investing encompasses several key characteristics that distinguish it as an investment approach. First and foremost, fundamental analysis plays a central role. Investors thoroughly evaluate a company's financial health and prospects through quantitative analysis and fundamental research. This analysis considers earnings, cash flow, book value, and dividend yield to determine an asset's intrinsic value. By conducting extensive research, value investors seek to identify discrepancies between the market price and the true value of an investment (MSCI, n.d., p. 2).

A long-term perspective is another hallmark of value investing. Practitioners of this strategy are patient and hold their positions in undervalued assets for long periods. In doing so, they give the market enough time to recognize and incorporate the true value of these investments. This approach requires confidence in one's analysis and a willingness to withstand short-term market fluctuations (Marks, 2021, p. 4).

Value investing relies heavily on the concept of a margin of safety (Cheng, 2022). Investors seek to purchase assets at a significant discount to their estimated intrinsic value. This practice is a buffer against potential valuation errors and unanticipated risks, thereby mitigating downside risk for investors. By building a margin of safety, value investors protect their investments and increase the likelihood of favorable returns. They carefully evaluate the competitive position of the companies in which they invest, assess the quality of management, analyze industry dynamics, and evaluate future growth prospects. In their search for undervalued assets, value investors target companies that may be temporarily out of favor or facing short-term challenges but have the potential to create long-term value (Graham & Dodd, 2008).

Marks (2021, p. 4) states that value stocks are commonly associated with sectors characterized by a greater degree of maturity or cyclical patterns. These sectors encompass various industries, including financial services, energy, utilities, manufacturing, and consumer staples. Companies operating within these sectors often exhibit stable cash flows, well-established business models, and comparatively lower growth prospects. The identification of value stocks within these sectors is frequently guided by criteria (Hardin, 2021).

3.2.2. How to identify Value stocks

Lakonishok, Shleifer, and Vishny (1994) introduced a definition of value stocks based on their study of stock market anomalies. Their research identifies value stocks based on specific financial ratios that indicate their value characteristics. These ratios include book-to-market (B/M), earnings-to-price (E/P), and cash flow-to-price (CF/P). The researchers define value stocks as those with high book-to-market ratios, earnings to price, or cash flow to price. The rationale behind this definition is that value stocks are perceived to have lower market valuations relative to their fundamental metrics.

In other words, the market may undervalue these stocks, potentially presenting an investment opportunity. Focusing on financial ratios allows investors to identify value stocks based on their relative cheapness compared to their book value, earnings, or cash flow. These stocks will likely outperform the market in the long run, as their lower valuations provide the potential for capital appreciation (Hardin, 2021).

Based on Fama and French's research from 1975 through 1995, value stocks can be identified using the following criteria:

1. Book-to-Market Ratio: A practical approach for identifying value stocks is seeking those exhibiting higher book-to-market ratios. This ratio serves as a metric for evaluating the extent to which a stock's market value falls below its book value. Investors can leverage this screening tool to uncover potential value stocks (Fama and French, 1992, p. 445).
2. Earnings-to-Price Ratio (E/P): Value stocks are defined by their higher earnings-to-price ratio, which compares a company's earnings per share to its stock price. This metric indicates a stock's potential to generate value, as highlighted by Fama and French (1992, p. 445).
3. Cash Flow-to-Price Ratio: Fama and French (1992, p. 445) have suggested a method for identifying value stocks by analyzing the cash flow-to-price ratio. This ratio measures a company's operating cash flow per share against its stock price. Companies that exhibit a higher cash flow-to-price ratio may be classified as value stocks.

3.2.3. Value Trap

For value managers, value traps are a fact of life (GMO, 2021). Acknowledging that value investing as a strategy does not guarantee success is crucial. There are potential challenges and risks associated with value investing, including the risk of value traps, which are companies that appear undervalued but fail to deliver expected improvements and extended periods of underperformance during market cycles that favor investments focused on growth-oriented approaches (Penman, 2014, p. 1).

Penman and Reggiani's (2018) paper, "Fundamentals of Value versus Growth Investing and an Explanation for the Value Trap," explores the concept of a value trap. The authors define a value trap as a scenario in which an investment appears undervalued based on traditional metrics such as low price-to-earnings (P/E) or price-to-book (P/B) ratios but fails to generate expected returns or suffers from prolonged underperformance.

According to the authors, the value trap phenomenon can be attributed to several factors. One factor is the presence of deteriorating fundamentals within the company, such as declining earnings, weak cash flows, or unfavorable industry dynamics. These deteriorating fundamentals can erode the investment's intrinsic value, resulting in a flat or declining stock price despite seemingly attractive valuation metrics.

Another factor emphasized by Penman and Reggiani (2018) is the market's mispricing or misunderstanding of the company's intrinsic value. The market may have mispriced the company's growth prospects or overlooked hidden risks that could lead to poor performance. In such cases, investors may mistakenly perceive the stock as undervalued, only to realize later that their initial assessment needed to be revised. The paper suggests that a comprehensive analysis of a company's fundamentals, including earnings quality, cash flows, and competitive positioning, is essential to avoid falling into a value trap. By taking a holistic approach to valuation, considering both quantitative and qualitative factors, investors can better assess true investment potential and identify potential value traps.

3.3. Growth

Growth Investing is an investment strategy that involves selecting and investing in companies with strong potential for above-average growth in earnings, sales, and market value over time (Marks, 2021, p. 3). This approach requires identifying companies with high growth prospects, especially in industries experiencing rapid technological advancement or disruptive innovation.

Growth investing emphasizes future growth potential over current valuation, with investors willing to pay a premium for stocks with solid growth prospects, believing that the company's future earnings growth will justify the higher valuation over time. This approach typically has a longer investment horizon, as it may take time for a company's growth potential to materialize fully and be recognized by the market. Investors who follow this strategy tend to have a higher tolerance for short-term market volatility and fluctuations and hold their investments through periods of a market downturn (Licsauer, 2023).

According to Philip Fisher (1996) and Peter Lynch (1989), two prominent investors and authors, growth investing is an investment approach that focuses on identifying and investing in companies with significant growth potential. Fisher and Lynch have provided valuable insights and frameworks for understanding Growth investing. Fisher (1996), known for his book "Common Stocks and Uncommon Profits" emphasized the importance of thoroughly researching companies and investing in those with exceptional long-term growth prospects. Fisher believed in investing in companies with substantial competitive advantages, innovative products or services, capable management teams, and sustainable business models. He advocated a patient, long-term approach that allowed investments to compound over time as companies realized their growth potential.

Lynch (Lynch & Rothchild, 1989), known for his book "One Up on Wall Street" and his successful tenure as manager of Fidelity's Magellan Fund, popularized the concept of “investing in what you know”. Lynch believed that individual investors have an advantage in identifying successful growth companies through their everyday experiences and observations. He emphasized the importance of fundamental analysis, understanding the company's business model, assessing its growth prospects, and considering factors such as industry trends, competitive position, and management quality.

3.3.1. Key characteristics

According to Marks (2021, p. 3), a growth portfolio is characterized by specific attributes distinguishing it from other investment strategies.

Firstly, it comprises companies with price multiples of earnings and sales that exceed those of the overall market. Investors are willing to pay premium prices in anticipation of future gains as these companies continue to grow and justify their valuations.

Additionally, Marks (2021, p. 3) states that companies within the portfolio benefit from the favorable tailwinds of a secular growth trend, allowing for expansion without relying heavily on a robust economic backdrop.

Growth stocks, typically regarded as long-term investments, derive value from future cash flows, especially when a significant portion of positive earnings is projected far into the future (Clissold et al., 2023, p. 4). As a result, the stock price is susceptible to interest rates, despite the underlying business not being particularly interest sensitive. However, it is essential to note that holdings within the portfolio may experience significant price declines in response to negative news about the company, lacking tangible book value support. Capital appreciation is expected to be the primary source of investment returns within the growth portfolio (Clissold et al., 2023, p. 1)

3.3.2. How to identify Growth stocks

When seeking growth stocks, several critical factors must be considered. Firstly, it is essential to examine the company's sales and earnings growth patterns over time to identify those companies with consistent and above-average growth potential.

Additionally, evaluating the market opportunity by assessing the size and potential of the company's market is crucial. Companies positioned to benefit from expanding markets, disruptive technologies, or changing consumer trends should be sought out. Companies that maintain a competitive advantage and can capture significant market share should also be considered. Identifying industries experiencing rapid growth or disruptive change is essential, and companies at the forefront of these trends, offering innovative products or services that have the potential to reshape the industry and capture a larger market share, should be evaluated (Marks, 2021, p.2).

Critical financial ratios such as profit margins, return on equity (ROE), and cash flow should be analyzed to evaluate the company's financial health. A healthy balance sheet and strong cash flow generation indicate the company's ability to invest in growth opportunities and withstand market fluctuations. It is also crucial to evaluate the quality and track record of the company's management team, including their past performance and alignment with shareholder interests. It is recommended to consult research reports and analyses from reputable sources, such as industry experts and financial analysts, to gain valuable insight into a company's growth prospects, industry dynamics, and competitive position.

When evaluating a company, it's essential to consider its growth potential alongside valuation metrics like price-to-earnings (P/E) or price-to-sales (P/S) ratios. Qualitative factors such as the company's brand strength, customer loyalty, product differentiation, and innovation pipeline should also be considered, as these factors contribute to a company's ability to sustain growth and maintain a competitive edge.

Based on Fama and French's research (1998) from 1975 through 1995, growth stocks can be identified using the following criteria:

1. High earnings growth: Growth stocks are typically characterized by higher-than-average earnings growth rates compared to the overall market. These companies are expected to grow their earnings at an above-average pace in the future, often

due to factors such as innovative products, expanding markets, or disruptive technologies (Marks, 2021, p 2).

2. High price-to-earnings (P/E) ratios: Growth stocks tend to have relatively high price-to-earnings ratios. Investors are willing to pay a premium for these stocks due to their anticipated future earnings growth. The high P/E ratios reflect the market's optimistic expectations for the company's future profitability.
3. Low Book-to-Market Ratio: A practical approach for identifying Growth stocks is seeking those exhibiting lower book-to-market ratios. This ratio serves as a metric for evaluating the extent to which a stock's market value falls below its book value (Fama & French, 1998, p. 1975)

3.3.3. Risks

While growth stocks can offer substantial potential for capital appreciation, they also come with certain risks and challenges that investors should be aware of.

In their study "Contrarian Investment, Extrapolation, and Risk," Lakonishok, Shleifer, and Vishny (1994) investigated the relationship between stock returns and investor behavior, particularly the tendencies of extrapolation and contrarian investment. The authors found evidence that investor behavior plays a significant role in driving stock returns. The study concluded that there is a value premium in average stock returns, indicating that undervalued or stocks tend to outperform overvalued or "glamour" stocks in the long run. This finding suggests that the market tends to undervalue distressed or out-of-favor stocks, leading to higher subsequent returns for these stocks. On the other hand, the market tends to overvalue growth stocks, resulting in lower subsequent returns.

Furthermore, the study highlighted the role of investor sentiment and the impact of extrapolation bias on stock returns. The authors found that investors tend to overreact to past performance, extrapolating recent trends into the future. This behavior leads to the overvaluation of recent winners (growth stocks) and the undervaluation of recent losers (value stocks).

3.4. Market conditions

In analyzing market conditions that favor either value or growth investment strategies, several factors come into play. It is important to assess these factors to determine which style may be more advantageous in a given market environment. It is important to note that market conditions can shift over time, and the preference for value or growth investing may change accordingly. Economic cycles, geopolitical events, and monetary policy decisions can influence market dynamics and investor sentiment, impacting the performance of value and growth stocks (Bodie, Kane, and Marcus, 2013, p. 373).

Market conditions that favor value investing often arise during periods of economic uncertainty, market corrections, or economic contractions. These conditions can result in investors seeking relatively safer and more stable investments. Value stocks tend to perform well in such scenarios due to their lower price-to-earnings (P/E) ratios, attractive dividend yields, and potential for higher intrinsic value compared to their market price (Clissold et al., 2023, p. 3). During economic downturns or market corrections, value stocks may exhibit resilience as investors flock toward companies with established track records, solid fundamentals, and reliable cash flows. Value investors often focus on industries or sectors that are out of favor or undervalued, seeking opportunities for long-term growth potential (Marks, 2021, p. 4) when the market sentiment improves. During times of inflation, value stocks are often preferred because they have a shorter duration. However, if the economy continues to grow rapidly despite inflation, growth stocks can still be a valuable investment option (Bai & Schubert, 2022).

Conversely, market conditions that favor growth investing typically occur during periods of economic expansion, technological advancements, or high investor confidence. Growth stocks are known for their higher potential for future earnings growth, and they tend to outperform during bull markets. In an environment of strong economic growth and favorable market sentiment, investors are willing to pay a premium for companies with promising growth prospects. When interest rates increase, it can have a negative impact on the stock market. In particular, growth stocks that rely heavily on future cash flow projections can be affected (Campbell, 2005, pp. 1-5)

Between 2004 and 2006, numerous rate hikes were implemented by the Federal Reserve, while the economy continued to remain strong due to the positive impacts of prior loose fiscal policies. As a result, increased productivity and wages were observed, contributing to the establishment of a self-sustaining growth cycle (Clissold et al., 2023, p. 5). Despite the aggressive nature of the rate hikes, the market managed them, leading to a robust performance in both value and growth within the equity market (Bai & Schubert, 2022).

The market had adverse reactions to the 2015-2018 cycle, particularly during the second half, starting in late 2018. The Federal Reserve began slowly normalizing policies in 2014, leading to five rate hikes over two years. Despite an economic recovery from the Global Financial Crisis (GFC), growth remained low in the US, causing value to outperform growth (Hodges et al., 2017).

Bai & Schubert (2022) mention however, that in 2018, the Fed escalated the pace of rate hikes, with four hikes occurring within a short timeframe, leading to an overestimation of the resilience of the US and the global economy as well as the rising inflationary pressures. Despite a deteriorating economic outlook in the second half of 2018, the decision was made by the Fed to continue with the rate hikes, resulting in a perception of a policy mistake within the market. Consequently, a significant sell-off transpired in the global equity market during late 2018, causing a sharp decline in both value and growth factors, causing them to lag behind the broad market indices in both regions.

In 2022, attractive opportunities in both value and growth stocks may be found by investors as the US economy and job market remained strong despite encountering particular challenges. Although COVID-related deficits have increased national debt, recent trends indicate that austerity measures might not be as prioritized by policymakers compared to the aftermath of the global financial crisis of 2008 and 2009. Productivity growth has been sustained through fiscal stimulus, although it may not match the pace witnessed in the early 2000s. While concerns regarding rising interest rates exist, borrowers continue to receive support from favorable financial conditions (Bai & Schubert, 2022). Furthermore, some of the supply-chain bottlenecks that had led to the inflationary surge in prices of specific goods, such as semiconductors and shipping containers, have started to alleviate . The Federal Reserve has indicated the possibility of raising rates sooner than previously anticipated. However, this action could also demonstrate confidence in the economy's resilience and capacity to manage higher borrowing costs. Based on past experiences, investors favoring growth over value may not observe a clear advantage in the upcoming months, as both styles have the potential to outperform the broad market (Bai & Schubert, 2022). However, as with any investment, risks and uncertainties persist, including the potential for policy mistakes or external shocks that could impact the outlook.

3.5. Times of crisis

This section provides an analysis of two significant crises that impacted global financial markets, namely the COVID-19 pandemic and the Ukraine-Russia conflict. Understanding the context and impact of these crises is essential to examining the performance of *Value versus Growth* investments during these specific periods.

3.5.1. COVID 19

The global impact of the COVID-19 crisis, caused by the sudden emergence and rapid transmission of the novel coronavirus (SARS-CoV-2), was significant. Originating in Wuhan, China, in late 2019, the pandemic quickly evolved into a severe health and economic crisis. The virus quickly spread across borders and led to various containment measures, such as lockdowns, travel restrictions, and social distancing. These measures caused significant disruptions to the global economy, according to Zhang et al. (2020, p.1). According to the Centers for Disease Control and Prevention (CDC, 2023), as of April 26, 2023, the US reported over 104.5 million COVID-19 cases. The country faced challenges in testing for the virus initially, as the initial diagnostic kits provided by the CDC were found to have flaws.

Nevertheless, the US has performed the highest number of COVID-19 tests of any country, with a total of 1.1 billion tests. Numerous states promoted self-isolation and remote work options to address the surge in cases in early 2020. In addition, most states implemented measures such as closing bars and restaurants, canceling public events, and banning large gatherings to reduce the spread of the virus. As of the end of March 2020, it is estimated that more than 90 percent of the US population is under some form of stay-at-home order (Statista, 2023).

The COVID-19 crisis profoundly impacted financial markets, characterized by increased volatility, widespread sell-offs, and sharp declines in asset prices. Stock markets experienced significant declines, credit markets faced liquidity problems, and many countries entered a recession. Investor sentiment was severely affected by uncertainty about the duration and severity of the crisis (Zhao et al., 2022, p. 150).

Xu (2020, p. 7) investigates the relationship between stock returns and COVID-19 shocks and uncertainty, focusing on whether these shocks have asymmetric effects on returns. By analyzing daily data, the study finds a negative impact of increasing COVID-19 cases on the overall stock market. For the US stock market, uncertainty negatively affects returns, although the magnitude of the effect is negligible. Furthermore, the responses of stock returns show relatively symmetric behavior in both the increase and decrease of COVID-19 cases in the US.

The study by Zhang, Hua, and Ji (2020, p. 5) examines the impact of the COVID-19 pandemic on the level of risk in stock markets. The results indicate a notable escalation in global financial market risk as a direct consequence of the pandemic, with individual stock market reactions influenced by the outbreak's severity in each country. The uncertainty surrounding the pandemic and the associated economic losses has led to exceptionally volatile and uncertain market conditions.

Overall, the US experienced a gross domestic product (GDP) decline of approximately 2.2% in 2020. However, there was a notable rebound in 2021, with GDP increasing by more than ten percent to nearly $23 trillion (Statista, 2023).

3.5.2. Ukraine-Russia conflict

The Russian invasion of Ukraine began on February 24, 2022, triggering widespread military action by Russian forces in major Ukrainian cities. According to Statista (2023) in April 2023, the Office of the United Nations High Commissioner for Human Rights (OHCHR) confirmed that 8.7 thousand civilian deaths were reported in Ukraine as a result of the ongoing war. The conflict has had profound humanitarian consequences, with many Ukrainians internally displaced or seeking refuge in other countries. Poland, in particular, has experienced the highest number of border crossings from Ukraine, reaching approximately 11 million by April 2023. Other countries experiencing significant influxes of Ukrainian migrants include Russia, Hungary, and Romania. In response to the aggression, Western nations, including members of the European Union (EU), Switzerland, the United Kingdom (UK), and the US, imposed sanctions on Russia. These sanctions targeted various sectors, including the financial industry, individuals linked to the Russian government, and the export of advanced technological products to Russia (Statista, 2023).

"The war is expected to have a considerable impact on the global economy" (Lagarde, 2022)

The attack on Ukraine has introduced new uncertainties into global stock markets, compounding the existing uncertainties associated with the COVID-19 pandemic (Boungou & Yatie, 2022, p.1). During the attack, the New York Times mentioned that the S&P 500 Index encountered its initial correction in October 2020, dropping over 10% from its recent high. While tensions between the two nations have been ongoing, stock market indices showed a more pronounced reaction to the conflict after Russia invaded Ukraine in February 2022.

According to Boungou and Yatié (2022) research, countries that share borders with Ukraine and Russia, as well as United Nations member states that supported ending the Russian offensive in Ukraine, had weaker stock market performance. These findings have significant implications as they can provide useful information for investors, portfolio managers, and policymakers to develop effective financial strategies amidst the ongoing conflict. Additionally, the study contributes to the existing research on the correlation between war and stock markets by examining the Ukraine-Russia war, which has primarily been focused on World War II.

The study of Boungou and Yatié (2022) provided empirical evidence that the war between Ukraine and Russia had a significant negative impact on global stock market returns. The analysis showed a clear correlation between the conflict and global stock market indices. This reinforced the notion that global markets were highly sensitive to the Ukraine-Russia war, which aligned with previous research indicating a negative relationship between conflicts and stock market indices. Additionally, the study examined changes in stock market returns before and after Russia's invasion of Ukraine and concluded that the invasion had an even more significant negative impact on global stock markets.

The paper by Mbah and Wasum (2022) examines the economic impact of the Russian-Ukrainian crisis on several countries, including the US. Through an extensive literature review, the authors analyze the impact of the crisis on various economic indicators. The study emphasizes that the conflict between Russia and Ukraine has had a significant economic impact on the countries studied. In particular, the authors examine the impact on trade, energy, financial markets, and investment sectors. They assess how the crisis has affected these sectors, including disruptions in trade flows, concerns about energy supplies, fluctuations in financial market stability, and reduced investment activity.

4. Data

Given the use of the two indices SVX and SGX and PMI data in this study, this section aims to explain the methodology used by S&P to construct their style indices. This is followed by an explanation of the S&P Global PMI. Both are sourced only by S&P as the information is written by S&P Global itself.

4.1. S&P US Style Indices Methodology

The S&P US style indices function as a method of monitoring the performance of US equities by categorizing them into growth or value classifications based on style scores. The indices' weightage is determined by float-adjusted market capitalization (FMC). The indices serve two primary purposes: firstly, to provide broad style indices that offer a general understanding of a particular style, and secondly, to provide narrow pure style indices. Each parent index's total market capitalization is allocated proportionally between growth and value indices. The indices employ six distinct factors, divided into two dimensions, to measure growth and value. These factors are enumerated in the table below:

Growth Factors	Value Factors
Three-Year Net Change in Earnings per Share over Current Price	Book Value to Price Ratio
Three-Year Sales per Share Growth Rate	Earnings to Price Ratio
Momentum (12-Month % Price Change)	Sales to Price Ratio

Table 1: S&P US Style Indices factors

According to S&P Dow Jones Indices (2022, p.6), in cases where three-year historical results are unavailable, a two-year change in earnings per share over the price per share is utilized. Similarly, if two years of earnings data are not accessible, the one-year difference in earnings per share over the price per share is used instead. The factor is assigned a zero value if one year's results are unavailable.

Regarding the second factor, if three-year sales data is not available, the two-year sales per share growth is considered. In cases where two-year sales data is unavailable, the one-year sales per share growth is used. If only one year's sales information is not accessible, the factor is zero. When the starting point is less than zero, the style factor is multiplied by a negative one. In cases where there is insufficient trading history to calculate 12-month momentum, the momentum is calculated from the stock's listing date.

Lastly, if book value to price, earnings to price, or sales to price data is unavailable, the respective factor is assigned a zero value. (S&P Dow Jones Indices, 2022, p.6).

As reported by S&P Dow Jones Indices (2022, p. 6), calculations are performed for each company within the S&P Total Market Index (TMI) universe to determine three growth and value factors. These initial calculations are adjusted by winsorizing them to the 90th percentile, followed by standardization. The standardization process involves computing the difference between each company's raw score and the mean of the entire set, which is then divided by the standard deviation of the entire set. The standardized figures obtained are then used to calculate the growth and value scores for each company. The growth score is derived by averaging the standardized figures of the three growth factors, while the value score is obtained by averaging the standardized figures of the three value factors. Consequently, each company within the TMI universe is assigned both a growth score and a value score, which measure growth and value along distinct dimensions (S&P Dow Jones Indices, 2022, p. 6).

S&P Dow Jones Indices (2022, p. 8) has a specific objective when creating the growth and value indices. They aim to divide the market capitalization of each parent index equally between the growth and value indices while reducing the overlap of stocks. The indices should include all parent index constituents and use float market capitalization weighting. The style baskets form the foundation for index construction. Companies in the value basket receive 100% of their float market capitalization in the value index. In comparison, those in the growth basket receive 100% of their float market capitalization in the growth index. Companies in the middle, which make up 34%, have similar growth and value rankings, and they are assigned to the indices based on their distance from the midpoint of the baskets. The midpoint of each style region is calculated by averaging the Value and Growth scores of the companies in the style basket.

The backtesting results of S&P Dow Jones Indices (2022, p. 9) show that the market capitalization of the growth and value indices is almost equal. There is no mathematical procedure to enforce this equality, as stock price movements would result in immediate inequality after rebalancing. In addition, stocks not in the style baskets are assigned to either the growth or value index, which allows for gradual movements and prevents stocks from constantly changing indexes. This procedure also reduces the overlap between the two indices, with only 34% of the parent index's market capitalization spread between the two indices, resulting in narrower style indices (S&P Dow Jones Indices, 2022, p. 9).

Every year, on the third Friday of December, the S&P US Style Indices undergo a rebalancing process after the market closes. The reference date used for growth and value measures is after the last trading day of the prior month. During this rebalancing, the style scores, float market capitalization weights, and growth and value midpoint averages are reset. Any other changes made to the US-style indices are done on an as-needed basis, following the guidelines of the parent index. These changes may be made at any time in response to corporate actions and market developments. Typically, changes to the parent index constituents are announced two to five days before implementation. The indices are calculated in USD according to the S&P Dow Jones Indices Index Methodology of 2022 (p.13).

4.2. PMI by S&P Global

The Purchasing Managers' Index is a survey-based measure of business conditions that includes sub-indices for key economic factors such as inflation, GDP, exports, employment, capacity utilization, and inventories. Respondents are asked to indicate whether these variables have increased, decreased, or remained unchanged from the previous month and their sentiment about their performance one year from now (S&P Global, n.d.). S&P Global (n.d.) originally developed the PMI for the manufacturing sector but expanded its coverage in the 1990s to include services, construction, and retail trade. The PMI and its sub-indices anticipate changing economic trends and serve as an alternative or supplement to official data such as GDP, which can suffer from publication delays, poor availability, or data quality issues. S&P Global collects monthly Purchasing Managers' Index data for more than forty economies worldwide. The PMI is a highly regarded and timely gauge of business conditions that helps analysts and economists accurately predict fluctuations in official economic indicators such as GDP, employment, inflation, and industrial production. The PMI is considered one of the world's most influential economic data releases, as it is often released well before the corresponding official statistics (S&P Global, n.d.).

This paper uses the US PMI Composite, a combination of the manufacturing and services PMIs. This composite PMI is calculated as a weighted average, with the weights based on official data on each sector's contribution to gross domestic product (GDP).

5. Methods

This chapter defines the descriptive statistics that were applied to measure and compare the performance of SVX, SGX, and the Portfolio. Additionally, the portfolio construction is explained.

Source of indices and economic indicator

To conduct the analysis, historical performance data for the SVX, SGX and SPX was obtained from Bloomberg. The dataset includes last price information. This data is used to compare the two indices and to construct the portfolio in the third part of the analysis. The US PMI Composite data is obtained from Refinitiv. This dataset contains monthly PMI readings from several countries, providing insight into the prevailing trends of economic expansion or contraction. By incorporating this economic indicator into the analysis, it is possible to construct a portfolio based on the interplay between the performance of the S&P 500 Value Index, the S&P 500 Growth Index, and the broader economic landscape.

Time series

The performance analysis conducted in this study focuses on two distinct periods introduced in chapter three, namely the COVID-19 pandemic and the Ukraine-Russia conflict. These specific periods were deliberately chosen to examine and evaluate the performance of the SVX and SGX during periods of significant geopolitical tension and economic instability. The first period considered is the COVID-19 crisis, which emerged as a global health pandemic in early 2020 and continues to impact global affairs. Given the ongoing nature of this crisis, the analysis includes the performance of the indices from the onset of the pandemic on December 02, 2019, when the first group of pneumonia cases in Wuhan was reported by the Wuhan Municipal Health Commission in China, to the end of April 2023, as the crisis is still ongoing and has not been fully resolved (World Health Organization: WHO, 2020). The second period of interest focuses on the Ukraine-Russia conflict, which began on February 24, 2022, and remains an ongoing geopolitical issue with a significant impact on global markets and investor sentiment (Boungou & Yatié, 2022, p. 1). In order to fully evaluate the performance of the indices in the context of this crisis, the analysis is extended to the end of April this year, taking into account the ongoing evolution of this geopolitical situation.

Benchmark

This analysis used the SPX as a benchmark for computational purposes. Including this benchmark was essential to facilitate the calculation of financial measures dependent on market performance and volatility indicators. Including the SPX as a benchmark allowed for a comparative evaluation and assessment of the performance of the analyzed assets or indicators in relation to the broader market. As a reference point, this benchmark made it possible to examine the relative performance and volatility of the assets or indicators studied. It is important to emphasize that, in this context, the benchmark served primarily as a quantitative tool to improve the accuracy and comprehensiveness of the analysis. Its use facilitated more robust calculations of various financial metrics, thereby promoting a deeper understanding of performance dynamics within the study's specific context.

Risk-free

The risk-free rate refers to the interest rate earned from a low-risk investment with high certainty. Usually, government bonds are used to determine this rate because of their low risk of default. The risk-free rate acts as a standard for calculating the risk premium in risk-adjusted metrics such as the Sharpe ratio. It shows the extra return that an investment should provide above the return of a risk-free asset (Bodie et al., 2013, p. 134).

In the US market, the risk-free rate is typically estimated using the yield on US Treasuries, as these securities are widely regarded as having minimal risk of default. The yield on 10-year US Treasury securities is a commonly used benchmark, representing the expected return on a 10-year US Treasury bond held to maturity with zero default risk.

Figure 2: 10-year US Treasury bond

5.5. Approach to the performance analysis

In the following section, descriptive statistics have been employed to evaluate the performance, volatility, and risk-adjusted returns of SVX and SGX, along with the constructed portfolio. The comparative analysis entailed assessing the indices in relation to one another and the portfolio. The quantitative analysis calculations were conducted using Microsoft Excel. The descriptive statistics encompassed a range of metrics, including simple daily, cumulative, and annualized returns, drawdown, Calmar ratio, standard deviation, Sharpe ratio, Sortino ratio, beta, Jensen's alpha, and Treynor ratio.

Holding period return

The holding-period return (HPR) is a financial metric used to gauge investment return by measuring the dollars earned per dollar invested over a specific period. This calculation considers fluctuations in the investment's value and any dividends received. The overall HPR of a stock is determined by both price appreciation and dividends, indicating the net financial gain achieved over the investment period. As described by Bodie et al. (2013, p. 111), this calculation provides a comprehensive assessment of investment performance:

$$r_t = \left(\frac{P_t + D_t}{P_{t-1}}\right) - 1$$

Equation 1

r_t = holding period return at time t

P_t = last price at end of period (time t)

D_t = dividend payment paid

P_{t-1} = last price beginning of period

Geometric return

The geometric average is a commonly used performance measure that effectively captures the cumulative impact of actual returns by compounding individual returns per period. As per the research conducted by Bodie et al. (2013, p. 112), this measure is calculated by compounding the actual returns over each period in a step-by-step manner to determine the per-period rate that would lead to the same ending value. This rate is recognized as the geometric average and represents the cumulative effect of the actual returns, thereby providing a reliable measure of performance.

$$R_C = (1 + r_1)(1 + r_2) \dots (1 + r_n) - 1 = \Pi_t[1 + r_t] - 1$$

Equation 2

R_C = cumulative return over n periods

r_t = holding period return at time t

Average return p.a.

To evaluate the average returns per year over several years, equation 3 (Alexander, Bailey, & Sharpe, 1995, p. 161) was used to calculate the geometric returns of the indices (Rf) and the market index (RM).

$$R_f = \sqrt[n]{[(1 + r_t)(1 + r_2) \dots (1 + r_n)]} - 1$$

Equation 3

R_f = average return p.a.

r_t = holding period return at time t

Drawdown

Drawdown refers to the decline from a previous peak in a variable, typically associated with equity or accumulated profits. At the same time, the maximum drawdown is the largest magnitude of drawdown observed during the specified period. Undoubtedly, this metric is an essential quantification of the inherent risk associated with using the trading system (Di Lorenzo, 2013, p. 167). This analysis calculated the maximum drawdowns by analyzing the daily returns over the two crisis periods for the SVX, SGX, and SPX. The average drawdown calculates the daily drawdown over the specified periods (Bacon, 2012, p. 98). As shown below, smaller drawdowns are useful because they indicate that an investment is less vulnerable to volatility.

$$MDD = \frac{trough\ value - peak\ value}{peak\ value}$$

Equation 4

Calmar Ratio

The Calmar Ratio was calculated for SVX, SGX, and SPX for the periods 2019 to 2023 and 2022 to 2023. This ratio, introduced by Terry Young in 1991, is a measure used to evaluate and compare risk-adjusted returns of investments, with a focus on maximum drawdown. By considering maximum drawdown, the ratio evaluates the risk premium of a portfolio by comparing the average compounded annual return to the most significant drawdown experienced over the previous three years or a more extended period, as shown in equation 20 (CFI, 2023).

A higher Calmar ratio indicates the investment had less exposure to significant drawdowns, suggesting a lower susceptibility to the risk and price fluctuations (CRI, 2023). This ratio can help identify an investment's ability to withstand adverse market conditions, providing valuable insight into its risk-return profile.

$$CRp = \frac{\left(R_f - r_f\right)}{MDD}$$

Equation 5

R_f = average return p.a.

r_f = risk-free

Volatility

To provide a concise representation of risk, Bodie et al. (2013, p. 116) defines the variance as the expected value of the squared deviation from the mean. The purpose of squaring variances is to prevent positive and negative variances from canceling out, ensuring that the expected deviation from the mean return remains zero. In addition, squared variances are inherently positive, and the squaring process emphasizes large deviations while downplaying smaller ones. Another consequence of squaring the variances is that the variance is expressed in percent squared units. To maintain consistency in dimensionality, the measure of risk is conveyed by the standard deviation, which is defined as the square root of the variance (Bodie et al., 2013, p. 116).

$$\sigma^2 = \frac{\sum_{i=1}^{i=n}(r_t - r)^2}{(n-1)}$$

$$\sigma = \sqrt{\sigma^2}$$

Equation 6

σ^2 = variance

σ = standard deviation

r = mean return

Sharpe Ratio

The Sharpe ratio is a measurement that helps evaluate the attractiveness of a risky investment strategy or instrument. It was first introduced by William Sharpe (1966, p. 122) to assess the performance of mutual funds. To calculate this ratio, the average period return minus the risk-free rate is divided by the standard deviation of the return. However, a limitation of the Sharpe ratio is that it cannot differentiate between upside and downside volatility. Sen (n.d., p. 6) revealed the superiority of the Sharpe ratio as an optimization parameter compared to the Sortino and Calmar Ratio. Unusually high returns have a more significant impact on the denominator (standard deviation) than the numerator, reducing the ratio's overall value. Removing the most significant positive returns can increase the Sharpe Ratio, which goes against the typical investor's preference for substantial positive returns. Bodie et al. (2013, p. 125) suggests that the Sharpe ratio should include annualized returns.

$$SR_f = \frac{R_f - r_f}{\sigma_F}$$

Equation 7

σ_F = standard deviation of fund

R_f = average return p.a.

Sortino Ratio

In the early 1980s, Dr. Frank Sortino conducted extensive research to develop an improved measure of risk-adjusted returns. The Sortino ratio is a superior alternative in several respects, particularly when evaluating and contrasting the performance of managers whose investment strategies have skewed return distributions. Unlike the traditional Sharpe ratio, the Sortino ratio uses downside deviation instead of standard deviation as a risk measure. Specifically, it considers only those returns that fall below a predefined target or desired rate of return as indicative of risk (Rollinger & Hoffman, 2015, p. 3).

$$SO = \frac{R_f - r_f}{TDD\ (downside\ deviation)}$$

Equation 8

Beta

An investments beta serves as a measure of the investment’s relative responsiveness to macroeconomic news. A beta greater than 1 indicates a higher sensitivity to economic conditions and classifies the stock as cyclical. Conversely, betas less than 1 indicate below-average sensitivity, classifying them as defensive stocks. It is important to note that market risk, also known as systematic risk, arises from the stock's exposure to uncertain market returns, reflecting the uncertainty that exists throughout the economic system (Bodie et al., 2013, p. 170).

$$\beta = \frac{Cov(r_f; r_m)}{\sigma_M^2}$$

Equation 9

σ_M^2 = variance market

$Cov(r_f; r_m)$ = covariance of the fund and market

Jensen’s Alpha

The Capital Asset Pricing Model (CAPM) was created in the 1960s by W. Sharpe and J. Lintner and based on the principles of modern portfolio theory. The single index model looks at the return of an asset by considering its systematic (market) risk and firm-specific (diversifiable) risk (Bodie et al., 2013, p. 171). Market risk is the inherent risk associated with the market that can't be eliminated, while diversifiable risk can be reduced through portfolio diversification (Bodie et al., 2013, p. 149). The single index model breaks down the excess return of securities (return minus the risk-free rate) into three components: beta, alpha, and residual (firm-specific) risk (Bodie et al., 2013, p. 170).

After Michael Jensen's 1968 publication, Jensen's alpha represents the excess return adjusted for systematic risk and indicates risk-adjusted returns above the market index. Negative alpha values indicate overvalued securities, while positive values indicate that the fund has outperformed the market benchmark and may be undervalued (Bodie et al., 2013, p. 603).

$$\alpha = R_f - [r_f + \beta_F(R_M - r_f)]$$

Equation 10

α = Jensen's alpha of fund

R_M = average return p.a. of market

Treynor Ratio

The Treynor Ratio compares the risk-adjusted performance of an investment with the systematic risk taken (Sharpe, 1966, p. 127) and was originally proposed by Jack L. treynor in 1965. A portfolio that exhibited a higher slope than the security market line indicated superior performance compared to the market. The calculation of the Treynor Ratio was performed for the indices using equation 11 and subsequently compared to the ex-post SML (Bodie et al., 2013, p. 602).

$$TR = \frac{R_f - r_f}{\beta_F}$$

Equation 11

β_F = beta of the fund

5.6. Approach to portfolio construction

The portfolio construction approach implemented for this analysis started on December 2, 2019, with an initial allocation of 50% in the SVX index and 50% in the SGX index. Additionally, US PMI data was obtained for the same period. Since the PMI data are published on a monthly basis and the index returns on a daily basis, the PMI data will be at the same level every day until the next changeover.

An IF formula was employed in Excel to link the daily returns of the SVX and SGX indices to the PMI data. The formula considered different weightings for the portfolio based on the PMI levels.

$$Portfolio\ weights = IF(J10 <= \$L\$1; 0.25 * C10 + 0.75 * G10; IF(J10 <= \$L\$2; 0.5 * C10 + 0.5 * G10; 0.75 * C10 + 0.25 * G10))$$

$J10$	= PMI data
$L1$	= 45; bottom cutoff
$L2$	= 60; top cutoff
$C10$	= daily return SGX
$G10$	= daily return SVX

Two cutoffs were established for the PMI: a top cutoff at 60 and a bottom cutoff at 45. When the PMI was 45 or lower, the portfolio was weighted with 75% in SVX and 25% in SGX. If the PMI fell between 45 and 60, the weights were adjusted to 50% in SVX and 50% in SGX. Conversely, if the PMI exceeded 60, the portfolio's weights were set at 25% in SVX and 75% in SGX.

This weight calculation formula was applied continuously until April 28, 2023. This calculation is a simple solution for portfolio construction, where the portfolio is rebalanced at the time of a PMI release. After in-depth research, it has been found that it is challenging to predict PMI data, which is why this simple solution has been used.

Following the determination of the portfolio weights, the performance of the constructed portfolio was compared to the performance of the SVX and SGX indices (equally weighted portfolio).

5.7. Regression Analysis

Regression analysis is a statistical method widely used in finance to analyze and model relationships between variables. It helps to understand the impact of independent variables on a dependent variable, allowing for predictive and explanatory capabilities in financial analysis. Here's an explanation of regression analysis in the context of finance: Dependent Variable: In finance, the dependent variable is typically a financial metric or an asset's return, such as stock prices, bond yields, or portfolio returns. It represents the variable we try to predict or explain based on other factors (Taylor, 2023).

Independent Variables: The independent variables in finance regression analysis can include various financial indicators, economic factors, market variables, or any other relevant data that might influence the dependent variable. For example, independent variables could be interest rates, inflation, GDP growth, industry-specific metrics, or company-specific factors.

Regression Model: The regression model aims to establish a mathematical relationship between the dependent and independent variables. The linear regression model is the most commonly used type of regression analysis in finance. It assumes a linear relationship between the variables and estimates the coefficients that represent the impact of each independent variable on the dependent variable (Sarstedt & Mooi, 2018, p. 224).

R^2: R-squared measures the proportion of the variation in the dependent variable (Y) that is explained by the independent variables (X). It ranges from 0 to 1, where 0 indicates no relationship and 1 indicates a perfect fit. A higher R-squared value suggests a stronger connection between the variables (Taylor, 2023).

Coefficients: The coefficients, also known as beta values, represent the estimated effect of each independent variable on the dependent variable. They indicate the relationship's direction (positive or negative) and magnitude. Significant coefficients (p-value below a chosen significance level, e.g., 0.05) suggest a statistically significant relationship (CFI, 2023).

P-values: P-values indicate the statistical significance of each coefficient. They assess whether the estimated coefficient is significantly different from zero. A p-value below a chosen significance level (e.g., 0.05) indicates a statistically significant relationship between the independent and dependent variables (CFI, 2022).

6. Results

This section examines the performance of the two indices, SVX and SGX, in the portfolio. In the first section, the results of the descriptive statistics show the ex-post performance, outlier intensity, and risk and risk-adjusted returns for the periods 2020 to 2023 and 2022 to 2023. Throughout this section, reference is made to the results of the quantitative analysis for each SVX, SGX, portfolio, and SPX. The second part of this section describes the results of portfolio construction in terms of performance. Detailed information can be found in the Appendix.

6.1. Performance Analysis

6.1.1. COVID-19 pandemic

Figure 3 shows the development of the cumulative returns of the SGX and SVX. It is noteworthy that the returns developed very similar in the first months before the SGX was able to clearly outperform SVX by more than 16%. The spread was maintained in the remaining observation period, tightening more and more during the last nine months.

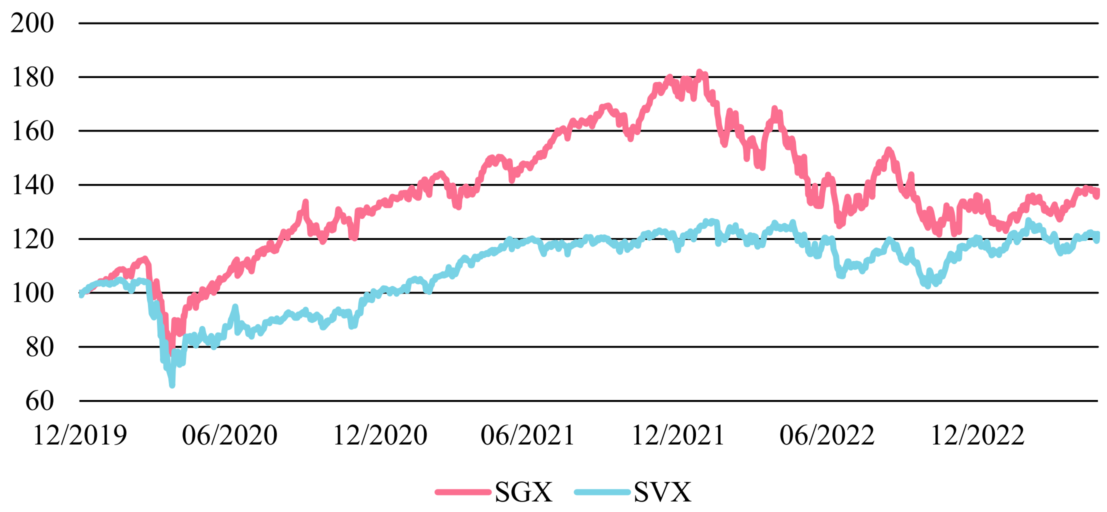

Figure 3: cumulative performance COVID-19

Table 2 summarizes and compares the performance ratios of the two indices. To make the performance comparison easier to understand, better results are highlighted in green. The SGX outperformed the SVX in almost every year, except 2022 which will be explained in the next chapter focusing on the invasion of Ukraine. Only in 2020, the SGX outperformed its peer by more than 30%. The average performance p.a. differentiated by almost 4%, speaking for a superior performance of the SGX. Looking at the COVID-19 pandemic isolated (02.12.2019-23.02.2022) the differences in performance are much more significant, with the SGX almost outperforming the SVX by 12% on an average basis (see Appendix X). Despite the notable disparity in performance between the two indices, the level of volatility observed in the SGX, does not display a significant increase, indicating a more attractive risk-return profile as reflected in the Table 2.

Performance	**SGX**	**SVX**	**SPX**
average p.a.	9.78%	6.01%	8.62%
cumulative return	39.05%	22.90%	33.90%
2023	2.20%	1.92%	2.19%
2022	-24.25%	-3.40%	-14.39%
2021	31.04%	22.20%	26.89%
2020	31.99%	-1.45%	16.26%
2019 (02.12-31.12)	3.85%	3.65%	3.75%
Risk			
Max Drawdown	-33.19%	-37.36%	-33.92%
Volatility p.a.	26.82%	23.40%	23.95%
Beta	1.08	0.91	1.00
Downside deviation	1.33%	1.23%	1.24%
Ratios			
Sharpe Ratio	0.29	0.17	0.28
Sortino Ratio	5.91	3.31	5.40
Calmar Ratio	0.29	0.16	0.25
Jensen's Alpha	0.60%	-2.02%	-
Treynor Ratio	7.24%	4.47%	6.69%

Table 2: despcriptive statistics COVID-19

Drawdown

Chapter Five explains that drawdowns can be used to assess investment risk by measuring the extent of the differences between peak and trough values. During the COVID-19 pandemic, significant drawdowns have been observed, reflecting the turbulent market conditions brought by the crisis. Notably, SGX recorded a maximum drawdown of -33.19%, indicating a decline of 33.19% from its peak value to the lowest point reached during this period. Similarly, the SVX experienced a more severe drawdown, with a maximum decline of -37.36%, demonstrating the heightened market stress and investor pessimism for value stocks. Considering the overall market performance, the maximum drawdown was observed to be -33.92%. Looking at the COVID-19 pandemic isolated (02.12.2019-23.02.2022), SVX and SPX have not changed substantially (-37.36% and -33.92%) and the SGX had a slightly more positive maximum drawdown (-31.42%).

Calmar Ratio

The Calmar Ratio is a measure of a portfolio's downside risk. It compares the risk premium to its maximum drawdown, indicating that a higher risk premium for a certain level of risk (represented by drawdowns) results in a higher payoff. A Calmar Ratio above 0.5 is deemed favorable. Nonetheless, during this period, the market experienced increased volatility, which adversely affected the Calmar Ratio levels attained.

SGX exhibited a Calmar ratio of 0.29, indicating that for each unit of maximum drawdown experienced, the index generated approximately 0.29 units of annualized return. In contrast, the SVX index has a Calmar ratio of 0.16, signifying a lower risk-adjusted return compared to the SGX. Despite its relatively larger drawdown of -37.36%, the SVX generated less return per unit of risk incurred. This indicates that value investors may have faced higher volatility and/or lower returns during the COVID-19 period, emphasizing the challenges and risks associated with investing in value stocks. Considering the overall market performance, a Calmar ratio of 0.25 for the SPX has been calculated. Looking at the COVID-19 pandemic isolated (02.12.2019-23.02.2022), the Calmar ratio for the SGX doubled to 0.61 while the SVX stayed almost the same (0.20).

Sharpe Ratio

The Sharpe Ratio is calculated by using a risk-free rate of 1.93%. The rate of 1.93% was obtained by taking average yield of the 10-year Treasury Bond as explained at the beginning of this chapter.

A comparison of the Sharpe Ratios between the SGX and SVX reveals that the SGX's Sharpe Ratio is more than 10 basis points higher than that of the SVX (0.29 versus 0.17). This observation indicates that, on average, a favorable risk-adjusted return relative to the risk-free rate was generated by the SGX, taking into account the level of volatility associated with the index, which was higher for the SGX compared to the SVX. Looking at the COVID-19 pandemic isolated (02.12.2019-23.02.2022), the Sharpe Ratio for the SGX doubled again to 0.64 while the SVX stayed almost the same (0.22).

Sortino Ratio

Closely related to Sharpe Ratio is the Sortino Ratio, which in comparison uses the downside deviation instead of the standard deviation risk – i.e., only those returns falling below a user-specified target (0%).

The SGX clearly beat the SVX with a Sortino Ratio of 5.91 compared to 3.31. Looking at the COVID-19 pandemic isolated (02.12.2019-23.02.2022), the Sortino Ratio for the SGX doubled to 11.79 compared to 3.88 for the SVX. Also the Sortino Ratio for the market SPX increased notably to 8.64 (from 5.40).

Beta

Beta quantifies the relationship between an investment's price movement and the movement of a benchmark, such as the SPX (Bodie et al., 2013, p. 149). A beta value of 1 indicates that the investment tends to align with the market. If the beta is greater than 1, it suggests that the investment is more sensitive than the market, meaning it is likely to experience more significant price swings. Conversely, a beta of less than 1 indicates lower sensitivity than the market (CFI, 2023).

As displayed in table 2, the beta for the SGX is higher than 1 (1.08) compared to the SVX with 0.91, which suggests higher volatility compared to the SPX and vice versa for the SVX. Looking at the isolated period, the old beta move close to the market beta of 1 (1.03 for the SGX and 0.96 for the SVX), indicating similar volatility than during the entire period.

Jensen's Alpha

The Jensen's alpha shows the excess return compared to the benchmark and indicates investments with superior returns when the alpha value is greater than zero (CFI, n.d.f).

A comparison of the Jensen's Alpha between the SGX and SVX reveals that the SGX's with 0.60% is more than 2% higher than that of the SVX with -2.02%. This observation indicates that, that the SGX's returns exceeded the expected returns based on its systematic risk exposure. Looking at the COVID-19 pandemic isolated (02.12.2019-23.02.2022), the Jensen's Alpha for the SGX multiplied by 7.5 to 4.50% while the negative alpha for the SVX multiplied times 3 to -6.12%. While the average performance p.a. almost stayed the same for the SVX – the SGX and the SPX increased drastically, returning in a stronger negative alpha for the SVX.

Treynor Ratio

The Treynor Ratio measures how much extra return is earned compared to the market's systematic risk. If the Treynor Ratio is higher than the SML slope (RM-Rf), which is 6.69% (SPX), outperformance has been achieved (Bodie et al.,2013, p. 602).

The Treynor Ratio values calculated shown in Table 2 show the same results as seen in other ratios. The SGX is outperforming with a Treynor Ratio of 7.24%, beating the market by 0.55%. The SVX is underperforming the market by 2.22% with a Treynor Ratio of 4.47%. This can be explained through the variables in the equation.

The analyses conducted indicate that the SGX exhibits superior performance compared to the SVX throughout the COVID-19 pandemic, reflecting also the Ukraine-Russia conflict. This outperformance is particularly pronounced during the isolated period under examination.

6.1.2. Ukraine-Russia conflict

Figure 4 shows the development of the cumulative returns of the SGX and SVX during the Ukraine-Russia conflict, which started on February 24, 2022. The market crash was not as severe as the COVID-19 crash, but a very clear style rotation can be observed from August 2022 onwards. The spread was increasing in the remaining observation period.

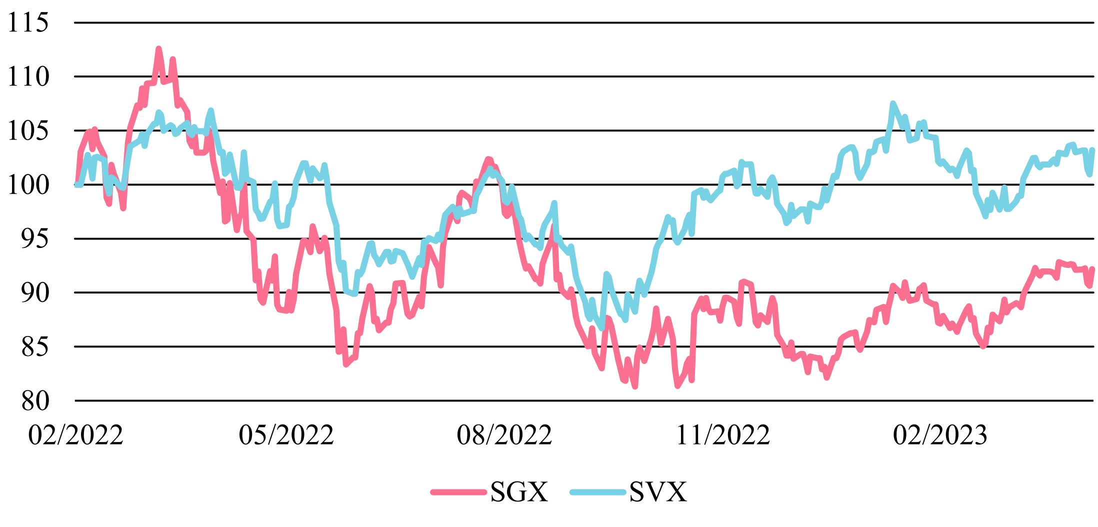

Figure 4: cumulative performance Ukraine-Russia conflict

Table 3 shows that the SGX underperforms the SVX clearly, with an average performance p.a. of -5.82%, more than 9% lower compared to the SVX. The SVX not only beats the SGX but also the overall market, being the only positive returning index during the period examined (+3.31%). When looking at the volatility, it is noteworthy that the SVX not only has the superior performance, but also a significantly lower volatility (18.80%) compared to the SGX (-27.34%) and the SPX (-22.25%), resulting in a more attractive risk-return profile.

Performance	**SGX**	**SVX**	**SPX**
average p.a.	-5.82%	3.31%	-1.09%
cumulative return	-7.07%	4.06%	-1.33%
2023	10.21%	6.51%	8.44%
2022 (24.02-31.12)	-15.68%	-2.30%	-9.01%
Risk			
Max Drawdown	-27.79%	-18.85%	-22.77%
Volatility p.a.	27.34%	18.80%	22.25%
Beta	1.20	0.81	1.00
Downside	1.12%	0.77%	0.92%
Ratios			
Sharpe Ratio	-0.28	0.07	-0.14
Sortino Ratio	-6.95	1.80	-3.28
Calmar Ratio	-0.21	0.18	-0.05
Jensen's Alpha	-4.14%	3.82%	-
Treynor Ratio	-6.47%	1.71%	-3.02%

Table 3: descriptive statistics Ukraine-Russia conflict

Drawdown

During the specified period, drawdowns have been observed rather similar to the COVID-19 pandemic. The SGX recorded a maximum drawdown of -27.79%. Similarly, the SPX experienced a drawdown of -22.77%. The SVX, on the other hand, experienced a much smaller maximum drawdown of -18.85%, half the drawdown of the COVID-19 pandemic, representing a smaller decline from its peak value.

Calmar Ratio

The SVX exhibited a Calmar ratio of 0.18, indicating that for each unit of maximum drawdown experienced, the index generated approximately 0.18 units of annualized return. In contrast, the SGX index had a negative Calmar ratio of -0.21, signifying a lower risk-adjusted return compared to the SVX index. Considering the overall market performance, a Calmar ratio of -0.05 for the SPX has been calculated. A drastic change can be found from COVID-19 levels as well as the isolated period.

Sharpe Ratio

A comparison of the Sharpe Ratios between the SGX and SVX reveals that the SVX's Sharpe Ratio was more than 30 basis points higher than that of the SGX (0.07 versus -0.28). This observation indicates that, on average, a favorable risk-adjusted return relative to the risk-free rate was generated by the SVX, taking into account the level of volatility associated with the index, which was lower for the SVX compared to the SGX.

Sortino Ratio

Since the offset of the Ukraine-Russia conflict, the SVX clearly beat the SGX with a Sortino Ratio of 1.80 compared to -6.95. Also the SPX declined drastically to -3.28, highlighting the strong negative average performance p.a. generated by SGX as well as the overall market.

Beta

As illustrated in Table 3, the beta values for the indices have been adjusted for the period subsequent to the invasion. Notably, the disparity in beta values for the SVX index has widened, with a revised beta of 0.81 (below 1), indicating a lower level of volatility compared to the SPX index. On the other hand, the beta for the SGX index has increased to 1.20, signifying a higher level of volatility relative to the overall market.

Jensen's Alpha

Upon comparing the Jensen's Alpha values between the SGX and SVX indices, it becomes apparent that the SVX exhibits a significantly higher value of 3.82%, which is nearly 8% greater than the SGX's value of -4.14%. This finding suggests that the returns generated by the SVX index surpassed the expected returns based on its systematic risk exposure, indicating a positive abnormal performance.

Treynor Ratio

The calculated Treynor Ratio values confirm the previously observed trends. The SVX index continues to demonstrate superior performance with a Treynor Ratio of 1.71%, surpassing the overall market by 4.73%. In contrast, the SGX index exhibits significant underperformance relative to both the SVX index and the market, with a Treynor Ratio of -6.47%.

6.2. Portfolio construction

Figure 5 shows the development of the cumulative returns of the Portfolio versus the equal weighted Portfolio (50/50 portfolio) representing both indices. The Portfolio that has been linked to the PMI data recorded a 2.23% outperformance versus its peer.

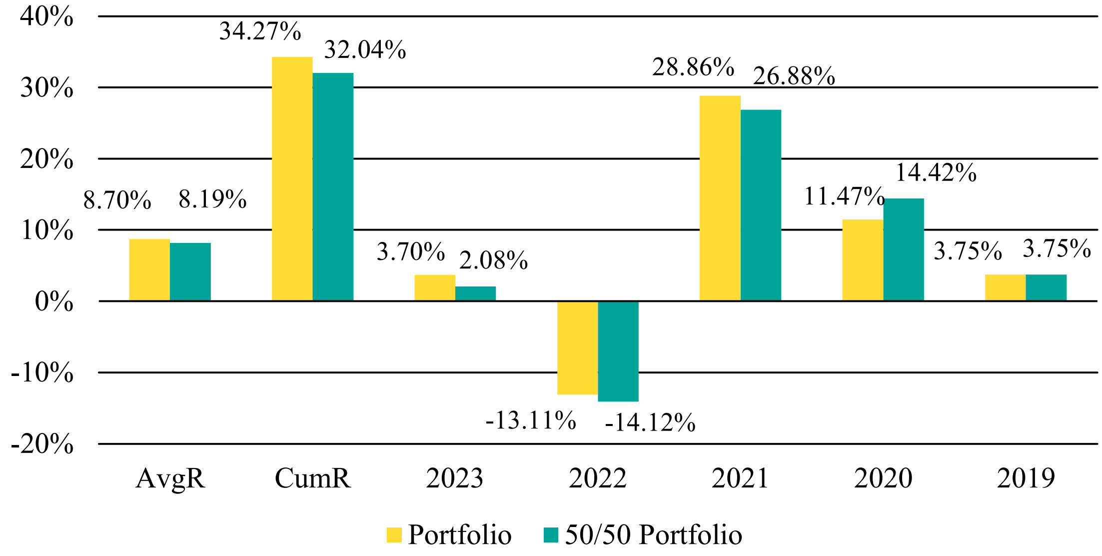

Figure 5: annual, cumulative, average returns

As seen in Table 4, since the beginning of the COVID-19 pandemic up until April 2023, the Portfolio outperformed the equally weighted portfolio by 0.51%, with an average return p.a. of 8.70%.

Performance	**Portfolio**	**50/50 Portfolio**
average p.a.	8.70%	8.19%
cumulative return	34.27%	32.04%
2023	3.70%	2.08%
2022	-13.11%	-14.12%
2021	28.86%	26.88%
2020	11.47%	14.42%
2019	3.75%	3.75%
Risk		
Max Drawdown	-35.06%	-33.92%
Volatility p.a.	24.15%	24.02%
Beta	1.001	0.999
Downside	1.25%	1.25%
Ratios		
Sharpe Ratio	0.28	0.26
Sortino Ratio	5.40	5.02
Calmar Ratio	0.25	0.24
Jensen's Alpha	0.08%	-0.42%
Treynor Ratio	6.77%	6.27%

Table 4: descriptive statistics portfolio

The volatility of the portfolios is almost the same with 24.15% for the Portfolio and 24.02% for the 50/50 Portfolio, speaking for a superior risk-return profile for the Portfolio linked to the PMI.

Drawdown

During the entire period, significant drawdowns have been observed, reflecting the turbulent market conditions brought about by the COVID-19 pandemic as well as the Ukraine-Russia conflict. Notably, the Portfolio recorded a maximum drawdown of -35.06%, which is 1.14% lower than the equally weighted portfolio.

Calmar Ratio

The Portfolio exhibited a Calmar ratio of 0.25, which corresponds to the SPX. In contrast, the 50/50 portfolio only showed a slightly lower Calmar Ratio of 0.24.

Sharpe Ratio

Sharpe ratios for the Portfolio and the 50/50 Portfolio indicate that both stocks have generated positive risk-adjusted returns relative to the risk-free rate. This suggests that, on average, the returns they have provided have compensated investors for the level of risk associated with each stock. However, it's important to note that when comparing Sharpe ratios, a higher value indicates a more favorable risk-adjusted return. Therefore, the Portfolio, with a slightly higher Sharpe ratio of 0.28, may be considered to have a slightly more attractive risk-adjusted performance compared to the 50/50 Portfolio, which has a Sharpe ratio of 0.26.

Sortino Ratio

The Sortino Ratio displayed a marginal advantage for the Portfolio, with a value of 5.40 compared to 5.02. It is important to note that the Sortino Ratio for the Portfolio is again reflects the benchmark represented by the SPX.

Beta

As displayed in table 3, the beta for the Portfolio and the 50/50 Portfolio equal 1, which is the beta of the market. A beta of one for an investment indicates that the investment is expected to have a same level of volatility as the overall market and its price movements are likely to mirror the fluctuations of the broader market.

Jensen's Alpha

The Jensen's alpha for the Portfolio is 0.08%. This positive alpha indicates that the portfolio has outperformed its expected return based on its beta and the market return. The Portfolios actual average return p.a. of 8.70% exceeds the expected return slightly, considering its beta of 1 and the market return of 8.62%. Therefore, generated a positive risk-adjusted return, suggesting that it has performed better than expected given its level of systematic risk. The Jensen's alpha for the 50/50 Portfolio is -0.41%. This negative alpha suggests that the 50/50 Portfolio has underperformed its expected return based on its beta and the market return. The 50/50 Portfolio's actual average return p.a. of 8.19% falls short of the expected return. Therefore, the 50/50 Portfolio has generated a negative risk-adjusted return.

Treynor Ratio

The Treynor Ratio values calculated shown in Table 4 show that the Portfolio is outperforming with 6.77%, beating its peer by 0.50%. A higher Treynor Ratio indicates that the Portfolio has delivered more return for each unit of systematic risk undertaken – which was 1 for both portfolios.

The analyses conducted indicate that the Portfolio exhibits superior performance, even if very moderate, compared to the 50/50 Portfolio throughout the COVID-19 pandemic, reflecting also the Ukraine-Russia conflict. It is also worth noting that the portfolio performs in many respects like the overall market (SPX).

6.3. Regression Analysis

6.3.1. Value versus Growth

A regression analysis in Excel has been performed to examine the relationship between the returns of SGX (dependent variable, Y) and the returns of SVX (independent variable, X). Here are the results obtained:

R^2 = *0.69*

Coefficient of X (SVX) = 0.00019

P-value of X (SVX) = 0.5498

The R-squared value of 0.69 indicates that 69% of the variation in the returns of SGX can be explained by the returns of SVX. This suggests a relatively strong relationship between the returns of the two indices in our sample.

The coefficient of X (SVX) being 0.00019 suggests a very small effect. For every 1% increase in the returns of SVX, one can expect, on average, only a 0.019% increase in the returns of SGX. The positive coefficient still implies a positive relationship, but the magnitude of the effect is minimal.

The p-value associated with the coefficient of X (SVX) being 0.5598 suggests that the relationship between the returns of SVX and the returns of SGX is not statistically significant. With a p-value above the conventional significance level of 0.05, the test fails to reject the null hypothesis. Therefore, a significant and meaningful relationship between the returns of SVX and the returns of SGX cannot be concluded in this scenario.

Based on the given results, it seems that there is a very weak relationship between the returns of SVX and the returns of SGX. The coefficient of X (SVX) indicates a very small effect, while the p-value suggests that this relationship is not statistically significant. Therefore, we cannot conclude that there is a significant and meaningful relationship between the returns of SVX and the returns of SGX in this scenario.

6.3.2. Portfolio versus 50/50 Portfolio

A second regression analysis in Excel has been conducted to investigate the correlation between the returns of the Portfolio (dependent variable, Y) and the returns of the 50/50 Portfolio (independent variable, X). Here are the findings obtained, following the completion of two previous portfolio analyses:

R^2 *= 0.996*
Coefficient of X (50/50 Portfolio) = 0.000019
P-value of X (50/50 Portfolio) = 0.5628

The R-squared value of 0.996 indicates that 99.6% of the variation in the returns of the portfolio can be explained by the returns of the 50/50 portfolio. This suggests an extremely strong relationship between the returns of the two portfolios in the sample.

The coefficient of X (50/50 Portfolio) is 0.0000186. This means that for every 1% increase in the returns of the 50/50 Portfolio, one can expect, on average, a 0.00186% increase in the returns of the Portfolio. Since the coefficient is positive, it suggests a positive relation between the returns of the 50/50 Portfolio and the returns of the the Portfolio.

The p-value associated with the coefficient of X (50/50 Portfolio) is 0.5628. Since this p-value is above the conventional significance level of 0.05, we fail to reject the null hypothesis. This suggests that the relationship between the returns of the 50/50 Portfolio and the returns of the Portfolio is not statistically significant. The observed relationship could likely occur by chance.

Based on the given results, one can say that there is an extremely strong relationship between the returns of the 50/50 Portfolio and the returns of the Portfolio, as indicated by the high R-squared value. However, the coefficient of X (50/50 Portfolio) suggests a very small effect, and the p-value indicates that this relationship is not statistically significant. Therefore, it cannot be concluded that there is a significant and meaningful relationship between the returns of the 50/50 portfolio and the returns of the portfolio in this scenario.

7. Conclusion

7.1. Answers to research questions

1. How did value and growth investing perform during these two exceptional situations of i) the COVID-19 pandemic and ii) the Ukraine-Russia conflict, characterized by high volatility and uncertainty in financial markets? Were there any significant performance differences between the two styles during these periods of market turmoil?

The comprehensive analysis of the SGX and SVX indices reveals a consistent outperformance of the growth index compared to the value index throughout the COVID-19 pandemic from December 02, 2019 until April 2023. However, a significant shift occurred during the Ukraine-Russia crisis, starting from February 24, 2022, where the value index displayed notable outperformance for the first time in many years relative to its peer and benchmark.

During the COVID-19 pandemic, growth investing demonstrated resilience and exhibited significant outperformance, accompanied by superior scores in all calculated ratios. Particularly in 2020, during the height of the pandemic, the SGX outperformed the SVX by 33.49%, with an annual performance of 31.99% compared to -1.45%. This strong performance can be attributed to the favorable portfolio weights of the growth index in companies from the technology and healthcare sectors, which were better equipped to navigate the challenges posed by the pandemic. Factors such as the increased demand for digital services, rapid adoption of remote work technologies, and advancements in healthcare solutions contributed to the positive performance of growth stocks. In contrast, value investing faced challenges during the pandemic due to the adverse impact on industries such as energy, retail, and travel. Value stocks, often found in traditional or cyclical sectors, experienced significant declines as economic activity contracted, and consumer spending weakened.

Despite the higher volatility observed in the SGX compared to the SVX, the former exhibited a higher Sharpe Ratio. Additionally, the Jensen's Alpha of the SGX is approximately 3% higher than that of the SVX over the entire period from the onset of the COVID-19 pandemic to 2023. Notably, when focusing on the isolated COVID-19 period, excluding the subsequent Ukraine-Russia conflict, the SGX displayed a remarkable Jensen's Alpha of 4.50% compared to -6.12% for the SVX. However, it is important to acknowledge the positive alpha of the SGX as well as the significant improvement of the SVX during the Ukraine-Russia crisis in 2022.

In 2022, the SVX managed to outperform the SGX by more than 20%. Noteworthy the performance of 4.06% has been achieved by value investors who initiated their investments at the end of February 2022, despite the ongoing conflict between Ukraine and Russia that has gripped the world's attention. Conversely, young growth investors who missed the market upswing of past decades have experienced a negative cumulative return of -7.07%. This further emphasizes the evident shift in investment styles aligned with specific sectors, as discussed in previous studies presented in Chapter 2.

Considering the analysis encompassing both periods up until April of the current year, it can be concluded that, on an aggregated basis, growth investing has exhibited superior performance compared to value investing.

2. Is it possible to construct a portfolio that combines the two strategies by linking the respective portfolio weights to the US Purchasing Managers' Index (PMI) to generate higher returns? In particular, can overweighting or underweighting the two styles within a portfolio lead to better performance than investing in each style separately?

Undoubtedly, the construction of a portfolio utilizing US PMI data is feasible, given that economic up- and downtruns are interlinked with equity market movements. This study aimed to assess the potential for achieving outperformance against two distinct investment styles. To validate the findings, a comparative analysis was conducted between the constructed portfolio and a 50/50 portfolio.

However, it is essential to manage expectations regarding the extent of potential outperformance. The observed outperformance resulting from the integration of the two strategies linked to the PMI tends to be modest and does not reach statistical significance. Consequently, investors should carefully consider their risk tolerance and return objectives before making decisions to overweight or underweight value and growth styles within their portfolios.

In terms of the actual performance of the constructed portfolio, it exhibited positive results, surpassing not only its peer, the equally weighted portfolio but also the SVX on a cumulative basis as well as average return p.a. Notably, the constructed portfolio demonstrated a remarkably similar Sharpe Ratio to the SGX, specifically 0.28 (compared to 0.29). However, what makes it particularly intriguing is that the constructed portfolio outperformed the SVX and the equally weighted portfolio by implementing a simple over- and underweighting strategy based on two cutoffs in the US PMI figures.

Additionally, the overall Jensen's Alpha for the constructed portfolio was positive, measuring at 0.08%. This result was almost 0.50% higher than the Jensen's Alpha of the equally weighted portfolio, which presented a negative value. These findings emphasize the value of the constructed portfolio's performance, as it not only achieved positive returns but also surpassed the benchmark portfolio while generating a higher risk-adjusted excess return.

Overall, the performance analysis of the constructed portfolio demonstrates its superiority in comparison to the equally weighted portfolio and the SVX. It achieved positive returns, exhibited a comparable risk-adjusted performance to the SGX, and outperformed the SVX and the equally weighted portfolio.

Ultimately, constructing a portfolio that combines value and growth strategies based on the PMI can offer potential benefits. However, continuous monitoring and assessment of performance are crucial, as market conditions and economic factors evolve. Regular adjustments may be necessary to align the portfolio with prevailing conditions and optimize outcomes.

7.2. Interpretation and recommendation

In light of the deviating performance of value and growth investing observed during the extraordinary times, several potential recommendations emerge for investors seeking to navigate such circumstances.

Firstly, diversifying portfolios by incorporating both value and growth stocks can be advantageous. This strategy aims to capture potential gains from the unique strengths associated with each investment style, while mitigating risks linked to relying solely on one style.

Secondly, implementing a dynamic asset allocation approach that adjusts portfolio weightings between value and growth stocks based on market conditions and the severity of the crisis presents a slight opportunity to capitalize on the relative performance of each style during different phases of the crisis.

Thirdly, developing robust risk management strategies tailored to the characteristics of value and growth stocks during crisis periods is crucial. Employing techniques such as setting appropriate stop-loss levels, employing hedging strategies, or utilizing options can help mitigate downside risk. Furthermore, conducting comprehensive fundamental analysis on individual value and growth stocks within specific sectors during crises facilitates the identification of companies with resilient business models, strong financials, and potential for growth or recovery. This bottom-up approach enables the selection of high-quality investments within each style.

Finally, due to the dynamic nature of crisis situations, active management and continuous portfolio monitoring are essential. Regularly reviewing and adjusting the portfolio's allocation between value and growth stocks, informed by updated market trends too, can help seize emerging opportunities and navigate changing market conditions effectively. These recommendations, while not exhaustive, provide a foundation for further exploration and should be customized to individual investment objectives, risk tolerance, and specific crisis circumstances. Rigorous research, consultation with financial professionals, and consideration of historical data and market conditions are vital for developing sound investment strategies in the context of value versus growth investing during times of crisis.

7.3. Critical appraisal and limitation

In conducting a comprehensive academic analysis of the performance of value and growth investing during crises, several key considerations must be addressed. Firstly, evaluating the sample size and selection criteria is paramount to ensure that the study adequately represents the overall market and encompasses a diverse range of value and growth stocks across various sectors. This scrutiny is vital for drawing meaningful and representative conclusions.

Secondly, an in-depth examination of the methodology employed is crucial. This entails assessing the data sources, variables, and statistical techniques utilized to evaluate performance. By scrutinizing these aspects, researchers can ascertain the robustness and reliability of the findings. Additionally, it is imperative to identify any potential limitations in the methodology, such as survivorship bias or data mining, to maintain the integrity and validity of the analysis.

The generalizability of the results is another critical aspect to consider. Researchers must assess whether the findings extend beyond the specific crisis period or market conditions under investigation. Understanding the broader applicability of the results and considering the potential influence of different crises or economic environments on the performance of value and growth investing is pivotal for deriving meaningful implications. Before conclusions can be drawn, other crises must be studied, and it remains to be seen whether the same result can be achieved in future crises.

Finally, exploring alternative explanations or factors that may have impacted the observed performance differences between value and growth investing during crises is necessary. By incorporating additional variables such as market sentiment, investor behavior, or specific industry dynamics, researchers can gain a more comprehensive understanding of the observed performance disparities. This analysis contributes to a more nuanced interpretation of the findings and expands the depth of insights derived from the research.

7.4. Implications for practice and outlook

This thesis provides opportunities for future research to explore the performance of value and growth investing in diverse crisis scenarios, as well as investigate the underlying factors that contribute to such performance differences more in depth. Conducting further studies that examine additional variables, including market sentiment, investor behavior, and specific industry dynamics, can yield a more comprehensive understanding of the observed variations in performance and offer insights for optimizing investment strategies.

The study's outcome presents chances for further research on refining the methodology and exploring additional variables to enhance the predictive power of incorporating economic indicators, such as US PMI data, into portfolio construction. Investigating alternative factors and market indicators can contribute to a deeper understanding of the performance differences and improve the effectiveness of incorporating economic data into investment strategies.

List of References

Alexander, G. J., Sharpe, W. F. & Bailey, J. V. (2001). *Fundamentals of Investments* (3rd Edition). Pearson Educacion.

Athanassakos, G. (2009). Value versus growth stock returns and the value premium: The Canadian experience 1985-2005. *Canadian Journal of Administrative Sciences*, *26*(2), 109–121. https://doi.org/10.1002/cjas.93

Bacon, C. R. (2021). *Practical Risk-Adjusted Performance Measurement* (2nd Edition) John Wiley & Sons.

Bai, Y. & Schubert, S. (2022). *Forget about rotating into value*. https://am.vontobel.com/en/insights/forget-about-rotating-into-value

Bannigidadmath, D., Narayan, P. K., Phan, D. H. B. & Gong, Q. (2021b). How stock markets reacted to COVID-19? Evidence from 25 countries. *Finance Research Letters*, *45*, 102161. https://doi.org/10.1016/j.frl.2021.102161

Bellone, B., Declerck, P., Nordine, M. & Vy, T. (2019b). Multi-Asset Style Factors Have Their Shining Moments. *Social Science Research Network*. https://doi.org/10.2139/ssrn.3444208

Bickford, B. (2020). *Growth Stocks Accelerate Dominance Over Value Stocks Amid COVID-19 Crisis. Have they gone too far?* https://www.cambridgetrust.com/insights/investing-economy/growth-stocks-accelerate-dominance-over-value-stoc

Boungou, W. & Yatié, A. (2022). The impact of the Ukraine–Russia war on world stock market returns. *Economics Letters*, *215*, 110516. https://doi.org/10.1016/j.econlet.2022.110516

Campbell, J., Polk, C. & Vuolteenaho, T. (2005). *Growth or Glamour? Fundamentals and Systematic Risk in Stock Returns*. https://doi.org/10.3386/w11389

CDC. (2020). *COVID Data Tracker*. https://covid.cdc.gov/covid-data-tracker/#trends_weeklyhospitaladmissions_select_00

Chan, L. & Lakonishok, J. (2004). Value and Growth Investing: Review and Update. *Financial Analysts Journal*, 60(1), 71–86. https://doi.org/10.2469/faj.v60.n1.2593

Chen, J. (2022). *Margin of Safety: Examples, Meaning and FAQ*. https://www.investopedia.com/terms/m/marginofsafety.asp

Clissold, E., Anderson, R. & Chin, D. (2023). *What will drive the next phase in Growth versus Value?* https://www.ndr.com/web/ndr/publications/-/c/SP20230502*PDF/what-will-drive-the-next-phase-in-growth-versus-value

Corporate Finance Institute. (2023). *Beta*. https://corporatefinanceinstitute.com/resources/valuation/what-is-beta-guide/

Corporate Finance Institute. (2023). Calmar Ratio. https://corporatefinanceinstitute.com/resources/capital-markets/calmar-ratio/

Corporate Finance Institute. (2023). *Growth Stocks.* https://corporatefinanceinstitute.com/resources/capital-markets/growth-stocks/

DiCiurcio, K., Lepigina, O., Krsnak, I. & Davis, J. (2021). *Value versus growth stocks:The coming reversal of fortunes*. https://www.vanguard.co.uk/content/dam/intl/europe/documents/en/value-versus-growth-stocks-uk-en-pro.pdf

Di Lorenzo, R. (2013). Basic Technical Analysis of Financial Markets. *Perspectives in business culture*. https://doi.org/10.1007/978-88-470-5421-9

Fama, E. F. & French, K. R. (1992). The Cross-Section of Expected Stock Returns. *Journal of Finance*, *47*(2), 427–465. https://doi.org/10.1111/j.1540-6261.1992.tb04398.x

Fama, E. F. & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, *33*(1), 3–56. https://doi.org/10.1016/0304-405x(93)90023-5

Fama, E. F. & French, K. R. (1998). Value versus Growth: The International Evidence. *Journal of Finance*, *53*(6), 1975–1999. https://doi.org/10.1111/0022-1082.00080

Ferber, M. (2017). *Der ewige Kampf Value gegen Growth*. https://www.nzz.ch/finanzen/fonds/aktien-anlagestile-der-ewige-kampf-value-gegen-growth-ld.1288752

Fisher, P. A. (2003). *Common Stocks and Uncommon Profits and Other Writings*. John Wiley & Sons.

Gambarini, S. (2023). *Growth vs. Value: Re-Think Your Investment Style*. https://www.gsam.com/content/gsam/us/en/institutions/market-insights/gsam-insights/perspectives/2023/growth-vs-value-re-think-your-investment-style.html

GMO. (2021). *Value Traps vs. Growth Traps*. https://www.gmo.com/americas/research-library/value-traps-vs.-growth-traps_insights/#:~:text=Value%20traps%20have%20underperformed%20their,to%20deliver%2C%20investors%20are%20merciless.

Graham, B. & Dodd, D. (2008). *Security Analysis: Sixth Edition, Foreword by Warren Buffett*. Mcgraw-hill.

Hardin, T. (2021). *Value vs Growth: A Brief Historical View.* https://www.nasdaq.com/articles/value-vs-growth%3A-a-brief-historical-view-2021-05-06

Hodges, P. J., Hogan, K., Peterson, J. & Ang, A. (2017). Factor Timing with Cross-Sectional and Time-Series Predictors. *The Journal of Portfolio Management*, *44*(1), 30–43. https://doi.org/10.3905/jpm.2017.44.1.030

J.P. Morgan. (2022). *Still value in value*. https://am.jpmorgan.com/se/en/asset-management/per/insights/market-insights/investment-outlook/growth-vs-value-stocks/

Kahn, R. A. & Lemmon, M. D. (2016). The Asset Manager's Dilemma: How Smart Beta Is Disrupting the Investment Management Industry. *Financial Analysts Journal*, *72*(1), 15–20. https://doi.org/10.2469/faj.v72.n1.1

Kim, S. (2022). Factor investing: a unified view. *Applied Economics*, *55*(14), 1567–1580. https://doi.org/10.1080/00036846.2022.2097635

Lagarde, C. (March 26, 2022). *Interview with Phileleftheros*. https://www.ecb.europa.eu/press/inter/date/2022/html/ecb.in220326~3f3d478120.en.html

Licsauer, J. (2023). *Value versus growth investing – the great rotation and what's next*. https://www.hl.co.uk/news/articles/value-versus-growth-investing-the-great-rotation-and-whats-next

Lynch, P. & Rothchild, J. A. (1989). *One Up On Wall Street: How To Use What You Already Know To Make Money In The Market*. https://ci.nii.ac.jp/ncid/BA84159682

Marcus, A., Bodie, Z. & Kane, A. (2012). *Essentials of Investments* (9th Edition) McGraw-Hill Education.

Markowicz, S. (2021). *What really drives rotations from growth to value stocks?* https://www.schroders.com/en-us/us/individual/insights/what-really-drives-rotations-from-growth-to-value-stocks/

Markowitz, H. (1952). Portfolio Selection. The Journal of Finance, 7(1), 77-91. https://www.jstor.org/stable/2975974?seq=1#metadata_info_tab_contents

Marks, L. (2021). *Thinking differently about growth versus value*. https://www.mackenzieinvestments.com/content/dam/mackenzie/en/insights/mi-value-and-growth-lesley-marks-en.pdf

Mbah, R. E. & Wasum, D. F. (2022). Russian-Ukraine 2022 War: A Review of the Economic Impact of Russian-Ukraine Crisis on the USA, UK, Canada, and Europe. *Advances in Social Sciences Research Journal*, *9*(3), 144–153. https://doi.org/10.14738/assrj.93.12005

Menges, P. & Rabattu, D. (2022). *Quality is the decider in the battle between value and growth*. https://am.lombardodier.com/ch/en/contents/news/investment-viewpoints/2022/january/quality-is-the-decider-in-the-ba.html

MSCI. (n.d.). FACTOR *FOCUS: VALUE*. https://www.msci.com/documents/1296102/1339060/Factor+Factsheets+Value.pdf

MSCI. (n.d.). *FACTOR FOCUS: GROWTH*. https://www.msci.com/documents/1296102/8473352/MSCI-SingleFactor-Growth.pdf

Nasdaq. (2022). *Billionaire Snapshots: The Oracle of Omaha and What He's Buying Even in the Face of a Recession*. https://www.nasdaq.com/articles/billionaire-snapshots%3A-the-oracle-of-omaha-and-what-hes-buying-even-in-the-face-of-a

Nicholas, D. (2020). *Value Investing – Is It Different This Time?* https://www.im.natixis.com/en-institutional/insights/value-investing-is-it-different-this-time

Pappas, N. & Dickson, J.M. (2015). *Factor-based investing*. https://conferences.pionline.com/uploads/conference_admin/FactorBased_Investing.pdf

Penman, S. H. (2014). The Value Trap: Value Buys Risky Growth. *Social Science Research Network*. https://doi.org/10.2139/ssrn.2494412

Penman, S. H. & Reggiani, F. (2018b). Fundamentals of Value versus Growth Investing and an Explanation for the Value Trap. *Financial Analysts Journal*, *74*(4), 103–119. https://doi.org/10.2469/faj.v74.n4.6

Rajablu, M. (2011). *Value investing: review of Warren Buffett's investment philosophy and practice*. https://core.ac.uk/download/pdf/234629199.pdf

Roth, C. (2019). *Warren Buffetts Value-Strategie: Kommt nun das Comeback*. https://www.nzz.ch/finanzen/warren-buffetts-value-strategie-kommt-nun-das-comeback-ld.1528787

Sansa, N. A. (2020). The Impact of the COVID-19 on the Financial Markets: Evidence from China and USA. *Social Science Research Network*. https://doi.org/10.2139/ssrn.3567901

Sarstedt, M. & Mooi, E. (2018). *A Concise Guide to Market Research: The Process, Data, and Methods Using IBM SPSS Statistics*. Springer.

Sen, J. (2022). A Comparative Study on the Sharpe Ratio, Sortino Ratio, and Calmar Ratio in Portfolio Optimization. *ResearchGate*. https://www.researchgate.net/publication/366517929

Sharpe, W. F. (1964). CAPITAL ASSET PRICES: A THEORY OF MARKET EQUILIBRIUM UNDER CONDITIONS OF RISK*. *Journal of Finance*, *19*(3), 425–442. https://doi.org/10.1111/j.1540-6261.1964.tb02865.x

Sharpe, W. F. (1966). Mutual Fund Performance. *The Journal of Business*, *39*(S1), 119. https://doi.org/10.1086/294846

Solberg, L. (2022). *5 Charts on Value Stocks' Big Comeback.* https://www.morningstar.com/markets/5-charts-value-stocks-big-comeback

Statista. (2023). *Topic: Coronavirus (COVID-19) in the U.S.* https://www.statista.com/topics/6084/coronavirus-covid-19-in-the-us/#topicOverview

S&P Dow Jones Indices. (2022). *S&P U.S. Style Indices Methodology*. https://www.spglobal.com/spdji/en/indices/equity/sp-500-growth/#overview

S&P Global. (n.d.). *Purchasing Managers' Index^{TM} (PMI^{TM})* https://www.spglobal.com/marketintelligence/en/mi/products/pmi.html

Van Gelderen, E., Huij, J. & Kyosev, G. (2019). Factor Investing from Concept to Implementation. *Social Science Research Network.* https://doi.org/10.2139/ssrn.3313364

Vanguard Switzerland. (2021). *A reversal of fortunes for US value and growth stocks. Vanguard Switzerland Professional*. https://www.ch.vanguard/en/professional/insights/market-commentary/reversal-of-fortunes-us-growth-stocks

Weng, J. & Butler, I. (2022). *Value vs growth investing: A historical overview.* https://am.jpmorgan.com/ch/en/asset-management/adv/insights/value-vs-growth-investing/

World Health Organization. (2020). Archived: WHO Timeline - COVID-19. https://www.who.int/news/item/27-04-2020-who-timeline---covid-19

Xu, L. (2021). Stock Return and the COVID-19 pandemic: Evidence from Canada and the US. *Finance Research Letters*, *38*, 101872. https://doi.org/10.1016/j.frl.2020.101872

Yousaf, I., Patel, R. & Yaroyaya, L. (2022). The reaction of G20+ stock markets to the Russia–Ukraine conflict “black-swan” event: Evidence from event study approach. *Journal of Behavioral and Experimental Finance*, *35*, 100723. https://doi.org/10.1016/j.jbef.2022.100723

Zhang, D., Hu, M. & Ji, Q. (2020b). Financial markets under the global pandemic of COVID-19. *Finance Research Letters*, *36*, 101528. https://doi.org/10.1016/j.frl.2020.101528

Zhao, L., Rasoulinezhad, E., Sarker, T. & Taghizadeh-Hesary, F. (2022b). Effects of COVID-19 on Global Financial Markets: Evidence from Qualitative Research for Developed and Developing Economies. *The European Journal of Development Research*. https://doi.org/10.1057/s41287-021-00494-x

Appendix 1: Isolated COVID-19 period (02.12.2019-23.02.2022)

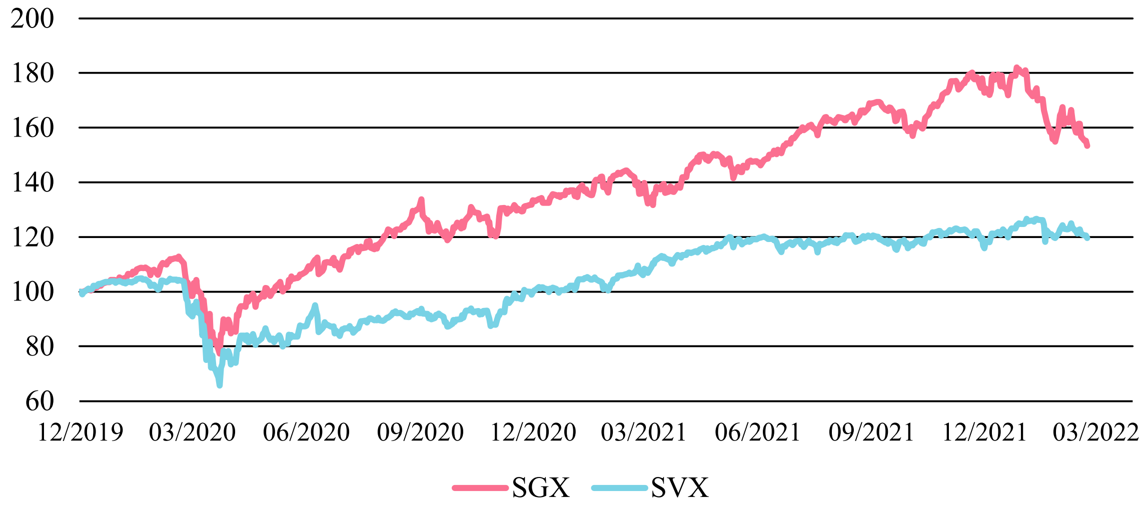

Figure 6: Isolated COVID-19 period

Appendix 2: Isolated COVID-19 period (02.12.2019-23.02.2022)

Performance	**SGX**	**SVX**	**SPX**
average p.a.	19.03%	7.45%	14.11%
cumulative return	49.62%	18.10%	35.70%
2022	-16.70%	-5.39%	-11.34%
2021	31.04%	22.20%	26.89%
2020	31.99%	-1.45%	16.26%
2019	3.85%	3.65%	3.75%
Risk			
Max Drawdown	-31.42%	-37.36%	-33.92%
Volatility p.a.	26.54%	25.50%	24.79%
Beta	103.46%	95.61%	100.00%
Downside	1.45%	1.42%	1.41%
Ratios			
Sharpe Ratio	0.64	0.22	0.49
Sortino Ratio	11.79	3.88	8.64
Calmar Ratio	0.61	0.20	0.42
Jensen's Alpha	4.50%	-6.12%	0.00%
Treynor Ratio	16.52%	5.78%	12.18%

Table 5: Isolated COVID-19 period

Appendix 3: Cumulative return 02.12.2019 - 28.04.2023

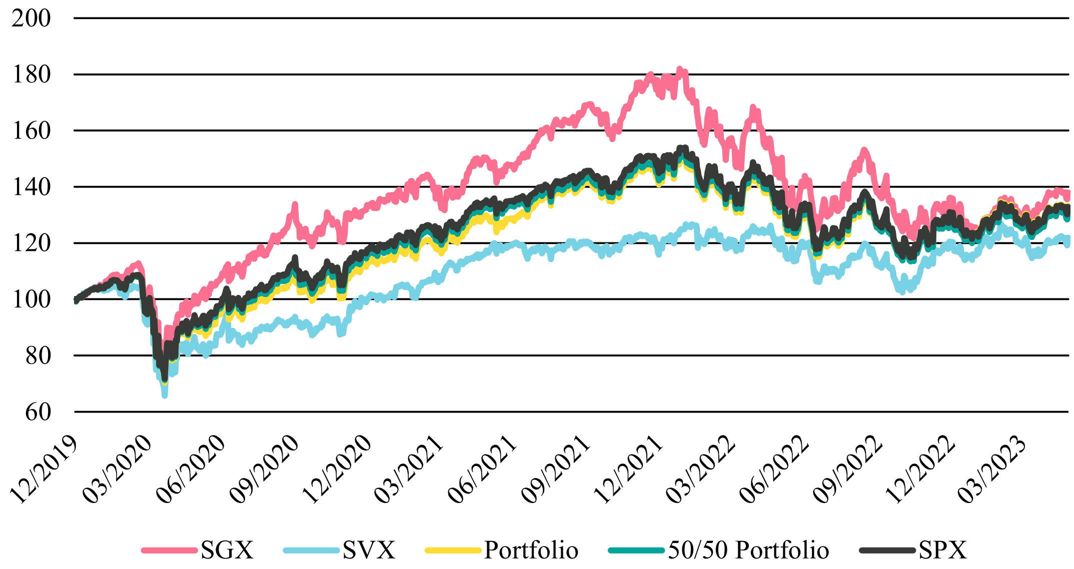

Figure 7: Cumulative return; all investments

Appendix 4: Excel file for own figures and tables

- Complete excel file with the entire time series for the SGX, SVX, SPX, Portfolio as well as 50/50 Portfolio.
- All tables and charts are included in this excel and all calculations and conventions are shown for each separate time period.
- In addition, the PMI data used can be seen from Refinitiv.
- The two regression analysis are in the last two tabs

Appendix 5: Regression Analysis SGX versus SVX

Regression Statistics	
Multiple R	0.8283
R Square	0.6860
Adjusted R Square	0.6857
Standard Error	0.0095
Observations	890

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.1741	0.1741	1940.3384	0.0000
Residual	888	0.0797	0.0001		
Total	889	0.2538			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.0190%	0.0318%	59.8215%	54.9849%	-0.0433%	0.0813%	-0.0433%	0.0813%
X Variable 1	94.9413%	2.1553%	4404.9272%	0.0000%	90.7111%	99.1714%	90.7111%	99.1714%

Table 6: Regression Analysis SGX/SVX

Appendix 6: Regression Analysis Portfolios

Regression Statistics	
Multiple R	0.9980
R Square	0.9960
Adjusted R Square	0.9960
Standard Error	0.0010
Observations	890

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.2047	0.2047	221238.5825	0.0000
Residual	888	0.0008	0.0000		
Total	889	0.2055			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.0019%	0.0000	0.5789	0.5628	0.0000	0.0001	0.0000	0.0001
X Variable 1	1.0031	0.0021	470.3601	0.0000	0.9989	1.0072	0.9989	1.0072

Table 7: Regression Analysis Portfolios