

Changes in Inflation Expectations and Firm Performance during Recent Global Economic Shocks^{*}

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Given the theoretically ambiguous relationship between stock prices and inflation, this study contributes to growing literature by emphasizing the importance of using subjective expectations, rather than objective realizations, to models of asset pricing. An event study and downside risk measures are used to capture sector-specific sensitivities to expected inflation and monetary policy announcements under varying market conditions and investor return targets. Oil and Gas, Basic Materials, and Technology emerge as the most effective for constructing optimal hedging portfolios when the objective is to minimize downside risk. As investors increase their return targets, portfolio weights shift toward the Technology sector.

Key Words: Inflation expectations; Monetary policy announcements; U.S. stock market reactions; Sectoral and industry-level analysis; Downside risk; Event study.

JEL Classification Numbers: E31, E52, G11, G15.

1. INTRODUCTION

In 2020 and 2021, the COVID-19 crisis has driven marked shifts in demand, buying patterns, cost to serve, and perceived value across sectors and value chains, which have yielded to significant surge in commodity prices. Oil prices rose substantially due to increasing demand pressure against constrained supply. Food-price inflation in 2022 has attained its highest level since 2011. Although some price spikes were expected, the US inflation evolution has exceeded economists' expectations. The US inflation hit the highest level in more than 40 years as the prices rose by 7.5% in 2021. Consumer spending was further fueled by the range of announced monetary policies and governments' fiscal stimulus packages (Platitas and Ocampo, 2025). As the world economy has reopened, inflation has con-

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tinued to climb due to the direct and indirect effects of the energy shock, together with a set of US economy's reopening-related factors (see Figure A1 in Appendix). Even though the increase in inflation was hardly unexpected, central banks were caught off guard by the updating of inflation-forecasting models to a fast-evolving scenario (Voinea and Loungani, 2021), the identification of the determining forces behind this unexpected surge (Daly and Chankova, 2021) and, whether these drivers are transitory or permanent (Gomez-Pineda et al., 2021). In response, the US Federal Reserve (Fed) claimed that higher inflation had a temporary nature, albeit more persistent than expected. They rationalized the market surge in inflation rates by supply bottlenecks and demand shifts associated with the COVID-19 crisis, and expected these transitory factors to collapse. As long as inflation expectations remain anchored, they projected the underlying inflation to be stable and close to the central bank's targets. This view was highly supported by economists underscoring the role of clear and decisive monetary policy in preventing past inflation spiral episodes going back to the 1960s. (for instance, Ball et al., 2021; Krugman, 2021; Bernstein and Tadeschi, 2021; Powell, 2021).

The Russia-Ukraine war further intensified uncertainties surrounding the outlook of the US inflation, thereby ensuring the pain of inflation is set to get worse and last even longer. For the global economy, Russia and Ukraine are important suppliers of raw materials including energy, metals, and agricultural products (Seiler, 2022). Global oil prices have risen dramatically since the invasion due to the considerable threat of global supply disruption. The war has called into question the supply of these resources and accelerated their price development (Khan et al., 2021; Umar et al., 2021; Wang et al., 2022), reinforcing concerns about raising de-anchored inflation expectations (Coibion and Gorodnichenko, 2015; Coibion et al., 2020), ultimately prompting more persistent inflationary pressures (D'Acunto and Weber, 2022). The US consumer prices also rose in March 2022 by most since late 1981, which is evidence of a painfully rising cost of living, thus exacerbating the pressure on the Federal Reserve to raise interest rates more aggressively.

As inflation expectations become unanchored, investors may revise their expectations regarding corporate profits, adjust discount rates, and reprice assets. This could yield to sharp changes in stock valuations and amplify market volatility (Davig et al., 2023). Investors anticipate tighter monetary policy, such as interest rate hikes, in periods of rising inflation expectations. This may prompt a high discount rate being applied to firms' future cash flows, which could in turn yield to a drop in stock prices (Ioannidis and Kontonikas, 2008). This suggests that stock prices are sensitive to shifts in monetary policy since investors adjust their expectations based on future monetary actions (e.g., Fama and Schwert, 1977; Bodie and Rosan-

sky, 1980; Nelson, 1976). The markets' responses are seemingly greater in periods of heightened macroeconomic uncertainty, when investors reevaluate risks and long-term earnings expectations (see *inter alia*, Coibion and Gorodnichenko, 2015; Coibion et al., 2020). In heavily uncertain macroeconomic contexts, interest rate decisions especially unanticipated signals from the Federal Open Market Committee (FOMC) can result in significant repricing of financial assets, (Bernile et al., 2016; Du et al., 2018).

In such circumstances marked by changes in inflation expectations and heightened monetary policy uncertainty, inflation hedging would help investors better safeguard against unusual economic shocks and protect their portfolios from unpredictable movements in both inflation and monetary policy. It is therefore very important to address whether inflation risk can be easily hedged in financial markets. Accordingly, the main objective of this study is twofold: First, a dynamic downside risk analysis is used. It consists of conducting a two-step approach of the quantile regression estimation for the GARCH model to explore the inflation hedging capability of sectoral and industry-level stock returns in the United States for various scenarios (*i.e.*, different stock market conditions and target rates). Second, an event study methodology is carried out to test how US stock sectors/industries respond to rising inflation expectations and monetary policy developments resulting from the pandemic and the war in Ukraine. For these purposes, this analysis assesses how the government's monthly release of inflation news over May 2022 was different from what investors expected by comparing the inflation released in the print with the information reported in the survey of market forecasters. Stocks could react very sensitively to this inflation news, and in this framework, we also account for the expectations of monetary policy developments. It could be that investors react to inflationary news because they expect it to trigger anti-inflationary monetary policy reaction. As argued by Kiley (2009) and Clark and Davig (2011), inflation expectations tend to remain stable largely due to the systematic implementation of restrictive monetary policy. This suggests that market surveys partly reflect public and financial market beliefs about how monetary authorities are likely to respond.

The present research aims to contribute to the growing literature on how stock returns react to inflation expectations and monetary policy uncertainty in several ways: (i) It aligns with recent studies testing whether investors hedge against specific macro-financial risks, especially those related to resurgent inflation risk and shifts in monetary policy developments. By focusing on subjective expectations rather than realized outcomes, the study provides a forward-looking perspective that better captures investor sentiment and market pricing; (ii) It conducts sectoral and industry-level analysis, moving beyond aggregate indices. The construction of portfolios based on sectoral stocks whose returns seem significantly associated with

inflation and has the potential to offer a much better inflation hedging properties than the aggregate market (Boudoukh et al., 1994; Bils et al., 2003; Gautier, 2006). Although an abundance of empirical studies have focused on how stock markets react to inflation shocks including examining the correlations of real stock returns with inflation, these investigations have not come to a consensus over the inflation-hedging properties of sectoral and industry-level stocks; (iii) it uses downside risk measures, controlling asymmetry in return distributions, to examine the inflation-protecting potential of asset allocation across varying investor objectives and market conditions. Accurately, this work focuses on minimum semi-variance portfolios for distinct return scenarios: a “safety first” investor seeking only to avoid negative returns (target rate = 0%), and performance-oriented investors targeting real returns of 1% and 2%, respectively. Although prior research has employed the semi-variance framework to portfolio construction (Kroencke and Schindler, 2010; Cumova and Nawrocki, 2011), to the best of our knowledge, this is the first assessment to apply it in the context of inflation-hedging asset allocation. (iv) Finally, using an event study methodology centered on the Federal Open Market Committee (FOMC) announcements, the study tests how different U.S. sectoral equities respond to inflation surprises and shifts in monetary policy developments in the context of recent global economic shocks.

Our findings reveal that the Oil and Gas, Basic Materials, and Technology equity sectors serve as the best options to hedge against the developments in expected inflation and expectations of monetary policy changes. This holds valid for investors requiring just to hedge merely against the risk (i.e., “safety first” investor). But when raising the target of real return by focusing on more ambitious investors, the optimal allocation increasingly favors the Technology sector. The latter usually benefits from significant pricing power owing to continuous innovation and the introduction of high-value-added products, which can help firms maintain margins even in inflationary environments.

The remainder of this study is organized as follows: Section 2 provides a literature review. Section 3 discusses the data and provides a detailed account of the methodology. Section 4 reports the main findings. Section 5 concludes and offers some relevant policy implications.

2. LITERATURE REVIEW

Inflation expectations play a substantial role in the price-setting decisions of firms, and thus in the future realized inflation. Central banks also base their policy decisions on expected inflation rather than realized levels, underscoring that stock returns are more reactive to future inflation expectations than to past inflation (Bekaert and Engstrom, 2010). This study

contributes to the broader empirical literature exploring the link between stock returns and realized inflation (see *inter alia*, Fama, 1990; Lee, 2009; Bekaert et al., 2010; Kim and Ryoo, 2011; Ang et al., 2012; Bampinas and Panagiotidis, 2016). Compared to inflation expectations, the effect of realized inflation on stock returns is less ambiguous. Given this, this work aligns more closely with the literature assessing how stock returns react to increased inflation expectations (for instance, Fama and Schwert, 1977; Fama, 1981; Chen et al., 1986; Bekaert and Engstrom, 2010; David and Veonesi, 2013; Campbell et al., 2017; Philip, 2021; Chaudhary and Marrow, 2022).

Inspired by Fisher's (1930), various studies show that nominal interest rates include available information about inflation expectations. This argument, largely known as the "Fisher hypothesis", supposes that real returns are driven by real factors like the productivity of capital rather than nominal variables such as inflation. When applied to equities, which represent claims against the real assets of a business, this hypothesis suggests that they may serve as a hedge against inflation. In other words, stocks compensate investors for increasing inflation through increases in nominal stock returns, thereby leaving real returns unaffected.

Contrary to the Fisher hypothesis, many empirical studies report a negative relation between stock returns and inflation. Different reasons have been put forward to explain such observed negative patterns. Fama's (1981, 1990) hypothesis suggests that inflation acts as a proxy for expected real activity where high inflation predicts an economic downturn, which negatively affects the future corporate profits and pushes investors to require higher risk premiums to cover the additional risk, and hence, lowers stock prices. Modigliani and Cohn (1979) argue that stock market investors are prone to a particular form of money illusion, wrongly discounting real cash flows with nominal discount rates. They provide evidence that shifts in the level of inflation cause subjective equity return expectations to systematically diverge from rational expectations. Accordingly, a low inflation rate is coupled with rational equity-premium expectations that are lower than the market's subjective expectations, and thus, the stock market is considered as overvalued.

Most of the research on the relationship between stock prices and inflation expectations have produced conflicting results about the sign and strength of this dependence, in contrast to the responses of stock returns to realized inflation (David and Veronesi, 2013; Campbell et al., 2017). According to Bekaert and Engstrom (2010), high US expected inflation is likely to coincide with periods of rising uncertainty about real economic growth and a high-risk aversion, both of which rationally raise equity yields. Kim and Ryoo (2011), using a two-regime threshold vector error-correction model, provide strong support for the Fisher hypothesis, showing a one-to-

one long-run relationship between stock prices and goods prices based on a century-long U.S. dataset. In examining the inflation illusion hypothesis, Lee (2009) finds that although the relationship between stock returns and inflation is not significant for the entire sample period of 1927-2007 in developed countries, it is positive and statistically significant during the pre-war period of 1927-1939 and negative during the post-war period of 1948-2007, which is in line with the Modigliani-Cohn (1979) hypothesis.

It seems interesting to note that some works have shown significant non-homogeneity in how equity sectors react to inflation expectations and that the aggregate stock market has weak inflation-hedging characteristics (see inter alia, Boudoukh et al., 1994; Boyd et al., 2001; Bils et al., 2003; Bampinas and Panagiotidis, 2016; Kramer, 2017; Philip, 2021). For instance, sectors including utilities and consumer staples tend to be more responsive to anticipated inflation owing to their high dependance on raw materials and less elastic demand for their products. Bampinas and Panagiotidis (2016) indicate that these sectors usually face greater input costs in inflationary circumstances, which can have detrimental impacts on the stock performance. They also unambiguously deduce that the industries with the greatest potential for investors looking to effectively safeguard against inflation risk are the energy and industrials. Not surprisingly, a surge in commodity prices during times of changes in inflation expectations are heavily advantageous to the energy sector, particularly for Oil and Gas, since energy prices rise in tandem with inflation. The industrial sector has the ability to pass on rising costs to consumers, thus maintaining or increasing profit margins in times of inflationary pressure (Albulescu et al., 2016). Also, the cyclical nature of both sectors makes them heavily attractive to investors seeking to hedge against inflation risks (Kim and Ryoo, 2011). Moreover, Lall and Zeng (2020) demonstrate that technology equities, characterized by their focus on intangible assets and innovation, have a reduced sensitivity towards rising inflation expectations. The sector's independence from physical input enables it to capitalize on inflationary alterations in demand for digital services (Fama and French, 1993). Due to their anticipated role in spurring future productivity growth which could offset the harmful consequences of inflationary pressures, technology stocks have been perceived as a good hedge against inflation risk (Bodie, 1995). In line with these research outcomes, Philip (2021) argues that it is prominent to scrutinize changes in inflation beliefs across all sectors of the economy. By utilizing a high-frequency identification around CPI releases, Chaudhary and Marrow (2022) attempted to test if industry-level stocks may act as an effective hedge against inflation expectations. It is revealed that the 30 industries under consideration show a positive sensitivity to changes in inflation expectations over the last two decades, though with varying extent.

Monetary policy also plays a central role in shaping sectoral stock returns. More specifically, monetary policy uncertainty may amplify or attenuate the impact of inflation expectations, with considerable sectoral variation. Interest rate-sensitive sectors, such as financials and utilities, tend to respond more strongly to changes in monetary policy developments, whereas growth sectors such as technology may be less affected by monetary policy shifts due to their lower vulnerability to interest rate fluctuations (for example, Bernanke and Kuttner, 2005; Bekaert and Engstrom, 2010). The current paper belongs to this limited number of papers since it focuses on the responses of sectoral stocks to the risk of persistently high inflation and shifts in monetary policy developments.

3. METHODOLOGY AND DATA

This paper aims first at exploring the inflation-protecting asset allocation while considering a dynamic portfolio invested in the eight specific sectors of the S&P 500 stock market index, namely, the Oil and Gas, Basic Materials, Industrials, Health Care, Utilities, Financials and Technology information under various market conditions and for different investors' degrees of ambition. This analysis recognizes that changes in inflation expectations may not influence stock returns homogeneously under distinct scenarios. This is overlooked in traditional portfolio strategies even if it seems crucial to effectively manage macroeconomic risks in a highly uncertain context. Moreover, this study is the first to use an improved event study methodology to assess how the US stock sectors react to changes in expected inflation and monetary policy developments during times of heightened uncertainty surrounding the COVID-19 pandemic and the Russia-Ukraine war.

3.1. Asymmetric downside risk analysis of inflation-hedging capabilities of stock returns and optimal asset allocation

Under a risk allocation approach, the investor has a desired asset allocation and does not plan to move away from it. However, extensive research documents that the risk and the dependence between the assets may vary, depending to various market circumstances. Early contributions by Hoevenaars et al. (2008) and Amenc et al. (2009) assess the optimal portfolios regarding inflation hedging. The present analysis extends the models by incorporating different assets and focusing on optimal portfolios for investors exposed to inflations expectations. Briere and Signori (2012) emphasize that inflation-hedged portfolios are highly sensitive to varying market states. In contrast to prior research, these authors do not carry out the conventional mean-variance framework to extract the optimal allocation of several assets. Rather, they optimize the portfolios by focusing on the shortfall probabilities, though without considering the ex-

pected shortfall. The novelty of this study lies in extending the Briere and Signori (2012) study by assessing the shortfall with an inflation target, in addition to the shortfall probability. Although a large strand of empirical literature uses the semi-variance approach in a portfolio context, none has examined the roles of the sector- and industry-level U.S. stocks in an inflation-protecting asset allocation framework. In addition to state-on-state analysis, the study analyzes the risk that stock returns may fall below the inflation target. For this purpose, the concept of Lower Partial Moments (LPM), introduced by Fishburn (1977), is applied. LPM mainly focuses on the left tail of the return distribution, making it well-suited for properly detecting asymmetric downside risk and seems highly relevant during uncertain environments. The LPM is denoted as,

$$LPM_n(t) = \int_{-\infty}^{\iota} (\iota - r_i)^n f(r_i) dr_i \quad (1)$$

where ι is the real target rate, r_i is the real return of the U.S. equity sector i , and $f(r_i)$ is the density function of the i^{th} the sectoral stock return. The n order of LPM can be described as a risk aversion parameter. High values of n imply large deviations below the target rate.

Throughout this analysis, we focus on three LPM classes, the shortfall probability ($n = 0$), the expected shortfall ($n = 1$), and the semi-variance ($n = 2$). For a portfolio, the downside covariances among various asset returns are captured. More accurately, the semi-covariances are identified based on the co-Lower Partial Moments for assets i and j ($CLPM$).

$$\begin{aligned} CLPM_{ij}(\iota) &= E[\max(0, (\iota - r_{it})) \cdot \max(0, (\iota - r_{jt}))] \\ &= \frac{1}{T} \sum_{t=1}^T [\max(0, (\iota - r_{it})) \cdot \max(0, (\iota - r_{jt}))] \end{aligned} \quad (2)$$

When considering the eight stock sectors under study, we obtain the semi-covariance matrix. According to Estrada (2008), we minimize the downside risk measure by performing a minimum semi-variance portfolio choice written as follows:

$$\min_{\omega} LPM_{2,p} = \sum_{i=1}^8 \omega_i CLPM_i(t) \text{ subject to } \sum_{i=1}^8 \omega_i = 1; \omega_i \geq 0, i = 1, \dots, 8 \quad (3)$$

where the vector $\omega = (\omega_1, \omega_2, \omega_3, \omega_4, \omega_5, \omega_6, \omega_7, \omega_8)$ represents the allocation weights of the eight selected sectors of the S&P 500 index to be evaluated within the minimum downside risk portfolio framework.

To maintain clarity in the presentation of results, Detailed outcomes regarding the reactions of all the industries will be available for interested readers upon request.

The results of the optimal portfolio at time t , derived from the Equation (3), is based on a conditional quantile estimation of a GARCH model.¹ During periods of high macroeconomic uncertainty, the loss distribution of an asset return tends to shift upward, prompting large expected losses over normal situations. In such circumstances, conventional downside risk measures may be inappropriate to effectively hedge against inflation risk. Therefore, an inflation protection under diverse stock market states (i.e., bear, normal, bull) is considered. This assessment also aims to determine the optimal asset allocation that will preserve the investor's capital from inflation expectations with an acceptable probability of shortfall. The study considers cases of an investor (or a "safety first" investor) simply wanting to hedge inflation, having a target real return of 0%, and another investor having a more ambitious target real return of 1% and 2%. For each of the investor's targets, we test whether the optimal portfolio composition is sensitive to varying market conditions (i.e., bear, normal, bull).

3.2. Event study methodology

Another key objective of our study is to examine how various sectors and industries within the U.S. stock market have responded to the resurged inflation risk and the rising uncertainty surrounding monetary policy shifts in the aftermath of the COVID-19 crisis and the Russia-Ukraine war. We focus on the role that inflation expectations should play in the price setting decisions of the firms, and thus, on the future realized inflation. Expectations about the future play a central role in all economic activities. Indeed, companies base their decisions on production volumes, investments, and pricing strategies widely on anticipated future demand, costs, and market states. Accordingly, stock prices can fluctuate significantly in response to changes in these expectations. It is important to point out that inflation expectations are commonly assessed in two ways: (1) from expected inflation rates implied in market interest rates, and (2) from surveys of market forecasters or consumers. According to Gurkaynak et al. (2010) and D'Amico et al. (2018), market-based inflation expectations can be measured by comparing nominal interest rates to their inflation protected counterparts. Despite their relevance, measures of expected inflation based on surveys of

¹Following Xiao and Koenker (2009), a two-step approach of the quantile regression estimation for the GARCH time series is conducted. The first step consists of employing a quantile autoregression approximation for the GARCH model by combining the information over several quantile levels. The second step consists of applying the GARCH model to the first stage minimum distance estimation of the scale process of the time series.

market forecasters have shown to be superior to market-based measures. As the government's monthly release of inflation of May 10, 2022² was very different from what investors expected, we believe that stocks could react very sensitively to this inflation news. Since the CPI print only incorporates direct information about inflation, it is very reasonable to assume that any effect of the information shock on other variables works via inflation expectations. In this context, Chaudhary and Marrow (2022) argue that agents update their growth expectations because they updated their inflation expectations following the CPI release.

In response to increasing inflation risk, as commodity prices increase and supply bottlenecks disrupt global trade, the Federal Open Market Committee (FOMC) raised federal fund rates by 25 basis points (bps) on March 22, 2022, followed by a 50 bps on May 22, 2022 and a 75 bps hike in the June 22 meeting, the first 75 bp since November 1994. Fed's chair Powell stated that the recent readings on the rising inflation expectations and the poor CPI data caused such moves. The Fed's chair also affirmed that the Fed's future moves remain data-dependent with respect to the path of future policy rate adjustment. Such a statement would have a significant impact on the stock markets. Given these considerations, this study also accounts for changes in monetary policy expectations. A growing literature has tried to address how unpredictability of monetary policy affects the economy. This refers to monetary policy uncertainty. Even though this topic has been largely explored not least owing to its relevance for central bank credibility (Neely, 2005; Swanson, 2006), but it also has gained a marked emphasis since the 2008-2009 global financial collapse (Arce-Alfaro and Blagov, 2022). According to Bauer et al. (2021), FOMC announcements have significant effects on the uncertainty of monetary policy. The latter is highly prominent for the transmission of policy actions to financial markets.

This analysis conducts an event study methodology to evaluate the abnormal return attitudes for various sectors and industries of the U.S. stock market around developments in inflation expectations (May 11, 2022) and shifts in monetary policy developments (June 23, 2022). To do so, we adjust the stock returns to obtain the ex-ante (before the event) and the ex-post (after the event) abnormal returns and the cumulative abnormal returns. The abnormal returns (AR) are, thereafter, grouped into the U.S. stock sectors and the different industries in those sectors to measure the disaggregated average (D) at time t , and (AR_{Dt}) expressed as follows:

$$AR_{Dtit} = \sum_{i=1}^n \ln \left(\frac{P_{it}}{P_{it-1}} \right) - E(R_{it}) \quad (4)$$

²https://www.bls.gov/schedule/news_release/cpi.htm

where the expected return $E(R_{it})$ is determined by means of this equation,

$$E(R_{it}) = \beta_{0it} + \beta_{1it}(r_{mt} - r_{ft}) \quad (5)$$

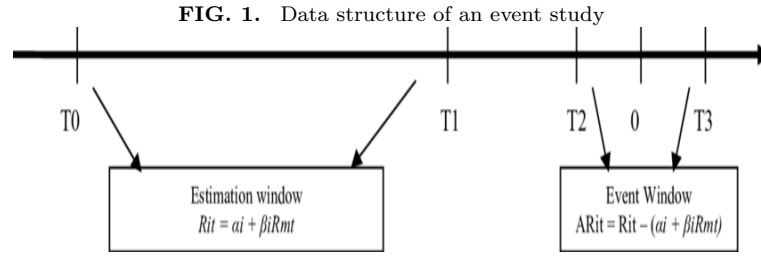
with P_{it} refers to the adjusted price of a specific sector/industry i at time t , $E(R_{it})$ corresponds to the anticipated return on sector/industry i at time t , r_{mt} is the U.S. market return, and r_{ft} represents the U.S. risk-free rate.

The sample data incorporates several sectors and industries of the U.S. stock price index. The selected industries are reported in Table A2 of the Appendix. The data of industry-level S&P 500 index were collected from DataStream (Thomson Reuters). Monthly data from January 2007 to August 2022 are used, and the return on U.S. Treasury bills is considered as a potential proxy for the risk-free rate. The risk-free rate is defined as the interest an investor would anticipate from an investment that is totally free from a monetary loss. The yields in the US Treasury bills market are often employed as the risk-free rate for US investors. Since we use stock returns, we employ the return on U.S. Treasury bills rather than the interest rate on the Treasury bills. It is downloaded from the U.S. Department of Treasury.³

In the following, the event window and the post-event window are employed to examine the evolving behaviors of the sectoral and industry-level U.S. stock market in response to changes in inflation and monetary policy expectations. We define day “0” as the event dates related to noticeable changes in expected inflation and sharp developments of monetary policy expectations resulting in the wake of the COVID-19 and the war in Ukraine. Thereafter, the estimation and event windows can be determined. FIG.1 illustrates the data structure used in the event studies and explains how it is applied within the market model. The interval $T_0 - T_1$ is the estimation window which provides the information needed to specify the normal return (i.e., prior to the event date). The interval $T_2 - T_1 + 1$ is the event window, and the interval $T_3 - T_2$ is the post event window which is used to assess the stock market’s responses to the event dates. The event window consists of 41 days from t_{-20} to t_{+20} days; only the trading days have been considered. Throughout the remainder of the analysis, possible overreactions or underreactions to inflation and monetary policy expectations are allowed for, thereby the different U.S. stock sectors and industries under study tend to correct their mistakes in subsequent periods.

To determine the change in a systematic risk, a dummy variable (DV), which takes the value 1 on the first day following the May CPI release (May 11, 2022) and the day reflecting changes in monetary policy expectations following the June Fed meeting (June 23, 2022) and 0 otherwise, is incorporated. The DV is multiplied by the market risk premium to create an

³Ibbotson Associates also provide monthly returns on Treasury bills.



Source: Benninga (2008).

interaction variable. The following equation represents the function to be estimated:

$$\tilde{r}_{it} - \tilde{r}_{ft} = \beta_i^0 + \beta_i^1 [\tilde{r}_{mt} - \tilde{r}_{ft}] * DV + \beta_i^3 DV_t + \varepsilon_{it} \quad (6)$$

where $\tilde{r}_{it}$ is the sector/industry i 's return at time t , $\tilde{r}_{ft}$ denotes the risk-free rate, $\tilde{r}_{mt}$ is the market return, DV is the dummy variable that takes the value 1 on the first day after the event and 0 otherwise, β_i^0 denotes the intercept, corresponds to the coefficient of the short-run systematic risk of a specific sector/industry, β_i^2 denotes the coefficient of change in the industry risk, and β_i^3 measures the coefficient of DV , and ε_{it} is the error term.

3.3. Data and descriptive statistics

As mentioned at the outset, this study addresses which S&P 500 stock sectors/industries could act as a hedge against changes in expected inflation and expectations of monetary policy developments. The present research considers all companies that have been constituents of the Standard & Poor's 500 Index (S&P 500). The S&P 500 is a market capitalization weighted index of the 500 biggest U.S. publicly traded companies by market value. The latter is a typical universe for large institutional investors such as pension funds and sovereign wealth funds. Many of those investors are heavily concerned with inflation risk and they consider the S&P universe investable (Ang et al., 2012). The industry-level composition of the S&P500 (in % of sectors) are summarized in Table A1 (Appendix)⁴. The data of the sector level and the industry-level S&P500 indices data were collected from the DataStream database. We utilize the U.S. consumer price index (headline CPI) from DataStream as the measure of inflation. This index incorporates the sub-components of all items' consumer price index, namely food, housing, energy, and an index which includes the remaining goods and services.

⁴The eight sectors and the different U.S. industries considered in this analysis are chosen based on the sector level and the industry level of the DataStream classification.

Since the expected inflation rate is not directly observable, several techniques have been employed to estimate the expected inflation. The most frequently used technique to compute the expected inflation is the univariate time series Box-Jenkins/ARIMA estimates derived from a risk-free rate proxied by the 1-month Treasury bill rate (Fama and Schwert, 1977). Following Gultekin (1983), the ARIMA model is applied to generate inflation rates for expected and unexpected components. More precisely, the inflation forecasts of the ARIMA model as estimates of expected inflation, and the forecasts errors as estimates of unexpected inflation. The Akaike information criterion is utilized to find out the ARIMA model which best fits the data.

TABLE 1.

Statistical properties of U.S. expected inflation and sector-level S&P 500 stock returns

	Mean	Median	Std. Dev.	Skewness	Kurtosis	J-B
Inflation	0.034	0.025	2.398	-0.227	4.515	198.2 ⁺
Oil and Gas	-0.016	-0.011	5.348	-0.341	4.826	100.7 ⁺
Basic Materials	0.123	0.156	2.943	-0.311	3.711	119.5 ⁺
Industrials	0.064	0.127	3.561	-0.291	3.956	133.2 ⁺
Consumer Goods and Services	0.113	0.241	3.808	-0.489	5.167	189.7 ⁺
Health Care	0.082	0.019	2.553	-0.827	8.276	978.3 ⁺
Utilities	-0.011	-0.013	3.782	-0.248	4.892	113.6 ⁺
Financials	0.043	0.038	3.994	-0.189	4.551	129.4 ⁺
Technology Information	0.059	0.042	2.679	-0.314	3.854	131.8 ⁺

Notes: J-B corresponds to the Jarque-Bera test, a goodness-of-fit test, evaluating whether sample data have the skewness and kurtosis matching a normal distribution; ⁺ denotes the rejection of the null hypotheses of normality.

Table 1 reports the descriptive statistics of the monthly returns of the sectoral S&P500 stocks⁵ and the expected inflation shows that the average monthly returns are positive for all the return series over the sample period (except, Oil and Gas, and Utilities). Basic Materials and Consumer Goods exhibit the highest average return. Oil and Gas is the most volatile market, followed by Industrials and Financials, whereas the lowest volatility is for Technology Information and Health Care. The skewness coefficients are negative, and the kurtosis coefficients are above three for all return series, indicating that the probability distributions of the return series are skewed and leptokurtic, thereby rejecting normality which is also confirmed by the Jarque-Bera statistics (J-B). In short, the properties of inflation (typically measured by % changes in the U.S. consumer price index) and sectoral U.S.

⁵To keep the presentation simple, the descriptive statistics for the industry-level S&P stock returns will be available upon request.

stock returns reveal well-documented patterns: large standard deviations for all the variables and strong evidence of non-normality with observed fat tails, thus validating the use of a downside risk analysis under different (i.e., bear, normal and bull) market scenarios and an improved event study methodology. As the stock price changes may tend to exhibit nonlinear serial dependencies⁶, this study conducts an improved event study methodology accounting for certain known characteristics of the financial time series, including the time-varying beta, the autocorrelated squared returns, and the fat-tailed property of the return data.

4. EMPIRICAL RESULTS

4.1. The downside risk analysis

The first objective of this work is to assess the optimal sector-specific stock portfolios for investors exposed to the U.S. inflation risk. To this end, various downside risk measures conditional on distinct market conditions and varying investors' degrees of ambition are used. Specifically, three Lower Partial Moments (*LPM*) classes are performed, namely, the shortfall probability ($n = 0$; LMP_0), the expected shortfall ($n = 1$; LPM_1), and the semi-variance ($n = 2$; LPM_2). The optimal portfolios are explored for investors with a real return target of 0% (or "safety first" investor), and thereafter for more ambitious investors with positive real returns of 1% and 2%. Table 2 reports the minimum semi-variance portfolios' real return targets ranging from 0% to 2%.

It is shown that the minimum semi-variance portfolio is dominantly invested in the Oil and Gas and Basic Materials sectors under different market states, but is much less strongly invested in Consumer Goods and Services, Health Care, Utilities and Financials. The probability of collapsing below the inflation rate (LPM_0) appears strong, with values ranging from 37% to 57% under the bear individual U.S. stock market conditions (Table 2(a)). These portfolios have expected shortfalls and semi-variances (LPM_1 and LPM_2) stronger than 1%. Considering the bull market conditions ($\tau = 0.6, 0.7, 0.8, 0.9$), it is noticed that the portfolio weights of Oil and Gas, Basic Materials and Technology remain pronounced. However, the weights associated with Industrials, Consumer Goods and Health Care appear more intense when the sectoral stock market is at its normal or bull states. These findings suggest that diversification benefits can be obtained from allocating more towards Oil and Gas, which benefits from increased commodity prices, Basic Materials, and Technology, a sector where

⁶Brooks et al. (2000) conjecture that when unusual events (such as the COVID-19 or the Russia -Ukraine war) hit the market, the price adjustment process generally generates a pattern of nonlinear price movements relative to previous movements since investors are cautious and uncertain of how to respond.

TABLE 2.

Shortfall probabilities and minimum semi-variance sector specific stock portfolios conditional on different sectoral stock market states and target rates

States	$\tau = 0.1$	$\tau = 0.2$	$\tau = 0.3$	$\tau = 0.4$	$\tau = 0.5$	$\tau = 0.6$	$\tau = 0.7$	$\tau = 0.8$	$\tau = 0.9$
(a) Target: Real return 0%									
Oil and Gas	0.23	0.20	0.19	0.24	0.22	0.23	0.20	0.22	0.24
Basic Materials	0.24	0.28	0.26	0.26	0.25	0.23	0.26	0.24	0.27
Industrials	0.07	0.05	0.05	0.07	0.11	0.11	0.11	0.09	0.13
Consumer Goods and Services	0.08	0.06	0.06	0.05	0.09	0.07	0.08	0.07	0.08
Health Care	0.06	0.06	0.06	0.06	0.07	0.09	0.07	0.07	0.07
Utilities	0.10	0.07	0.06	0.08	0.07	0.07	0.06	0.08	0.06
Financials	0.09	0.07	0.07	0.09	0.08	0.08	0.06	0.06	0.05
Technology Information	0.18	0.20	0.18	0.19	0.20	0.21	0.20	0.19	0.20
LPM_0	57.1%	45.9%	44.1%	37.9%	10.2%	7.8%	9.3%	10.4%	12.9%
LPM_1	2.1%	2.9%	2.4%	1.8%	1.4%	1%	0.6%	1.1%	0.9%
LPM_2	1.5%	1.8%	1.2%	0.9%	0.8%	0.7%	0.5%	0.8%	1.2%
(b) Target: Real return 1%									
Oil and Gas	0.22	0.20	0.19	0.18	0.18	0.19	0.21	0.19	0.20
Basic Materials	0.21	0.20	0.23	0.23	0.24	0.23	0.23	0.24	0.24
Industrials	0.08	0.08	0.11	0.09	0.10	0.09	0.09	0.09	0.08
Consumer Goods and Services	0.10	0.08	0.08	0.08	0.08	0.11	0.09	0.09	0.10
Health Care	0.06	0.08	0.08	0.08	0.08	0.07	0.08	0.08	0.08
Utilities	0.05	0.06	0.06	0.06	0.06	0.07	0.07	0.06	0.06
Financials	0.09	0.09	0.09	0.11	0.07	0.07	0.07	0.08	0.08
Technology Information	0.22	0.22	0.24	0.22	0.23	0.21	0.21	0.22	0.23
LPM_0	69.5%	54.8%	51.2%	40.6%	33.8%	22.9%	23.1%	14.8%	15.6%
LPM_1	8%	5.4%	3.9%	4.4%	3.6%	4.2%	1.9%	1.6%	2.4%
LPM_2	3.9%	4.6%	3.3%	2.8%	3.4%	1.9%	2.3%	1.4%	1.9%
(c) Target: Real return 2%									
Oil and Gas	0.19	0.21	0.20	0.22	0.19	0.19	0.18	0.19	0.19
Basic Materials	0.20	0.18	0.18	0.17	0.17	0.18	0.18	0.17	0.18
Industrials	0.10	0.09	0.09	0.11	0.11	0.09	0.12	0.12	0.12
Consumer Goods and Services	0.09	0.08	0.08	0.08	0.08	0.07	0.07	0.06	0.07
Health Care	0.08	0.06	0.06	0.06	0.08	0.07	0.04	0.05	0.05
Utilities	0.07	0.08	0.07	0.06	0.08	0.08	0.09	0.08	0.08
Financials	0.12	0.11	0.10	0.09	0.11	0.09	0.08	0.09	0.08
Technology Information	0.25	0.29	0.31	0.30	0.31	0.29	0.30	0.33	0.33
LPM_0	77.68%	75.1%	66.9%	49.1%	44.2%	31.9%	22.8%	25.6%	18.3%
LPM_1	15.1%	11.2%	7.4%	8.3%	7.9%	5.6%	5.9%	5.3%	4.8%
LPM_2	7.2%	6.1%	6%	5.9%	6.2%	4.4%	3.7%	3.2%	2.6%

Notes: LPM_0 corresponds to the shortfall probabilities, LPM_1 refers to the expected shortfall probabilities; LPM_2 refers to the semi-variance. Please note that the shortfall probability is a risk measure largely used in finance to assess the market risk of a portfolio. It refers to the probability that a portfolio will not exceed the minimum (benchmark) return that has been set by an investor. In other words, it is the expected return of a portfolio in the worst cases.

the products of many companies command premium prices owing to high technological innovation (Ang et al., 2012).

The fact that Oil and Gas stocks appear to be one of the best options to hedge against inflation risk is not surprising. Oil is a hard asset that is frequently characterized by its stable purchasing power, and then it is one of the preferable assets at times of increased inflation, as their values increase as the general price levels for goods and services surge. Basic Materials refer to firms mainly engaged in the exploration or mining of metals, minerals and other commodities as well as the development and the processing of raw materials. This implies that a large proportion of the best inflation-hedging stocks is involved in commodity extraction or processing. Furthermore, the inflation-hedging outperformance of the Technology sector compared to other S&P500 equity sectors can be attributed to multiple factors. One can cite, for instance, the fact that technology companies are more resilient to a significant surge in costs associated with inflation risk as they have high profit margins and are likely to be less dependent on physical inputs. Based on Fama and French (1993)'s study, growth-oriented industries like technology can perform better during uncertain macroeconomic states. Additionally, many technology firms can pass on increased costs to customers and have substantial pricing power, enabling them to effectively maintain their profitability (Cevic et al. 2024). Moreover, the technology sector benefits from a growing demand for efficiency and innovation, enhancing its resilience to inflationary pressures and increased policy uncertainty (see, for instance, Fama and Schwert, 1977; Lall and Zheng, 2020). Last but not least, technology stocks are largely viewed as a good hedge against both realized and expected inflation because of their great capability to drive future productivity growth, which can counteract the detrimental effects of changes in inflation expectations (Bodie, 1995). It seems important to point out at this stage that regardless of its large profit margins, pricing its power, and the need for innovation, Albulescu et al. (2016) deeply suggest that these features might not completely insulate technology firms from the adverse impacts of inflation risk and policy uncertainty in the long run.

The proportion assigned to the Industrials in the optimal portfolios appears to be important, but solely when the Industrials market is at its bullish state. Inflation in the cost of raw materials is pushing industrial firms to take swift action on pricing (Krishnamurthy et al., 2021). Allocations to Consumer Goods and Services, Health Care, Utilities, and Financials are relatively modest, which is in line with the results reported by Ang et al. (2012).

Considering more ambitious investors, we investigate the optimal semi-variance portfolios with positive real return targets. By increasing the target real return to 1% and 2% (Tables 2(b) and 2(c), respectively), it is

shown that the shortfall probabilities (LPM_0), the expected shortfall probabilities (LPM_1) and the semi-variance (LPM_2) increase with the high target returns. The findings reveal that investors who want an additional return premium should reduce their allocations to Oil and Gas and Basic Materials and invest more in the technology sector a sector where the products of many companies command premium prices owing to technological innovations, which may remain robust even in inflationary environments (Fama and Schwert, 1977). For example, when looking at the bull market scenario (for $\tau = 0.9$), the weight of technology is 20% in the optimal portfolio for the target of 0% (Table 4(a)), compared to 23% for the target of 1% (Table 2(b)) and 33% for the target of 2% (Table 2(c)). It is also shown that the allocations drop from 24% for Oil and Gas and 27% for Basic Materials for the target of 0% (Table 2(a)) to 19% for Oil and Gas and 18% for Basic Materials for the target of 2% (Table 2(c)). Expectedly, the technology sector accounts for companies which generally create new, high value-added products that are differentiated from those already on the market. Nevertheless, due to the long-term cash flows of technology companies, the stocks may react sensitively to rising interest rates and increased monetary policy uncertainty.

4.2. The event study methodology results

This study compares the responses of the U.S. sectoral stock market to rising inflation expectations and the uncertainty of monetary policy in the wake of the COVID-19 pandemic and the Russia-Ukraine war.

Table 3 (Panel A) summarizes the abnormal returns and the cumulative abnormal returns prior to and after the CPI release of May 2022 (May 11, 2022). As mentioned at the outset, this date has been considered since it is supposed that stocks respond significantly to the sharp differences between the inflation released in the print of May 2022 and the information displayed in the survey of market forecasters. The findings reveal that the impact of this inflation news on the U.S. stock market varies across the different sectors under study. Some sectors responded positively to this event date including the technology and health care sectors. However, Oil and gas, basic materials and utilities experienced a negative abnormal return over 10 days after the inflation news, but this response becomes less pronounced after 20 days.

Table 3 (Panel B) reports the abnormal returns and the cumulative abnormal returns before and after the Fed meeting of June 2022 (June 23, 2022). The first day following the event was considered. It could be that investors react to inflationary news because they expect it to trigger anti-inflationary monetary policy. As uncertainty about future policy rates plays a potential role for the transmission of monetary policy to financial markets, this study follows Bauer et al. (2021) by using event studies of the

TABLE 3.

The sectoral reactions of the U.S. stocks to expected inflation and changes in expectations of monetary policy

Sectors	AR	CAR(-20)	CAR(-15)	CAR(-10)	CAR(-5)	CAR(+5)	CAR(+10)	CAR(+15)	CAR(+20)
Panel A. Changes in inflation expectations (t_0: May 11, 2022)									
Oil and Gas	-1.78***	-1.82***	-1.31*	-1.04**	-1.12**	-1.00*	-0.94**	-0.37***	-0.08**
Basic Materials	-0.16***	0.51***	-0.09	0.48**	0.44***	-0.18**	-0.39**	-0.11**	-0.026***
Industrials	-0.42*	0.89***	0.97**	1.15***	1.22*	-0.69**	-0.61***	-0.23**	-0.044***
Consumer Goods and Services	-0.94*	1.05**	-0.61	1.28***	-1.64	-0.85**	-1.65***	-1.92**	-1.81**
Health Care	-0.11***	0.38***	0.44**	0.52***	0.49**	0.22***	0.38***	0.35***	0.47**
Utilities	-1.42***	0.67**	0.39*	0.81***	0.77*	0.19***	0.04***	-0.01**	0.10***
Financials	-1.88**	0.89**	-1.26	0.94***	0.91**	-0.08**	-0.31***	-0.49**	-0.86**
Technology	1.95**	1.11**	1.37***	1.49**	-3.51	1.62**	1.90***	1.86***	1.65**
Panel B. Expectations of monetary policy changes (t_0: June 23, 2022)									
Oil and Gas	-1.84***	-0.66***	-0.72**	-0.50**	1.09	-0.59**	-1.23***	0.37**	1.1***
Basic Materials	-0.36*	0.41***	0.40*	0.45**	0.41**	-0.03*	-0.10***	0.12	0.32***
Industrials	-0.59***	0.52***	0.46**	0.40***	0.49**	-0.08***	-0.22**	-0.04*	0.069***
Consumer Goods and Services	-0.31**	0.27**	-1.05	0.43**	0.36***	-0.15**	-0.40***	-0.37**	-0.44**
Health Care	-0.11***	0.30**	0.33*	0.26***	0.35**	-0.02***	-0.18***	-0.21*	-0.16**
Utilities	-1.38*	0.29***	0.18***	0.31**	0.27***	0.10**	-0.09**	0.01	-0.07***
Financials	-2.14**	0.23**	0.10	0.16**	0.16*	-0.13**	-0.91***	-0.86***	-0.90**
Technology	1.16**	1.58**	1.64**	1.73***	1.66*	1.77**	1.94***	1.91***	1.86**

Notes: AR: Abnormal returns; CAR: Cumulative abnormal returns; *, **, *** denote the statistical significance at the 10%, 5% and 1% levels, respectively.

Federal Open Market Committee (FOMC)'s announcement to raise interest rates by 75 basis points on June 22, 2022. The results reveal that the different U.S. stock sectors were more reactive to the FOMC announcement, exacerbating uncertainty about the future path of monetary policy. In addition, varying sensitivities across the different sectors are shown. Positive responses of Oil and Gas, Basic Materials, and Technology equities are observed. In contrast, Consumer Goods and Services and Financials are adversely influenced by the uncertainty of monetary policy, and such an impact seems to be strong and persistent. For Utilities and Health Care, although a decline in the cumulative abnormal returns is found over the 10 days after the event day, a marked increase is shown after the 20 days. Likewise, the negative responses of some sectors such as the Industrials and Financials are observed after the FOMC announcement. But these negative responses do not appear to be persistent. These effects are likely to vanish over time.

TABLE 4.

Short-run systematic risk of the US stock market sectors due to expected inflation and changes in expectations of monetary policy

Sectors	Beta prior to the event date	Immediate risk	Beta post- the event date
Panel A. Changes in inflation expectations (t_0: May 11, 2022)			
Oil and Gas	0.18***	0.41**	0.36**
Basic Materials	0.15**	0.27***	0.20**
Industrials	0.14**	0.22**	0.21***
Consumer Goods and Services	0.20*	0.23**	0.34***
Health Care	0.17**	0.28***	0.23***
Utilities	0.15**	0.23	0.29***
Financials	0.22***	0.33**	0.46**
Technology Information	0.15**	0.10*	0.07***
Panel B. Expectations of monetary policy changes (t_0: June 23, 2022)			
Oil and Gas	0.24***	0.45**	0.41***
Basic Materials	0.20***	0.32**	0.20**
Industrials	0.18***	0.30**	0.26*
Consumer Goods and Services	0.31***	0.49***	0.63**
Health Care	0.21**	0.31**	0.22***
Utilities	0.32**	0.40**	0.34***
Financials	0.21***	0.36**	0.51**
Technology Information	0.18**	0.12**	0.10*

Notes: *, **, *** denote the statistical significance at the 10%, 5% and 1% levels, respectively.

Table 4 reports the changes in the short-run systematic risk by sector due to expected inflation and changes in expectations of monetary policy (Panels A and B, respectively). The findings reveal that both changes in inflation expectations and the uncertainty of monetary policy have led to a significant rise in the systematic risk for most of the U.S. stock sectors under study, though with varying magnitude. Oil and Gas and Basic Materials — the best U.S. stock sectors for optimal hedging portfolios when investors aim to reduce the risk of negative return due to the high U.S. inflation according to the downside risk analysis (see Table 2) — experienced an increase in the immediate risk after the two events (i.e., the CPI news release and the FOMC announcement). The technology sector is the best asset to hedge rising inflation risk when increasing the investor's degree of ambition-witnessed a significant decline in the short-term systematic risk for the two considered events.

Aware that the S&P500 stock sectors incorporate many individual firms that are very different, in the following I consider disaggregating their sec-

tors further. Table 5 reports the industry-level systematic risks due to the resurgent inflation risk and the growing monetary policy uncertainty. Most U.S. industries (in particular, oil and gas storage and transportation, industrial gases, gas utilities, construction materials and consumer finance) witnessed an increase in the systematic risk with the publication of the CPI release, leading to changes in expected inflation. The technology sector (especially data processing and outsourced services, systems software, electronic manufacturing services and semi-conductors) experienced a significant decline in the systematic risk.

More interestingly, the industries under study are likely to be more sensitive to the FOMC announcement that occurred in June 2022 to raise interest rates by 75 bps, thereby amplifying uncertainty of the future monetary policy. To lighten up data-heavy presentations, the results of the impact of shifts in monetary policy expectations will be available upon request. The fact that stock industries seem more vulnerable to the uncertainty of monetary policy might be a result of investors losing confidence in the Fed to stabilize inflation. Indeed, investors remain heavily concerned about the Federal Reserve's monetary tightening plan as the Fed's rate hike persists. The so-called "soft landing" (i.e., when the central bank can stabilize prices without causing a recession) seems not achievable in a highly uncertain macroeconomic environment in the wake of the COVID-19 and the war in Ukraine, and accordingly companies continue to witness margin pressures due to expected inflation.

The abnormal AR distribution, higher kurtosis and positive skewness, yielded to widespread criticism of the methodology of the event study. These factors can have a significant impact on the parametric t statistics. In that context, De Jong et al. (1992) argues that results obtained using standard error assumptions (normal distribution, homoskedasticity) show that the omission of fat tails and heteroskedasticity may prompt erroneous conclusions. Accordingly, the present analysis seeks to successfully circumvent some problems encountered in practice. One criticism of the Brown and Warner (1985) method is that abnormal returns are not normally distributed, which leads to a bias in parametric t -statistics (Corrado 1989). The first robustness test we use to address this question is the nonparametric ranking test developed by Corrado (1989). The non-parametric conditional distribution method of Chesney et al. (2011) was performed as an alternative test for robustness. The use of Kernel estimation is advocated on the grounds that it does not necessitate the specification of a regression function neither is it required to determine the distribution of the error term. In the following, the Corrado (1989) non-parametric ranking test and the non-parametric conditional distribution suggested by Chesney et al. (2011), that do not rely on a normal distribution, have been employed to explore the impacts of changes in inflation expectations and FOMC an-

TABLE 5.
Short-run systematic risk of different US industries due to changes in
inflation expectations

Sector	Industry	Beta prior to the event date	Immediate risk	Beta post-the event date
Oil and gas	Integrated oil and gas	0.25**	0.39**	0.31**
	Oil and gas equipment and services	0.17***	0.30**	0.44**
	Oil and gas exploration and production	0.20**	0.44***	0.35**
	Oil and gas refining and marketing	0.16***	0.37**	0.33***
	Oil and gas storage and transportation	0.23**	0.52***	0.41***
Basic materials	Commodity chemicals	0.19*	0.31**	0.24**
	Construction materials	0.27	0.29**	0.39***
	Copper	0.16**	0.37**	0.19**
	Diversified chemicals	0.19*	0.28**	0.21**
	Fertilizers and agricultural chemicals	0.16**	0.14***	0.11**
	Gold	0.07***	0.11	0.05**
	Industrial gases	0.13**	0.21**	0.46**
	Metal and glass containers	0.18*	0.29**	0.22***
	Paper packaging	0.15*	0.23**	0.20**
	Specialty chemicals	0.23**	0.28**	0.33*
	teel	0.21**	0.30***	0.29***
Industrials	Aerospace and defense	0.11**	0.28**	0.28**
	Industrial conglomerates	0.15***	0.24***	0.20**
	Industrial machinery	0.18**	0.27*	0.21**
	Rail roads	0.20**	0.23***	0.23**
	Research and consulting services	0.19***	0.24**	0.18**
	Trading companies and distributors	0.11**	0.23**	0.27***
	Tracking	0.16***	0.19**	0.24*
Consumer goods and services	Internet and direct marketing retail	0.14**	0.32***	0.36***
	Leisure products	0.22**	0.41**	0.43***
	Restaurants	0.14**	0.15**	0.13***
	Agricultural products	0.10	0.28**	0.32**
	Food distributors	0.09**	0.17**	0.25***
	Food retail	0.12**	0.19***	0.31**
	Household products	0.16***	0.20**	0.28**
	Hypermarkets and supercenters	0.13*	0.21**	0.24**
	Packaged foods and meats	0.06**	0.09***	0.15*
	Personal products	0.31	0.14**	0.23***
	Soft drinks	0.18***	0.21**	0.24***
	Tobacco	0.11**	0.13***	0.10*

TABLE 5—Continued

Sector	Industry	Beta prior to the event date	Immediate risk	Beta post-the event date
Health care	Biotechnology	0.02*	0.14***	0.08**
	Health care distributors	0.13***	0.27**	0.22**
	Health care equipment	0.16**	0.24**	0.19***
	Health care facilities	0.14***	0.22***	0.22***
	Health care services	0.03	0.17**	0.19*
	Health care supplies	0.12***	0.23**	0.16**
	Health care technology	0.04***	0.09	0.07**
	Life sciences tools and services	0.10*	0.16**	0.11**
	Managed health care	0.19**	0.21**	0.18***
	Pharmaceuticals	0.12***	0.15**	0.13**
Utilities	Electric utilities	0.14**	0.23***	0.19***
	Gas utilities	0.17***	0.30**	0.38**
	Independent power producers and energy traders	0.10***	0.16***	0.13**
	Water utilities	0.11***	0.20**	0.15***
	Multi-utilities	0.14**	0.23**	0.18*
Financials	Asset management and Custody banks	0.21**	0.34***	0.42**
	Consumer finance	0.26*	0.41**	0.49**
	Diversified banks	0.17***	0.25**	0.34**
	Financial exchanges and data	0.18***	0.19**	0.22***
	Insurance brokers	0.23	0.21**	0.25**
	Investment banking and brokerage	0.20	0.33***	0.34**
	Life and health insurance	0.24**	0.37**	0.39*
	Multi-line insurance	0.22***	0.25**	0.30**
	Multi-sector holdings	0.14*	0.29**	0.44***
	Property and casualty insurance	0.20**	0.30***	0.19**
	Regional banks	0.18**	0.23**	0.22***
	Reinsurance	0.20**	0.24**	0.27***
Information Technology	Application software	0.23*	0.21**	0.18**
	Communication equipment	0.19**	0.27	0.15*
	Data processing and outsourced services	0.13*	0.09**	0.04***
	Electronic components	0.17**	0.15**	0.11**
	Electronic equipment and instruments	0.15**	0.19*	0.12**
	Electronic manufacturing services	0.14**	0.11*	0.11**
	Internet services and infrastructure	0.11***	0.18**	0.15**
	IT consulting and other services	0.18**	0.20*	0.16*
	Semi conductor equipment	0.11	0.14**	0.11**
	Semi conductors	0.15**	0.13**	0.06*
	Systems software	0.24	0.15**	0.09***
	Technology distributors	0.17**	0.13***	0.12**
	Technology hardware, storage and peripherals	0.14**	0.16**	0.13***

Notes: *, **, *** denote the statistical significance at the 10%, 5% and 1% levels, respectively.

TABLE 6.

Robustness tests for the sectoral reactions of the U.S. stocks to expected inflation and changes in expectations of monetary policy

Sectors	$t_{Corrado}$		CP	
	Prior to the event	Post the event	Prior to the event	Post the event
Panel A. Changes in inflation expectations (t_0: May 11, 2022)				
Oil and Gas	-1.01*	0.20**	-0.92	0.34***
Basic Materials	0.34**	0.11*	0.50*	0.06**
Industrials	0.52***	0.09*	0.44**	0.10*
Consumer Goods and Services	1.14*	-1.63***	0.62**	0.01*
Health Care	0.49***	-0.05**	0.68*	-0.12
Utilities	0.33**	-0.04*	0.42*	0.01***
Financials	0.69**	-0.80***	0.78***	0.03*
Technology Information	1.33**	1.71**	0.81***	0.98**
Panel B. Expectations of monetary policy changes (t_0: June 23, 2022)				
Oil and Gas	-0.80***	0.41**	-0.89	0.37***
Basic Materials	0.16*	0.24**	0.22**	0.18***
Industrials	0.41**	0.13***	0.38**	0.09**
Consumer Goods and Services	1.23**	-1.94**	0.81**	0.05**
Health Care	0.36***	-0.14**	-0.67	0.01***
Utilities	0.55***	-0.11**	0.51**	-0.10
Financials	0.78**	-0.61***	0.83**	0.02**
Technology Information	1.50**	1.84***	0.77**	0.98***

Notes: $t_{Corrado}$ refers to the Corrado (1989) non-parametric ranking test; CP refers to the non-parametric conditional probability proposed by Chesney et al. (2011); *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

nouncement on the S&P500 equity sectors. The findings summarized in Tables 3 and 4 are supported by the robustness test outcomes reported in Table 6. After controlling for asynchronicity (Corrado test), the results robustly reveal that the different U.S. stock sectors react dissimilarly to changes in inflation expectations and the FOMC announcement. Most sectors are more responsive to changes in monetary policy expectations. The Oil and Gas, Basic Materials, Industrials and Technology sectors are positively affected by these changes. Consistently with the Corrado test results, the findings of the non-parametric conditional probability of Chesney et al. (2011) indicate that the majority of U.S. stock sectors react more significantly to shifts in monetary policy actions rather than changes in inflation expectations.

Although most standard event study methods propose a constant variance through the pre-and post-event windows, some researchers including

Brown and Warner (1985) have argued that if the variance is underestimated, the test statistic will lead to a rejection of the null hypothesis. Schwert and Seguin (1990) have assessed the importance of adjusting for the autoregressive conditionally heteroskedastic (ARCH) effects in the residuals derived from the standard market models. It is largely documented that the ability to reliably form statistical inferences can be compromised by failing to control for the ARCH error structure. Since the volatility clustering and leptokurtosis are commonly observed in stock returns series (Brockett et al. 1999), one can cast doubt on the way abnormal returns are measured in the traditional event studies. While trying to check the robustness of the event study methodology findings, a market model that accounts for GARCH effects is used to reflect the heteroskedastic behavior of the error variance over time. The results reported in Table 7 robustly reveal that both changes in inflation expectations and the uncertainty of monetary policy raise the short-run systematic risk for different U.S. stock sectors (except for the technology stocks). This task confirms the robustness of the obtained results to heteroskedasticity, autocorrelation and non-normality.

Overall, while the findings reveal that industries in the United States have heterogeneous sensitivities to changes in expected inflation and uncertainty of monetary policy, the different stock market states and the distinct investors' ambition degrees. The results also demonstrate that most U.S. equity sectors and industries are more sensitive to the FOMC announcement to raise interest rates by 75 bps (June 2022), thereby intensifying uncertainty about the future policy direction. The sharp heterogeneity in how industry-level stock returns react to expected inflation as well as changes in monetary policy expectations, unambiguously suggests that selecting portfolios across industries rather than within industries would be more appropriate. Regardless of the relevance of the obtained findings, it seems highly important to acknowledge the potential endogeneity between inflation expectations and stock returns. This can happen when these variables are driven by the same underlying factors. More accurately, changing market regimes and stock prices movements may exert a significant influence on inflation expectations, particularly when investors modify their projections in response to observed market swings. At the same time, stock returns may be impacted by increasing inflation expectations as investors typically incorporate future inflation risks as well as expectations of future monetary policy responses to inflation into their pricing decisions (Fang et al., 2022). This issue is heavily challenging to control for, as identifying credibly valid instruments to inflation expectations is a difficult task mainly owing to its complex interplay with stock market dynamics (Madsen, 2007). Importantly, an event study approach can partially deal with possible endogeneity bias, but it is not essentially designed to fully

TABLE 7.

Short-run systematic risk of the US stock market sectors due to changes in expected inflation and expectations of monetary policy (control of the GARCH effects)

Sectors	Beta prior to the event date	Immediate risk	Beta post- the event date
Panel A. Changes in inflation expectations (t_0: May 11, 2022)			
Oil and Gas	0.19***	0.36**	0.30**
Basic Materials	0.23**	0.27**	0.22**
Industrials	0.20**	0.29***	0.18***
Consumer Goods and Services	0.23**	0.29**	0.36**
Health Care	0.19**	0.25**	0.20**
Utilities	0.18**	0.21**	0.33**
Financials	0.25***	0.32**	0.44**
Technology Information	0.22**	0.14***	0.11**
Panel B. Expectations of monetary policy changes (t_0: June 23, 2022)			
Oil and Gas	0.25**	0.39***	0.33***
Basic Materials	0.17**	0.31***	0.24**
Industrials	0.23	0.34*	0.23**
Consumer Goods and Services	0.28**	0.46**	0.58***
Health Care	0.22**	0.26***	0.20**
Utilities	0.27***	0.39***	0.28***
Financials	0.34**	0.48***	0.41***
Technology Information	0.15	0.12**	0.12***

Notes: *, **, *** denote the statistical significance at the 10%, 5% and 1% levels, respectively.

solve this problem. One of the major characteristics of this econometric tool consists of isolating the effect of surprising news or unusual events on stock prices by assuming that the timing and nature of the event are exogenous (MacKinlay, 1997). However, this cannot be valid when the event is associated with economic expectations or monetary policy announcements that may be expected or endogenous to market states (Eden et al., 2022). Further work using short windows (i.e., hours) is required to lessen the probability of drawing confounding outcomes. This could be an important area for future research.

5. CONCLUSIONS

Nowadays, policymakers are highly concerned by testing if inflation expectations are becoming unanchored from the target, as this would reflect the level of the central bank's credibility in the eyes of financial markets. As policymakers move to mitigate inflation pressures, higher and unan-

chored inflation expectations could disturb the achievement of this goal. Because of escalating inflation projections and the uncertainty surrounding the anti-inflationary monetary policy, investors are becoming growingly worried about the possible loss of value in their financial assets and are therefore looking for assets with strong inflation-hedging capabilities. This study uses an improved event study methodology to explore the reactions of different U.S. stock industries to inflation expectations and shifts in monetary policy developments in the wake of the COVID-19 crisis and the war in Ukraine. Moreover, a downside risk analysis is conducted considering not only investors who want to preserve capital at times of rising inflation risk, but also investors with a more performance-oriented target or ambition.

It is robustly shown that the results of the inflation-hedging properties of the aggregate S&P500 stock market index mask significant disparities among disaggregated stocks. Even though the inflation-hedging capabilities of the aggregate stock market have long been documented in the literature, the findings reveal that there is a substantial heterogeneity in how sectoral and industry-level stock returns covary with anticipated inflation and monetary policy expectations. The results also suggest that the inflation protection can be enhanced by concentrating on stocks in specific sectors/industries that are more closely associated with inflation cycles (for instance, Oil and Gas, Basic Materials and Industrials). Whilst it is possible to reduce exposure to the risk of high inflation, searching for assets that effectively protect against inflationary pressures proves to be a complex enterprise. The inflation-protecting capabilities of the U.S. industries appear to be sensitive to various stock market conditions, and distinct investors' degrees of ambition.

More interestingly, the U.S. stock market responds more strongly to changes in the expected policy rate path rather than inflation expectations though with varying sensitivities depending on the specific sector/industry under study. This result is consistent with Bauer et al. (2021), deducing that the FOMC announcements have significant effects on the monetary policy uncertainty. The latter is important for the transmission of policy actions to financial markets in two ways: (i) changes in expectations about the policy rate have significant impacts on asset prices; and (ii) the level of uncertainty over a FOMC announcement is censorious in determining how unusual policy news is transmitted to financial markets. This underscores that policymakers need to withstand with the possibility that financial markets may have more confidence in the central bank's ability and commitment to bring inflation back to the goal.

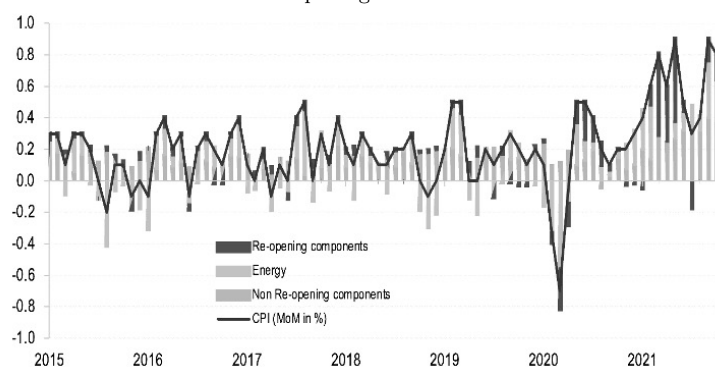
The technology sector- in particular, data processing, systems software and electronic manufacturing- proved their great resilience to changes in expected inflation and the uncertainty of monetary policy. Such a finding is expected because this sector accounts for companies which generally create

new, high value-added products that are differentiated from those already on the market, and in turn can raise prices. Technology stocks offer the potential for sizeable gains, with investors usually prepared to pay a premium for future growth. But it is important to point out that the recent rising interest rates tend to hurt growth stocks, and especially the tech stocks due to their high price to earnings ratios and low dividend payments. In other words, inflation and anti-inflationary monetary policy that raises interest rates will cause a large decrease in the present discounted value of assets that yield cash flows in the distant rather than the near future. Higher rates can slow down businesses' cash flows and stunt their reinvestment into innovation and growth prospects. Accordingly, investors in the tech sector should continue to pay close attention to how technology is being increasingly deployed in the global economy and how this translates into profitable results.

Overall, this study's findings are relevant for mitigating exposure to inflation risks and monetary policy uncertainty through portfolio construction and diversification, as varying reactions of different stock sectors and industries have been discovered. This highlights the importance of selecting portfolios across sectors rather than within sectors. Investors and portfolio managers should rebalance their portfolio compositions based on different investors' ambition degrees and market conditions. This assessment can be perceived as a relevant input to design appropriate hedging strategies and make optimal portfolio allocations.

This paper points to multiple fruitful directions for research avenues. An interesting development in this work would be to explore the role that may be played by policy communications to keep inflation expectations well anchored. Future research can focus on the levels of short-run and long-run inflation expectations, as well as on the range of disagreements for such expectations. For instance, further work can answer what are the responses of short-run and long-run inflation expectations to a monetary policy uncertainty shock. Such analysis would allow us to observe if long-run and short-run inflation expectations respond dissimilarly to monetary policy uncertainty shocks, and therefore, enhance our understanding of whether the uncertainty of monetary policy plays a differentiated role in shaping the expectations formation process at distinct time-horizons. These extensions would not only strengthen the theoretical understanding of expectations dynamics but also carry practical implications for the design of effective monetary policy and communication strategies.

APPENDIX

FIG. 1. The contributions of reopening and other factors to the US CPI inflation

Source: Bloomberg; BNP Paribas Asset Management (<https://investor-corner.bnpparibas-am.com/economics/us-inflation-blasts-past-expectations-as-economy-reopens/>).

Table A1. The industry-level composition of S&P 500 index for the period under study

Sector	Industry	% of sector
Oil and gas	Integrated oil and gas	50.88%
	Oil and gas equipment and services	8.13%
	Oil and gas exploration and production	20.30%
	Oil and gas refining and marketing	11.51%
	Oil and gas storage and transportation	9.18%
Basic materials	Commodity chemicals	6.71%
	Construction materials	4.11%
	Copper	2.71%
	Diversified chemicals	1.46%
	Fertilizers and agricultural chemicals	6.71%
	Gold	8.02%
	Industrial gases	27.73%
	Metal and glass containers	3.47%
	Paper packaging	8.80%
	Specialty chemicals	28.45%
	Steel	1.82%

Sector	Industry	% of sector
Industrials	Aerospace and defense	20.41%
	Industrial conglomerates	13.56%
	Industrial machinery	10.12%
	Rail roads	11.13%
	Research and consulting services	4.11%
	Trading companies and distributors	2.84%
	Tracking	1.32%
Consumer goods and services	Internet and direct marketing retail	47.65%
	Leisure products	0.31%
	Restaurants	10.44%
	Agricultural products	1.25%
	Food distributors	1.41%
	Food retail	1.43%
	Household products	26%
	Hypermarkets and supercenters	17.15%
	Packaged foods and meats	14.79%
	Personal products	2.39%
	Soft drinks	21.31%
	Tobacco	10.28%
Health care	Biotechnology	15.66%
	Health care distributors	1.65%
	Health care equipment	25.73%
	Health care facilities	1.06%
	Health care services	4.80%
	Health care supplies	1.64%
	Health care technology	0.54%
	Life sciences tools and services	8.56%
	Managed health care	11.30%
	Pharmaceuticals	29.08%
Utilities	Electric utilities	62.41%
	Gas utilities	1.53%
	Independent power producers and energy traders	1.20%
	Water utilities	3.15%
	Multi-utilities	31.71%
Financials	Asset management and Custody banks	8.08%
	Consumer finance	4.40%
	Diversified banks	27.43%
	Financial exchanges and data	11.91%
	Insurance brokers	5.77%
	Investment banking and brokerage	6.63%
	Life and health insurance	4.08%
	Multi-line insurance	1.84%
	Multi-sector holdings	14.23%
	Property and casualty insurance	7.41%
	Regional banks	7.91%
	Reinsurance	0.33%

Sector	Industry	% of sector
Information Technology	Application software	8.79%
	Communication equipment	3.42%
	Data processing and outsourced services	15.67%
	Electronic components	0.74%
	Electronic equipment and instruments	0.53%
	Electronic manufacturing services	0.48%
	Internet services and infrastructure	0.54%
	IT consulting and other services	4.27%
	Semi conductor equipment	1.95%
	Semi conductors	15.10%
	Systems software	24%
	Technology distributors	0.22%
	Technology hardware, storage and peripherals	24.29%

Source: DataStream (Thomson Reuters).

REFERENCES

- Albulescu, C. T., C. Aubin, and D. Goyeau, 2016. Stock prices, inflation and inflation uncertainty in the U.S.: testing the long-run relationship considering Dow Jones sector indexes. *Applied Economics* **49**(18), 1794-1807.
- Amenc, N., L. Martellini, and V. Ziemann, 2009. Alternative Investments for Institutional Investors, Risk Budgeting Techniques in Asset Management and Asset-Liability Management. *Journal of Portfolio Management* **35**, 94-110.
- Ang, A., M. Briere, and O. Signori, 2012. Inflation and Individual Equities. *Financial Analysts Journal* **68**(4), 36-55.
- Arce-Alfaro, G., and B. Blagov, 2022. Monetary Policy Uncertainty and Inflation Expectations. *Oxford Bulletin of Economics and Statistics* **85**, 70-94.
- Artuc, E., G. Falcone, G. Porto, and B. Rijkers, 2022. War-induced food price inflation imperils the poor. VoxEU.org.
- Bai, J., and P. Perron, 1998, Estimating and testing linear models with multiple structural changes. *Econometrica* **66**, 47-78.
- Bai, J., and P. Perron, 2003. Computation and analysis of multiple structural change models. *Journal of Applied Econometrics* **18**, 1-22.
- Ball, L., G. Gopinath, D. Leigh, P. Mishra, and A. Spilimbergo, 2021. US inflation: Set for Take-Off? VoxEU.org.
- Bampinas, G., and T. Panagiotidis, 2016. Hedging inflation with individual US stocks: A long-run portfolio analysis. *The North American Journal of Economics and Finance* **37**(C), 374-392.
- Bauer, M., L. Aeimit, and P. Mueller, 2021. Market-Based Monetary Policy Uncertainty. Federal Reserve Bank of San Francisco Working Paper 2019-12.
- Beine, M., S. Laurent, and C. Lecourt, 2002. Accounting for conditional leptokurtosis and closing days effects in FIGARCH models of daily exchange rates. *Applied Financial Economics* **12**(8), 589-600.
- Bekaert, G., and E. Engstrom, 2010. Inflation and the stock market: Understanding the "Fed Model". *Journal of Monetary Economics* **57**(3), 278-294.

- Bekaert, G., X. Wang, and C. Tille, 2010. Inflation risk and the inflation risk premium. *Economic Policy* **25**(64), 755-806.
- Benninga, S., 2008. Financial modeling (3rd edition), Boston, MA: MIT Press.
- Bernanke, B. S., and K. N. Kuttner, 2005. What Explains the Sork Market's Reaction to Federal Reserve Policy? *Journal of Finance* **60**(3), 1221-1257.
- Bernile, G., J. Hu, and Y. Tang, 2016. Can information be locked up? Informed trading ahead of macro-news announcements. *Journal of Financial Economics* **121**(3), 496-520.
- Bernstein, J., and E. Tedeschi, 2021. Pandemic Prices: Assessing Inflation in the Months and Years Ahead. The White House blog.
- Bils, M., P. J. Klenow, and O. Kryvtsov, 2003. Sticky Prices and Monetary Policy Shocks. *Federal Reserve of Minneapolis Quarterly Review* **27**(1), 2-9.
- Binder, C., and R. Kamdar, 2022. Expected and Realized Inflation in Historical Perspective. *Journal of Economic Perspectives* **36**(3), 131-56.
- Briere, M., and O. Signori, 2012. Inflation-Hedging Portfolios: Economic Regimes Matter. *Journal of Portfolio Management* **38**(4), 43-58.
- Brockett, P-L., H-W. Chen, and J. Garven, 1999. New stochastically flexible event methodology with application to Proposition 103. *Insurance: Mathematics and Economics* **25**, 197-217.
- Brooks, C., M. J. Hinich, and R. Molyneux, 2000. Episodic nonlinear event detection: political epochs in exchange rates. Michigan University Press.
- Brown, S. J., and J. B. Warner, 1985. Using daily stock returns: the case of event studies. *Journal of Financial Economics* **14**(1), 3-31.
- Bodie, Z., 1995. On the Risk of Stocks in the Long Run. *Financial Analysts Journal* **51**(3), 18-22.
- Bodie, Z., and V. I. Rosansky, 1980. Risk and Return in Commodity Futures. *Financial Analysts Journal* **36**(3), 27-39.
- Boudoukh, J., M. Richardson, and R. F. Whitelaw, 1994. Industry Returns and the Fisher Effect. *Journal of Finance* **49**(5), 1595-1615.
- Boyd, John H., Ross Levine, and Bruce D. Smith, 2001. The Impact of Inflation on Financial Sector Performance. *Journal of Monetary Economics* **47**(2), 221-248.
- Boyd, John H., and C. Bruce, 2006. Inflation, Banking, and Economic Growth. Federal Reserve Bank of Cleveland.
- Brock, W. A., J. A. Scheinkman, W. D. Dechert, and B. LeBaron, 1996. A test for independence based on the correlation dimension. *Econometric Reviews* **15**(3), 197-235.
- Caldara, D., S. Conlisk, M. Iacoviello, and M. Penn, 2022. The Effect of the War in Ukraine on Global Activity and Inflation. FEDS Notes. Washington: Board of Governors of the Federal Reserve System.
- Campbell, J. Y., A. Sunderam, and M. L. Viceira, 2017. Inflation Bets or Deflation Hedges? The Changing Risks of Nominal Bonds. *Critical Finance Review* **6**, 263-301.
- Cavallo, A., 2020. Inflation with COVID Consumption Baskets. NBER Working Paper Series N° 27352.
- Cevic, S., A. Fan, and S. Naik, 2024. Is Inflation Good for Business? The Firm-Level Impact of Inflation Shocks in the Baltics, 1997-2021. IMF Working Paper series 24/43.

- Chaudhary, M., and M. Benjamin, 2022. Inflation Expectations and Stock Returns. Available at SSRN.
- Chen, N-F., R. Roll, and S. A. Ross, 1986. Economic Forces and the Stock Market. *The Journal of Business* **59**(3), 383-403.
- Clark, T. E., and T. Davig, 2011. Decomposing the declining volatility of long-term inflation expectations. *Journal of Economic Dynamics and Control* **35**(7), 981-999.
- Coibion, O., and Y. Gorodnichenko, 2015. Is the phillips curve alive and well after all? Inflation expectations and the missing disinflation. *American Economic Journal: Macroeconomics* **7**(1), 197-232.
- Coibion, O., Y. Gorodnichenko, S. Kumar, and M. Pedemonte, 2020. Inflation expectations as a policy tool? *Journal of International Economics* **124**, 103297.
- Cumova, D., and D. Nawrocki, 2011. A symmetric LPM model for heuristic mean-semivariance analysis. *Journal of Economics and Business* **63**(3), 217-236.
- D'Acunto, F., U. Malmendier, and M. Weber, 2022. What Do the Data Tell Us About Inflation Expectations? NBER Working Paper N° w29825.
- D'Amico, Stefania, Don H. Kim, and M. Wei, 2018. Tips from TIPS: The Informational Content of Treasury Inflation-Protected Security Prices. *Journal of Financial and Quantitative Analysis* **53**(1), 395-436.
- Daly, K., and R. Chankova, 2021. Inflation in the aftermath of wars and pandemics. VoxEU.org.
- David, A., and P. Veronesi, 2013. What ties return volatilities to price valuations and fundamentals? *Journal of Political Economy* **121**(4), 682-746.
- Du, B., S. Fung, and R. Loveland, 2018. The informational role of options markets: Evidence from FOMC announcements. *Journal of Banking and Finance* **18**(1), Available at SSRN: <https://ssrn.com/abstract=2698700>
- Eden, L., S. R. Miller, S. Khan, R. J. Weiner, and D. Li, 2022. The Event Study in International Business Research: Opportunities, Challenges, and Practical Solutions. *Journal of International Business Studies* **53**, 803-817.
- Fama, E. F., and F. Schwert, 1977. Asset returns and inflation. *Journal of Financial Economics* **5**(2), 115-146.
- Fama, E. F., 1981. Stock Returns, Real Activity, Inflation, and Money. *The American Economic Review* **71**(4), 545-565.
- Fama, E. F., 1990. Stock returns, expected returns and real activity. *Journal of Finance* **45**, 1089-1108.
- Fama, E. F., and K. R. French, 1993. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* **33**(1), 3-56.
- Fang, X., Y. Liu, and N. Roussanov, 2022. Getting to the Core: Inflation Risks Within and Across Asset Classes. NBER Working Paper N° 30169.
- Feldstein, M., 1980. Inflation and the stock market. *The American Economic Review* **70**(5), 839-847.
- Fishburn, P. C., 1977. Mean-Risk Analysis with Risk Associated with Below-Target Returns. *American Economic Review* **67**(2), 116-126.
- Fisher, I., 1930. *The Theory of Interest*. Macmillan, New York.
- Forbes, K. J., and F. E. Warnock, 2012. Capital flow waves: Surges, stops, flight, and retrenchment. *Journal of International Economics* **88**(2), 235-251.

- Gautier, E., 2006. The Behaviour of Producer Prices: Some Evidence from the French PPI Micro Data. ECB Working Paper n° 699.
- Gultekin, B., 1983. Stock market returns and inflation: Evidence from other countries. *Journal of Finance* **38**(1), 49-65.
- Gurkaynak, Refet S., Brian P. Sack, and Jonathan H. Wright, 2010. The TIPS Yield Curve and Inflation Compensation. *American Economic Journal: Macroeconomics* **2**(1), 70-92.
- Hoevenaars R. P., R. D. Molenaar, P. C. Schotman, and T. B. Steenkamp, 2008. Strategic Asset Allocation with Liabilities: Beyond Stocks and Bonds. *Journal of Economic Dynamics & Control* **32**, 2939-2970.
- Huang, Y. C., and B. J. Lin, 2004. Value-at-Risk analysis for Taiwan stock index futures: Fat tails and conditional asymmetries in return innovations. *Review of Quantitative Finance and Accounting* **22**, 79-95.
- Ioannidis, C., and A. Kontonikas, 2008. The impact of monetary policy on stock prices. *Journal of Policy Modeling* **30**(1), 33-53.
- Khan, K., C-W. Su, R. Tao, and M. Umar, 2021. How do geopolitical risks affect oil prices and freight rates? *Ocean & Coastal Management* **215**, 105955.
- Kiley, M. T., 2009. Inflation Expectations, Uncertainty, the Phillips Curve, and Monetary Policy. *Finance and Economics Discussion Series*.
- Kim, J. H., and H. Ryoo, 2011. Common stocks as a hedge against inflation: Evidence from century-long US data. *Economics Letters* **113**, 168-171.
- Krämer, W., 2017. Equity Investments as a Hedge against Inflation. Lazard Asset Management.
- Krishnamurthy, H., A. Queirolo, B. White, and S. Redaelli, 2021. Winning the race with inflation: The pricing opportunity for industrial companies. McKinsey & Company.
- Kroencke, T. A., and F. Schindler, 2010. Downside Risk Optimization in Securitized Real Estate Markets. ZEW-Centre for European Economic Research Discussion Paper No. 10-034, Available at <http://dx.doi.org/10.2139/ssrn.1622688>
- Krugman, P., 2021. What Inflation Risks and My Intermittent Fasting Have in Common. Opinion: The New York Times.
- Lall, S., and L. Zeng, 2020. Intangible investment and low inflation: A framework and some evidence. IMF Working Paper series 20/190.
- Lee, B. S., 2009. Stock Returns and Inflation Revisited. Working paper, Florida State University.
- MacKinlay, A. C., 1997. Event Studies in Economics and Finance. *Journal of Economic Literature* **35**(1), 13-39.
- Madsen, J. B., 2007. Pitfalls in estimates of the relationship between stock returns and inflation. *Empirical Economics* **33**, 1-21.
- Modigliani, F., and R. Cohn, 1979. Inflation, rational valuation, and the market. *Financial Analysts Journal* **37**, 24-44.
- Neely, C., 2005. Using Implied Volatility to Measure Uncertainty About Interest Rates. *Federal Reserve Bank of St. Louis Review* **87**(3), 407-425.
- Neison, C. R., 1976. Inflation and rates of return on common stocks. *The Journal of Finance* **31**, 471-483.
- Philip, R. L., 2021. Inflation dynamics during a pandemic. European Central Bank report.

- Platitas, R. G. C., and J. C. G. Ocamop, 2025. From bottlenecks to inflation: Impact of global supply-chain disruptions on inflation in select Asian economies. *Latin American Journal Central Banking* **6**(1), 100141.
- Powell, J., 2021. Transcript of Chair Powell's Press Conference: Federal Reserve.
- Schwert, G. W., and P. J. Seguin, 1990. Heteroskedasticity in stock returns. *Journal of Finance* **45**, 1129-1155.
- Selier, P., 2022. The Ukraine war has raised long-term inflation expectations. VoxEU.org.
- So, M. K. P., and P. L. H. Yu, 2006. Empirical analysis of GARCH models in Value at Risk estimation. *Journal of International Financial Markets, Institutions & Money* **16**, 180-197.
- Swanson, Eric T., 2006. Have increases in Federal Reserve transparency improved private sector interest rate forecasts? *Journal of Money, Credit, and banking* **38**, 791-819.
- Umar, M., C-W. Su, S. K. Rizvi, and L. Oana-Ramona, 2021. Driven by fundamentals or exploded by emotions: Detecting bubbles in oil prices. *Energy* 231,120873.
- Vaitilingam, R., 2022. Economic consequences of Russia's invasion of Ukraine: Views of leading economists. VoxEU.org.
- Voinea, L., and P. Loungani, 2021. Predicting inflation using cumulative wage gaps. VoxEU.org.
- Wang, K-H., L. Liu, X. Li, and L. Oana-Ramona, 2022. Do oil price shocks drive unemployment? Evidence from Russia and Canada. *Energy* **253**, 124107.
- Xiao, Z., and R. Koenker, 2009. Conditional quantile estimation for GARCH models. The Cass Conference in Econometrics.