Inflation surprises and equity returns*

Antonio Gil de Rubio Cruz† Emilio Osambela‡ Berardino Palazzo§

Francisco Palomino¶ Gustavo Suarez‖

June 2023

Abstract

U.S. stocks' response to inflation surprises is, on average, robustly negative and shows pronounced time-series variability. Consistent with a view that stock prices respond to inflation surprises that affect the monetary policy stance, we document that the stock market sensitivity is the largest during periods when inflation expectations and the output gap are running high. During these periods, firms with low net leverage, large market capitalization, high market beta, low book-to-market, and low market power (i.e. low markups) are especially susceptible to inflation surprises.

Keywords: Inflation surprises, equity returns, firm characteristics.

JEL Classification: E31, G12, G14

First draft: October 2022

*We thank Andrew Chen, Anna Orlik, Nitish Sinha, Steve Sharpe, and Michael Weber, as well as seminar and conference attendants at the Federal Reserve Board, Society for Economic Dynamics 2023 conference, and International Finance and Banking Society 2023 conference for valuable comments and suggestions. The views expressed are those of the authors and do not necessarily reflect those of the Federal Reserve Board and Federal Reserve System.

†Antonio.d.Gilderubiocruz@frb.gov

‡Emilio.Osambela@frb.gov

§Dino.Palazzo@frb.gov

¶Francisco.Palomino@frb.gov

‖Gustavo.A.Suarez@frb.gov

1 Introduction

The high inflationary period of the 1970s motivated researchers to carefully investigate the link between inflation and equity returns and to explore feasible ways to hedge against inflation surprises.[1] Today's economic environment, with inflationary pressures that the U.S. economy has not witnessed in more than 40 years, is spurring a renewed effort in answering long-dated questions involving inflation and asset prices.

We contribute to this renewed effort by studying the response of equity prices to inflation surprises around inflation announcement windows for a large panel of publicly traded non-financial U.S. corporations.[2] Building on recent insights (e.g., Ajello, Benzoni, and Chyruk (2020) and Fang, Liu, and Roussanov (2022)), we focus our attention on core rather than headline inflation shocks, to purge our surprise measure from the volatile price behavior of food and energy items. Following the lead of Pearce and Roley (1984), we measure core inflation surprises as the difference between the announced inflation value and the median expectations of market participants, as measured by Haver Analytics's Money Market Services (MMS) survey medians. All the announcements in our sample are made at 8.30am EST, when U.S. equity markets are closed, thus preventing us from building firm-level returns in a narrowly defined window around the announcement time for a large cross-section of firms. To overcome this limitation and improve identification, we use daily opening equity prices to build a close-to-open equity return around inflation announcements for a very large cross-section that spans more than 30 years of data.

The first part of our analysis addresses the question: When do inflation surprises matter for stock returns? To answer this question, we use our large panel of U.S. publicly traded firms to study the average response of equity prices to inflation surprises by regressing close-

[1]A partial list of of papers includes Lintner (1975), Bodie (1976), Modigliani and Cohn (1979), Fama (1981), Schwert (1981), Summers (1981), French, Ruback, and Schwert (1983), and Bernard and Frecka (1983).

[2]In what follows, we will use the terms surprise, shocks, and innovations interchangeably.

to-open equity returns on inflation surprises. Admittedly, close-to-open equity returns are not ideal for high-frequency identification purposes since they are very likely polluted by other systematic news like earning announcements, news from abroad, or any other systematic news that is revealed when U.S. equity markets are closed. To mitigate this concern, we use S&P500 futures to calculate a market-wide equity return outside a narrowly defined inflation announcement window. Specifically, we include in our regression the market return from closing to 8.25am and from 9.15am to market opening on the announcement day. In this way, all systematic news outside our inflation announcement window (8.25am-9.15am) is accounted for.

We start by showing that the average stock price response to inflation surprises is robustly negative over our 1993-2023 sample. For each 0.1 surprise in month-on-month core inflation, stock prices, on average, decline about 0.18%. We also show that (i) headline inflation surprises do not matter when core inflation surprises are controlled for, (ii) that the stock price reaction is confined at opening and no significant residual response is detected in the first 5 minutes of market trading or in the rest of the trading day, and (iii) that the response of stocks is robustly negative across a series of broadly defined industries and it is weaker in absolute value for industries where price adjustments are more frequent.

Next, we document substantial time variation in the average stock price response to inflation surprises. In particular, when we split the core inflation surprise into negative and positive surprises we find that the response to negative inflation surprises fluctuates relatively less than the response to positive inflation surprises. The latter varies dramatically over time and it becomes positive at various junctures in our sample, usually around recessionary periods. This finding is in accordance with the view that positive inflation shocks are good news during bad economic times since they might signal an economic recovery (e.g., Knif, Kolari, and Pynnönen (2008)).

During the recent monetary policy tightening cycle, which started in March 2022, equity prices had, on average, the largest sensitivity to both positive and negative inflation surprises. This is to be expected when inflation surprises are closely associated with movements in monetary policy expectations. For example, a positive inflation surprise can move market expectations toward a more aggressive policy rate tightening and the latter has a negative effect on stock prices both via a discount rate and an expected cash flows channel. To explore the monetary policy channel, we use contemporaneous changes in the policy-sensitive 2-year Treasury yield. Specifically, we calculate the change in this yield from 8.25am to 9.15am on the inflation announcement day and show that in this window stock prices react negatively and significantly to contemporaneous positive changes in 2-year Treasury yields. This significance disappears when we interact the policy-sensitive Treasury yield with dummy variables that indicate if there is contemporaneous negative or positive inflation surprise thus suggesting that stock prices only respond to changes in monetary policy expectations triggered by inflation surprises.

The above findings suggest that stock prices respond to inflation surprises when the latter affect expectations about the future path of short-term rates, thus signalling changes in monetary policy expectations. We directly test this transmission channel by assuming that expectations about future monetary policy are affected by expectations about inflation and output, which is consistent with the dual mandate of the Federal Reserve and similar in spirit to the Taylor (1993) interest-rate rule. In particular, we test whether the documented stock price response to inflation can be explained by variables capturing deviations in inflation and output from their respective policy targets. Our results clearly show that this is indeed the case: the stock market sensitivity to inflation surprises is the largest when inflation expectations and the output gap are running high.

In the second part of the paper, we take advantage of the large cross-section of firms to answers the following question: In periods when the stock market is particularly susceptible to inflation surprises, what are the stocks that react more? We look for the answer by interacting the inflation surprise measure with a battery of characteristics and contemporaneously control for announcement day fixed effects, thus removing any systematic news that might affect stock returns on a particular announcement day. The estimated coefficient on the interaction terms tells us how much more (or less) stocks react to inflation surprises depending on a given characteristic.

We select firm characteristics mainly following previous studies. A large literature has studied the effect of nominal contracts on asset pricing, consequently we include net leverage, account receivables, and inventories among the variables of interest.[3] We also include a measure of firm physical assets (or tangibility) and a set of variables related to a firm's ability to generate cash and adjust final goods prices: gross margin, cash flows, and markups. Finally, we include three market-based quantities with a strong association with the cross-section of equity returns: market capitalization (i.e., size), book-to-market, and market beta. To the best of our knowledge, ours is the first study to explore how the propagation of inflation shocks in the cross-section of equity returns is *jointly* affected by the firm-level characteristics described above.

We find that net leverage, markups, market capitalization (size), book-to-market, and market beta significantly affect how individual stocks respond to unexpected inflation and their estimated signs are consistent with what has been documented separately in previous studies. Following a positive inflation shock, firms with high net leverage, high book-to-market, and high markups experience a milder decline in their stock prices, while large firms and firms with a high CAPM beta witness a stronger decline. The significance of these results does not change much (i) if we split the sample in pre- and post-Global Financial Crisis and (ii) if we look at small and large stocks separately.

In the last part of the paper, we use the estimated coefficients on those five firm-level

[3] Studies that discuss the relation between inflation on one hand and cash balances, accounts receivables, inventories, and debt on the other include Lintner (1975), Summers (1981), French et al. (1983), Bernard (1986), and Pearce and Roley (1988), among many others.

characteristics to build portfolios that are more or less sensitive to inflation shocks and derive an inflation-sensitivity-based excess return using close-to-open returns. To obtain these excess returns, we first calculate the difference between the equally weighted returns in the inflation-sensitive portfolio and the equally weighted returns in the inflation-insensitive portfolio and then we take the residual from a regression of these excess returns on the S&P 500 return calculated from previous close up to 8.25am of the announcement day to control for systematic news not related to inflation surprises. We find that over the inflation announcement window the average excess returns when surprises are negative is 0.32%, while the same quantity takes a value of -0.30% when surprises are positive. These average excess returns are economically large and they are both significant at the 1% level.

Our analysis ends with an out-of-sample assessment. Specifically, we build inflation-sensitive and inflation-insensitive portfolios during the recent monetary policy tightening episode (from March 2022 to March 2023, the last observation in our sample) using a firm–level measure of inflation sensitivity built on coefficients estimated over the sample prior to the Global Financial Crisis. We find that the portfolio of inflation-sensitive firms consistently outperforms (underperforms) the portfolio of inflation-insensitive firms when the inflation surprise is negative (positive). This result has important financial hedging implications. An investor that expects a prolonged period of positive inflation surprises should go long inflation insensitive firms and short inflation sensitive ones. The first portfolio would be composed by highly levered small firms with a low CAPM beta, a high book-to-market ratio and the ability to set their final goods price. The second portfolio would contain firms with exact opposite characteristics.

Literature review. Our work is related to several strands of the literature. First, our work is related to the literature on the inflation hedging properties of equity prices. Fama and Schwert (1977), Boudoukh and Richardson (1993) and Bekaert and Wang (2010), among others, show that equities have a negative correlation with unexpected inflation, and are therefore poor inflation hedges. In an early contribution, Fama (1981) argued that inflation is negatively correlated with stocks because inflation is a proxy for high growth of real activity. More recently, however, Fang et al. (2022) find that core inflation is not driven by real activity, and it therefore constitutes a risk by itself. In this paper we confirm the negative correlation between core inflation surprises and stock returns, and we consider in addition the separate effect of positive and negative core inflation surprises, finding very different effects according to the sign of the surprise. Moreover, we show that both positive and negative inflation surprises show a tight link with contemporaneous changes in policy sensitive rates.

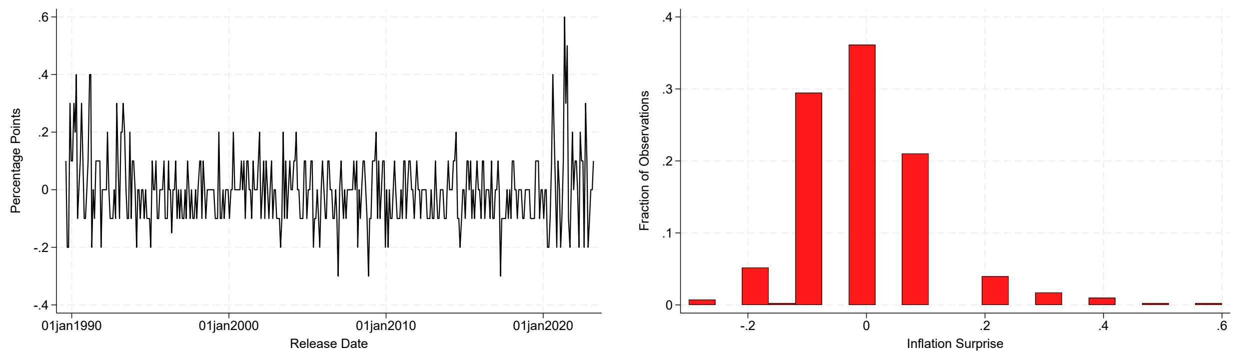
In a recent contribution, Chaudhary and Marrow (2022) document a positive relation between stock returns and expected inflation. Considering inflation surprises are inversely related to expected inflation, their time-series result is consistent with ours. In the cross-section they find that while stocks with larger CAPM betas are more sensitive to inflation expectations, other firm characteristics including leverage and profitability do not affect stock returns' sensitivity to inflation expectations. This is at odds with our results and suggests that while the sensitivity of stock returns to inflation surprises is driven by several firm characteristics, their sensitivity to inflation expectations is more homogeneous in the cross-section.

Second, our work relates to the literature trying to obtain and characterize the inflation risk premium. Chen, Roll, and Ross (1986), Ferson and Harvey (1991), and Ang, Brière, and Signori (2012) estimate the inflation risk premium in the cross-section of stocks and find a negative and mostly insignificant inflation risk premium. Boons, Duarte, De Roon, and Szymanowska (2020) allow for a time-varying inflation risk premium that can change sign, and they show that the inflation risk premium is negative prior to 2000 and positive thereafter. David and Veronesi (2013) and Campbell, Pflueger, and Viceira (2020) suggest this change is driven by higher inflation proxying for higher growth after 2000. Gourio and Ngo (2020) document that in the period 2008-2015 inflation and stock returns were positively rather than negatively associated, and attribute this regime change to the zero lower bound (ZLB) constraint on monetary policy. Consistent with this literature, we confirm that the inflation-based excess return tends to be negative following positive surprises and positive following negative surprises. Moreover, we show that the magnitude of this excess return declined significantly after the 2008 global financial crisis.

Third, our work contributes to the literature trying to relate the magnitude of the impact of inflation on stock returns to firms characteristics, including Summers (1981), French et al. (1983), Bernard (1986), and Pearce and Roley (1988), among others. Compared to these studies, we use a much larger time series data set and a richer cross-section of firms, including the most recent periods of market stress, such as the global financial crisis and the COVID-19 pandemic.

Finally, our work provides new empirical patterns that could be incorporated in future models trying to characterize the equilibrium relation between inflation and stock returns, as well as the corresponding inflation risk premium. For instance, extensions of existing theoretical papers aiming to quantitatively match inflation and stock returns (including, among others, Buraschi and Jiltsov (2005), Wachter (2006), Piazzesi, Schneider, Benigno, and Campbell (2006), Bansal and Shaliastovich (2013), Li and Palomino (2014), Bhamra, Dorion, Jeanneret, and Weber (2018), and Dumas and Savioz (2020)) should separately model positive and negative inflation shocks and allow for them to have potentially different effects in equilibrium, similar to the modeling approach of Segal, Shaliastovich, and Yaron (2015) and Kilic and Shaliastovich (2019). Similarly, our results suggest future theoretical work on this subject should go beyond the representative firm paradigm and incorporate a cross section of firms with different sensitivities to inflation shocks.

Figure 1. The left panel reports Core inflation surprises (in percentage points) over the period 1989m7-2023m3. The right panel reports their frequency distribution.



2 Data

We combine firm-level and economy-wide information to study how inflation surprises propagate in the cross-section of equity returns. Following Ajello et al. (2020) and Fang et al. (2022), we use core inflation to compute inflation surprises. Our core inflation data are from Haver Analytics' Money Market Services (MMS) Survey. We use these data to build a core inflation surprise measure defined as the difference between the announced month-on-month value and the median expectation from market participants. The left panel in Figure 1 depicts the observed core inflation surprises over a 35-year period of time that goes from July 1989 to March 2023, while the right panel plots the surprise magnitude's frequency distribution. Panel A of Table 1 shows some summary statistics. Core inflation surprises are essentially zero basis points on average and have a standard deviation of 12 basis points. Not surprisingly, core inflation surprises are less volatile than headline inflation surprises given that the latter includes the highly volatile food and energy components.

Panel A of Table 1 also reports some aggregate stock and Treasury markets movements around the inflation announcement time, which is always 8.30am EST in our sample. To control for any systematic news affecting stock prices before the inflation announcement[4],

[4]Example of systematic news that can be incorporated overnight are earnings announcements after market

Table 1. This table reports the summary statistics of the variables used in the empirical analysis. Panel A summarizes aggregate quantities. Core (headline) CPI surprise is the difference between the announced month-on-month Core (headline) CPI value and the median expectation from market participants. We split the S&P 500 percentage return from its closing value on the day before the announcement day up to its opening value on the announcement day in three sub-intervals: from closing to 5 minutes before the announcement, from 5 minutes before the announcement to 45 minute after the announcement, and from 45 minute after the announcement to market opening. The change (in basis points) in the on-the-run 2-year Treasury yield is calculated from 5 minutes before the announcement to 45 minute after the announcement and captures changes in the expected monetary policy stance triggered by the inflation announcement. Panel B reports firm-level stock returns. We calculate the close-to-open returns and open-to-close returns on the announcement day using CRSP data. We also include the previous day stock return to control for short-term reversal. We use TAQ data to calculate a 5-minute return right after market opens on the announcement day. Panel C reports the firm-level characteristics discussed in Section 2

Panel A: Aggregate variables

	Mean	Std. Dev.	Min	Median	Max	Obs.
Core CPI surprise (%)	-0.00	0.12	-0.30	0.00	0.60	404
Headline CPI surprise (%)	-0.01	0.14	-0.50	0.00	0.60	404
S&P 500 return from close to 8.25am (%)	0.05	0.57	-3.32	0.07	1.55	334
S&P 500 return from 8.25am to 9.15am (%)	0.01	0.51	-3.12	0.02	3.03	334
S&P 500 return from 9.15am to 9.30am (%)	0.01	0.14	-0.55	0.00	0.80	335
Change in 2yr from 8.25am to 9.15am (bps)	-0.01	4.20	-21.94	0.00	23.77	367

Panel B: Firm-level returns (%)

	Mean	Std. Dev.	Min	Median	Max	Obs.
Close-to-open (CRSP)	0.03	2.06	-9.41	0.00	10.00	876,266
Open-to-close (CRSP)	0.02	3.36	-12.79	0.00	14.29	876,266
ret_{t-1}	0.01	3.60	-13.64	0.00	15.91	876,248
Open-to-935 (TAQ)	-0.01	1.17	-4.99	0.00	4.92	312,263

Panel C: Firm-level characteristics

	Mean	Std. Dev.	Min	Median	Max	Obs.
Net leverage	0.23	0.43	-0.88	0.31	1.37	875,933
Receivables	0.15	0.12	0.00	0.13	0.88	864,382
Inventories	0.13	0.14	0.00	0.09	0.70	863,919
Tangibility	0.23	0.21	0.00	0.16	0.92	874,556
Cash Flows	0.00	0.07	-0.44	0.02	0.17	825,893
Gross Margin	-0.27	4.50	-42.18	0.36	1.00	848,641
Markup	1.05	0.20	0.19	1.05	1.90	715,437
Size	17.56	2.04	13.15	17.46	23.39	876,266
Book-to-market	0.55	0.56	-0.89	0.42	4.65	874,643
CAPM Beta	1.47	1.07	-1.17	1.30	5.79	775,891

we use S&P 500 futures prices to recover the market-wide return from the previous close up to 5 minutes before the announcement. We also calculate the S&P 500 returns over (i) the inflation announcement window, which goes from 8.25am to 9.15am, and (ii) the period that goes from the end of the inflation surprise window (9.15am) to market opening (9.30am).[5] This latter measure should control for the rare aggregate news affecting stock prices after the inflation data are made public and before the stock market opens. The availability of S&P 500 futures prices limits our analysis to the period 1993m10–2023m3. The last line in Panel A reports the change in the on-the-run 2-year Treasury yield calculated over the inflation announcement window. We use this quantity to control for movements in monetary policy-sensitive rates. We use the 2-year Treasury yield to better capture movements in monetary policy-sensitive rates during the Zero Lower Bound (ZLB) period.

Firm-level returns around the inflation announcement time are given by the close-to-open return calculated using daily data from The Center for Research in Security Prices (CRSP). Specifically, we use the firm-level opening price (CRSP variable OPENPRC available starting in 1992) on the announcement day together with the corresponding firm-level closing price (CRSP variable PRC) from the closest trading day preceding the announcement day. We also use the previous day return (CRSP variable RET) to control for short-term reversal.[6] Panel B of Table 1 reports the summary statistics of the latter two firm-level returns together with additional firm-level returns used in the empirical analysis to explore at which point in time the inflation news is fully incorporated in asset prices. These returns are the open-to-close return calculated on the announcement day using CRSP data and the 5-minute return calculated over the period 9.30am-9.35am of the announcement day using intraday Trade

close or macroeconomic news from abroad, among many others.

[5] We consider 45 minutes minutes after the release to allow for the inflation surprise to be fully incorporated. The results are very similar if we use a narrower 15-minute (or 30-minute) time interval.

[6] Lou, Polk, and Skouras (2019) show remarkable persistence in the overnight and intraday components of firm-level returns, which is consistent with clienteles persistently trading certain types of stocks either near the open or later during the trading day. We do not decompose returns into these components, and attempt to capture the reaction of stocks to inflation announcements close to market opening.

and Quote (TAQ) data.

Panel C of Table 1 reports the summary statistics of firm-level characteristics that we use to study the propagation of inflation news in the cross-section of equity returns. All market-based quantities are calculated the day before the announcement day, while accounting-based quantities (from the COMPUSTAT quarterly database) are calculated using quarterly data that precede the announcement day by at least six months, as it is customary in empirical asset pricing studies.

We exclude from our analysis firms in the finance (SIC codes 6000-6999) and utility (SIC codes 4000-4999) sectors and firms not traded in the three major stock exchanges (NYSE, NASDAQ, and AMEX). We also drop firms not incorporated in the U.S.A. and with no information available for total sales and total book assets. We also exclude from the sample a negligible fraction of stocks that undergo a stock split the day before and the day of the inflation announcement. All firm-level data are winsorized at the top and bottom 0.5% to mitigate the effects of outliers on our results.

We include nominal variables whose valuations in real terms are directly affected by inflation like net leverage ((LTQ-CHEQ)/ATQ), receivables (RECTQ/ATQ), and inventories (INVQ/ATQ) (e.g.,Summers (1981), Fama (1981), Bernard and Frecka (1983), and Pearce and Roley (1988)) We also include net property, plant, and equipment (PPENTQ/ATQ), as real assets may represent a hedge against inflation risk. In our sample, the average net leverage is 23% of assets while average receivables are 15% of assets. Net leverage shows a large dispersion that reflects the presence of both cash rich (large negative net leverage) firms and highly leveraged (large positive net leverage) firms in U.S. public equity markets. Firms carry on average 13% of their total assets as inventories, while about a quarter of the assets are net PP&E (i.e., tangible assets).

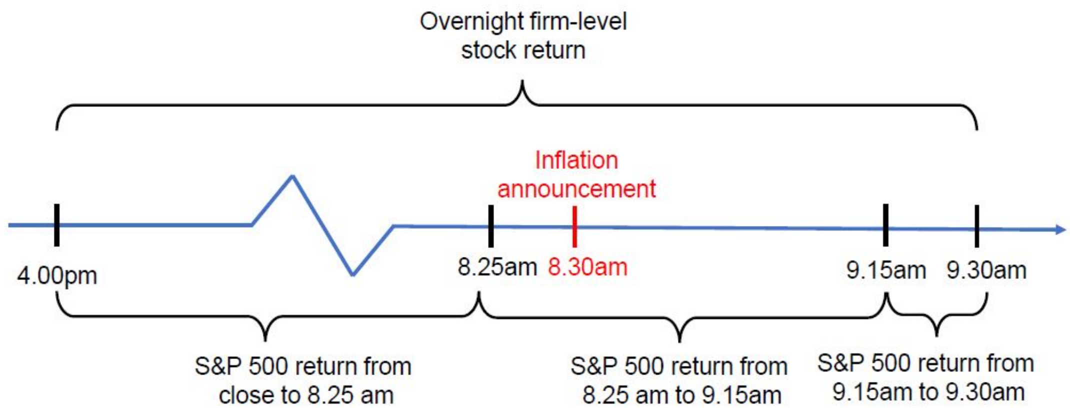
The next group of variables is related to a firm's ability to generate profits and adjust final goods prices. These variables are cash flows ((IBQ+DPQ)/ATQ), gross margin ((SALEQ-

COGSQ)/SALEQ), and a firm-level markup variable calculated following De Loecker, Eeckhout, and Unger (2020) that measures the ability of firms to set prices above marginal production costs.[7] More than 50% of observations in our sample come from firms with positive cash flows, while the average gross margin is negative. The latter result is driven by firms with very little revenues relative to their operating costs. The firm-level markup has an average and median value slightly above one and it is essentially uncorrelated with the cash flow variable (unreported).

The last group of firm-level characteristics includes three market-based quantities with a strong association with the cross-section of equity returns: market capitalization (i.e., size), book-to-market, and market beta (e.g., Fama and French (1992)). We calculate the market capitalization the day before the inflation announcement, while the book-to-market ratio is calculated using accounting data ((ATQ-LTQ)/(PRCCQ*CSHOQ)). Following Fama and French (1992), we calculate market beta over a 60-month rolling window (when available) that we use to regress the firm's monthly stock return on the contemporaneous and the one-month lagged market return. The market beta is defined as the sum of the estimated coefficients on the latter two quantities. We require a firm to have at least 24 months of available data to calculate its market beta.

[7] Since marginal costs are not directly observable, markups can be indirectly measured as the wedge between a variable input share in revenue and the output elasticity to that input, a relationship derived from an implied condition for cost minimization (Hall (1988)). Following De Loecker et al. (2020) , we use the cost of goods sold (COGS) as the variable input and approximate output elasticity to COGS using the following cost share definition: COGS/ (COGS+XSGA+rK) , where rK are the expenditures on capital and XSGA are selling, general, and administrative expenses. We calculate the markup variable at an annual frequency and then we define quarterly markup data by interpolating yearly observations.

Figure 2. This time-line describes the periods of various returns calculated around an inflation announcement.



3 Inflation surprises and equity returns: A time-series perspective

Figure 2 reports the timing of the various equity returns used in our analysis. Inflation surprises are reported at 8.30am EST, one hour before the regular U.S. equity markets opening time. Unfortunately, we do not have enough high frequency firm-level futures data to calculate a large number of equity returns around a very tight inflation announcement window. To overcome this limitation we use the overnight (i.e., close-to-open) firm-level return as dependent variable. However, this return can capture other systematic news that are revealed at any time between the market closing the day prior to the inflation announcement and immediately before the inflation announcement itself. To mitigate the effect of non-inflation news on our results, we split the interval of time that goes from 4.30pm of day $t-1$ to 9.30am of day t in three sub-intervals: 4.30pm of day $t-1$ to 8.25am of day t, 8.25am of day t to 9.15am of day t (the inflation announcement window), and 9.15am of day t to 9.30am of day t, where t is the inflation announcement day. We use the closing value of the S&P500 on day $t-1$ and intraday S&P500 futures data to calculate aggregate market returns over the three time intervals described above. The aggregate market return in the first (second) interval should capture all the relevant systematic information before (around) the inflation announcement. The aggregate market return in the last interval should capture the systematic news after the inflation announcement window and before market opening.

Table 2 reports the results of our baseline analysis. All the regressions have firm fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. We restrict the sample to days when intraday S&P500 futures data are available to facilitate the comparison across the different specifications. In column (1), we report the unconditional response of the firm-level overnight returns to inflation surprises. The estimated coefficient is negative and strongly significant, implying that stock returns fall, on average, by about 0.18% following a 0.1 percentage point positive core inflation surprise (roughly a 1-standard deviation surprise).

In Column (2), we replace the core inflation surprise with the headline inflation surprise. We find that the latter elicits an average response in stock returns that is smaller in absolute value than the one generated by headline inflation. When we use both core and headline inflation (Column (3)), only the former remains significant, while headline inflation has no role in explaining movements in equity returns. The results in Column (4) show that the estimated coefficient on the inflation surprise is little changed when we control for aggregate market movements before and after the inflation announcement window.[8] While the estimated coefficients on the aggregate market movements before the inflation announcement are positive and strongly significant, the aggregate market movements in the period 9.15am–9.30am are not economically and statistically important, very likely reflecting the fact that they are calculated over a short period of time during which systematic events are exceedingly rare . Note that in Column (4) we also include the firm-level return the day prior the inflation announcement to control for short-term reversal. The estimated coefficient on

[8]While this result holds when we use the whole sample, controlling for aggregate market movements becomes crucial when performing subsample analysis that uses a shorter time dimension.

Table 2. This table reports the average firm-level stock price reaction to inflation surprises. In all regressions, the dependent variable is the close-to-open return around the inflation announcement. In Column (1) we only use the core inflation surprise as independent variable. In Column (2) we substitute core inflation with headline inflation, while in Column (3) we have both measures of inflation surprises. In Column (4) we add the S&P 500 percentage return from its closing value on the day before the announcement day up to 5 minutes before the announcement together with the firm-level previous day return. In the last column, we add the S&P 500 percentage return calculated over the inflation announcement window to the regressors in Column (4). All the regressions have firm fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent.

	(1)	(2)	(3)	(4)	(5)
surprise core	-1.807***		-1.486***	-1.860***	0.049
	(-4.484)		(-3.653)	(-4.743)	(0.307)
surprise headline		-1.100***	-0.478		
		(-3.409)	(-1.516)		
Close-to-825 (SP500)				0.600***	0.634***
				(8.013)	(17.117)
915-to-930 (SP500)				0.121	0.470***
				(0.324)	(2.786)
ret_{t-1}				-0.051***	-0.048***
				(-8.609)	(-11.132)
825-to-915 (SP500)					0.877***
					(19.899)
Obs	802,487	802,487	802,487	802,487	802,487
R^2	0.015	0.012	0.016	0.052	0.093

the latter quantity has the expected negative sign and it is strongly significant.

To conclude the baseline analysis, we add in Column (5) the aggregate stock market return calculated over the inflation announcement window. As we can see, the explanatory power of core inflation surprises completely disappears and its estimated coefficient is statistically indistinguishable from zero, thus confirming the systematic nature of inflation surprises. In what follows, we explore more in depth the average stock price response to inflation surprises using the specification in Column (4) of Table 2 as our benchmark.

Table 3. In this table we modify the specification in Column (2) of Table 2 to understand when inflation surprises are incorporated in the cross-section of equity returns. Column (1) reports the results when we calculate the firm-level close-to-open return using TAQ data for the opening price. Column (2) reports the results using the open-to-close return on the announcement day as dependent variable, while Column (3) reports the results using the 5-minute return after market opening as dependent variable. All the regressions have firm fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent.

	(1)	(2)	(3)
	close_{t-1}-to-open_t	open_t-close_t	9.30-9.35
surprise core	-2.570***	-0.346	-0.061
	(-4.001)	(-0.384)	(-0.292)
Close-to-825 (SP500)	0.808***	0.344	0.035
	(6.462)	(1.505)	(0.964)
915_to_930 (SP500)	0.475	-1.082	0.143
	(0.799)	(-1.047)	(0.865)
ret_{t-1}	-0.004	-0.036*	-0.005
	(-0.350)	(-1.933)	(-1.566)
Obs	305,576	305,576	305,576
R^2	0.118	0.024	0.017

When are inflation surprises incorporated in equity prices? To answer this question, we use a subsample of firms with available high-frequency intraday stock prices to calculate their equity returns in a very narrow interval of time right after the market opens on the inflation announcement day. Combining these returns with the close-to-open returns allows us to verify if news from the inflation releases are fully incorporated into asset prices at opening or if there is some residual reaction after opening.

Table 3 presents the results. We first verify that the subsample of firms with available intraday returns data indeed delivers a negative and significant stock price reaction to inflation surprises as in the full sample (Column 1). We then show in Column 2 that inflation surprises have no explanatory power for the portion of equity return calculated from market opening to market close on the inflation announcement day. In Column 3, we look at the

Table 4. This table reports results for the specification in Column (2) of Table 2 across different broadly defined industries. In column (1), we group together industries in the agricultural, mining, and construction sectors to allow for a sizable number of observations (4-digit SIC codes 1-1000, 1000-1500, 1501-1799). Columns (2) to (4) report the results for the following industries: Manufacturing (4-digit SIC codes 2000-3999) , Trade (4-digit SIC codes 5000-5999), and Services (4-digit SIC codes 7000- 8999). In the last column we interact the inflation surprise measure with a dummy variable that takes value of one if an industry tends to adjust its price infrequently (low freq) and with a dummy variable that takes value of one if an industry tends to adjust its price frequently (high freq). We use price adjustment frequencies at the 4-digits NAICS level calculated in Pasten, Schoenle, and Weber (2020). An industry tends to adjust its price infrequently (frequently) if it belongs to the bottom (top) 20 percent of the price adjustment frequency distribution. All the regressions have firm fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent.

	(1) Agriculture, mining, and constructions	(2) Manufacturing	(3) Trade	(4) Services	(5) Frequent adjusters
surprise core	-1.355***	-1.857***	-1.628***	-2.116***	-1.903***
	(-3.093)	(-4.968)	(-4.311)	(-4.576)	(-5.067)
surpriseXlow freq					-0.259
					(-1.389)
surpriseXhigh freq					0.603***
					(3.111)
Close-to-825 (SP500)	0.619***	0.600***	0.567***	0.613***	0.607***
	(7.066)	(8.079)	(7.808)	(7.337)	(8.125)
915-to-930 (SP500)	0.096	0.141	0.064	0.102	0.116
	(0.277)	(0.394)	(0.183)	(0.228)	(0.310)
ret_{t-1}	-0.049***	-0.047***	-0.070***	-0.054***	-0.049***
	(-4.445)	(-7.696)	(-9.744)	(-7.736)	(-8.196)
Obs	50,526	459,841	93,821	196,432	644,920
R^2	0.055	0.050	0.057	0.052	0.051

firm-level returns' reaction calculated over the first 5 minutes after market opening using TAQ data and again inflation surprises have no significant association with equity returns. These results strongly suggest that inflation surprises are immediately incorporated into stock prices at the opening of the stock market session on the day of the announcement and have no role in explaining firm-level equity prices movement after opening.

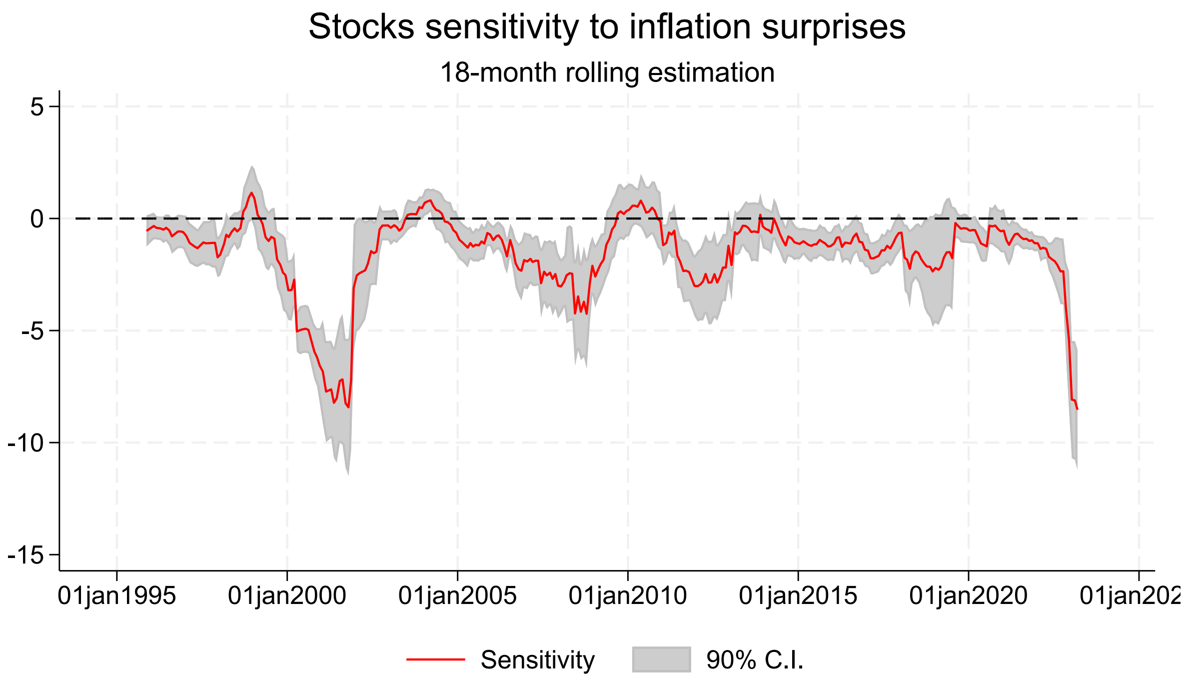
These findings expand on Adams, McQueen, and Wood (2004), who find that stocks respond negatively to inflation surprises during the first 10-20 minutes after market opens.

Using a larger sample and close-to-open returns, we also show that stock do respond negatively to inflation surprises, but not after market opening.

Heterogeneity across industries. In Table 4, we run the baseline analysis across broadly-defined industries. In Column 1, we group together industries in the agricultural, mining, and construction sectors to allow for a sizable number of observations (4-digit SIC codes 1-1000, 1000-1500, and 1501-1799, respectively). Columns 2 to 4 report the results for: Manufacturing (4-digit SIC codes 2000-3999) , Trade (4-digit SIC codes 5000-5999), and Services (4-digit SIC codes 7000- 8999), respectively. Table 4 shows that stocks react to inflation surprises in a negative and significant fashion across all industries. The estimated responses are not too far off from each other, varying between -1.36 and -2.12.

In the last column of Table 4 we explore if firms in industries that adjust their product prices more frequently are less responsive to inflation surprises. To this end, we interact the inflation surprise measure with a dummy variable that takes value of one if an industry tends to adjust its price infrequently (low freq) and with a dummy variable that takes value of one if an industry tends to adjust its price frequently (high freq). We use price adjustment frequencies at the 4-digits NAICS level as calculated in Pasten et al. (2020). An industry tends to adjust its price infrequently (frequently) if it belongs to the bottom (top) 20 percent of the price adjustment frequency distribution. The results show that firms in industries that adjust product prices more frequently do react significantly less to inflation surprises, specifically their response is 32% smaller in absolute value than firms in industries in the middle of the price adjustment frequency distribution (-1.3 versus -1.9). This finding suggests that firms with the ability of adjusting their sales prices very frequently are better able to shield themselves from the negative effects of inflation. At the same time, the results in the last column of Table 4 show that firms in industries that tend to adjust their prices infrequently do react significantly more negatively to inflation surprises, but the estimated

Figure 3. This figure reports the estimated coefficients on inflation surprises for the regression model in Column (4) of Table 2 estimated on a 18-month rolling basis from 1993m10 to 2023m3. The shaded area is the corresponding 90% confidence interval.



coefficient is not statistically significant.

Time-varying sensitivity. Figure 3 reports the average stock price reaction to inflation surprises estimated on a rolling 18 months basis over the period 1993m10–2023m3 using the specification for the regression model in Column (4) of Table 2.[9] Overall, the stock response to inflation surprises is negative and significant most of the time, but there are periods during which the average response is positive but almost never significant. Stock prices strongly reacted to inflation surprises during the periods surrounding the DotCom bubble burst, the Global Financial Crisis, and the more recent inflationary environment. For the period that goes from 2013 to 2021, the stocks' response has been relatively subdued fluctuating around

[9]We choose a 18 months period so that we have at least one positive and one negative inflation surprise in all sub-samples.

negative 1 with little variability. This behavior dramatically changed around the second half of 2021, when inflationary concerns started to dominate the U.S. economic landscape. During the 18 months period that goes from October 2021 to March 2023, a 0.1 positive inflation surprise elicited an average decline in stock prices of around 1%.

To shed more light on the time variation in stock price responses to inflation surprises, in Table 5 we divide the core inflation surprises into positive surprises and negative surprise to estimate an expanded version of the baseline regression Table 2.[10] This exercise turns out to be particularly useful to better understand periods when the relation between equity returns and inflation surprises is weak (i.e., close to zero) or even positive.

Column 1 reports the results over the entire sample and shows that stocks are, on average, more sensitive to negative surprises. Specifically, stocks increase (decrease) on average 0.24% (0.14%) following a 0.1 negative (positive) inflation surprise. Columns 2 and 3 report the average stock price reaction to inflation surprises over two subsamples. The first one goes from 1993 to 2007, while the second one goes from January 2008 to March 2023. We choose to split the sample around the Global Financial Crisis to take into account the fact that, following such a severe economic event, the Federal Reserve incorporated a battery of unconventional tools to the conduct of monetary policy, such as large-scale asset purchases and forward guidance, that were absent in the first part of the sample. Table 5 shows that stocks are generally more sensitive to negative surprises after 2007, while the opposite is true for positive surprises.

Figure 4 helps to better understand the patterns reported in Table 5. The top (bottom) panel reports the estimated coefficients on positive (negative) inflation surprises for the regression model in column 1 of Table 5 together with the corresponding 90% confidence interval on a 18-month rolling basis. Several stylized facts stand out. First, the trailing 18-month average stock price sensitivity to positive inflation surprises displays much larger

[10] The negative (positive) surprise variable takes value of zero when the core inflation surprise is non-negative (non-positive) and negative (positive) values otherwise.

Table 5. In this table we modify the specification in Column (4) of Table 2 and split core inflation surprises into negative surprises and positive surprises. Column (1) reports the results for the entire sample. Column (2) reports the results for the 1993m10-2007m12 sub-sample. Column (3) reports the results for the 2008m1-2023m3 sub-sample. Column (4) reports the results for the 2008m3-2009m8 period. The last column reports the results for the period 2022m1-2023m3. All the regressions have firm fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent.

	(1) 1993m10- 2023m3	(2) 1993m10- 2007m12	(3) 2008m1- 2023m3	(4) 2008m3- 2009m8	(5) 2021m10- 2023m3
-surprise	-2.416***	-1.240***	-3.388***	-3.415**	-9.810***
	(-4.178)	(-3.011)	(-3.764)	(-2.317)	(-3.096)
+surprise	-1.408**	-2.062**	-1.316*	4.904*	-7.490***
	(-2.277)	(-1.982)	(-1.758)	(2.023)	(-3.279)
Close-to-825 (SP500)	0.599***	0.490***	0.794***	0.962***	0.477
	(8.041)	(6.559)	(6.744)	(7.997)	(0.925)
915-to-930 (SP500)	0.140	-0.350	0.760	-0.095	1.944
	(0.361)	(-0.793)	(1.465)	(-0.169)	(1.256)
ret_{t-1}	-0.051***	-0.069***	-0.027***	-0.039**	-0.064*
	(-8.666)	(-12.077)	(-2.702)	(-2.753)	(-1.998)
Obs	802,487	399,284	403,187	40,823	47,507
R^2	0.052	0.036	0.094	0.106	0.248

fluctuations than the sensitivity to negative inflation surprises (this is especially true if we exclude the recent inflationary environment). A direct consequence is that the overall stocks' sensitivity to inflation surprises is more highly correlated with movements in the positive component (correlation of about 0.81) than in the negative one (correlation of about 0.66). Second, the two trailing sensitivities show very little co-movement. Their correlation is only 0.19 and in some instances they have opposite signs for persistent periods of time, like in the mid-2000s and in 2009.

Figure 4. This figure reports the estimated coefficients on positive (top panel) and negative (bottom panel) core inflation surprises for the regression model in Column (1) of Table 5 on a 18-month rolling basis. The shaded area is the corresponding 90% confidence interval.

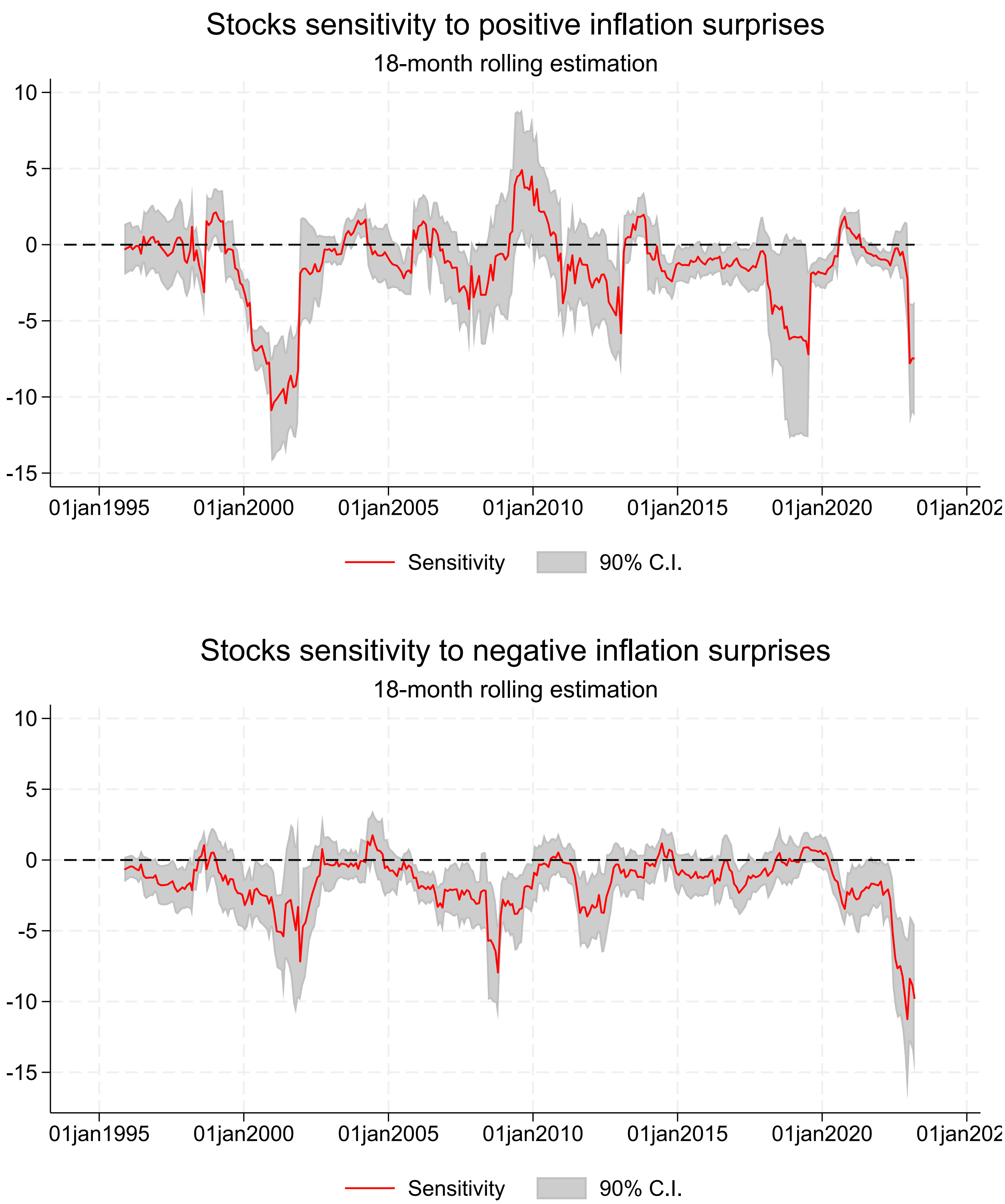


Figure 4 also tells us that in recent years stock prices have reacted strongly to both positive and negative inflation surprises. Column 5 in Table 5 shows that during the 18-month period from 2021m10 to 2023m3 the average stock price reaction to a 0.1 positive inflation surprise is about a 0.75% decline , while the reaction to a 0.1 negative inflation surprise is about a 1% increase. This 18-month period contains the recent monetary policy tightening cycle during which monetary policy expectations, as summarized by changes in policy-sensitive Treasury yields, played an important role in the propagation of inflation surprises into equity markets. We focus on this important dimension next.

Inflation surprises and monetary policy expectations. We now study how contemporaneous movements in monetary policy expectations affect the estimated average sensitivity to inflation surprises. Specifically, we consider the change in the on-the-run 2-year Treasury yield over the inflation announcement window as a proxy to capture changes in monetary policy expectations due to the inflation announcement.[11]

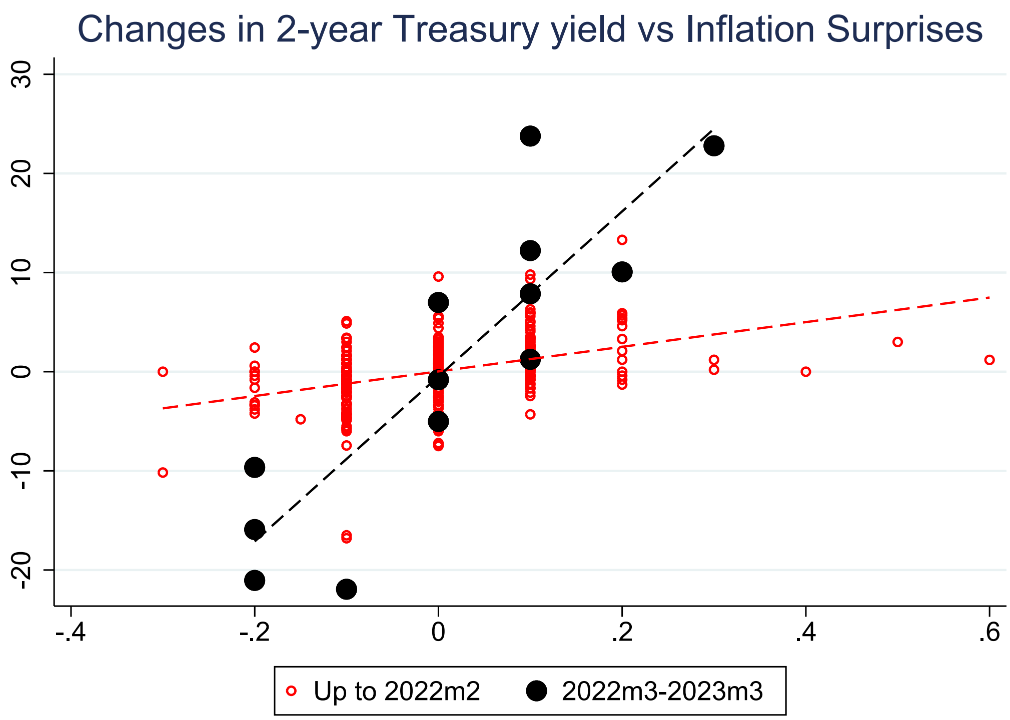
Column 1 of Table 6 shows that stock prices decline 0.75%, on average, for each 10 basis points increase in the 2-year Treasury yield over the inflation announcement window. Columns 2 and 3 of Table 6 report the results when we split the sample into two sub-periods: 1993 to February 2022 and March 2022 to March 2023, respectively. These results evidence that the stock prices' sensitivity to changes in monetary policy expectations in column 1 is mostly driven by the recent inflationary period. If we exclude this period, column 2 shows that stock prices decline only 0.2%, on average, for each 10 basis points increase in the policy rate, while during the recent tightening cycle this sensitivity is more than five times larger

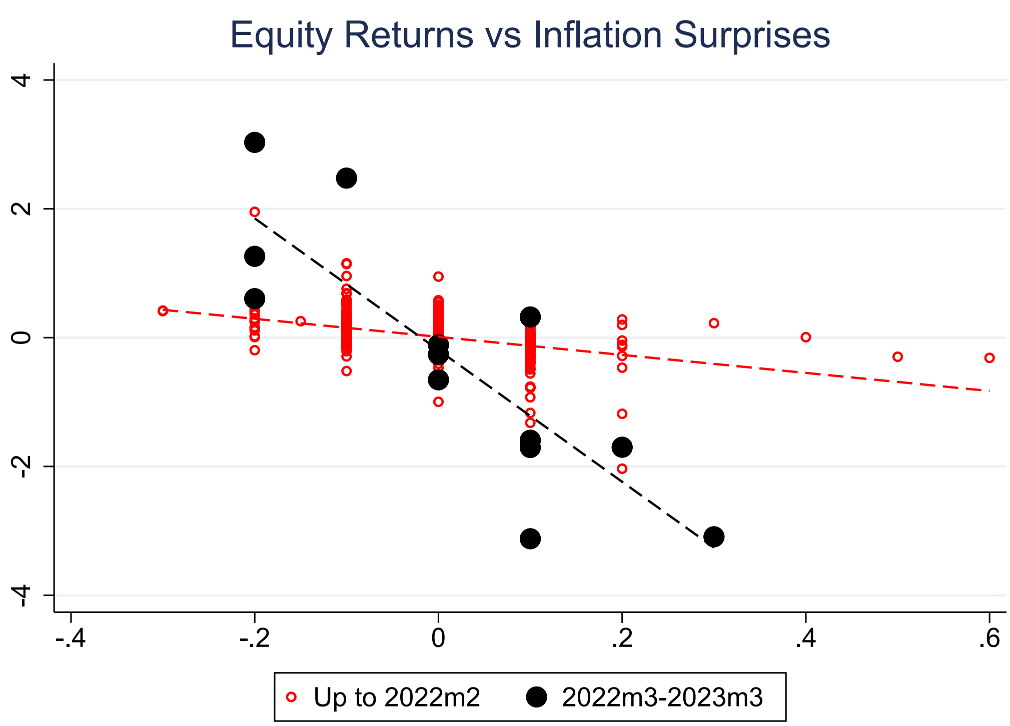
[11] It is reasonable to assume that in such a short window, movements in stock prices and Treasury yields are exclusively triggered by inflation surprises when the inflation announcement is the only macroeconomic news announced. In unreported results we obtain very similar results using the 6-month ahead Federal Fund Rate futures (FFR6). However, data on the 6-month ahead Federal Fund Rate futures are not available in the early period of our dataset, thus limiting the beginning of our analysis to 2004.

Table 6. In this table we report the sensitivity of stock returns to inflation surprises when we control for contemporaneous movements in monetary policy expectations, as proxied by the change in the on-the-run 2-year Treasury yield (Δ2YR) over the inflation announcement window. Column (1) reports the average response of stock prices to Δ2YR over the entire sample. Columns (2) and (3) reports average response of stock prices to Δ2YR over the periods 1993-2022m2 and 2022m3-2023-m3, respectively. Columns (4) to (6) augment the empirical specification in Columns (1) to (3) by adding a dummy variable (i.e., *positive surprise*) that takes value of 1 if the inflation surprise is positive and zero otherwise and a dummy variable (i.e., *negative surprise*) that takes value of 1 if the inflation surprise is negative and zero otherwise. For both dummy variables we also include an interaction term with Δ2YR. All the regressions have firm fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent.

	(1) Full Sample	(2) 1993-2022m2	(3) 2022m3-2023m3	(4) Full Sample	(5) 1993-2022m2	(6) 2022m3-2023m3
Δ2YR	-0.075***	-0.021**	-0.123***	0.003	0.010	-0.033
	(-6.481)	(-2.382)	(-22.880)	(0.192)	(0.863)	(-1.628)
negativeXΔ2YR				-0.079***	-0.024	-0.100***
				(-3.596)	(-1.521)	(-3.445)
positiveXΔ2YR				-0.097***	-0.029	-0.125***
				(-4.362)	(-1.037)	(-3.684)
negative surprise				0.105**	0.142***	0.010
				(2.188)	(3.215)	(0.018)
positive surprise				0.033	-0.100	0.757
				(0.334)	(-1.080)	(1.612)
Close-to-825 (SP500)	0.629***	0.637***	0.976***	0.634***	0.631***	0.953***
	(8.301)	(8.720)	(5.845)	(8.674)	(8.903)	(4.888)
915-to-930 (SP500)	-0.195	-0.271	1.324***	-0.222	-0.219	1.584***
	(-0.472)	(-0.653)	(3.469)	(-0.562)	(-0.572)	(3.322)
ret_{t-1}	-0.047***	-0.046***	-0.065***	-0.049***	-0.047***	-0.053**
	(-8.134)	(-8.430)	(-3.506)	(-8.812)	(-9.040)	(-2.623)
Obs	751,724	717,031	34,679	751,724	717,031	34,679
R^2	0.064	0.044	0.406	0.070	0.047	0.417

Figure 5. The top (bottom) panel reports the realized changes in the on-the-run 2-year Treasury yield (S&P500 futures returns) over the inflation announcement window by inflation surprise. The empty red dots refer to the period 1993m10–2022m2, while the solid black dots refer to the period 2022m3–2023m3. The dashed straight lines are the corresponding linear fit.





in absolute value, implying an average drop in stock prices of about 1.2% for each 10 basis points increase in the 2-year Treasury yield.

In Columns 4 to 6, we study how inflation surprises affect the sensitivity of stock prices to movements in the 2-year Treasury yield. To this end, we create two dummy variables and interact them with our Treasury yield variable. The first dummy (i.e., *positive surprise*) takes a value of 1 if the inflation surprise is positive and zero otherwise. The second dummy (i.e., *negative surprise*) takes a value of 1 if the inflation surprise is negative and zero otherwise.[12] The immediate result is that movements in the 2-year Treasury yield do not explain stock price changes when we control for the direction of the inflation surprise.

In the full sample, stock prices react to movements in the 2-year Treasury yield only if there is an inflation surprise. Additionally, stock prices are significantly different (i.e., higher) only when there is a negative inflation surprise, while positive inflation surprises affect stock prices only when there is a contemporaneous movement in Treasury yields. In this case, stock prices decline about 1% , on average, for each 10 basis points increase in the 2-year Treasury yield when the inflation surprise is positive. Again, this result is driven by the recent inflationary episode. Column 5 shows that outside this episode stock prices are significantly different (i.e., higher) only when there is a negative inflation surprise news and changes in Treasury yields are uncorrelated to stock prices. In contrast, Column 6 shows that during the recent inflationary episode stock prices react to inflation surprises only when there is a contemporaneous movement in Treasury yields. Specifically, stock prices increase (decline) about 1% (1.2%), on average, for each 10 basis points decrease (increase) in the 2-year Treasury yield when the inflation surprise is negative (positive).

To better understand the results in Column 6, we use Figure 5 to illustrate how the recent inflationary episode stands out by comparing the sensitivity of Treasury yields (top panel) and equity prices (bottom panel) to inflation surprises over the period 2022m3-2023m3 versus

[12] As illustrated in Figure 1, the inflation surprise is zero for about one-third of release dates, so both dummies are equal to zero for a substantial share of observations.

the rest of the sample. Absent inflation surprises, we see that changes in both stock market equity returns and Treasury yields (solid black dots) are, on average, close to zero and in line with past observations (empty red dots). This is not the case when we have positive or negative inflation surprises. Figure 5 shows that both equity returns and Treasury yields' responses are amplified during the recent inflationary episode, thus suggesting that inflation surprises might affect stock returns via their effect on monetary policy expectations. We explore this mechanism in what follows.

Aggregate drivers of the stock price sensitivity to inflation. We document above significant time variation in the average stock price response to inflation surprises as well as an asymmetric response to positive and negative surprises, and show that inflation surprises affect stock prices via movements in the two-year Treasury yield. These findings suggest that stock prices respond to inflation surprises that affect expectations about the future path of short-term rates, and then to changes in expected monetary policy. To test this transmission channel, we assume that expectations about future monetary policy are informed by the outlook for inflation and output, which is consistent with the dual mandate of the Federal Reserve and similar in spirit to the Taylor (1993) interest-rate rule. In particular, we test whether the documented stock price response to inflation can be explained by variables capturing deviations in inflation and output from their respective policy targets.

To capture deviations in expected inflation from the inflation target, we use the difference between the 1-year and the 30-year inflation expectations estimated by the Federal Reserve Bank of Cleveland, or $TargetDev$. The 30-year inflation expectations are used as a proxy for the long-run inflation target perceived by market participants. To capture deviations in economic output from its policy target the literature uses estimates of the output gap. We use deviations in total capacity utilization from its Hodrick-Prescott filtered trend (TCU) as a proxy for the output gap. TCU is available at monthly frequency and is highly correlated with measures of the output gap which are only available quarterly. Both $TargetDev$ and TCU are calculated the month that precedes the inflation announcement month.[13]

Table 7 summarizes the results of this analysis. Columns 1 to 3 report the average stock price response to the inflation surprise, $TargetDev$, and their interaction term for the full sample, the 1993 to 2007 subsample, and the 2008 to 2023 subsample, respectively. Using the full sample estimates in column 1, when inflation is at its target level ($TargetDev = 0$) a positive 0.1 percentage point inflation surprise is associated with a stock price decline of about 0.26% (i.e., -2.6×0.1). The decline is amplified to 0.60% (i.e., -2.6×0.1-3.4×0.1×1) if inflation is 1 percentage point above its target and becomes an increase of 0.08% (i.e., -2.6×0.1+3.4×0.1×1) when inflation is 1 percentage point below its target. The results are quantitatively very similar if we use the subsample estimates in columns 2 and 3.

Columns 4 to 6 in Table 7 report the average stock price response to the inflation surprise, our output gap measure TCU, and their interaction term for the full sample, the 1993 to 2007 subsample, and the 2007 to 2023 subsample, respectively. Using the full sample estimates in column 4, a positive 0.1 inflation surprise in the absence of an output gap ($TCU = 0$) produces a stock price decline of about 0.22%. This response is amplified to a 0.27% decline if TCU is 1% and attenuated to a 0.17% decrease if TCU is negative 1%. These negative responses are somewhat smaller in magnitude using the 1997-2007 estimates in column 5 and somewhat larger using the 2008-2023 estimates in column 6.

Finally, columns 7 to 9 in the table report results when we include the inflation surprise, $TargetDev$, TCU, and their interaction terms for the full sample, the 1993 to 2007 subsample, and the 2007 to 2023 subsample, respectively. The results are largely consistent with those reported in columns 1 to 6. Also, the negative and significant coefficient on the triple interaction term indicates that stocks react more negatively to inflation surprises when both inflation expectations and capacity utilization are simultaneously running high.

[13] Data on expected inflation and total capacity utilization are available at the Federal Reserve Economic Data (FRED) website (https://fred.stlouisfed.org/).

Table 7. In this table we explore how inflation expectations and output gap influence the stock prices' sensitivity to inflation surprises. $TargetDev$ is the monthly difference between the 1-year and the 30-year inflation expectations estimated by the Federal Reserve Bank of Cleveland in percentage terms. TCU is the monthly percentage deviation of total capacity utilization from its Hodrick-Prescott filtered trend. Both quantities are calculated the month that precedes the inflation announcement month. In columns 1 to 3 (4 to 6), we interact the inflation surprise with the deviation of inflation expectations from its long-run trend (with the deviation of total capital utilization from its Hodrick-Prescott filtered trend). In columns 7 to 9, we interact the inflation surprise with inflation expectations deviations and with total capacity utilization. We report the results for the full sample (columns 1, 4, and 7), the pre-2008 sample (columns 2, 5, and 8), and the post-2007 sample (columns 3, 6, and 9). All the regressions have firm fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	1993m10-2023m3	1993m10-2007m12	2008m1-2023m3	1993m10-2023m3	1993m10-2007m12	2008m1-2023m3	1993m10-2023m3	1993m10-2007m12	2008m1-2023m3
surprise	-2.565***	-2.369***	-2.918***	-2.167***	-1.528***	-2.695***	-2.175***	-1.506***	-2.524***
	(-6.090)	(-3.990)	(-5.227)	(-5.743)	(-4.266)	(-4.632)	(-6.414)	(-3.347)	(-5.777)
surpriseX$TargetDev$	-3.414***	-3.181**	-3.927***				-2.848***	-1.222	-3.568***
	(-4.553)	(-2.412)	(-4.888)				(-4.457)	(-1.152)	(-5.181)
$TargetDev$	-0.266***	-0.258**	-0.240**				-0.228***	-0.229**	-0.201**
	(-3.222)	(-2.608)	(-2.415)				(-3.107)	(-2.473)	(-2.232)
surpriseXTCU				-0.529***	-0.617***	-0.595***	-0.644***	-0.917***	-0.615***
				(-4.095)	(-3.268)	(-3.911)	(-5.604)	(-2.838)	(-4.566)
TCU				-0.042***	-0.017	-0.044***	-0.034***	-0.010	-0.040**
				(-3.959)	(-1.124)	(-3.343)	(-2.829)	(-0.557)	(-2.449)
surpriseX$TargetDev$XTCU							-0.639***	-1.284*	-0.646***
							(-6.602)	(-1.811)	(-6.569)
$TargetDev$XTCU							-0.039***	-0.038	-0.043***
							(-3.022)	(-0.916)	(-2.725)
Close-to-825 (SP500)	0.670***	0.500***	0.917***	0.650***	0.500***	0.863***	0.672***	0.484***	0.918***
	(11.488)	(6.963)	(11.211)	(9.849)	(6.728)	(8.285)	(12.520)	(6.504)	(12.898)
915-to-930 (SP500)	0.117	-0.283	0.775*	0.211	-0.215	0.803*	0.181	-0.207	0.797**
	(0.355)	(-0.721)	(1.823)	(0.641)	(-0.562)	(1.768)	(0.604)	(-0.590)	(2.096)
ret_{t-1}	-0.050***	-0.070***	-0.024**	-0.051***	-0.069***	-0.027***	-0.050***	-0.070***	-0.024***
	(-9.030)	(-12.640)	(-2.569)	(-8.941)	(-12.436)	(-2.755)	(-9.267)	(-12.929)	(-2.638)
Obs	799,844	399,284	400,544	802,487	399,284	403,187	799,844	399,284	400,544
R^2	0.065	0.038	0.127	0.059	0.038	0.109	0.072	0.040	0.142

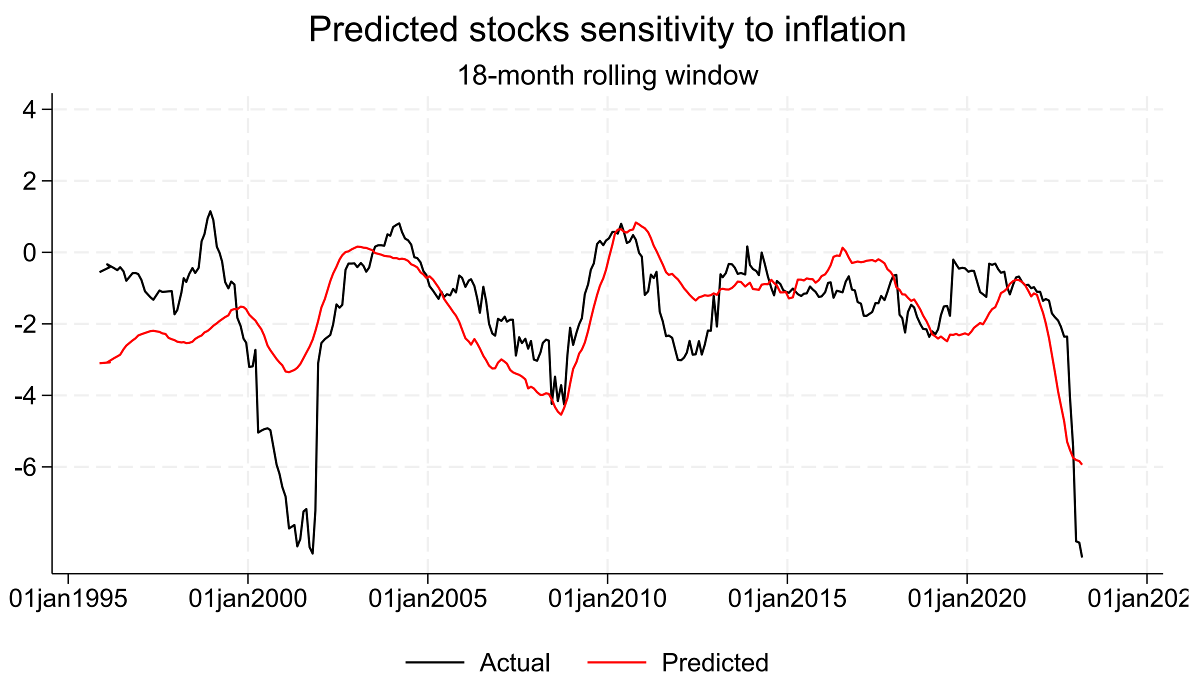
Table 8. In this table we report the average stock price response in percentage points to a 0.1 positive inflation surprises, calculated using the coefficients in Columns 7 to 9 of Table 7, for different combinations of $TargetDev$ and TCU. Specifically, we use three regimes for the latter two variables: no deviation (0), one standard deviation above ($+1\sigma$), and one standard deviation below (-1σ). $TargetDev$ is the monthly difference between the 1-year and the 30-year inflation expectations estimated by the Federal Reserve Bank of Cleveland in percentage terms. TCU is the monthly percentage deviation of total capacity utilization from its Hodrick-Prescott filtered trend. A one standard deviation for $TargetDev$ (TCU) corresponds to 0.5% (2.4%) over the full 1993-2023 period. Both quantities are calculated the month that precedes the inflation announcement month. Panel A reports the results using the full sample estimates, while Panel B (Panel C) reports the results using the estimates for the pre-2008 (post-2007) sample.

	Positive 0.1 inflation surprise		
	$TargetDev$=-1σ	$TargetDev$=0	$TargetDev$=+1σ
	Panel A: 1993-2023		
TCU=-1σ	0.00	-0.06	-0.13
TCU=0	-0.08	-0.22	-0.36
TCU=+1σ	-0.15	-0.37	-0.59
	Panel B: 1993-2007		
TCU=-1σ	-0.02	0.07	0.16
TCU=0	-0.09	-0.15	-0.21
TCU=+1σ	-0.16	-0.37	-0.59
	Panel C: 2008-2023		
TCU=-1σ	-0.00	-0.10	-0.21
TCU=0	-0.07	-0.25	-0.43
TCU=+1σ	-0.14	-0.40	-0.66

To compare the sensitivity of average stock prices to inflation surprises under different scenarios of inflation and output deviations from their targets, we report in Table 8 the response of average stock prices to positive a 0.1 percentage point inflation surprise for different combinations of $TargetDev$ and TCU (the responses to a negative 0.1 percentage point inflation surprise are symmetric) using the estimated coefficients in column 7 of Table 7. In particular, we analyze scenarios in which these variables are zero or one standard deviation above or below zero. Using estimates for the full sample, Panel A shows that stock prices have the most negative response (-0.59%) to positive inflation surprises when both inflation and total capacity utilization are one standard deviation above their targets.

The decline following a 0.1 percentage point inflation surprise is attenuated to about 40

Figure 6. This figure reports the estimated coefficients on inflation surprises for the regression model in Column (4) of Table 2 estimated on a 18-month rolling basis from 1993m10 to 2023m3 (solid line) together with the predicted sensitivity implied by the estimates in Column (7) of Table 7 , also reported on a 18-month rolling basis from 1993m10 to 2023m3. The correlation between the two series is 0.56.



basis points if one of the variables is at zero or attenuated even further to about 15 basis points if the variable is a standard deviation below zero while the other variable remains one standard deviation above zero. That is, a positive inflation surprise is particularly bad news for stocks when inflation or total capacity utilization are already elevated, but can have more modest effects when inflation or total capacity utilization are low. Panels B and C show that the results are broadly similar using subsample estimates, although with more sensitivity to TCU than to $TargetDev$ for the 1993-2007 period.

The reported variability in stock price sensitivities is consistent with expectations of future monetary policy that are more or less affected by inflation surprises depending on economic conditions. For instance, positive inflation surprises when inflation is high and the economy is above potential may trigger a significant increase in expected interest rates and an associated substantial decline in stock prices. The same surprise may have little impact on expected interest rates and stock prices if inflation is low and the economy is below capacity. In contrast, if inflation and economic activity are below targets, a positive inflation surprise may produce a substantial downward adjustment in expected future interest rates and the stock market increases in value, while the same surprise has more modest effects when inflation and output are elevated.

We conclude this section showing in Figure 6 that the model reported in column 7 of Table 7 captures reasonably well the time variation in the average stock price response to inflation surprises presented in Figure 3. In particular, the model explains the large negative sensitivity in recent years as a result of both elevated inflation and strong economic activity, consistent with interest rate expectations that are very sensitive to inflation surprises.

4 Which stocks are more sensitive to inflation surprises?

The analysis in Section 3 shows that firm-level stock prices react negatively to core inflation surprises, but not to headline inflation surprises when both measures are included. Stock prices incorporate all of the response at market opening on the inflation announcement day. This response is robust across different industries and it is stronger for industries that adjust prices less frequently. More importantly, the aggregate state of the economy, as summarized by inflation expectations and capacity utilization, broadly dictates when stocks are more or less sensitive to inflation surprises, on average. At the same time, this average response summarizes a rich cross-sectional heterogeneity that we exploit to answers the following question: In periods when the stock market is particularly susceptible to inflation surprises, what are the stocks that react more?

Specifically, we extend the baseline analysis in Section 3 to allow for interaction terms between the inflation surprise shock and firm level characteristics to identify which firms are more or less sensitive to inflation surprises. The model we test has the following form:

$$Ret_{i,t}^{CO} = \alpha_i + \nu_t + \beta_{S,k} X_{i,t,k} \times Surprise_t + \sum_{k=1}^{K} \beta_k X_{i,t,k} + \varepsilon_{i_t}, \tag{1}$$

where $Ret_{i,t}^{CO}$ is the close-to-open return of firm i calculated on the inflation announcement day, α_i is a firm fixed effect, ν_t an announcement day fixed effect, $\beta_{S,k}$ is the coefficient on the interaction term between the k^{th} firm level characteristic $X_{i,t,k}$, $k \in [1, ..., K]$, and the inflation surprise ($Surprise_t$), β_k is the coefficient on the k-th firm characteristic that we include in the regression. All firm-level variables are divided by their unconditional standard deviation so that the coefficient $\beta_{S,k}$ tells us the difference in stock price response of two firms that differ by one standard deviation with respect to the variable X_k. The inclusion of a time fixed effect takes care of all aggregate news that affect equity markets.

In each of the regressions in Table 9, we interact one firm-level characteristic at a time. We include the ten firm-level characteristics described in Panel C of Table 1. When considered individually, only six firm-level characteristics are significantly associated with inflation surprises over the entire sample period: net leverage, receivables, tangibility, market capitalization, book-to-market, and the firm-level CAPM beta.

A positive coefficient on net leverage is in accordance with the fact that the real value of cash balances is eroded by high inflation, hence negative net leverage firms respond negatively to positive inflation surprises. At the same time, positive net leverage firms respond positively to positive inflation surprises as real debt obligations become less cumbersome. These results are consistent with previous works that studied the effect of nominal contracts in shaping the firm-level response to inflation shocks (e.g., Summers (1981), French et al. (1983), Bernard (1986), Pearce and Roley (1988), among many others). A positive coefficient on receivables goes against the fact that positive (negative) inflation erodes (increases) the real value of

Table 9. This table reports how firm-level characteristics affect the propagation of inflation surprises in the cross-section of equity returns. Specifically, we estimate the following specification: $Ret^{OC}_{i,t} = \alpha_i + \nu_t + \beta_{S,k} X_{i,t,k} \times Surprise_t + \sum_{k=1}^{K} \beta_k X_{i,t,k} + \varepsilon_{i_t}$ where $Ret^{OC}_{i,t}$ is the close-to-open return of firm i calculated on the inflation announcement day, α_i is a firm fixed effect, ν_t an announcement day fixed effect, $\beta_{S,k}$ is the coefficient on the interaction term between the k^{th} firm level characteristic $X_{i,t,k}$, $k \in [1, ..., K]$, and the inflation surprise ($Surprise_t$), β_k is the coefficient on any firm characteristic that we include in the regression. All firm-level variables are divided by their unconditional standard deviation so that the coefficient $\beta_{S,k}$ tells us the difference in stock price response of two firms that differ by one standard deviation with respect to the variable X_k. Starting in Column (1) and ending in Column (10), we interact the following variables with core inflation surprises: net leverage, receivables, inventories, tangibility, gross margin, cash flow, mark-up, size, book-to-market, and CAPM beta. Section 2 provides a detailed description of the latter firm level variables, which are included in all of the regressions as additional controls. All the regressions have firm and announcement day fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
surpriseXnet leverage	0.223***									
	(3.174)									
surpriseXrec		0.134***								
		(2.922)								
surpriseXinv			0.062*							
			(1.666)							
surpriseXtangibility				0.169***						
				(2.734)						
surpriseXgross margin					-0.022					
					(-0.162)					
surpriseXCF						0.004				
						(0.074)				
surpriseXmarkup							0.048			
							(1.046)			
surpriseXsize								-0.375***		
								(-4.388)		
surpriseXbm									0.304***	
									(5.533)	
surpriseXbeta										-0.393***
										(-4.306)
ret_{t-1}	-0.069***	-0.069***	-0.069***	-0.069***	-0.069***	-0.069***	-0.069***	-0.069***	-0.069***	-0.069***
	(-16.865)	(-16.830)	(-16.828)	(-16.849)	(-16.826)	(-16.828)	(-16.833)	(-16.816)	(-16.861)	(-16.846)
Obs	601,376	601,376	601,376	601,376	601,376	601,376	601,376	601,376	601,376	601,376
R^2	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.115	0.115	0.115

Table 10. This table reports the results of regressions of firm-level stock returns on inflation surprises when we interact with core inflation surprises all the firm-level variables individually interacted in Table 9. Column (1) reports the results for the whole sample. Column (2) (Column (3)) reports the results for the period 1993m10-2007m12 (2008m1-2023m3). All regression include net leverage, receivables, inventories, tangibility, gross margin, cash flow, mark-up, size, book-to-market, and CAPM beta as controls. All the regressions have firm and announcement day fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent.

	(1)	(2)	(3)
	Full Sample	1993m10-2007m12	2008m1-2023m3
surpriseXnet leverage	0.252***	0.395***	0.195***
	(3.832)	(3.224)	(2.940)
surpriseXreceivables	0.033	-0.056	0.102**
	(0.777)	(-0.841)	(2.135)
surpriseXinventories	-0.071**	-0.082	-0.061
	(-2.111)	(-1.458)	(-1.481)
surpriseXtangibility	0.124**	0.068	0.164*
	(1.975)	(0.957)	(1.917)
surpriseXgross margin	-0.006	0.094	-0.050
	(-0.050)	(0.298)	(-0.395)
surpriseXCF	-0.095*	-0.100	-0.076
	(-1.689)	(-0.914)	(-1.140)
surpriseXmarkup	0.241***	0.165*	0.249***
	(4.897)	(1.692)	(4.263)
surpriseXsize	-0.477***	-0.539***	-0.440***
	(-4.844)	(-4.103)	(-3.224)
surpriseXbm	0.200***	0.179*	0.200***
	(4.812)	(1.893)	(4.708)
surpriseXbeta	-0.422***	-0.316***	-0.551***
	(-4.440)	(-3.015)	(-3.722)
ret_{t-1}	-0.069***	-0.093***	-0.030***
	(-16.938)	(-19.087)	(-5.307)
Obs	601,376	309,857	291,503
R^2	0.116	0.061	0.227

Table 11. This table reports the results of regressions of firm-level stock returns on inflation surprises when we interact with core inflation surprises all the firm-level variables individually interacted in Table 9 by market capitalization categories. We classify firms as small (large) if they belong to the bottom 50% of the market capitalization distribution the day before the announcement day. Columns (1) to (3) report the results for the small size firms, while Columns (4) to (6) report the results for the large size firms. For each size category, we report the results for the full sample and for the periods 1993m10-2007m12 and 2008m1-2023m3 separately. All regression include net leverage, receivables, inventories, tangibility, gross margin, cash flow, mark-up, size, book-to-market, and CAPM beta as controls. All the regressions have firm and announcement day fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent.

	(1)	(2)	(3)	(4)	(5)	(6)
	Small Size			Large Size		
	Full Sample	1993-2007	2008-2023	Full Sample	1993-2007	2008-2023
surpriseXnet leverage	0.150**	0.309**	0.047	0.357***	0.406**	0.396***
	(2.131)	(2.396)	(0.613)	(4.028)	(2.424)	(3.887)
surpriseXreceivables	-0.009	-0.107	0.073	0.094*	-0.003	0.156**
	(-0.143)	(-0.926)	(1.244)	(1.879)	(-0.051)	(2.257)
surpriseXinventories	-0.119**	-0.128	-0.102*	-0.044	-0.047	-0.054
	(-2.518)	(-1.436)	(-1.921)	(-1.203)	(-0.904)	(-1.123)
surpriseXtangibility	0.036	-0.027	0.078	0.203***	0.139**	0.265**
	(0.485)	(-0.220)	(0.892)	(2.875)	(2.094)	(2.603)
surpriseXgross margin	0.165	0.191	0.155	-0.815**	-0.505	-0.897**
	(1.194)	(0.487)	(1.023)	(-2.460)	(-1.307)	(-2.303)
surpriseXCF	-0.109	-0.154	-0.083	0.117	0.033	0.192
	(-1.590)	(-1.162)	(-1.013)	(1.228)	(0.215)	(1.591)
surpriseXmarkup	0.250***	0.257*	0.241***	0.317***	0.173	0.307***
	(3.567)	(1.811)	(3.160)	(4.495)	(1.614)	(3.696)
surpriseXsize	-0.711***	-0.787***	-0.697**	-0.281***	-0.500***	-0.169*
	(-2.915)	(-2.757)	(-2.112)	(-2.889)	(-2.653)	(-1.812)
surpriseXbm	0.144***	0.153	0.121***	0.468***	0.352**	0.510***
	(3.530)	(1.547)	(3.227)	(5.275)	(2.320)	(4.798)
surpriseXbeta	-0.320***	-0.291***	-0.363***	-0.508***	-0.288*	-0.779***
	(-4.488)	(-3.025)	(-3.781)	(-3.746)	(-1.893)	(-3.676)
ret_{t-1}	-0.093***	-0.125***	-0.041***	-0.015***	-0.021***	-0.005
	(-19.950)	(-22.404)	(-7.573)	(-3.281)	(-3.911)	(-0.570)
Obs	283,697	150,869	132,791	317,502	158,853	158,624
R^2	0.069	0.053	0.116	0.291	0.127	0.473

nominal payments to be received in the future (e.g., Ben-Horim and Levy (1983)), while a positive coefficient on tangible assets and inventories is in accordance with the intuition that a larger exposure to real assets should mitigate the effect of positive inflation surprises.

Firms with a higher book-to-market ratio are less sensitive to inflation surprises, a finding consistent with Wei (2009) and with the intuition that distressed firms might benefit from a reduction of the real value of their liabilities via higher inflation. Conversely, large firms react more to inflation surprises, a finding consistent with Adams et al. (2004), who document a more significant response of large stocks using intra-day equity returns and attribute this result to small stocks being more volatile and less likely to be traded around market opening. High CAPM beta firms, which tend to move more with aggregate market news, are more sensitive to inflation news, a finding consistent with the results in Bernard and Frecka (1983).

In Table 10, we interact all firm-level characteristics at once and show the results for the full sample (Column 1), the pre-2008 sample (Column 2), and the post-2007 sample (Column 3). Some findings are worth discussing. First, receivables lose their explanatory power, while firm-level markup, which is unconditionally not significant, becomes strongly significant (especially in the second part of the sample). The positive coefficient on the latter variable is consistent with the intuition that firms that have more latitude in adjusting their final good prices should be better equipped to react to inflation shocks, which is what we find in our industry-level analysis reported in Table 4.

Second, only five variables are jointly significant in the full sample and in both subsamples: net leverage, markup, market capitalization, book-to-market, and CAPM beta. While the coefficients on net leverage, and size are larger in absolute value in the earlier subsample, the coefficients on markup, book-to-market, and market beta are larger in the post-2007 period. Using the results in Column 1 of Table 10, we find that a firm that has a one standard deviation larger size and CAPM beta, together with one standard deviation smaller net leverage, markup, and book-to-market will have, on average, a smaller return of about 0.16%

following a 0.1 positive inflation surprise.[14] When we repeat the analysis by size categories (Table 11), we find results that are broadly consistent are not driven by small stocks.[15]

4.1 Firm-level inflation sensitivity

In this section, we conduct an in-sample analysis of inflation-sensitive and inflation-insensitive firms' performance over the period that goes from October 1993 to June 2022. To do so, we use the results in Table 10 to build a firm-level inflation sensitivity score. Specifically, we use the estimated coefficients in Column (1) on net leverage, markup, market capitalization, book-to-market, and CAPM beta to generate:[16]

$$\begin{aligned} Score_{i,t} &= -(0.252 \times \text{Net Leverage}_{i,t} + 0.241 \times \text{Markup}_{i,t} \\ &\quad -0.477 \times \text{Size}_{i,t} + 0.200 \times \text{BM}_{i,t} - 0.422 \times \text{Beta}_{i,t}). \end{aligned} \tag{2}$$

We categorize firms as inflation sensitive (insensitive) if they belong to the top (bottom) decile of the inflation sensitivity score distribution the day prior the inflation announcement and use this classification in Table 12 to explore the differential response to inflation shocks of inflation-sensitive and inflation-insensitive firms. In Table 12, we interact the inflation surprise shock both with a dummy that takes value of one if the firm belongs to the inflation-sensitive category and zero otherwise and a dummy that takes value of one if the firm belongs to the inflation-insensitive category and zero otherwise. We also control for firm-level characteristics and add firm and time fixed effects. We report the results for the full sample (Column 1), the pre-2008 sample (Column 2), and the post-2007 sample (Column 3).

[14]The overall effect is given by $(-0.252 - 0.241 - 0.477 - 0.200 - 0.422) \times 0.1 = -0.16$

[15]We split the sample in small and large firms, where small (large) firms are the one below (above) the median market capitalization the day before the inflation announcement.

[16]This methodology is similar in spirit to the one used by Ozdagli and Velikov (2020) to build their monetary policy exposure index and common practice in corporate finance to build firm-level measure of financial distress (e.g., Altman (1968) and Ohlson (1980)) or financing constraints (e.g., Kaplan and Zingales (1997), Whited and Wu (2006), and Hadlock and Pierce (2010)).

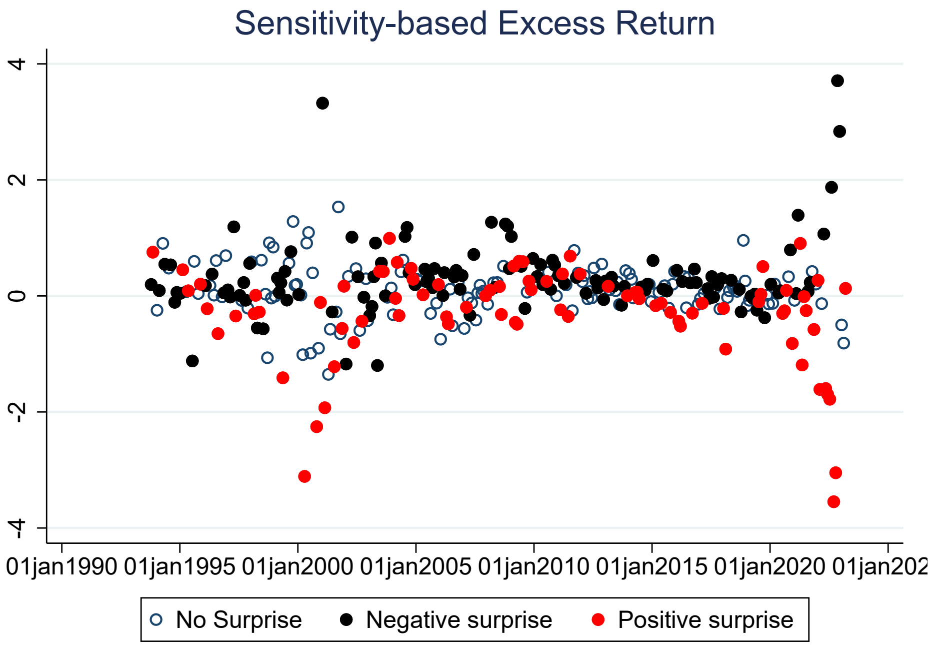
Table 12. This table reports the results of regressions of firm-level stock returns on inflation surprises when we interact core inflation surprises both with a dummy that takes value of one if the firm belongs to the inflation sensitive category group and zero otherwise and a dummy that takes value of one if the firm belongs to the inflation insensitive category group and zero otherwise. The classification of firms in inflation sensitive or inflation insensitive is described in Section 4.1. We report the results for the full sample (Column 1), the pre-2008 sample (Column 2), and the post-2007 sample (Column 3). All regressions include net leverage, receivables, inventories, tangibility, gross margin, cash flow, mark-up, size, book-to-market, and CAPM beta as controls. All the regressions have firm and announcement day fixed effects and the reported t-statistics are calculated using standard errors clustered both at the firm and at the announcement day level. * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent.

	(1)	(2)	(3)
	Full Sample	1993m10-2007m12	2008m1-2023m3
surpriseXinsensitive	1.004***	0.921***	1.073***
	(4.897)	(3.731)	(3.562)
surpriseXsensitive	-1.470***	-1.452***	-1.502***
	(-5.283)	(-3.091)	(-4.237)
insensitive	0.016	0.027	0.011
	(0.764)	(0.792)	(0.479)
sensitive	0.006	0.027	0.002
	(0.350)	(0.954)	(0.085)
ret_{t-1}	-0.069***	-0.093***	-0.030***
	(-16.919)	(-19.067)	(-5.286)
Obs	601,376	309,857	291,503
R^2	0.115	0.060	0.227

Using the estimated coefficients in Column 1, we show that inflation-insensitive firms earn a significant excess return of about 0.25% over inflation-sensitive firms following a 0.1 inflation surprise. The magnitude of this excess return remains significant and around 0.25% in both subsamples.

Figure 7 reports the time series of inflation-based excess returns over the announcement days in our sample. To obtain these excess returns, we first calculate the difference between the equally weighted close-to-open returns in the inflation-sensitive category and the equally weighted returns in the inflation-insensitive category and then we take the residual from a

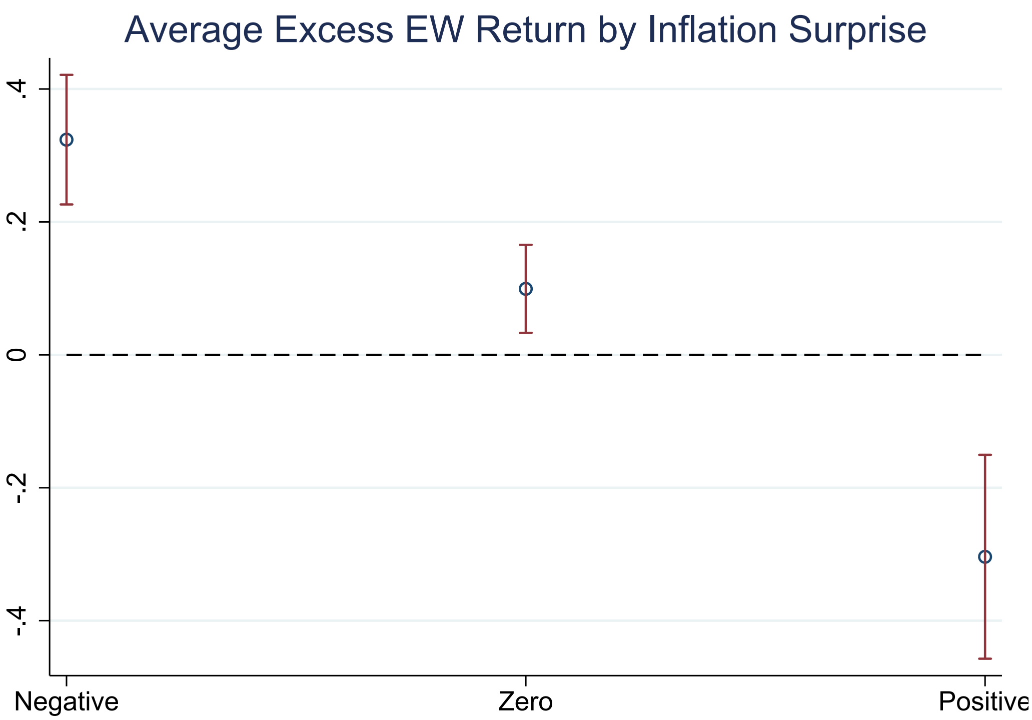
Figure 7. The figure reports the time series of the inflation-based excess returns in our sample. To obtain these excess returns, we first calculate the difference between the equally weighted returns in the inflation-sensitive category and the the equally weighted returns in the inflation-insensitive category and then we take the residual from a regression of these equally weighted excess returns on the S&P 500 return up to 8.25am of the announcement day to control for systematic news not related to inflation surprises. The empty dot are excess returns during days with no surprise, while the red (black) dots are excess returns during days with positive (negative) surprises.



regression of these equally weighted excess returns on the S&P 500 return up to 8.25am of the announcement day to control for systematic news not related to inflation surprises. We call this (adjusted) excess return the Inflation-Based Spread (IBS).

The empty dots in Figure 7 are inflation-based spreads during days with no surprise, while the red (black) dots are IBSs during days with positive (negative) surprises. As we can see, the excess return tends to be negative following positive surprises and positive following negative surprises, as the red dots tend to lay below the black ones. The largest negative (positive) IBSs following a positive (negative) inflation surprise occur between the end of the year 2000 and the beginning of the year 2001 and more recently after the first half of 2021.

Figure 8. The top (bottom) panel reports the average of the equally- (value-) weighted excess returns (hollow circles) in Figure 7 across inflation surprise categories (Negative, Zero, and Positive) together with its corresponding 10% confidence interval (in whiskers).



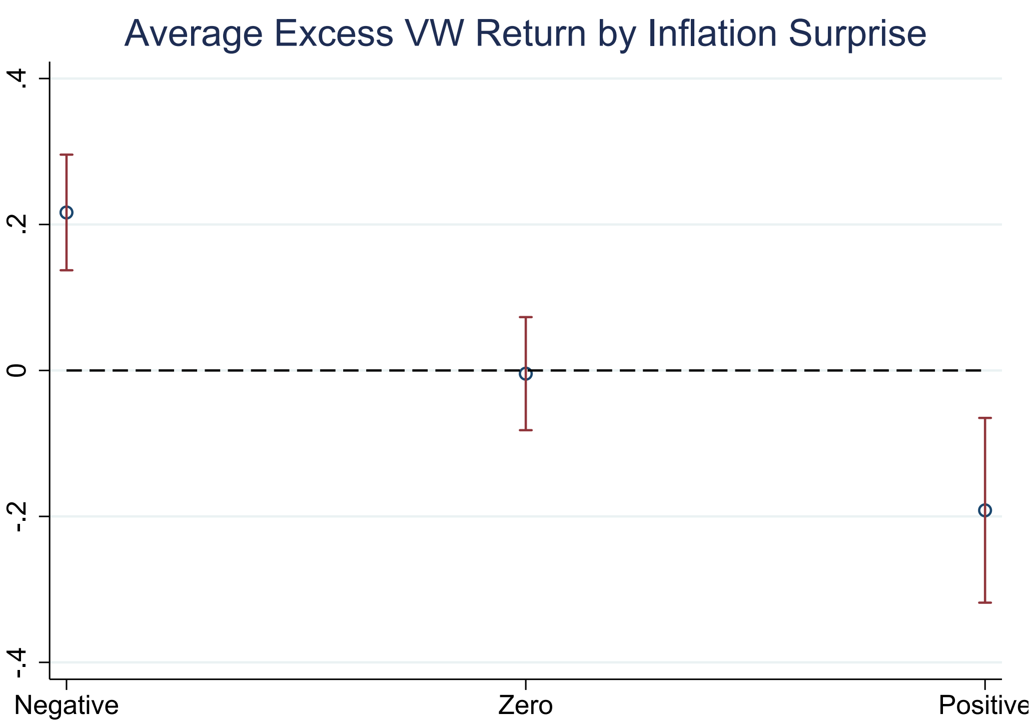
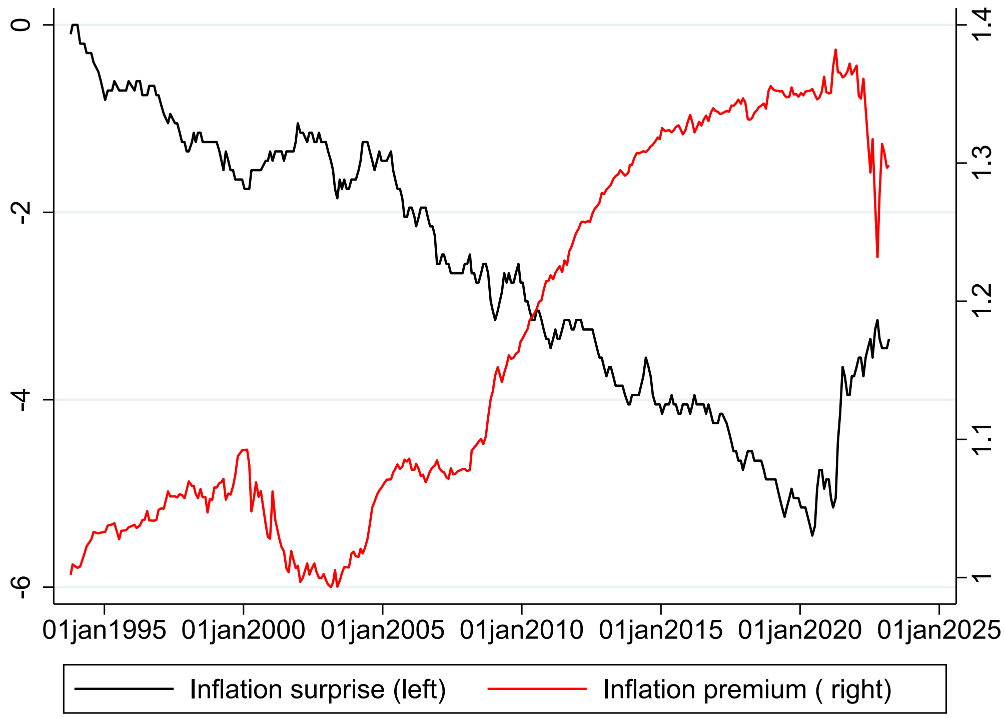


Figure 9. The figure reports the cumulative inflation surprise in percentage points (black line, left y-axis) and the cumulative inflation-based excess returns (red line, right y-axis) over the period 1993m10-2023m3.



As an example, on October 13, 2022, the IBS took a value of -3 percentage points following a 0.1 percentage point inflation surprise, while on November 10, 2022, the IBS took a value of 3.5 percentage points following a -0.2 percentage point inflation surprise.

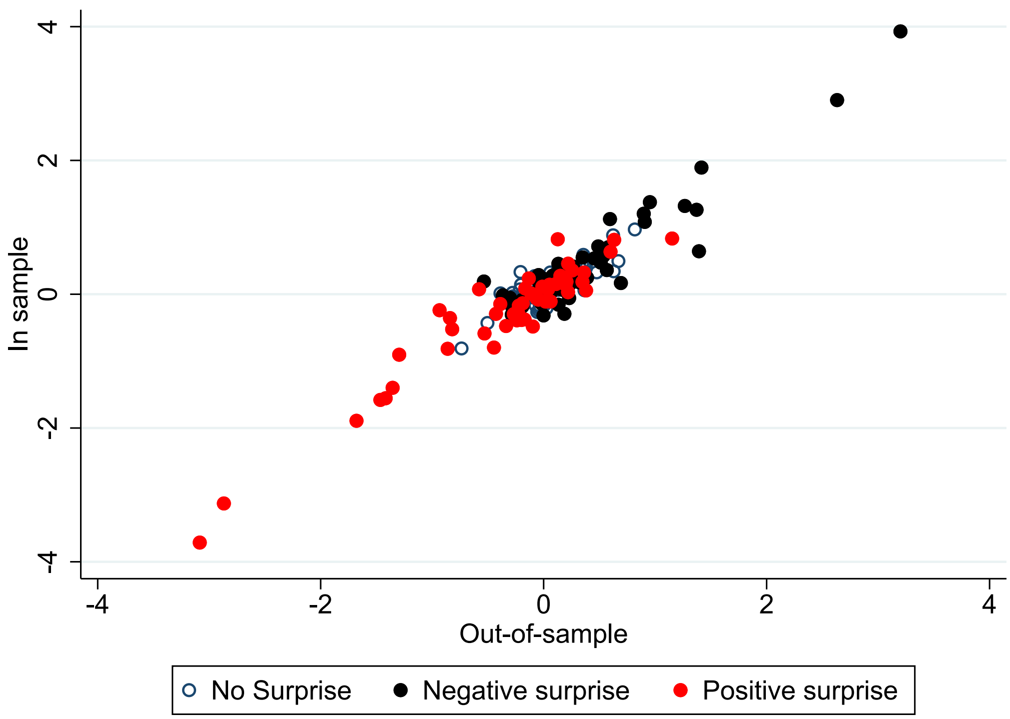
Figure 8 provides more details. The top panel reports the average of the equally weighted excess returns in Figure 7 by inflation surprise category. The average IBS when surprises are negative is 0.32 percentage points, while the same quantity takes a value of -0.30 percentage points when surprises are positive. Both quantities are significant at the 1% level. The bottom panel of Figure 8 reports the same quantities using value-weighted returns. In this case, the IBS is 0.22 percentage points when surprises are negative and 0.19 percentage points when surprises are positive. Also in this case both quantities are significant at the 1% level.

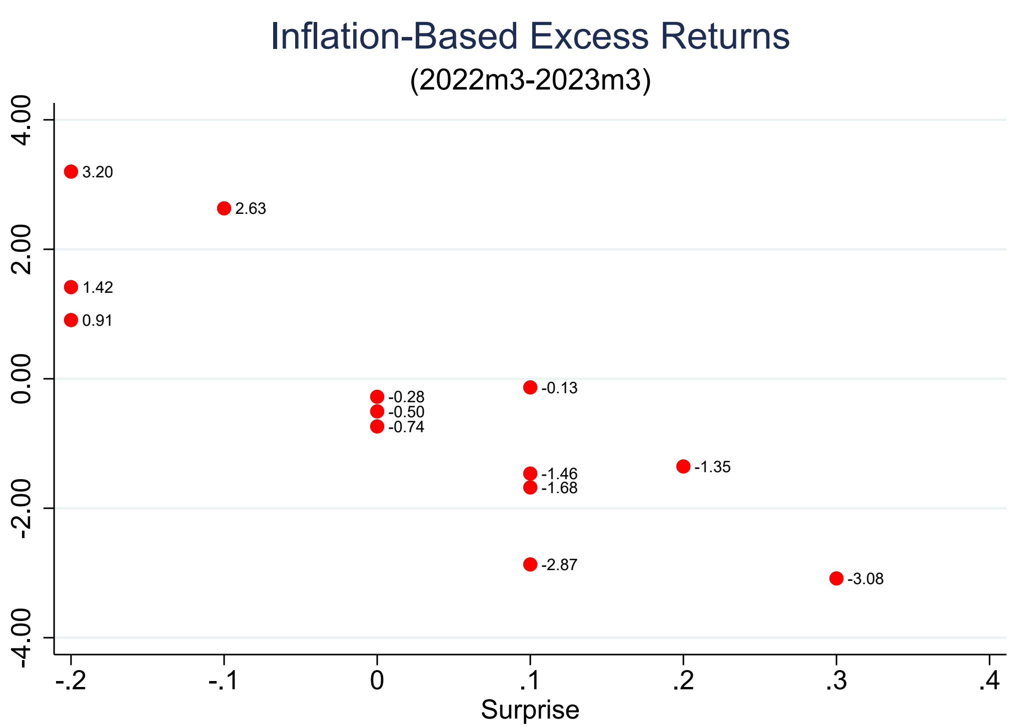
Figure 9 reports the cumulative equally weighted IBS together with the cumulative inflation surprise. Over the sample period that goes from October 1993 until the first half of 2020, market participants have been constantly negatively surprised by inflation announcements. During this period, that includes 296 announcement days, the cumulative surprise has been negative 505 basis points and the cumulative IBS has been a positive 35 percentage points. Starting from the second half of 2020, market participants have been constantly positively surprised by inflation announcements and the cumulative surprise has increased by 210 basis points. As a consequence, the contemporaneous cumulative IBS has decreased by about 4 percentage points going from 1.35 in June 2020 to 1.3 in March 2022.

Out-of-sample analysis. We conclude our analysis with an out-of-sample assessment of the IBS. To this end, we recalculate the IBS using inflation categories based on the estimates up to 2008 (Column 2 of Table 10) and compare its value with an IBS built using estimates post 2008 (Column 3 of Table 10) over the period 2009-2022. The top panel of Figure 10 compares the two methodologies and show that the generated spreads are virtually the same with a correlation of 0.94. The bottom panel of Figure 10 reports the IBS implied by the data up to 2008 for the recent tightening cycle (2022m3-2023m3). As we can see, the portfolio of inflation sensitive firms has consistently outperformed (underperfomed) the portfolio of inflation insensitive firms when the inflation surprise was negative (positive).

The exercise above illustrates how five firm-level characteristics robustly explain, in- and out-of-sample, the differential response of equity returns to inflation surprises. An investor that expects a prolonged period of positive inflation surprises should go long inflation-insensitive firms and short inflation sensitive ones. The first portfolio would be composed by highly levered small firms with a low CAPM beta, a high book-to-market ratio and a high price markup. The second portfolio would contain firms with exact opposite characteristics.

Figure 10. The top panel reports the in-sample inflation-based spread (IBS) against its out-of-sample counterpart. Section 4.1 describes the calculation of the in-sample and out-of-sample quantities. The bottom panel reports the IBS implied by the data up to 2008 versus the realized inflation surprises for the recent tightening cycle (2022m3-2023m3).





5 Conclusion

We bring a fresh perspective on the long standing research question about the effect of unanticipated inflation surprises on equity returns. Differently from most of the previous studies, we focus on core inflation rather than headline inflation because (i) core inflation is not affected by the volatile price behavior of food and energy items and (ii) core inflation seems to be more relevant for monetary policy decisions.

Using a large cross-section of U.S. publicly traded firms and their corresponding close-to-open returns around inflation announcements, we find that the average U.S. public company's reaction to core inflation surprises is significantly negative. This average response varies over time and becomes stronger (i.e., more negative) when both inflation expectations and the output gap are above their long run targets, thus highlighting a monetary policy expectation channel as an important driver of our findings.

In addition, we identify five firm-level characteristics that have a significant effect on the propagation of inflation surprises in the cross-section of equity returns: net leverage, markup, market capitalization, book-to-market, and CAPM beta. We use these characteristics to identify inflation-sensitive and inflation-insensitive firms and construct a risk-adjusted excess returns (Inflation-Based Spread) that could be potentially used to hedge against inflation surprises.

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