Stagflationary Stock Returns and the Role of Market Power[1]

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[1] The views expressed in these slides are those of the authors and do not necessarily reflect the views of the Federal Reserve Board or the Federal Reserve System.

Motivation

Recent inflationary episode renewed interest in understanding implications of inflation for firms

- difficult to answer question with macroeconomic data

$\Rightarrow$ stock prices to answer that question

The impact of inflation on firms' stock prices depends on

- firms' abilities to increase cash flows in line with rising prices
- the behavior of discount rates in response to inflation

Research questions studying stock returns and inflation surprises

- disentangle the role of cashflows/discount rates for stock returns?
- differential implications of inflation across firms

This Paper

Event-study approach

- high-frequency inflation surprises around CPI releases
- study multi-day asset price responses to inflation surprises

Key findings

1. persistent declines in stock prices following inflation surprises
2. expected nominal cash flows to remain stagnant
3. equity risk premium increases
4. real yields unchanged as inflation compensation offset nominal yields

   $\Rightarrow$ investors have a stagflationary view of world
   - inflation interpreted as marginal cost shock
5. consistently, market power mitigates stagflationary stock returns

Empirical Strategy - Time Series

Event study around CPI announcement days:

$$Y_t^k = \alpha^k + \beta_1^k \text{Inflationary News}_t + \epsilon_t^k \qquad \text{for all } k \in [-5, 10]$$

where

$$\text{Inflationary News}_t = \pi_t - E_{t'}(\pi_t | I_{t'})$$

Dependent variables, Y_t^k:

- measures k-day asset response to inflation news

Inflation Data, π_t:

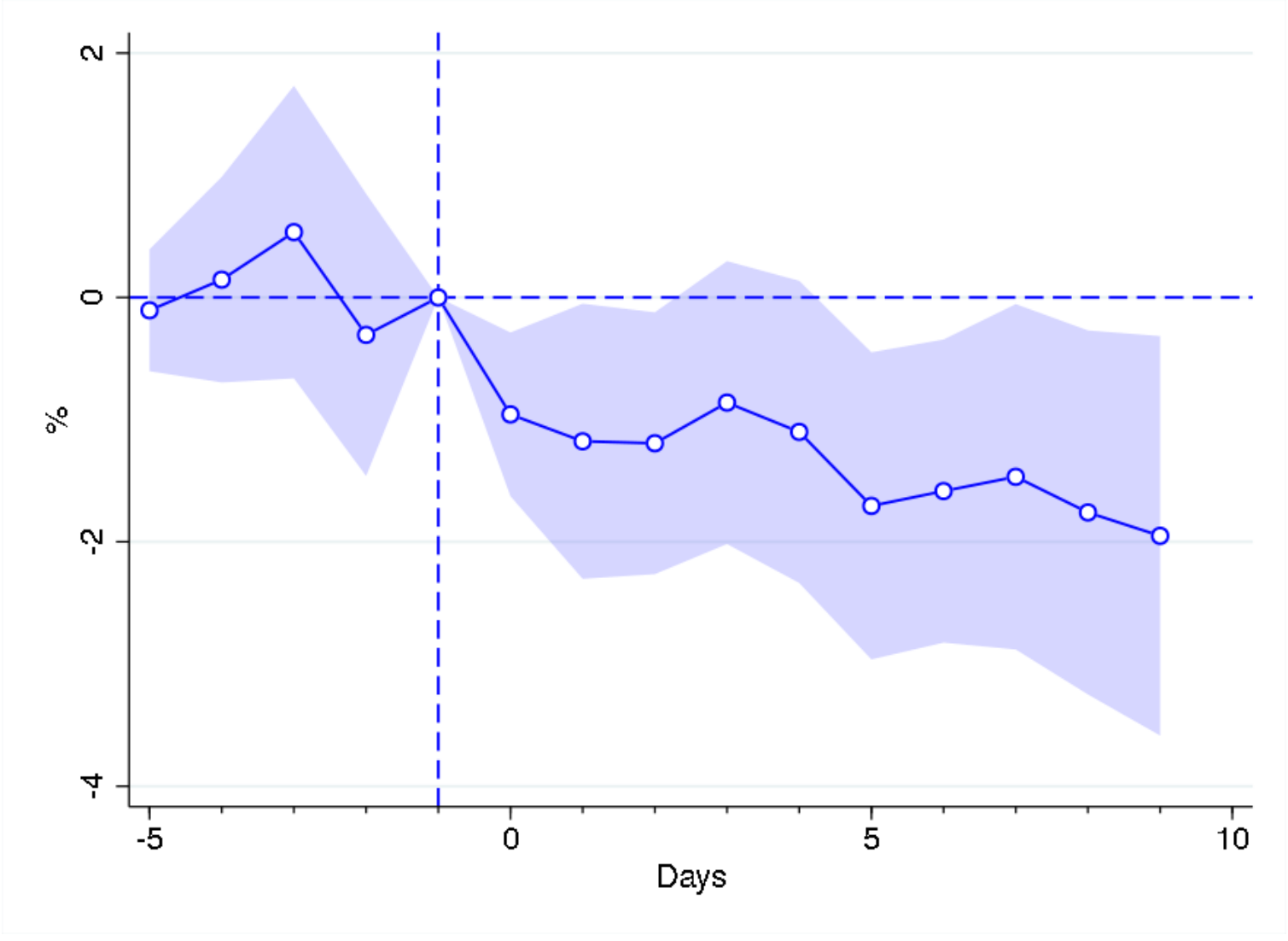
- month-on-month headline CPI (released 8.30am by BLS)

Inflation Forecast, $E_{t'}(.|I_{t'})$:

- Bloomberg and Haver Analytics's Money Market Services, median forecasts (longest sample starts 1977)

Stock Market Response to Inflation News

$$Return_{i,t}^{k} = \alpha^{k} + \beta_{1}^{k} \text{Inflationary News}_{t} + \epsilon_{i,t}^{k}$$



Stock Return Components

Observable data in modern financial markets: (Knox and Vissing-Jorgensen, 2022)

$$\text{Return}_{t+1} = \underbrace{\text{Yield curve news}_{t+1}}_{\text{TIPS, Treasuries + inflation swaps}} + \underbrace{\text{Equity risk premium news}_{t+1}}_{\text{Equity option prices}} + \underbrace{\text{Cashflow news}_{t+1}}_{\text{Dividend futures}}$$

Observable data availability:

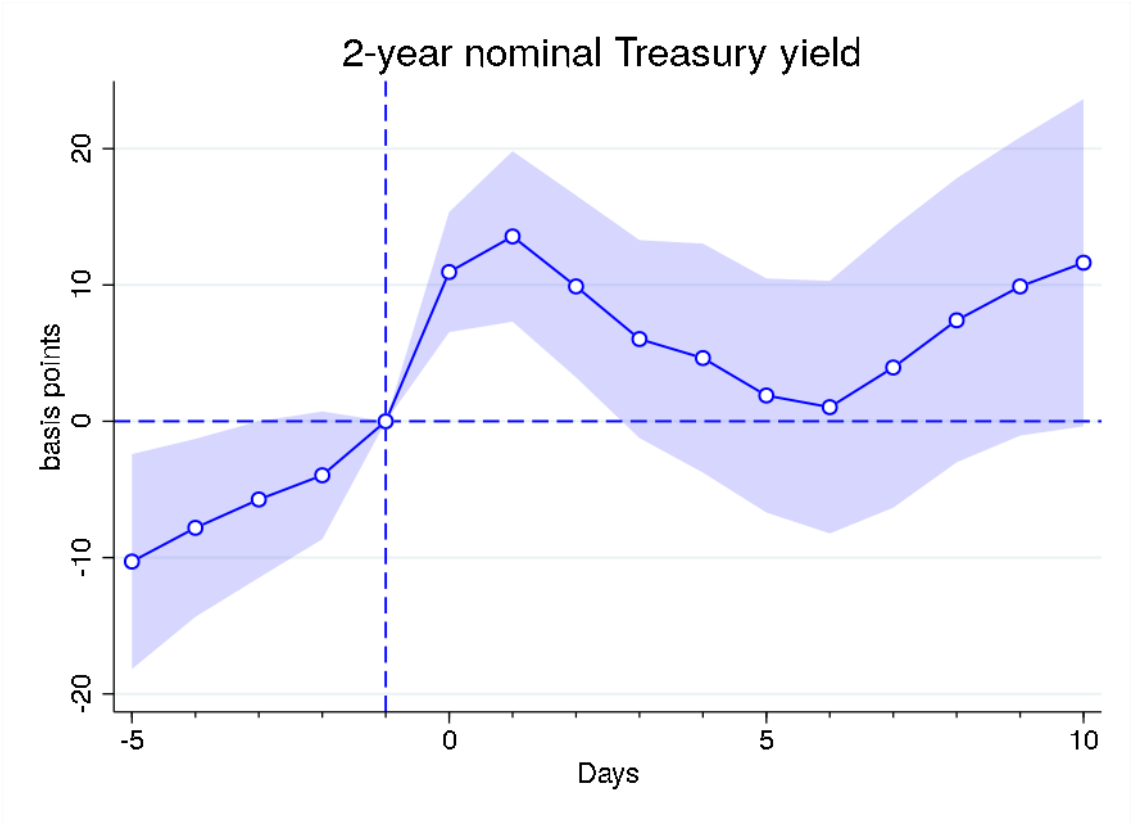
- Real risk-free rate yield curve: available out to 30-year maturity from 2004 using data from FRB website
- Equity risk premium: compute lower bound based on (Martin, 2017) measure. Available out to 2-year maturity starting from 1996 using equity option prices
- Expected dividends (some information on): available out to around 10 years starting from 2017

Benefits of observable data:

- asset prices are forward looking
- available daily (or higher frequency)

Short-Maturity Yield Responses to Inflation News

$$\Delta^k \text{yield}_t = \alpha^k + \beta_1^k \text{Inflationary News}_t + \epsilon_t^k$$

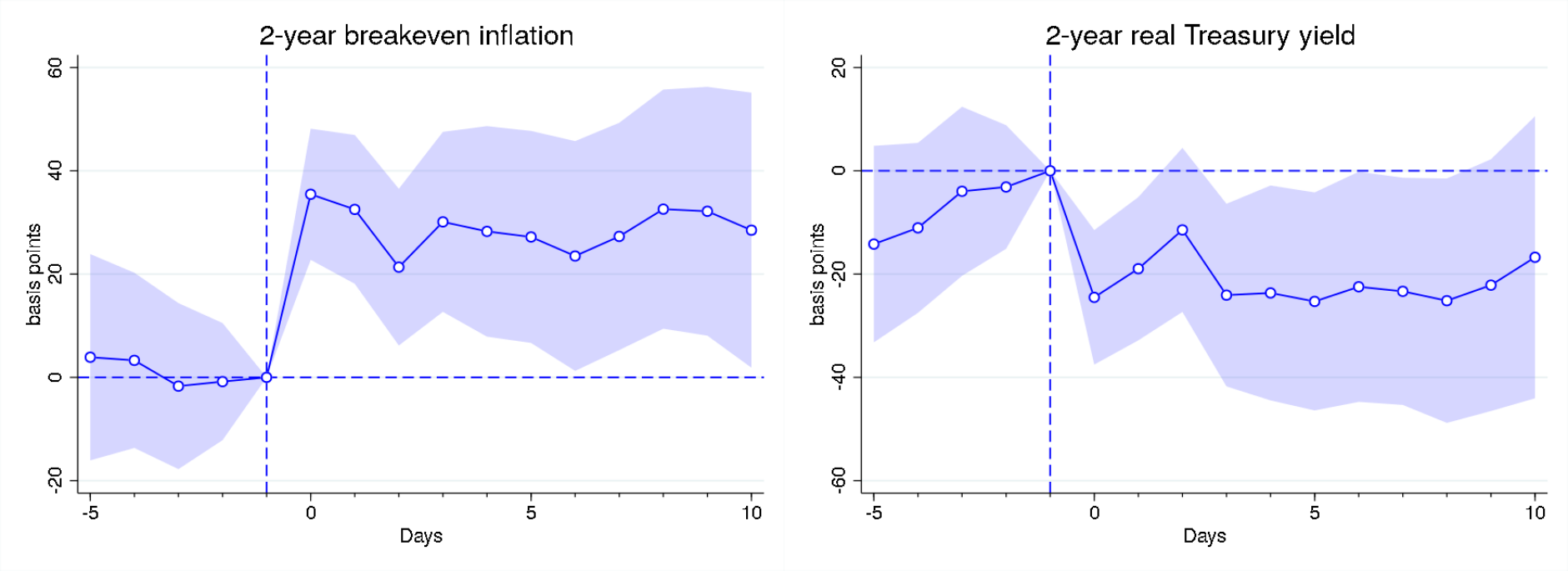


Short-dated nominal yields increase

- consistent with monetary policy response

Short-Maturity Yield Responses to Inflation News

$$\Delta^k \text{yield}_t = \alpha^k + \beta_1^k \text{Inflationary News}_t + \epsilon_t^k$$

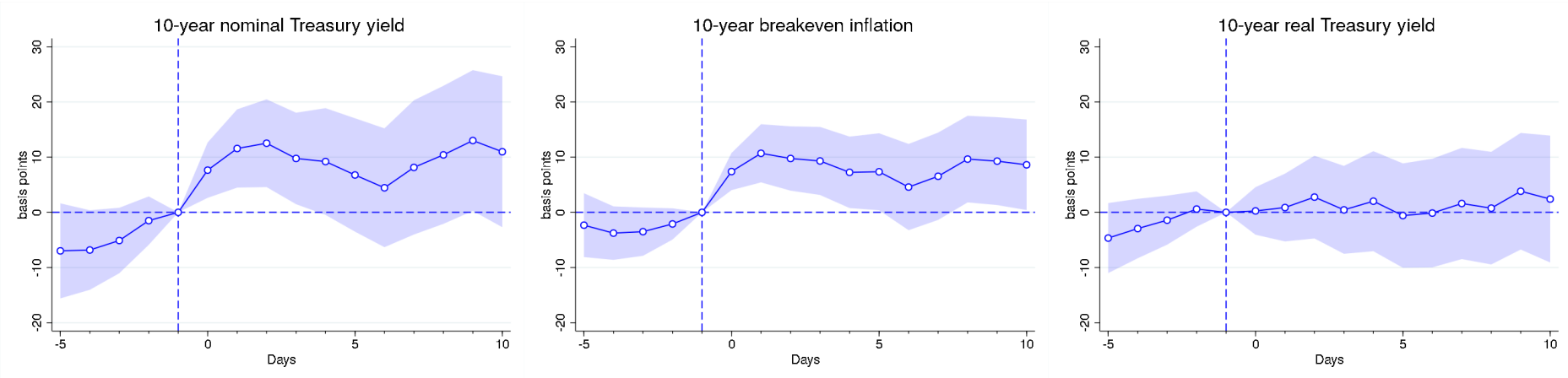


Short-dated real yields decline

- contrary to a Taylor rule prediction

Long-Maturity Yield Responses to Inflation News

$$\Delta^k \text{yield}_t = \alpha^k + \beta_1^k \text{Inflationary News}_t + \epsilon_t^k$$

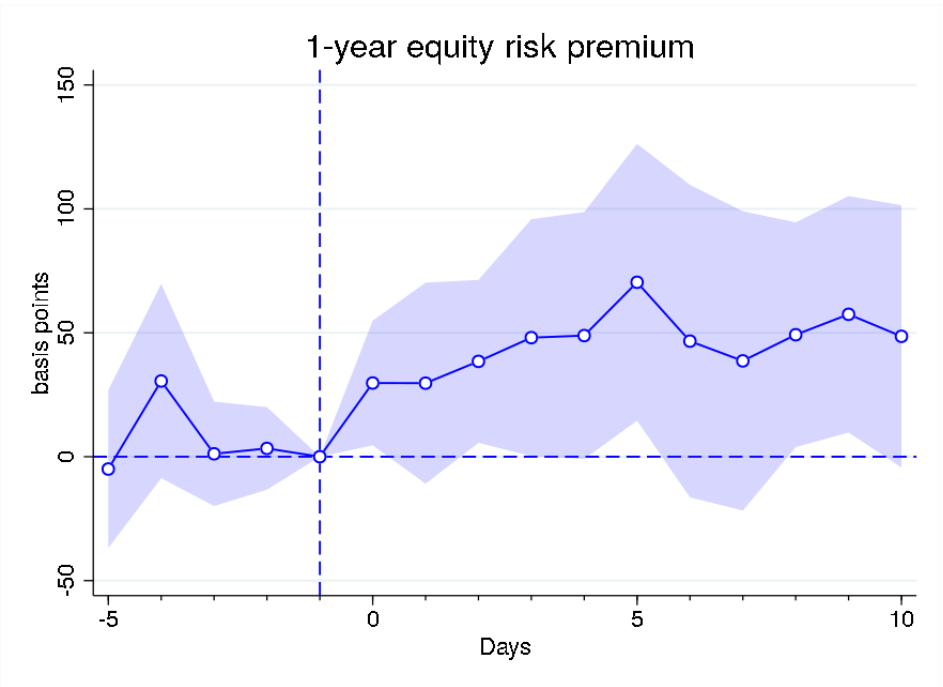


Negative stock returns with inflation news but long-maturity real yields are unchanged $\Rightarrow$ roles for:

- rising equity risk premium; and/or
- declining expected real cashflows

Equity Risk Premium Response to Inflation News

- Equity risk premium effect ambiguous ex-ante
  - depends on the correlation between inflation with economic activity and the asset's cashflows



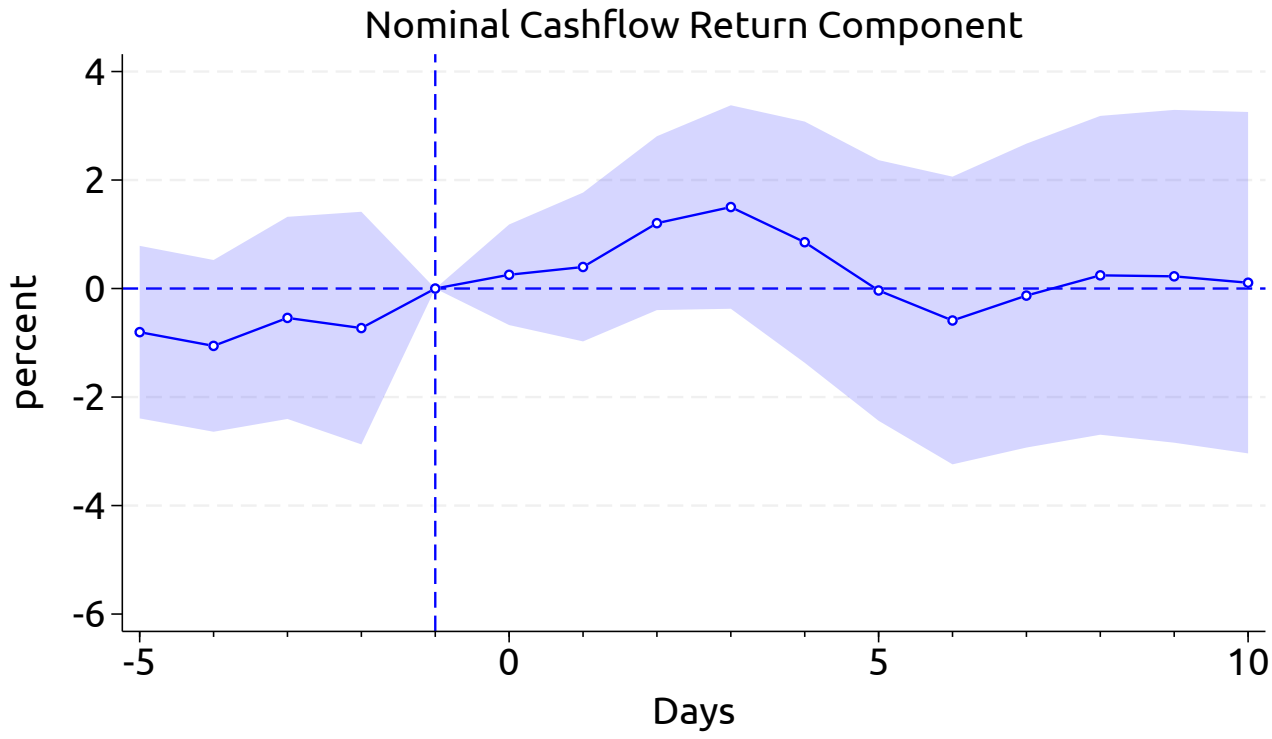
- Inflation not viewed as the result of strong economic activity, in which real cash flows would be high

Nominal Stock Return Decomposition

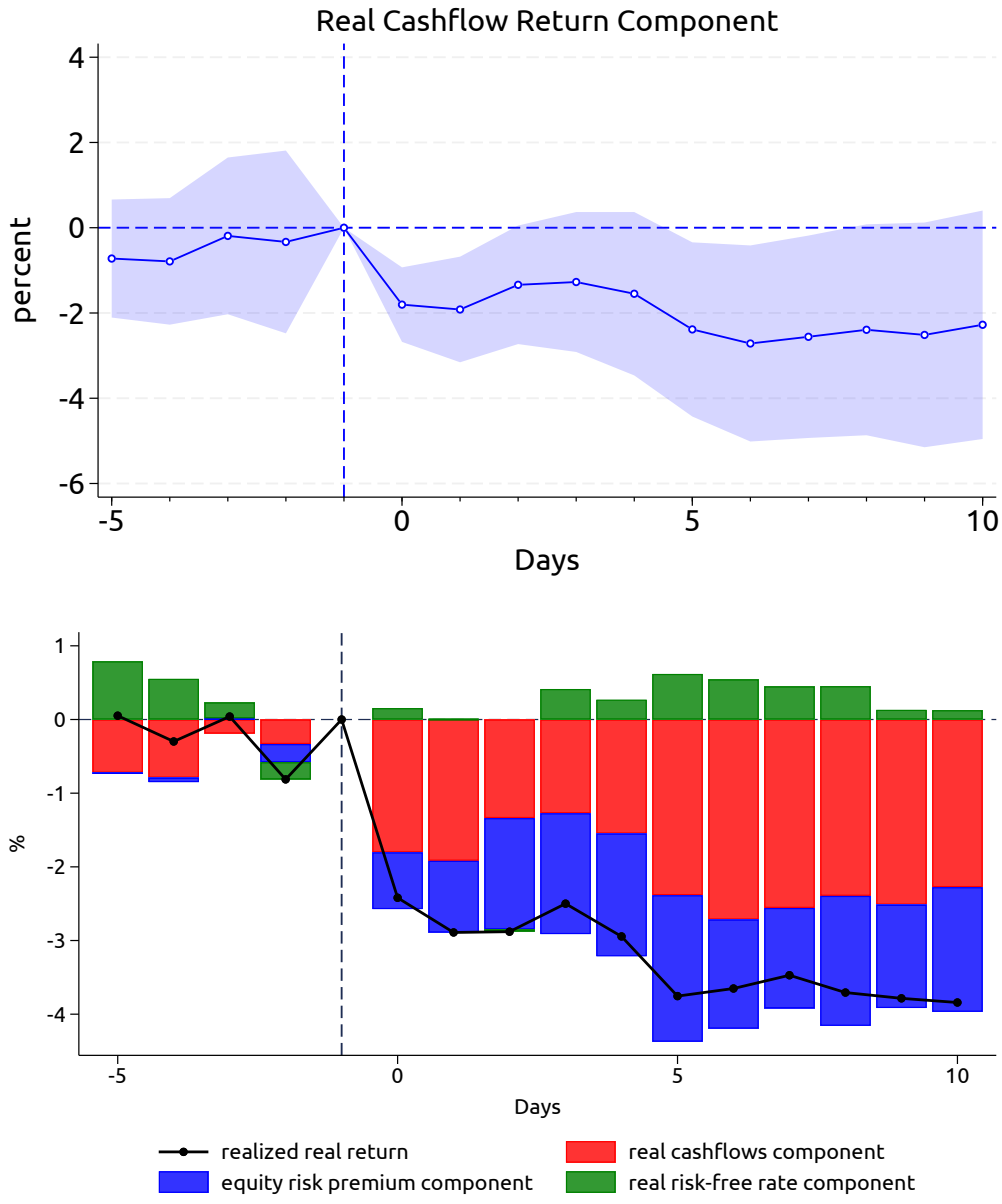
- Decomposition into yield, risk premium, and a residual cash flow component following Knox and Vissing-Jorgensen (2022)
- Yield component: weighted average of changes in interest rates across yield curve maturities
- Equity risk premium component: regression of yield-adjusted return component on changes in the observed Martin (2017) equity risk premium
- Cashflow component: residual

Stagnant nominal cashflows

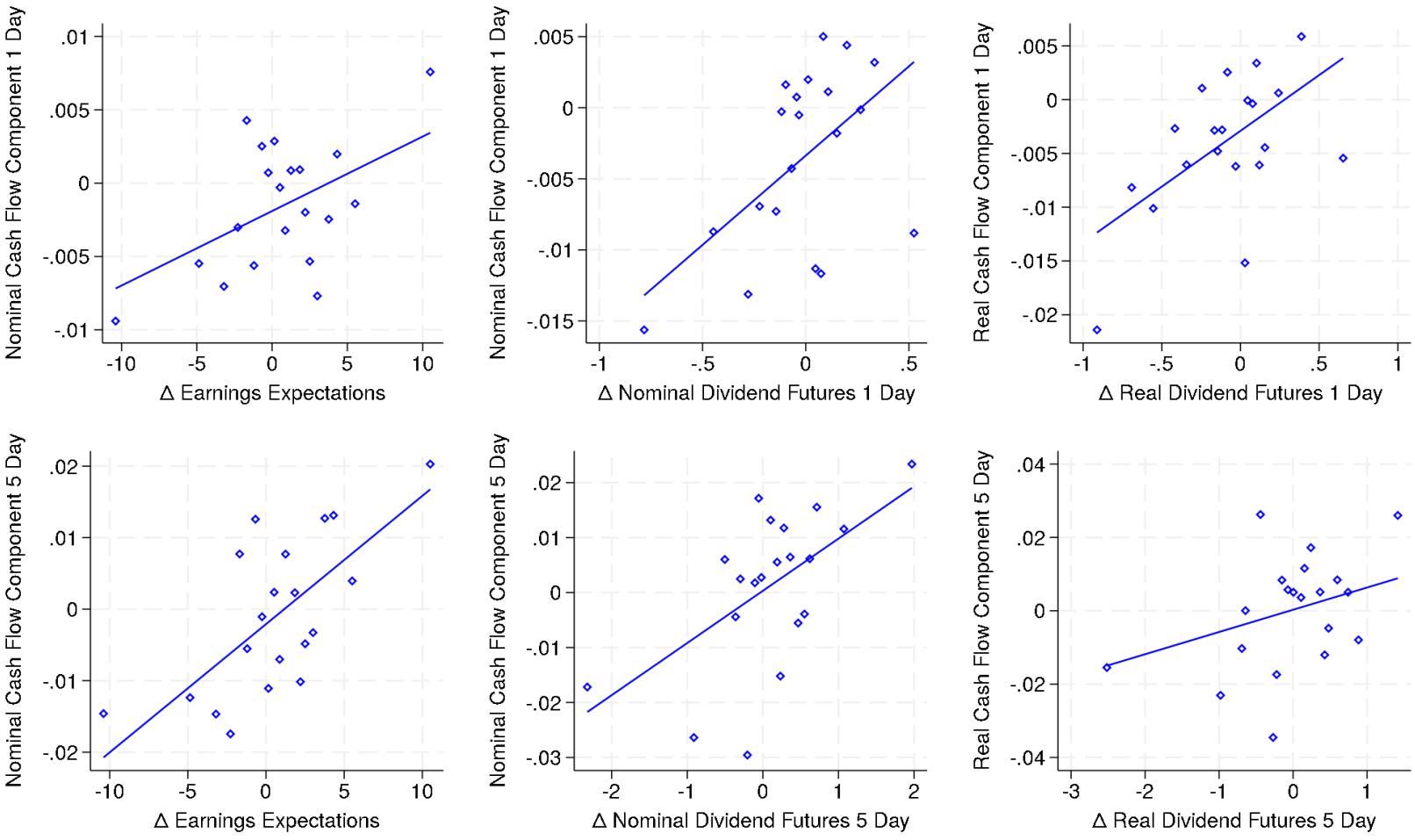
$$\widehat{Return}_t^{c,k} = \alpha^k + \beta_I^k \text{Inflationary News}_t + \epsilon_t^k$$



Real stock return decomposition



Verification of Cash Flow Component



Evidence from dividend futures

Extract investor expectations from dividend futures (Gormsen and Koijen (2020))

$$\Delta^k E_t \left[Div_{y(t)+m} \right] = \alpha^k + \beta_1^k \text{Inflationary News}_t + \epsilon_{i,t}^k$$

	1-day log change			
	1-yr nom	2-yr nom	1-yr real	2-yr real
Inflationary News	0.15	0.06	-1.38***	-1.62***
	(0.17)	(0.21)	(0.20)	(0.25)
R-squared	0.010	0.001	0.440	0.354
N	77	77	77	75

Consistent evidence to two-stage regression from dividend futures

- Sample starts in 2017
- Adjust for equity risk premium (Knox and Vissing-Jorgensen, 2022)

Discussion of findings

- Policy-sensitive real yields decline
  - inconsistent with the Taylor rule hypothesis
  - supply-driven inflation may not require tightening policy
- Rising equity risk premium
  - indicates that the real cashflows of equities are lower in inflationary times
- Positive stock-bond return correlation as stock prices decline and nominal yields rise
  - New Keynesian model, a positive stock-bond correlation is indicative of the economy being hit by supply shocks

$\Rightarrow$ Inflation interpreted supply-driven marginal cost shock?

Model of imperfect competition

Hypothesis (firm profitability and marginal costs)

In simple models of imperfect competition, firm profitability declines following an increase in marginal costs.

Hypothesis (market power, firm profitability and marginal costs)

The extent to which firm profitability declines with marginal costs is determined by firms' market power. In particular, firms with more market power see a smaller decline in profitability following an increase in marginal costs.

Testing model hypothesis

- Exploit cross-sectional heterogeneity across firms
- Empirical approach to test this hypothesis:

$$Return^{k}_{i,t} = \alpha^{k} + \beta^{k}_{1}\text{Inflationary News}_{t} * MarketPower_{i,y(t)-1} + \alpha_{i} + \alpha_{t} + \mathbf{X}'\gamma + \epsilon^{k}_{i,t}$$

- If investors interpret inflation as marginal cost shock, more market power dampens the negative stock price effect ($\beta > 0$)

Measuring Market Power

Production approach (De Loecker et al., 2020)

Estimate markups from the firm's cost minimization decision:

$$Markup_{i,t} = \theta^{\nu}_{i,t} * \frac{(P_{i,t}Q_{i,t})}{(P^{V}_{i,t}V_{i,t})}$$

where

- $\frac{(P_{i,t}Q_{i,t})}{(P^{V}_{i,t}V_{i,t})}$: the ratio of sales to variable inputs
- $\theta^{\nu}_{i,t}$: the output elasticity of variable inputs of production (industry-level estimates)

Calculate markups using firm-level data from Compustat

- variable inputs measured through 'cost of goods sold'
- well documented time series trends in aggregate markups $\Rightarrow$ we demean each year

Exploiting X-Sectional Markup Heterogeneity

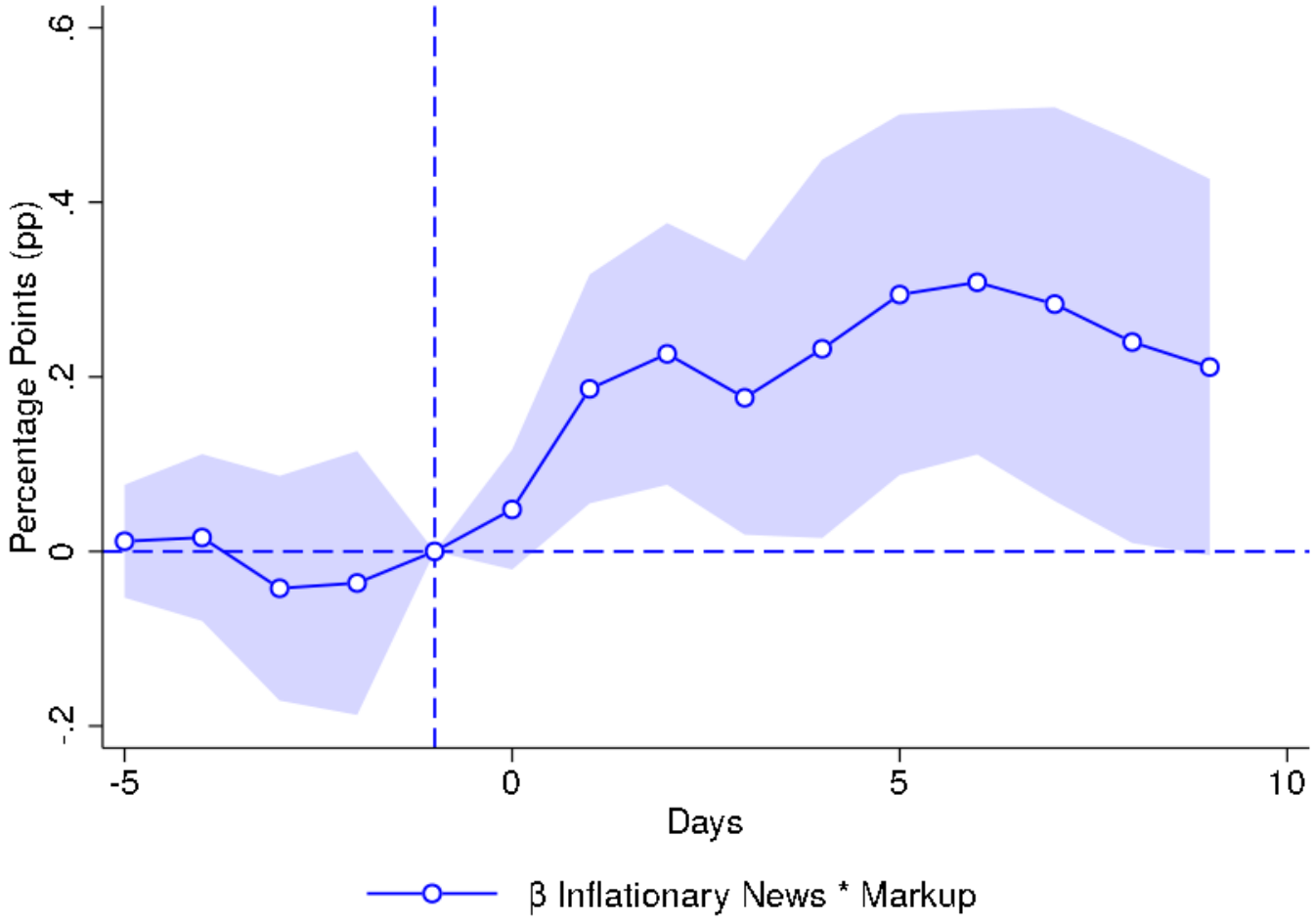
$$Return^{5}_{i,t} = \alpha + \beta_1 \text{Inflationary News}_t * Markup_{i,y(t)-1} + \alpha_i + \alpha_t + \mathbf{X}'\gamma + \epsilon_{i,t}$$

	Dependent Variable: $Returns^{5}_{i,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Inflationary News	-1.446					
	(1.006)					
Markup	0.00479	0.00805	-0.00564	0.00326	-0.00495	0.00335
	(0.0159)	(0.0158)	(0.0103)	(0.0104)	(0.0103)	(0.0104)
Inflationary News × Markup	0.286**	0.294**	0.185**	0.192**	0.191**	0.192**
	(0.121)	(0.125)	(0.0889)	(0.0806)	(0.0881)	(0.0801)
R-squared	0.015	0.130	0.158	0.158	0.158	0.159
N	1,947,431	1,947,429	1,943,129	1,894,237	1,920,435	1,883,037
Firm FE	✓	✓	✓	✓	✓	✓
Time FE		✓	-	-	-	-
Industry-Time FE			✓	✓	✓	✓
Firm Characteristics Controls				✓		✓
Factor Exposure Controls					✓	✓

- *Int. Firm Controls*: log assets, tangibility, leverage, market-to-book value
- *Int. Factor Controls* : Fama-French 3-factors: market beta, size, and value. Calculate firm-level 5-year rolling betas to factors (Fama-Macbeth approach)

Exploiting X-Sectional Markup Heterogeneity

$$\textit{Return}^k_{i,t} = \alpha^k + \beta^k_1 \text{Inflationary News}_t * \textit{Markup}_{i,y(t)-1} + \alpha_i + \alpha_t + \mathbf{X}'\gamma + \epsilon^k_{i,t}$$



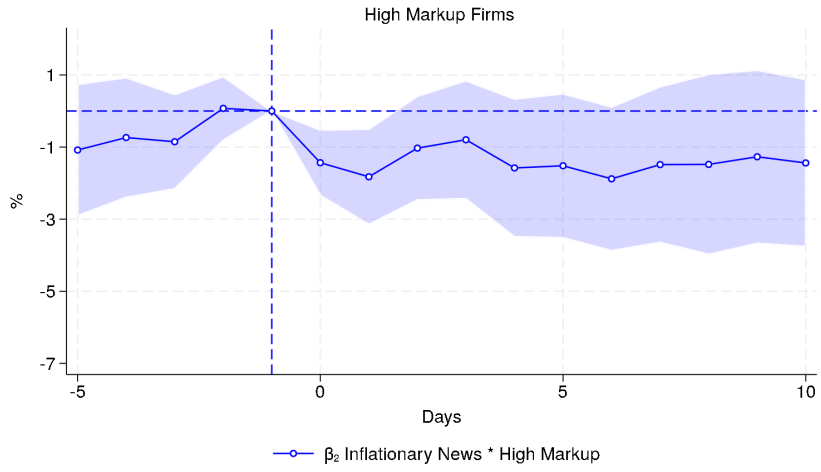
Controlling For X-sectional Discount Rate Sensitivity

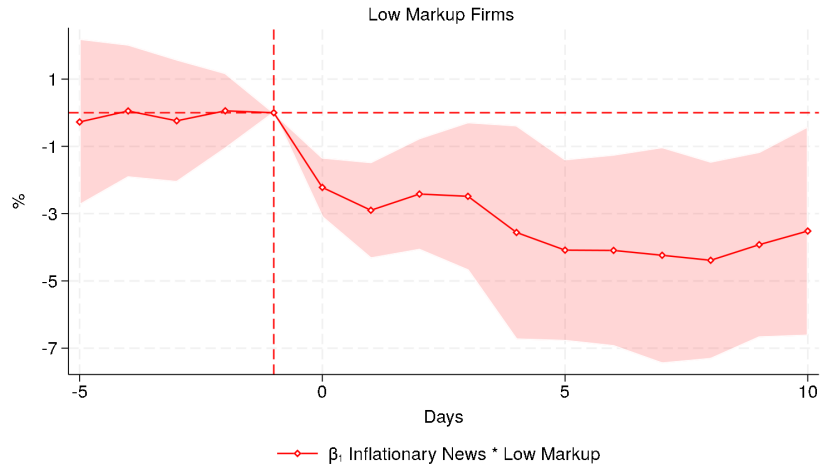
Stage 1. Control for cross-sectional sensitivity to discount rates:

$$Return^k_{i,t} = \alpha^k_i + (\Delta_k \mathbf{DCR}'_t \times Markup_{i,y(t)-1})\Theta^k + \Gamma_{i,t}\Psi^k + \epsilon^k_{i,t}$$

Stage 2. Extract predicted cashflows component of return, $\epsilon^k_{i,t} = \widehat{Return}^{k,CF}_{i,t}$, and regress this component on inflation news

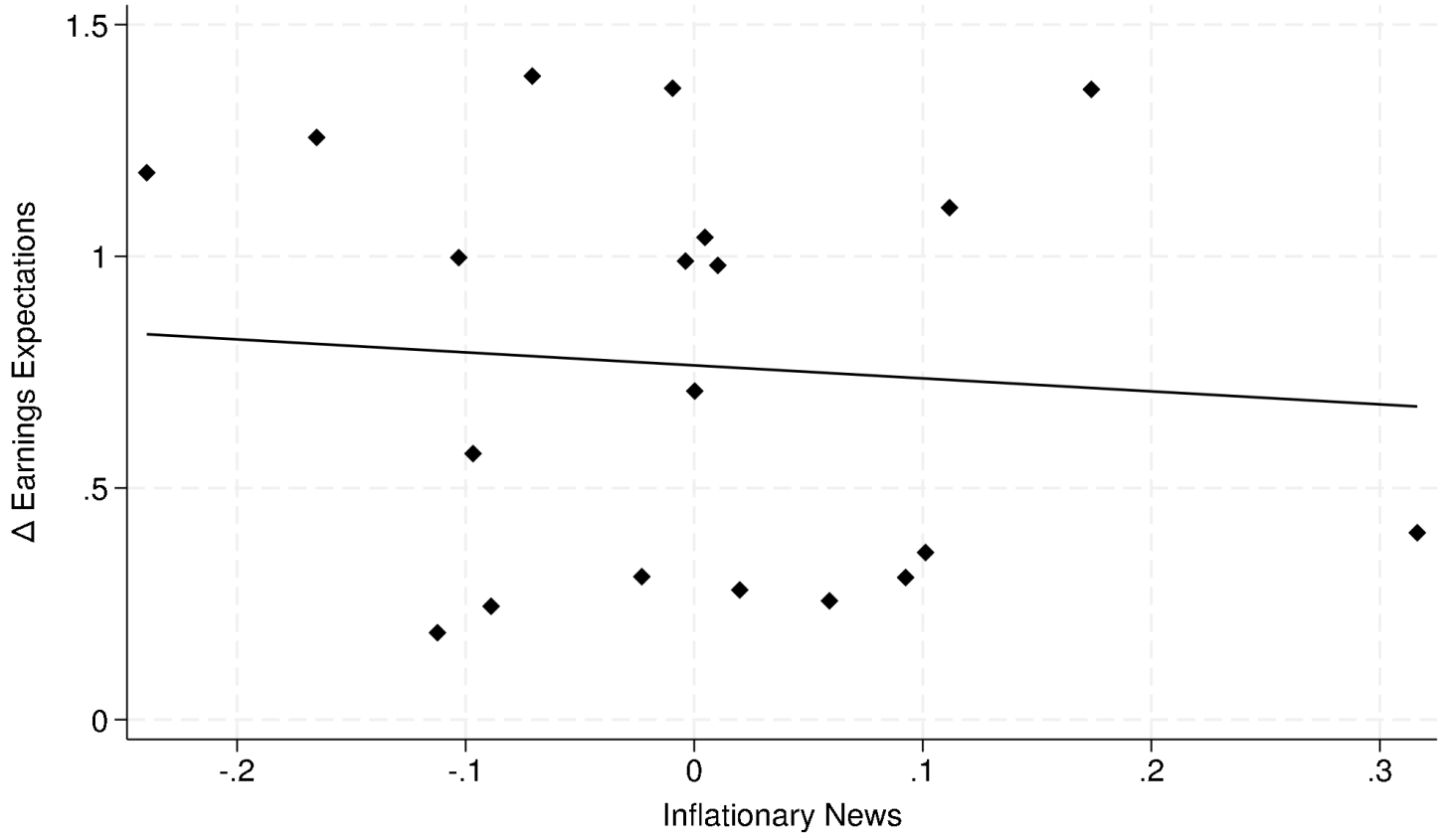
$$\begin{aligned}\widehat{Return}^{k,CF}_{i,t} =& \alpha + \beta_1 \text{Inflationary News}_t * \text{Low Markup}_{i,y(t)-1} \\ &+ \beta_2 \text{Inflationary News}_t * \text{High Markup}_{i,y(t)-1} + \beta_3 \text{Low Markup}_{i,y(t)-1} + \epsilon_{i,t}\end{aligned}$$





Evidence from Analyst Earnings Expectations

- Do analysts adjust their earnings expectations around inflationary news?
  - differentially across the market power distribution?



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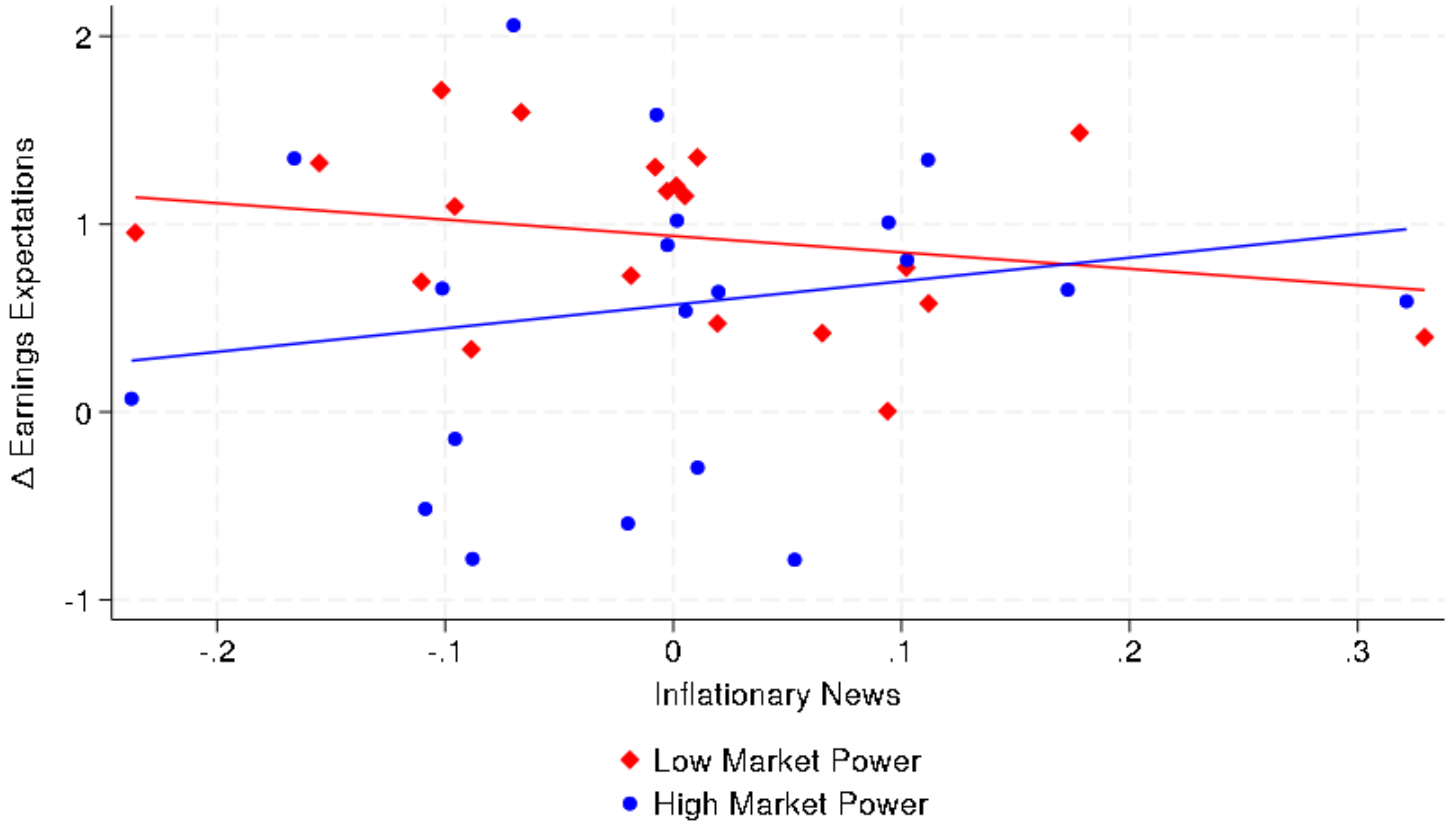

Conclusion

Research questions

- Understanding negative stock returns in response to high inflation

Main Findings

- Decline in real cash flow expectations
- No increase in real rates
- Increase in equity risk premium
- Underperformance of firms with high demand elasticity

Main Takeaway

- Consistent with all of the above results, investors have a stagflationary view of world in which they see inflation is a negative supply shock

Knox, Benjamin and Annette Vissing-Jorgensen (2022) “A stock return decomposition using observables”.

Martin, Ian (2017) “What is the expected return on the market?”, *The Quarterly Journal of Economics*, 132 (1), pp. 367–433.

Hanson and Stein (2015) Regressions

$$\Delta^2\text{long-term forward rate}_t = \alpha^k + \beta^2 \Delta^2\text{2-year nominal rate}_t + \epsilon_t^2$$

	FOMC			CPI releases		
	nominal	real	inflation	nominal	real	inflation
2-year treasury	0.49***	0.50***	-0.01	0.56***	0.17**	0.40***
	(0.15)	(0.12)	(0.09)	(0.10)	(0.08)	(0.09)
R-squared	0.068	0.104	0.000	0.131	0.019	0.090
N	146	146	146	218	218	218

Evidence suggests CPI days are different

- While there surely is monetary news on CPI release days ... CPI days are not just monetary days

State-(In)dependence

	Dependent Variable: $Return_t^5$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Inflationary News	-1.880**	-2.007**	-2.070**	-2.846*	-1.718**	-0.975	-1.706**	-3.402**	-1.839
	(0.800)	(0.866)	(0.982)	(1.458)	(0.842)	(1.502)	(0.804)	(1.431)	(0.81
State		0.00265	0.0781	-0.0700	0.0184	-0.112	-0.0395	-0.606***	-0.024
		(0.115)	(0.127)	(0.189)	(0.112)	(0.431)	(0.111)	(0.185)	(0.11
Inflationary News × State		0.266	2.008*	0.0345	-0.402	-1.166	0.653	-0.250	-0.18
		(0.636)	(1.036)	(1.765)	(0.643)	(2.630)	(0.879)	(1.121)	(0.58
R-squared	0.010	0.011	0.018	0.015	0.011	0.011	0.009	0.051	0.01
N	529	504	467	279	528	529	528	279	529
State		Stock-Bond	Inflation RP	Supply	Inflation	Positive	U-gap	$\Delta_5 2yr$	$\Delta_5 2y$