Response of Stock Market to Macroeconomic News

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Introduction

- Asset price reflects information set of investors.
- Arrival of new information must affect asset prices.
- Macroeconomic news are very convenient to study effect of information on prices, since they are:
  - Easily quantifiable.
  - Frequent.
  - Affect all asset prices.
- **Research question: How do stocks respond to macroeconomic news?**

Literature

- Response of asset prices to macroeconomic news announcements (MNA):
  - Schwert (1981), Pearce and Roley (1985), Cutler, Poterba and Summers (1988), Roley and McQueen (1993), Flannery and Protopapadakis (2002), Boyd, Hu and Jagannathan (2005), Andersen, Bollerslev, Diebold and Vega (2007), Law, Song and Yaron (2021).
- Asset prices and monetary policy:
  - Bernanke and Kuttner (2005), Hanson and Stein (2015), Nakamura and Steinsson (2018).

Main results

- Stocks exhibit strong positive response to good MNA: 11-25 bps per 1σ of MNA surprise.
- This response is stronger when monetary uncertainty is low.
- I decompose the response into cash flow channel and risk-free rate channel.
- 1 σ of MNA surprise leads to 30 bps higher returns through cash flow channel and 23 bps lower returns per 1% of monetary uncertainty via monetary channel.
- Major MNA are not priced in the cross-section of expected stock returns, so their releases do not move risk premium.

Data, Monetary uncertainty

- Aggregate stock returns: S&P 500 futures, 1997-2019, 1-minute frequency.
- Risk-free rate: Fed Funds futures 3 month ahead, Treasury rates at 2,5 and 10-year maturity, 1998-2019, 1-minute frequency.
- Individual stocks returns: constituents of S&P 500, 1997-2019, 5-minute frequency.
- Low frequency macroeconomic variables from FRED.
- I use implied volatility of 2-year Treasury rate to proxy for monetary uncertainty (MU).
- Over the sample period, monetary uncertainty fluctuates between 0.2% and 1.2%.

Data: Macroeconomic News Announcements (MNA)

- 20 types of MNA, released at monthly frequency, 1997-2019, Bloomberg.
- Investors' surveys for each MNA from Bloomberg.
- MNA surprise = Announced value - Mean expected value.
- To identify relevant news, I consider only MNA, which significantly affect volatility of market returns within 30-minutes window.
- 7 relevant news:
  - Nonfarm payroll (NFP)
  - ISM Manufacturing (PMI)
  - Retail Sales
  - CPI
  - PPI
  - Consumer Confidence
  - Construction Spending

Stock Response

- $R_t = a + bSurprise_t + \epsilon_t$.

Table: Response of S&P500 to MNA

Event	b	T-statistic(b)	R^2
Change in Nonfarm Payrolls	0.25	7.82	0.20
ISM Manufacturing	0.16	5.20	0.09
CPI MoM	-0.11	-5.84	0.12
Conf. Board Consumer Confidence	0.11	4.87	0.09
Retail Sales Advance MoM	0.11	5.87	0.12
Construction Spending MoM	0.07	2.44	0.02
Unemployment Rate	0.06	1.60	0.01
PPI MoM	-0.01	-0.71	-0.002

Measurement accuracy

- $R_t = a + bSurprise_t + \epsilon_t$.

	Dependent variable:			
	vwretd	SP500	SP500	SP500
	(1)	(2)	(3)	(4)
PMI surprise	0.160^{**}	0.169^{**}	0.193^{***}	0.156^{***}
	[1.994]	[2.027]	[3.142]	[5.135]
Constant	0.163^{**}	0.165^{*}	0.105^{*}	-0.008
	[2.018]	[1.961]	[1.696]	[-0.260]
Announcement window	Day	Day	Half-day	30 minutes
Observations	276	266	266	266
Adjusted R^2	0.011	0.012	0.032	0.087

Response in subsamples

- $R_t = a + bSurprise_t + \epsilon_t$.

	Dependent variable:			
	SPX			
	(1)	(2)	(3)	(4)
Surprise	0.203^{***}	0.141^{***}	0.244^{***}	0.094^{***}
	[4.552]	[9.998]	[12.869]	[4.987]
Constant	-0.030	0.013	0.006	0.004
	[-0.444]	[1.014]	[0.384]	[0.206]
Subsample	Recession	Expansion	Low MU	High MU
Observations	96	891	514	473
Adjusted R^2	0.172	0.100	0.243	0.048

Intuition

- Good MNA affects stocks through at least 2 channels:
  1. Positive: Higher cash flow growth $\Longrightarrow$ higher price.
  2. Negative: Higher probability of increasing rates $\Longrightarrow$ lower price:
     - Fed has dual mandate: full employment and price stability.
     - Fed changes interest rates in response to changes in economic environment.
- Strength of monetary channel varies over time:
  - Zero Lower Bound (ZLB): Fed can not decrease rates below 0.
  - When Fed Funds rate approaches zero, it becomes "sticky". Low monetary uncertainty.
  - Monetary channel is small when monetary uncertainty is low.

Basic framework

- $P = \frac{\mathbb{E}[D]}{R^F + RP}$.
- Assume MNA surprise is a pure growth shock ϵ_t.
- Good MNA surprise affects stocks through higher expected cash flows and through higher expected risk-free rate.
- $$R_t^S = a_1 \epsilon_t + a_2 \Delta R_t^F + e_{1,t}. \quad (1)$$
- $$\Delta R_t^F = (\gamma_0 + \gamma_1 MU_{t-1})\epsilon_t + e_{2,t}. \quad (2)$$
- $$R_t^S = [a_1 + a_2\gamma_0]\epsilon_t + [a_2\gamma_1] MU_{t-1}\epsilon_t. \quad (3)$$
- We can estimate $a_1, a_2, \gamma_0, \gamma_1$.
- Assumptions:
  1. Risk premium is unaffected.
  2. Strength of cash flow channel does not depend on the monetary uncertainty MU.

Decomposition

- If $\gamma_0 = 0$, then $R_t^S = [a_1]\epsilon_t + [a_2\gamma_1]MU_{t-1}\epsilon_t$.
- Run regression
  $R_t = b * Surprise_t + c * MU_{t-1} + d * Surprise_t * MU_{t-1} + e_t$.
- b is cash flow channel.
- d is monetary channel.

Results: Regression with interaction term

$$R_t = b * Surprise_t + c * MU_{t-1} + d * Surprise_t * MU_{t-1} + e_t$$

	Dependent variable:				
	SPX			$\Delta rate$	
	(1)	(2)	(3)	(4)	(5)
Surprise	0.15***	0.30***	0.29***	2.16***	0.17
	[11.29]	[7.82]	[7.35]	[17.35]	[0.47]
MU		−0.01	−0.02		0.46
		[−0.29]	[−0.29]		[0.98]
CFNAI			−0.02		
			[−0.66]		
Surprise:MU		−0.23***	−0.22***		2.93***
		[−4.18]	[−4.08]		[5.86]
Surprise:CFNAI			−0.05***		
			[−2.96]		
Constant	0.01	0.02	0.02	−0.01	−0.28
	[0.96]	[0.59]	[0.63]	[−0.08]	[−0.90]
Observations	978	978	978	1,008	1,005
Adjusted R^2	0.11	0.13	0.13	0.23	0.25

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- 1 σ of good news leads to 30 bps returns through cash flow channel.
- 1 σ of good news leads to -23 bps returns per 1% monetary uncertainty through monetary channel.

Cross-Sectional Analysis

- We can test whether these MNA are priced in cross-section of expected stock returns.
- For each MNA, estimate β_{MNA} and see whether long-short portfolio on β_{MNA} produces significant returns.
- I estimate returns of each stock during 2-hour window within MNA.
- $R_t = \alpha + \beta^{MNA} * surprise_t^{MNA} + e_t$.
- I use 4-year rolling window to estimate β_{MNA} for each MNA type.
- I divide stocks into quintile portfolios on β_{MNA} and estimate their returns.

Results: Average returns of quintile portfolios, sorted on β_{MNA}

Panel A: Non-Farm Payroll

	Q1	Q2	Q3	Q4	Q5	L/S
Mean ew	0.90**	0.84***	0.82***	0.83***	0.91**	0.01
T-stat ew	[2.47]	[2.74]	[2.73]	[2.71]	[2.40]	[0.03]
Mean vw	0.57*	0.77***	0.70***	0.74***	0.78**	0.21
T-stat vw	[1.65]	[2.85]	[2.78]	[2.74]	[2.39]	[0.82]

Panel B: PMI

	Q1	Q2	Q3	Q4	Q5	L/S
Mean ew	0.84**	0.86***	0.96***	0.85**	0.79**	-0.04
T-stat ew	[2.33]	[2.92]	[3.15]	[2.55]	[2.00]	[-0.24]
Mean vw	0.78**	0.80***	0.73***	0.59*	0.68**	-0.10
T-stat vw	[2.51]	[3.10]	[2.82]	[1.85]	[1.98]	[-0.51]

Panel C: Retail Sales

	Q1	Q2	Q3	Q4	Q5	L/S
Mean ew	0.96***	0.76**	0.89***	1.05***	1.03***	0.07
T-stat ew	[2.69]	[2.48]	[2.87]	[3.25]	[2.94]	[0.43]
Mean vw	0.86***	0.61**	0.52*	0.92***	0.98***	0.12
T-stat vw	[2.75]	[2.16]	[1.80]	[3.47]	[3.31]	[0.60]

Additional Results

- Main MNA shocks are not priced in the cross-section of expected stock returns, so probably do not move risk premium upon release.
- MNA surprise affects 5-year and 10-year rates to the similar extent. The whole yield curve shifts up/down.
- MNA surprises have similar predictive power for future earnings during periods of high or low monetary uncertainty. Cash flow channel is likely to be independent of MU.

Conclusion

- Stocks exhibit strong positive response to good MNA: 11-25 bps per 1σ of MNA surprise.
- This response is stronger when monetary uncertainty is low.
- I decompose the response into cash flow channel and risk-free rate channel.
- 1 σ of MNA surprise leads to 30 bps higher returns through cash flow channel and 23 bps lower returns per 1% of monetary uncertainty via monetary channel.
- Previous research failed to detect large positive response of stocks to MNA surprises due to very high monetary uncertainty in 1980s.