Show me the money: The monetary policy risk premium

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1. Introduction

Background & Motivation

- A large body of literature in macroeconomics and finance studies the effects of monetary policy on asset prices.
  - Bernanke and Kuttner (2005)
- Overall, the academic research and practitioners agree that monetary policy affects stock prices significantly and that stock prices of firms with different characteristics react differently to monetary policy.
- However, the effect of monetary policy on the cross-section of equity risk premiums is not as well understood.
  - Classical models differ widely in their predictions regarding the relation between monetary policy exposure and the risk premium.

1. Introduction

Background & Motivation

- Balduzzi (2007): price of monetary policy risk, and hence the sign of the policy risk premium, depends on the elasticity of substitution between cash and credit goods.
- New-Keynesian monetary models: an expansionary policy surprise — consumption growth — marginal utility of consumption.
- Bernanke and Blinder (1988): assets that pay off in times of high marginal value of wealth should be less risky.

- Driver channels or stabilizer channels

1. Introduction

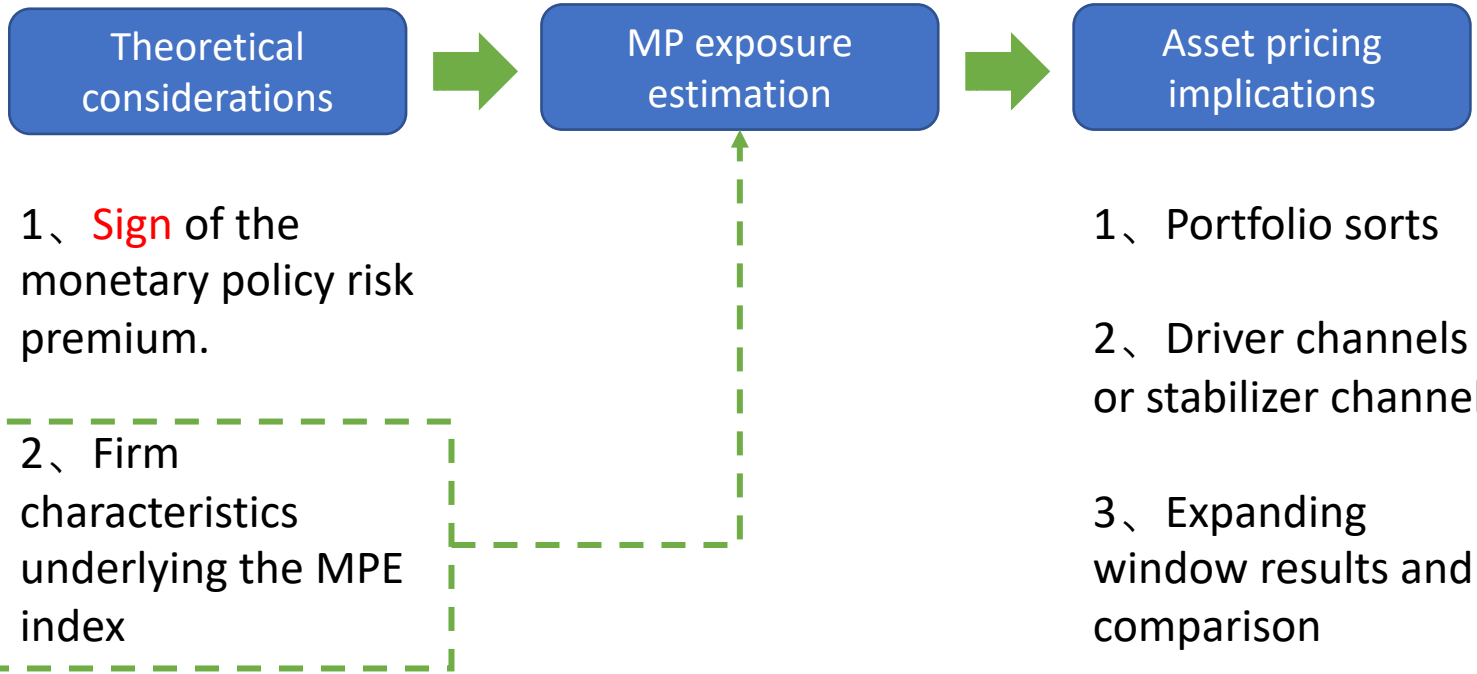
Question

- What is the relation between the monetary policy exposure and the risk premium, positive or negative?

- How to explain this monetary policy exposure effect, “driver” channels or “stabilizer” channels?

1. Introduction

Research contents



1.Introduction

Contribution

1）Literature

- use indices based on firm characteristics to study the cross-section of stock returns: *Pastor and Stambaugh (2003); Whited and Wu (2006); Campbell et al. (2008); Gu et al. (2018)*
- connects firm characteristics to their expected returns & studies macroeconomic aggregates as predictors of asset returns *(Lettau and Ludvigson (2001), Parker and Julliard (2005), Yogo (2006), and Bali et al. (2017))*
- FOMC cycles and aggregate stock returns: *Lucca and Moench, 2015; Cieslak et al., 2018; Neuhierl and Weber, 2018a*

1.Introduction

Contribution

2）Others

- We create a monetary policy exposure (MPE) and find that stocks with high MPE earn lower returns because high-MPE stocks provide a hedge against bad economic shocks.
- (“stabilizer” channels)
- Our index can also be useful in future research about how firms’ financing and investment decisions are related to monetary policy.

2. Variables

1) Monetary policy Exposure Model

$$r_{it}^{\mathrm{ID}} = \alpha + \Sigma_{k=1}^{n} \beta_k x_{it}^k + \Sigma_{k=1}^{n} \gamma_k MPS_t \times x_{it}^k + \mathrm{Controls}_{it} + \varepsilon_{it}$$

$$MPE_{it} = \Sigma_{k=1}^{n} \hat{\gamma}_k \times x_{it}^k$$

- where i is the firm identifier, t is the date of the scheduled FOMC meeting, r_{it}^{ID} is the intraday stock return in the 30-minute event window surrounding the FOMC press releases

- The characteristics including credit channel, balance sheet liquidity, discount rate effect, and nominal rigidities.
  - *Weber, 2015; Ozdagli, 2018*

2. Variables

1) Monetary policy Exposure Model

Advantages:

- An approach based on simply regressing each stock's returns separately on monetary policy surprises is not fruitful because the majority of stocks have high return volatility or lack a long enough return history, which leads to noisy exposure estimates
- Estimating policy exposure of portfolios based on a given firm characteristic will produce mixed results, which reflects the difficulty of capturing the entire cross-sectional variation in the policy sensitivity of stock prices with a single firm characteristic
- Our method is that we are not constrained by the availability of the policy surprise data.

2. Variables

2) Monetary policy Surprise

$$\Delta i_{GSS,tight} = \frac{D}{D-d}\left(f^0_{m,d,\text{Post 2:35 pm}} - f^0_{m,d,\text{Pre 2:05 pm}}\right)$$

$$MPS_t = -\Delta i_{GSS,tight}$$

- where D is the number of days in the month and $f^0_{m,d}$ is the federal funds rate implied by the federal funds future contract expiring in the current month.
- Advantages:
  - No predictable time-varying risk premiums.
  - A sufficient statistic when studying stock prices.

2. Variables

3) monetary policy transmission mechanisms

- a) Financial constraints (Credit channel): Negative

$$\begin{aligned} WW_{i,t} = &-0.091 \times CF_{i,t} - 0.062 \times DIVPOS_{i,t} \\ &+ 0.021 \times TLTD_{i,t} - 0.044 \times LNTA_{i,t} \\ &+ 0.102 \times ISG_{i,t} - 0.035 \times SG_{i,t} \end{aligned}$$

- b) Cash and short-term investments (Liquidity effect): Both
- c) Cash flow duration (Discount rate effect): Positive

$$\begin{aligned} \text{CF Duration}_t = &\frac{\Sigma_{s=1}^{T} s \times CF_{t+s}/(1+r)^t}{P_t} + T \\ &+ \frac{1+r}{r} \times \frac{P_t - \Sigma_{s=1}^{T} CF_{t+s}/(1+r)^s}{P_t} \end{aligned}$$

2. Variables

3) monetary policy transmission mechanisms

- d) Cash flow volatility: Both
- e) Operating profitability (Nominal rigidities): Negative
- f) Others (FE) : including firm, meeting, industry, and rating fixed effects, as well as interactions of the industry and rating fixed effects with the monetary policy surprises.

$$r_{it}^{\mathrm{ID}} = \alpha + \Sigma_{k=1}^{n} \beta_k x_{it}^k + \Sigma_{k=1}^{n} \gamma_k MPS_t \times x_{it}^k + \mathrm{Controls}_{it} + \varepsilon_{it}$$

$$MPE_{it} = \Sigma_{k=1}^{n} \hat{\gamma}_k \times x_{it}^k$$

$$\begin{aligned} \mathrm{MPE} = & -1.60 \times \text{Whited –Wu} - 0.87 \times \text{Cash} \\ & + 0.63 \times \text{CF Duration} \\ & + 4.36 \times \text{CF Volatility} - 5.74 \\ & \times \text{Operating Profitability.} \end{aligned}$$

3. Empirical results

1) Data

- **Source:** CRSP and Compustat
- **Time**: pre-1994; 1994-2008; post-2008
- **Details**: we exclude financial firms and utilities both in regression estimating and asset pricing tests.

Variable			Percentiles				
	n	Mean	5th	25th	50th	75th	95th
Whited–Wu	229,091	0.41	0.04	0.20	0.40	0.61	0.84
Cash	229,091	0.12	0.00	0.02	0.06	0.15	0.41
CF duration	229,091	0.53	0.09	0.35	0.57	0.73	0.90
CF volatility	229,091	0.08	0.02	0.03	0.05	0.09	0.18
Operating profitability	229,091	0.06	0.00	0.03	0.05	0.07	0.14

3. Empirical results

2) Monetary policy exposure estimation

$$r_{it}^{ID} = \alpha + \Sigma_{k=1}^{n} \beta_k x_{it}^k + \Sigma_{k=1}^{n} \gamma_k MPS_t \times x_{it}^k + \text{Controls}_{it} + \varepsilon_{it}$$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Whited–Wu		0.08					0.07
		[2.85]					[2.56]
Cash			− 0.01				−0.03
			[-0.18]				[−0.70]
CF duration				−0.05			−0.04
				[−3.15]			[−3.38]
CF volatility					−0.32		−0.32
					[−3.01]		[−3.07]
Operating profitability						0.62	0.53
						[3.12]	[2.96]
MPS	2.39						
	[3.43]						
MPS × Whited–Wu		−1.64					−1.60
		[−3.04]					[−2.47]
MPS × Cash			−0.90				−0.87
			[−2.34]				[−2.12]
MPS × CF duration				0.94			0.63
				[3.21]			[2.56]
MPS × CF volatility					4.08		4.36
					[2.55]		[2.58]
MPS × Operating profitability						−8.29	−5.74
						[−2.63]	[−2.02]
Firm FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Meeting FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE × MPS	No	Yes	Yes	Yes	Yes	Yes	Yes
Rating FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Rating FE × MPS	No	Yes	Yes	Yes	Yes	Yes	Yes
n	313,198	284,060	301,463	254,169	239,734	294,505	229,091
$\bar{R}^2$(%)	1.71	14.18	13.47	15.05	15.39	13.74	15.99

$$\begin{aligned}\text{MPE} = &-1.60 \times \text{Whited -Wu} - 0.87 \times \text{Cash} \\ &+ 0.63 \times \text{CF Duration} \\ &+ 4.36 \times \text{CF Volatility} - 5.74 \\ &\times \text{Operating Profitability.}\end{aligned}$$

3. Empirical results

3) External validity: out-of-sample

$$r_{it} = \alpha_i + \beta \text{MPE}_{it} + \gamma \text{MPS}_t \times \text{MPE}_{it} + \text{Controls}_{it} + \varepsilon_{it}$$

$$\text{MPS}^{\text{ED1,tight}} = -(ED1_{\text{Post 2:35 pm}} - ED1_{\text{Pre 2:05 pm}})$$

$$\text{MPS}^{\text{ED1,wide}} = -(ED1_{\text{Post 3:00 pm}} - ED1_{\text{Pre 2:00 pm}})$$

	1988–1993	1994–2008	2009–2015	
	(1)	(2)	(3)	(4)
MPE	−0.00	−0.06	−0.00	0.00
	[−2.41]	[−3.28]	[−0.69]	[0.17]
$\text{MPS}^{\text{GSS,tight}} \times$ MPE	1.98	1.00		
	[2.48]	[3.22]		
$\text{MPS}^{\text{ED1,tight}} \times$ MPE			2.04	
			[3.83]	
$\text{MPS}^{\text{ED1,wide}} \times$ MPE				1.93
				[4.24]
Firm FE	Yes	Yes	Yes	Yes
Meeting FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Industry FE × MPS	Yes	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes	Yes
Rating FE × MPS	Yes	Yes	Yes	Yes
n	63,895	229,091	93,230	80,817
N	40	116	48	48
$\bar{R}^2$ (%)	4.81	15.99	48.51	45.12

3. Empirical results

4) Asset pricing implications of monetary policy exposure

- From 1975-01 to 2015-12

Panel A: Excess returns and alphas on MPE-sorted portfolios

	(L)	(2)	(3)	(4)	(H)	(L-H)
r^e	1.30	1.03	0.87	0.69	0.53	0.76
	[5.08]	[4.22]	[3.84]	[3.37]	[2.58]	[4.91]
α^{CAPM}	0.59	0.32	0.19	0.07	−0.11	0.69
	[4.56]	[3.12]	[2.39]	[1.03]	[−1.98]	[4.46]
α^{FF3}	0.37	0.18	0.11	0.04	0.01	0.36
	[4.42]	[2.13]	[1.41]	[0.58]	[0.17]	[3.73]
$\alpha^{FF3+UMD}$	0.53	0.30	0.18	0.06	−0.01	0.54
	[6.96]	[3.63]	[2.42]	[0.86]	[−0.11]	[5.97]
α^{FF5}	0.36	0.15	0.04	−0.04	−0.03	0.39
	[4.27]	[1.72]	[0.55]	[−0.66]	[−0.69]	[4.00]

Panel B: Loadings on Fama and French (2015) 5-factor model of MPE-sorted portfolios

	(L)	(2)	(3)	(4)	(H)	(L-H)
β_{MKT}	1.04	1.08	1.08	1.01	0.99	0.05
	[51.25]	[51.80]	[58.69]	[64.64]	[90.55]	[2.02]
β_{SMB}	0.78	0.48	0.22	0.05	−0.13	0.90
	[25.94]	[15.46]	[8.11]	[2.15]	[−7.75]	[26.00]
β_{HML}	0.19	0.14	0.06	−0.02	−0.25	0.44
	[4.86]	[3.48]	[1.81]	[−0.52]	[−12.01]	[9.80]
β_{RMW}	0.05	0.11	0.10	0.11	0.05	−0.00
	[1.40]	[2.66]	[2.89]	[3.69]	[2.61]	[−0.01]
β_{CMA}	0.01	−0.02	0.11	0.15	0.06	−0.06
	[0.14]	[-0.38]	[2.01]	[3.37]	[2.00]	[−0.81]

3. Empirical results

5) Additional evidence on the stabilizer channel

- The long/short (low-minus-high MPE) portfolio should react more positively to news about employment and consumer price index that leads to an expectation of tighter monetary policy
- The response of the low-minus-high MPE portfolio to employment and CPI news should largely disappear once we control for the expected changes in future policy rates due to the news.

$$r_t^{(\text{L-H})} = \beta' \mathbf{x_t} + \varepsilon_t$$

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.031	0.031	0.031	0.031	0.031	0.031
	[3.71]	[3.79]	[3.71]	[3.81]	[3.71]	[3.71]
Change in policy expectations	−0.091			−0.091	−0.089	−0.088
	[−2.46]			[−2.44]	[−2.33]	[−2.31]
Inflation surprise		0.013		0.008		0.008
		[1.63]		[0.89]		[0.91]
Employment surprise			0.028		0.015	0.015
			[3.18]		[1.40]	[1.41]
Drop in non-policy coefficients (p-value)				0.08	0.02	0.08
n	7250	7250	7250	7250	7250	7250
R^2	0.02	0.01	0.02	0.02	0.02	0.02

3. Empirical results

6) expanding window results and comparison

- This strategy is a low-cost implementable strategy that exhibits fairly low portfolio turnover of about 11% per month. *(Novy-Marx and Velikov (2016))*

Panel A: Excess returns and alphas on MPE-sorted portfolios

	(L)	(2)	(3)	(4)	(H)	(L-H)
r^e	1.16	0.97	0.93	0.78	0.28	0.87
	[3.10]	[2.78]	[2.92]	[2.76]	[0.81]	[2.93]
α^{CAPM}	0.56	0.40	0.38	0.28	−0.32	0.88
	[2.75]	[2.21]	[2.81]	[2.57]	[−2.27]	[2.93]
α^{FF3}	0.38	0.26	0.29	0.27	−0.22	0.61
	[2.43]	[1.74]	[2.53]	[2.52]	[−2.34]	[2.81]
$\alpha^{FF3+UMD}$	0.56	0.37	0.33	0.28	−0.27	0.83
	[4.08]	[2.67]	[2.82]	[2.60]	[−2.85]	[4.29]
α^{FF5}	0.28	0.04	0.12	0.04	−0.15	0.42
	[1.73]	[0.26]	[1.05]	[0.38]	[−1.48]	[1.92]

Panel B: Net excess returns and "generalized" Fama and French (2015) 5-factor alphas

	(L)	(2)	(3)	(4)	(H)	(L-H)
r^e_{net}	–	–	–	–	–	0.71
						[2.37]
α^{FF5*}	–	–	–	–	–	0.57
						[2.75]

3. Empirical results

7) Robustness tests

Regressions of the form $r_{tj} = \beta' \mathbf{x}_{t-1,j} + \varepsilon_{tj}$									
Coef.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MPE	−0.68	−0.82	−0.68	−0.67	−0.63	−0.71	−0.65		−0.89
	[−8.76]	[−7.10]	[−7.95]	[−8.37]	[−8.51]	[−8.55]	[−8.92]		[−6.14]
log(ME)		0.03						−0.12	0.06
		[0.49]						[−2.76]	[1.26]
log(B/M)			0.08					0.26	−0.01
			[1.00]					[3.91]	[−0.18]
GP/A				−0.05				0.58	−0.27
				[−0.28]				[4.01]	[−1.90]
Investment					−0.69			v0.68	−0.54
					[−5.51]			[−8.82]	[−6.01]
$r_{12,1}$						0.61		0.32	0.52
						[3.18]		[1.81]	[2.93]
$r_{1,0}$							−4.58	−5.41	−5.36
							[−9.25]	[−12.68]	[−12.82]
R^2	0.50	1.71	1.11	0.87	0.74	1.54	1.43	3.35	4.12
n	492	492	492	492	492	492	492	492	492

3. Empirical results

7) Robustness tests

Excluding FOMC meetings.

Panel A: Excess returns and alphas on MPE-sorted portfolios

	(L)	(2)	(3)	(4)	(H)	(L-H)
r^e	1.11	0.84	0.66	0.47	0.32	0.79
	[4.52]	[3.52]	[2.99]	[2.34]	[1.60]	[5.36]
α^{CAPM}	0.44	0.16	0.02	−0.12	−0.28	0.73
	[3.36]	[1.44]	[0.16]	[−1.51]	[−4.01]	[4.92]
α^{FF3}	0.22	0.02	−0.07	−0.16	−0.19	0.42
	[2.36]	[0.19]	[−0.83]	[−2.00]	[−2.88]	[4.41]
$\alpha^{FF3+UMD}$	0.35	0.12	−0.01	−0.15	−0.22	0.57
	[3.85]	[1.21]	[−0.13]	[−1.85]	[−3.17]	[6.34]
α^{FF5}	0.20	−0.03	−0.14	−0.25	−0.23	0.43
	[2.05]	[−0.26]	[−1.56]	[−3.06]	[−3.36]	[4.51]

Conditional double sort on beta and MPE.

		MPE quintiles					
		(L)	(2)	(3)	(4)	(H)	(L-H)
Beta quintiles	(L)	1.89	1.34	1.07	0.88	0.41	1.49
							[5.86]
	(2)	1.43	1.31	0.80	0.78	0.63	0.80
							[4.03]
	(3)	1.43	1.10	1.02	0.78	0.59	0.84
							[4.52]
	(4)	1.61	1.22	0.92	0.84	0.48	1.13
							[5.45]
	(H)	1.36	1.14	0.73	0.80	0.58	0.79
							[2.90]

4. Conclusion

- we generate a monetary policy exposure index based on observable firm characteristics that are likely to capture how stocks react to monetary policy according to previous literature.
- we find that stocks that react more positively to expansionary monetary policy surprises earn lower average returns.
- We also provide evidence that this pattern is consistent with the fact that the central bank aims to stabilize the economy after economic shocks so that firms with higher monetary policy exposure provide a hedge against these shocks.