Getting to the Core: Inflation Risks Within and Across Asset Classes

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Introduction

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  - One of the most important topics of the time
  - The financial market highly sensitive to inflation news

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- This paper
  - Decomposes inflation into core and noncore components - in particular, energy
  - Uses data from 8 asset classes and shows that conventional wisdom tells only part of the truth

Main Findings

- Core inflation hedge: none
- Energy inflation hedge: stocks, currencies, commodities, and REITs
- Core inflation carries a negative risk premium
  - Magnitude consistently estimated within and across asset classes!
- The price of energy inflation risk: positive but insignificant
- Provide new insights on driver of the changing stock-bond correlation
- A two-sector NK model that accounts for the facts above

Related Literature

- Inflation hedging
  - Fama and Schwert (1977), Fama (1981), Boudoukh and Richardson (1993), Bekaert and Wang (2010), Katz, Lustig, and Nielsen (2017)
- Inflation risk premium
  - Chen, Roll, and Ross (1986), Hollifield and Yaron (2003), Ang, Bekaert, and Wei (2008), Ajello, Benzoni, and Chyruk (2019), Boons, Duarte, de Roon, and Szymanowska (2019), Cooper, Mitrache, and Priestley (2020), Andrews, Colacito, Croce, and Gavazzoni (2021)
- Equilibrium models of inflation, macroeconomy, asset prices
  - Buraschi and Jiltsov (2005), Piazzesi and Schneider (2006), Bansal and Shaliastovich (2012), Kung (2015), Weber (2015), Eraker, Shaliastovich, and Wang (2016), Bhamra, Dorion, Jeanneret, and Weber (2020), Pflueger and Rinaldi (2020)
- Stock-bond correlation
  - Campbell, Sundarem, and Viceira (2017), Campbell, Pflueger, and Viceira (2019), Song (2016), Cieslak and Pang (2020)
- Commodity prices, inflation, and other asset classes
  - Barro and Misra (2016), Ready, Roussanov, and Ward (2017, 2018), Ready (2017, 2018), Bakshi, Gao, and Rossi (2019)

Empirics

Inflation Summary Statistics

	Headline	Core	Food	Energy
	A. Summary Statistics			
Mean	3.76	3.75	3.75	4.01
Std	3.24	2.66	4.04	19.52
Persist	0.60	0.79	0.43	0.04
	B. Contribution to Headline			
	1.00	0.71	0.20	0.09
	C. Correlation			
Headline	1.00			
Core	0.80	1.00		
Food	0.60	0.44	1.00	
Energy	0.69	0.20	0.17	1.00

Sample: 1963Q3 to 2019Q4

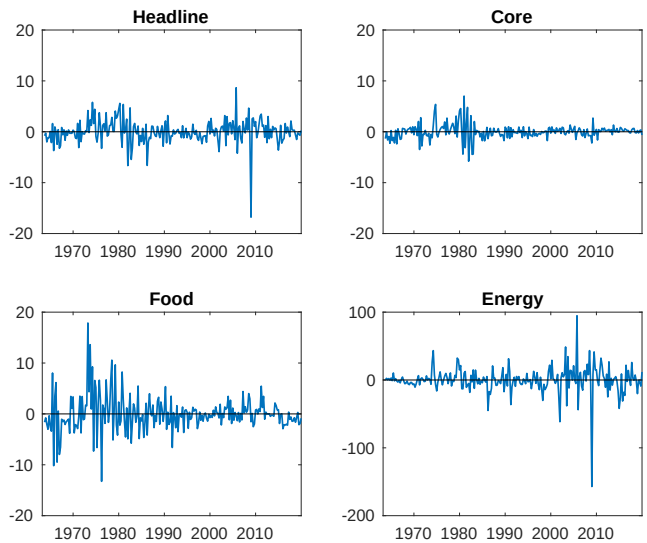
- Similar mean, different volatility and persistence
- Core accounts for the largest portion
- Three components have low correlations

Inflation Shocks

- VAR, u_t as shocks, normalized to unit variance

$$Y_t = c + AY_{t-1} + u_t$$

- Y_t includes headline inflation and its components, p/d ratio, risk-free rate, and output gap



- Alternative: using survey data to extract shocks

▸ VAR details

Portfolios

Wide and standard asset classes

- 8 asset classes: stock, Treasury, agency bond, corporate bond, currency, commodity future, REITs, and international stocks
- An average portfolio in each asset class
- A cross-section in each asset class, in total 38 portfolios

▸ portfolios

- An expanded cross-section in each class for within-class study

Inflation Exposure: 8 Average Portfolios

		A. Headline		B. Core and Energy			
	Mean	Headline β	t-stat	Core β	t-stat	Energy β	t-stat
Trea	2.07	-2.53	(-7.06)	-2.51	(-4.27)	-0.20	(-4.57)
Agen	2.44	-1.62	(-5.42)	-2.25	(-4.28)	-0.09	(-2.75)
Corp	3.08	-1.60	(-4.38)	-2.98	(-4.91)	-0.05	(-1.08)
Stock	6.80	-1.33	(-1.38)	-5.60	(-3.69)	0.21	(1.81)
Intl	6.09	-1.20	(-1.23)	-5.78	(-3.74)	0.19	(1.70)
REIT	7.96	0.31	(0.27)	-6.54	(-3.30)	0.31	(2.48)
Curr	1.76	1.04	(2.02)	-1.04	(-0.65)	0.13	(2.54)
Comm	4.47	8.59	(7.53)	-0.07	(-0.04)	1.10	(8.21)

- Fixed-income exposed negatively to both core and energy
- Stocks and REITs have significant negative core beta and positive energy beta
- Currencies and commodities only hedge energy inflation

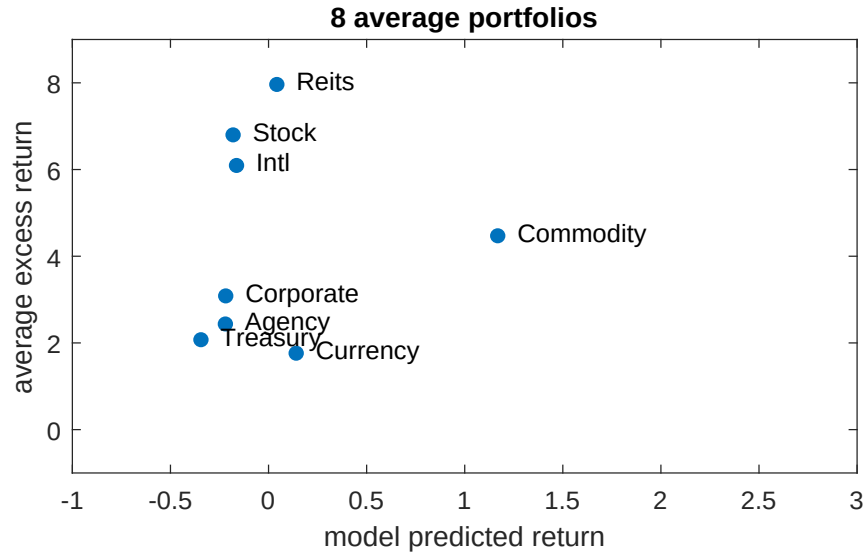
▸ 38 Portfolios

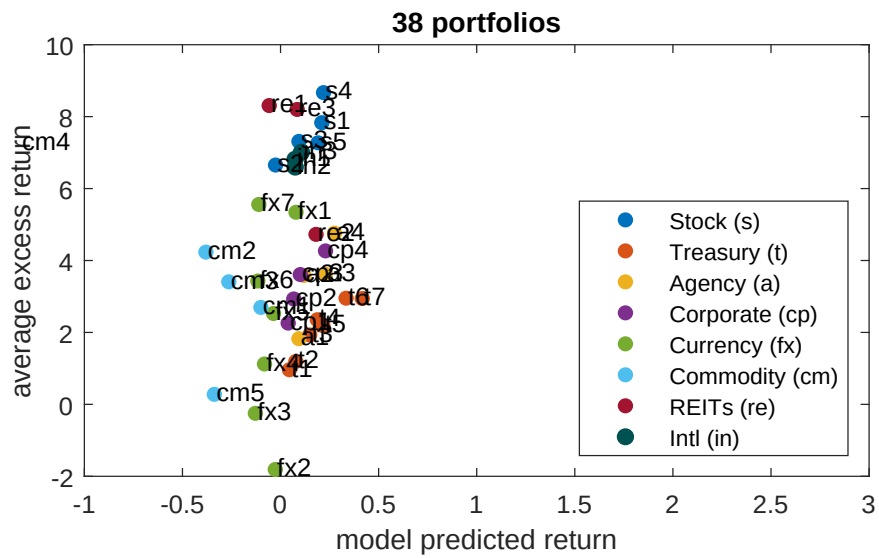
Price of Risk Estimates

	A. 8 Average Portfolios		B. 38 Portfolios	
headline	0.14		-0.08	
t-stat	(0.47)		(-0.32)	
core		-1.03		-1.07
t-stat		(-2.94)		(-3.72)
energy		3.86		3.81
t-stat		(1.35)		(1.36)
R^2	0.44	0.98	0.41	0.82

- Only core inflation carries a significant price of risk
- The price of risk estimate is consistent using both sets of portfolios

Expected Return Data vs. Model: Headline





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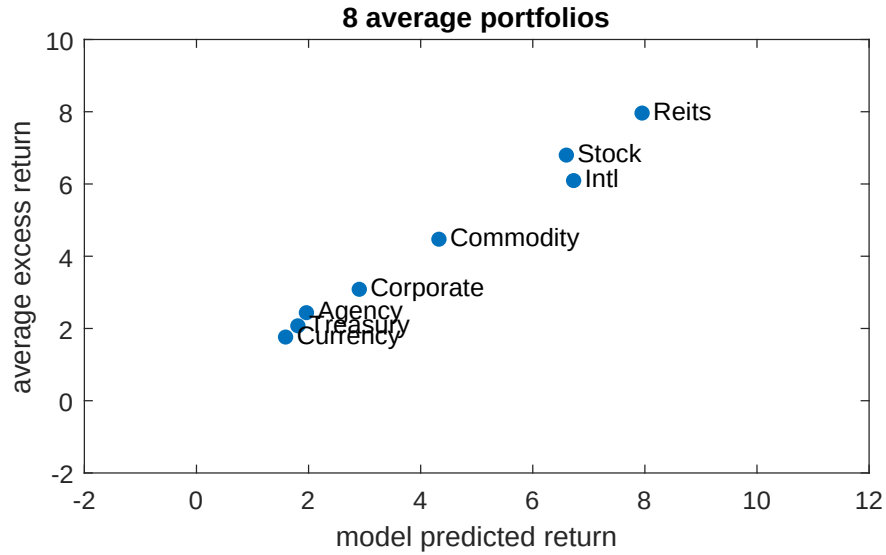

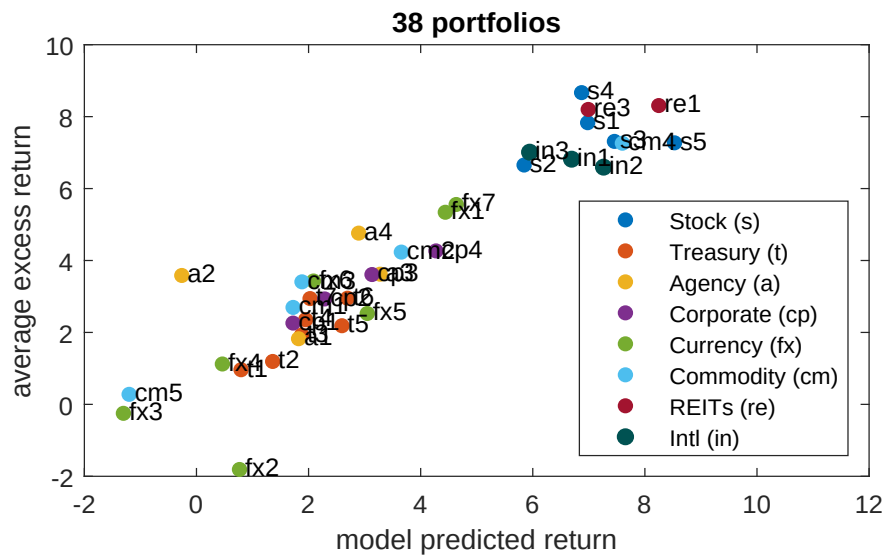

Core Inflation Factor Mimicking Portfolios

- Portfolio weights $\omega = (\beta\beta')^{-1}\beta$, where β's are the first-stage estimates

	Stock	Treasury	Agen	Corp	Curr	Comm	REIT	Intl	Aver	All
					A. Core					
mean	-1.26	-0.86	-0.68	-1.05	-1.13	-1.38	-1.05	-0.97	-0.91	-0.99
t-stat	(-3.31)	(-2.84)	(-2.09)	(-3.06)	(-3.92)	(-1.16)	(-3.25)	(-2.09)	(-2.92)	(-3.61)
SR	-0.44	-0.36	-0.27	-0.49	-0.64	-0.17	-0.51	-0.31	-0.40	-0.49
					B. Energy					
mean	2.02	0.64	-8.25	6.66	1.34	12.73	3.47	8.08	5.23	5.71
t-stat	(0.61)	(0.19)	(-1.30)	(2.07)	(0.18)	(1.88)	(0.55)	(1.58)	(2.03)	(2.10)
SR	0.09	0.03	-0.18	0.30	0.03	0.36	0.09	0.24	0.28	0.29
					C. Headline					
mean	-2.81	-0.80	-1.39	-1.40	0.79	1.07	0.89	-2.92	0.13	-0.11
t-stat	(-3.36)	(-2.24)	(-3.07)	(-2.85)	(0.88)	(1.61)	(1.12)	(-2.34)	(0.42)	(-0.35)
SR	-0.45	-0.30	-0.46	-0.42	0.17	0.29	0.18	-0.34	0.06	-0.05

- The average return of core FMP is consistent across asset classes with largely similar Sharpe ratios

Other Macroeconomic Factors

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	Cons	Cons/Dur	IP	Pay	Unem	HHL	Unf Cons	Cap
core	-1.06	-1.04	-1.07	-1.07	-1.06	-1.04	-1.07	-1.08
t-stat	(-3.69)	(-3.67)	(-3.51)	(-3.27)	(-3.39)	(-3.48)	(-3.70)	(-3.72)
energy	3.90	4.38	4.08	3.68	3.84	3.97	3.98	3.94
t-stat	(1.29)	(1.36)	(1.38)	(1.33)	(1.36)	(1.29)	(1.44)	(1.38)
macro	0.10	0.17	-0.34	-0.08	0.11	0.46	0.00	-0.31
t-stat	(0.18)	(0.32)	(-0.24)	(-0.16)	(0.26)	(0.62)	(0.26)	(-0.59)
macro2		-2.62				-0.01		
t-stat		(-0.67)				(-0.58)		
R^2	0.82	0.82	0.82	0.82	0.82	0.81	0.82	0.80

Conventional Wisdom Revisited: Currencies

		A. Headline		B.Core and energy			
	Mean	Headline β	t-stat	Core β	t-stat	Energy β	t-stat
Dol-carry	5.34	-0.98	(-1.52)	-4.17	(-2.08)	0.00	(-0.04)
Carry-1	-1.81	0.33	(0.57)	-0.52	(-0.28)	0.06	(0.95)
Carry-2	-0.25	1.60	(2.99)	1.72	(1.03)	0.14	(2.55)
Carry-3	1.12	1.02	(1.92)	-0.04	(-0.02)	0.11	(2.02)
Carry-4	2.53	0.45	(0.74)	-2.50	(-1.34)	0.10	(1.60)
Carry-5	3.43	1.44	(2.28)	-1.28	(-0.65)	0.19	(2.94)
Carry-6	5.56	1.38	(1.87)	-3.62	(-1.60)	0.20	(2.72)
Value-1	-0.01	1.65	(2.32)	-2.12	(-0.96)	0.21	(2.94)
Value-2	1.16	1.48	(2.15)	-2.53	(-1.19)	0.20	(2.85)
Value-3	2.52	1.54	(2.23)	-1.74	(-0.82)	0.20	(2.84)
Value-4	4.14	1.43	(2.22)	-2.73	(-1.38)	0.21	(3.24)
Dol-β-1	0.83	-0.37	(-1.24)	-0.04	(-0.04)	-0.04	(-1.39)
Dol-β-2	1.68	-0.82	(-1.90)	-1.46	(-1.04)	-0.05	(-1.20)
Dol-β-3	2.57	-0.30	(-0.56)	-1.77	(-1.01)	0.02	(0.34)
Dol-β-4	3.65	0.57	(0.90)	-3.27	(-1.61)	0.12	(1.99)
Dol-β-5	3.13	-0.79	(-1.02)	-3.85	(-1.52)	0.01	(0.07)
Dol-β-6	4.87	-0.62	(-0.75)	-5.05	(-1.91)	0.04	(0.46)

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- Seven (dollar-)carry portfolios' core betas decline and energy betas increase, largely in line with averege returns

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- Dollar carry portfolio (conditioning on AFD)'s core beta is more negative and energy beta is insignificant
- Four value portfolios have similar exposures to inflation
- The six dollar beta sorted portfolios (conditional on AFD) have negative core betas
  - The larger the dollar beta, the more negative the core exposure
  - Important to condition on AFD
  - Core betas in line with average returns

Conventional Wisdom Revisited: Commodities

		A. Headline		B. Core and Energy			
	Mean	Headline β	t-stat	Core β	t-stat	Energy β	t-stat
Agriculture	0.28	4.20	(3.28)	2.06	(0.96)	0.26	(1.66)
Energy	7.26	16.51	(7.05)	-0.76	(-0.11)	1.78	(7.54)
Ind metals	4.23	4.73	(2.98)	-1.07	(-0.39)	0.66	(3.66)
Livestock	2.70	1.24	(1.24)	-1.09	(-0.66)	0.15	(1.22)
Pre metals	3.41	3.28	(2.65)	-0.22	(-0.11)	0.43	(2.96)
Gold	1.98	2.14	(1.97)	1.74	(0.91)	0.24	(1.92)
Silver	3.52	4.95	(2.63)	-0.09	(-0.03)	0.68	(3.06)
Platinum	4.36	3.40	(2.29)	7.51	(1.63)	0.26	(1.69)

- Commodities hedge against energy inflation, including gold

Core Inflation and Growth

	headline	t-stat	R^2	core	t-stat	energy	t-stat	R^2
				1 quarter				
GDP	-0.14	(-1.21)	0.02	-0.21	(-1.88)	0.00	(-0.23)	0.03
Cons	-0.22	(-2.42)	0.08	-0.22	(-2.32)	-0.01	(-0.86)	0.07
Div	-0.27	(-1.15)	0.02	-0.67	(-4.27)	0.04	(0.96)	0.06
				1 year				
GDP	-0.75	(-2.34)	0.08	-0.70	(-2.24)	-0.05	(-1.05)	0.07
Cons	-0.66	(-2.24)	0.09	-0.46	(-1.81)	-0.05	(-1.12)	0.05
Div	-1.26	(-1.12)	0.03	-2.93	(-5.78)	0.18	(0.95)	0.11

- Core inflation negatively predicts future GDP, consumption, and dividends, especially at 1-year horizon

Cash Flow and Discount Rate News

	Cash Flow News				Discount Rate News			
	Core β	t-stat	Energy β	t-stat	Core β	t-stat	Energy β	t-stat
Mkt	-2.14	(-4.12)	-0.01	(-0.23)	4.23	(3.47)	-0.19	(-2.05)
Gr	-4.96	(-5.58)	-0.11	(-1.60)	2.57	(2.57)	-0.24	(-3.14)
BM2	-2.44	(-2.83)	0.00	(-0.03)	3.07	(3.55)	-0.10	(-1.55)
BM3	-2.28	(-2.76)	-0.03	(-0.47)	2.73	(3.37)	-0.14	(-2.26)
BM4	0.71	(0.80)	0.12	(1.80)	6.27	(4.33)	-0.12	(-1.07)
VI	1.27	(1.17)	0.08	(0.92)	7.17	(4.35)	-0.14	(-1.09)

- For an average stock portfolio, negative core betas come from both CF and DR news, positive energy betas mainly come from DR news

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- For an average stock portfolio, negative core betas come from both CF and DR news, positive energy betas mainly come from DR news
- Growth vs. value portfolios's negative core beta
  - Gowth portfolio: mainly comes from CF news
  - Value portfolio: mainly comes from DR news

Time-varying Exposure and Risk

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	A. Headline		B. Core and Energy			
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Stock	-5.42	(-4.20)	-5.19	(-3.26)	-0.24	(-1.01)
Treasury	-2.88	(-5.52)	-2.77	(-4.31)	-0.20	(-2.03)
			2000-2019			
Stock	2.96	(2.22)	-6.30	(-1.18)	0.35	(2.63)
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Note: red indicates a significant change across the two subsamples.

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- No significant change in core beta; energy beta increases for stock (also corporate bond, commodity, and REITs)
- Inflation correlated positively with stock and negatively with bonds
  - Driven by energy inflation (switched signs, increased contribution)
  - New insight on the changing stock-bond correlation

Time-varying Price of Risk

How does the price of inflation risk covary with other macroeconomic variables? (Adrian et al, 2015)

- Conditioning variable F_t: term spread $10y - 3m$
- Suppose the SDF follows

$$\frac{M_{t+1} - E_t M_{t+1}}{E_t M_{t+1}} = -\lambda_t u_{t+1}, \text{where } \lambda_t = \Sigma_u^{-\frac{1}{2}} (\lambda_0 + \lambda_1 F_t)$$

- Then $E_t R^i_{t+1} = \beta_i' (\lambda_0 + \lambda_1 F_t)$

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- Then $E_t R^i_{t+1} = \beta_i' (\lambda_0 + \lambda_1 F_t)$
- Result with 38 portfolios

	Estimate	t-stat
λ_0	-0.94	(-1.70)
λ_1	-0.52	(-1.58)

Why is Core Different from Energy?

- Core good prices are more sticky
  - Categorize goods based on price stickiness: sticky inflation and flexible inflation
  - Sticky inflation is highly correlated with core and resembles core inflation's exposure and price of risk ▸ Sticky price

Model

Goals

- Core inflation is associated with core output (stock return) negatively
- Core inflation carries a negative price of risk
- Energy inflation is associated with a higher return for stocks, currencies, and commodities
- Energy inflation has a price of risk that is ambiguous in sign (positive)

Households

- Representative agent with utility function

$$E \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^{1-\gamma} - 1}{1-\gamma} - \frac{N_t^{1+\varphi}}{1+\varphi} \right]$$

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- Consumption aggregator on core good and energy good

$$C_t^{\frac{\phi-1}{\phi}} = \alpha_c C_{c,t}^{\frac{\phi-1}{\phi}} + (1-\alpha_c) \left(e^{\delta_t} C_{e,t} \right)^{\frac{\phi-1}{\phi}}$$

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- Aggregate core consumpion

$$C_{c,t}=\left[\int_i C_{c,t}(i)^{\frac{\varepsilon_t-1}{\varepsilon_t}}di\right]^{\frac{\varepsilon_t}{\varepsilon_t-1}}$$

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$$C_{c,t}=\left[\int_i C_{c,t}(i)^{\frac{\varepsilon_t-1}{\varepsilon_t}}di\right]^{\frac{\varepsilon_t}{\varepsilon_t-1}}$$

- Energy goods are endowed, exogenously
- Interest rate follows a Taylor rule $i_t=\bar{i}+\phi_\pi\pi_t$

Firms and the Philips Curve

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- Core good producers are monopolistic in each variety
- Each variety is produced with labor $Y_i = N_i^{1-\alpha}$
- They face price rigidity and set the price optimally
- Log-linearize the optimal condition, we get the NKPC

$$\pi_t = \beta E_t \pi_{t+1} + \lambda(mc_t + \mu_t)$$

where $\mu_t \equiv \ln \frac{\varepsilon_t}{\varepsilon_t - 1}$ is the desired markup, λ is a constant, mc_t is the real marginal cost, and π_t is the inflation in core good

Solution

- All endogenous variables can be solved as linear functions in μ_t, $c_{e,t}$, and δ_t

$$c_{c,t} = c_{c,\mu}\mu_t + c_{c,e}c_{e,t} + c_\delta\delta_t$$

$$\pi_t = \pi_\mu\mu_t + \pi_e c_{e,t} + \pi_\delta\delta_t$$

- The real stochastic discount factor

$$m_{t+1} = E_t m_{t+1} - \lambda_\mu\mu_{t+1} - \lambda_e c_{e,t+1} - \lambda_\delta\delta_{t+1}$$

- Solve for asset prices using the Euler equation $E(MR) = 1$

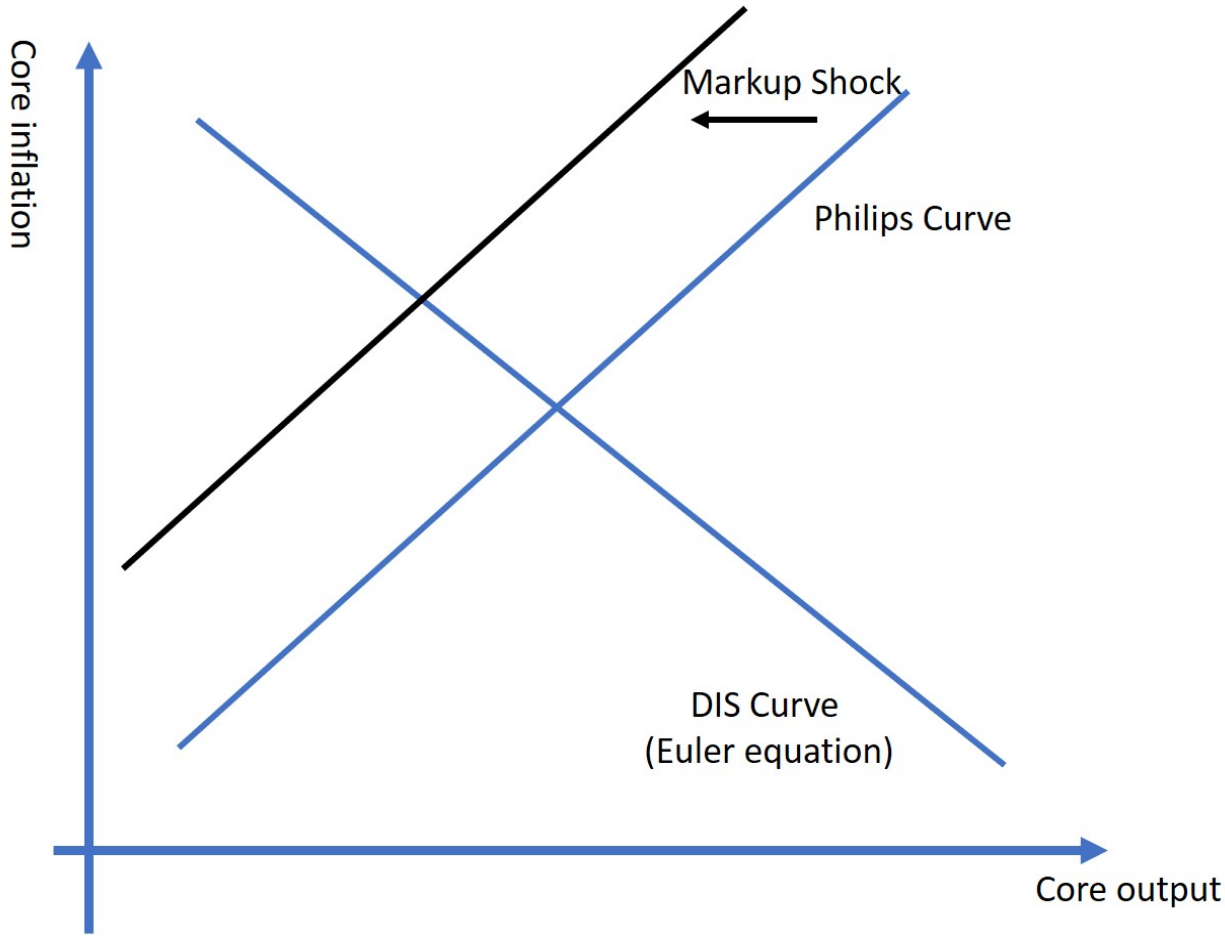
$$r_{i,t} = r_{i,\mu}\mu_t + r_{i,e}c_{e,t} + r_{i,\delta}\delta_t$$

where i represents stocks (s), bonds (b), currencies (fx), and commodities (cm)

- Goal: to determine the signs of the coefficients

▸ Equilibrium characterization

Markup Shock



- $c_{c,\mu} < 0, \pi_\mu > 0$. A higher markup shifts up the Philips curve, lowers core output and raises core inflation in equilibrium

Markup Shock: Impact on SDF and Asset Prices

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Markup Shock: Impact on SDF and Asset Prices

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- $r_{s,\mu} < 0$. Core output $\downarrow$ inflation $\uparrow \rightarrow$ Core firm dividend $\downarrow$ discount rate $\uparrow \rightarrow$ **Stock return** $\downarrow$
- $r_{b,\mu} < 0$. Inflation and its expectation $\uparrow \rightarrow$ **Bond return** $\downarrow$
- $r_{fx,\mu} < 0$. Domestic SDF $\uparrow \rightarrow$ **Foreign currency** $\downarrow$
- $r_{cm,\mu} < 0$. Core output $\downarrow$ and becomes more scarce
  - But the energy sector not moved much

Energy Shocks, Core Output and Energy Inflation

- Both energy demand and supply shocks have two effects considering marginal utility of core goods

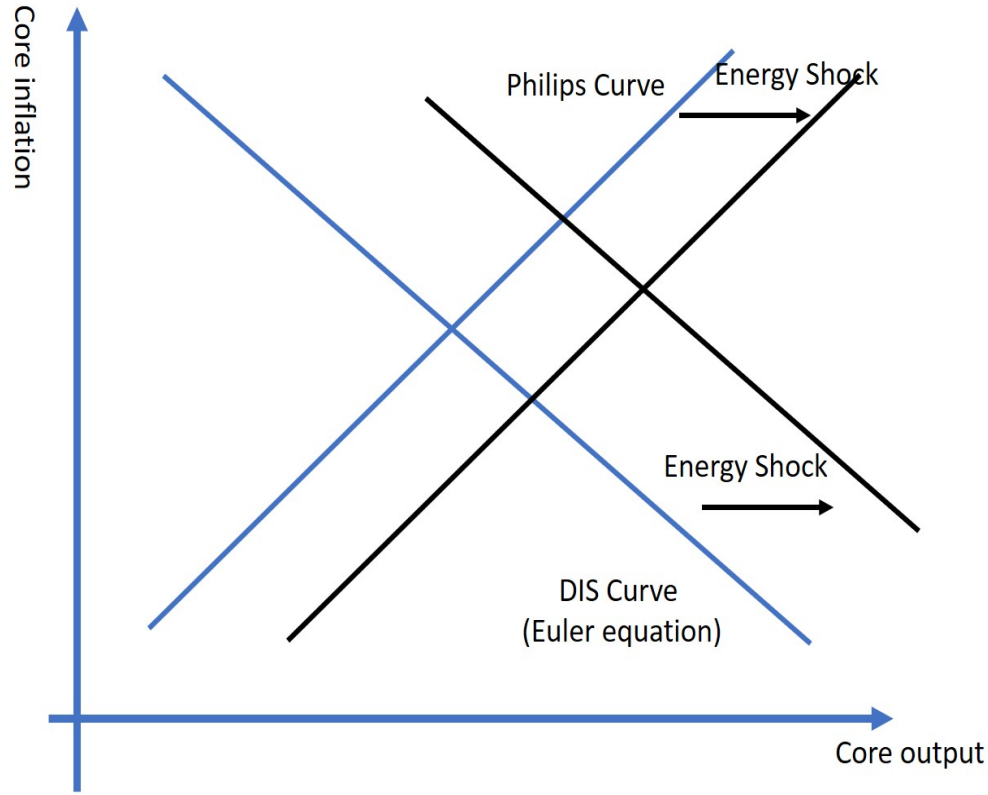
$$\log MU_t = -\gamma c_t - p_{h,t}$$

$$= -\underbrace{\gamma(\hat{\alpha}_c c_{c,t} + (1-\hat{\alpha}_c)(c_{e,t}+\delta_t))}_{(-)} \underbrace{-\frac{1-\hat{\alpha}_c}{\phi}(c_{c,t} - c_{e,t} - \delta_t)}_{(+)}$$

  - (-): Positive energy shocks raise the consumption bakset
  - (+): Positive energy shocks increase MU due to substitutability
  - When $\frac{1}{\phi} > \gamma$ (less substitutable intra-temporally than inter-temporally), (+) dominates, MU of core goods increases with energy shocks

- Supply (demand) shock lowers (raises) energy price

Energy Shocks



- Positive energy shock $\rightarrow$ Lower wage, shifts out Philips curve

$$\log MU_t + w_t - p_t = \varphi n_t$$

- Positive energy shock $\rightarrow$ Higher MU, shifts out DIS curve

$$E_t \log MU_{t+1} - \log MU_t + \bar{i} + \phi_\pi \pi_t - E_t \pi_{t+1} = 0$$

Energy Shocks, Asset Prices, and Energy Inflation

- Energy demand and supply shock have similar effect on SDF but opposite effects on energy inflation — **the price of energy inflation risk is ambiguous**
  - Positive but insignificant ($\lambda_e, \lambda_\delta > 0$)

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- Based on our evidence of positive energy beta of stock, currency, and commodity, energy demand shocks are dominant drivers of energy price

▸ Extended model

Conclusion

- A long position in stock, Treasury, agency bond, corporate bond, currency, commodity, REIT, and international stock cannot hedge core inflation
- Stocks, currencies, commodities, and REITs hedge energy inflation
- The price of risk for core inflation is negative since it contains info about bad economic fundamentals
- A two-sector NK model rationalizes these facts and implies that energy demand is the dominant driver of energy prices

VAR Estimates and Inflation Expectation

- VAR estimates (t-stats in the parenthese)

	core	energy
core	0.46 (7.41)	1.74 (2.15)
food	0.08 (2.96)	0.28 (0.77)
energy	0.01 (1.22)	-0.02 (-0.29)
rf	1.81 (3.02)	0.02 (0.00)
pd	-1.23 (-3.19)	6.13 (1.22)
output	0.06 (1.32)	0.30 (0.49)
R^2	0.70	0.04

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- Expected inflation AY_t and change of expected inflation Au_t
- Core shock u_t and shock to expected core Au_t correlation 0.90
- Energy inflation largely unpredictable

Back

Portfolio Details

- Stocks: 5 industry portfolios
- Treasuries: 7 maturity-sorted portfolios
- Agency bonds: 4 maturity-sorted portfolios
- Corporate bonds: 4 maturity-sorted portfolios
- Currencies: dollar carry and 6 carry portfolios
- Commodities: livestock, precious metal, industrial metal, energy, and agriculture
- REITs: equity, mortgage, hybrid
- International stocks: MSCI North America, Europe, Far East

Back

Inflation Exposure: 38 Portfolios

		A. Headline		B. Core and energy			
	Mean	headline β	t-stat	core β	t-stat	energy β	t-stat
			Stock				
Cons	7.83	-2.62	(-2.61)	-6.34	(-3.97)	0.06	(0.48)
Manu	6.65	0.32	(0.35)	-4.20	(-3.02)	0.36	(3.39)
HiTech	7.31	-1.17	(-1.00)	-6.07	(-3.29)	0.26	(1.86)
Health	8.67	-2.73	(-2.70)	-6.30	(-3.91)	0.04	(0.34)
Others	7.27	-2.38	(-2.08)	-7.40	(-4.09)	0.17	(1.22)
			Treasury				
1-year	0.96	-0.56	(-5.60)	-0.84	(-5.20)	-0.03	(-2.20)
3-year	1.19	-0.97	(-5.70)	-1.44	(-5.26)	-0.05	(-2.24)
5-year	1.93	-1.85	(-5.90)	-2.21	(-4.34)	-0.13	(-3.28)
7-year	2.35	-2.33	(-6.31)	-2.46	(-4.08)	-0.18	(-3.89)
10-year	2.19	-2.68	(-6.07)	-3.10	(-4.30)	-0.19	(-3.40)
20-year	2.95	-4.16	(-7.05)	-3.79	(-3.92)	-0.35	(-4.82)
30-year	2.94	-5.18	(-7.60)	-3.72	(-3.33)	-0.51	(-6.00)
			Agency Bond				
1-5 year	1.83	-1.17	(-4.99)	-1.90	(-4.66)	-0.05	(-2.03)
5-10 year	3.58	-1.48	(-3.89)	-0.26	(-0.21)	-0.14	(-3.70)
10-15 year	3.62	-2.84	(-5.69)	-3.71	(-4.25)	-0.18	(-3.10)
>15 year	4.76	-3.42	(-5.72)	-3.63	(-3.44)	-0.26	(-3.66)
			Corporate Bond				
1-3 year	2.26	-0.48	(-2.44)	-1.56	(-4.69)	0.02	(0.70)
3-5 year	2.93	-0.84	(-2.78)	-2.14	(-4.17)	0.00	(0.06)
5-10 year	3.61	-1.25	(-2.93)	-2.98	(-4.05)	-0.01	(-0.26)
>15 year	4.27	-2.85	(-4.98)	-4.47	(-4.66)	-0.13	(-1.91)

Inflation Exposure: 38 Portfolios (Cont'ed)

		A. Headline			B. Core and energy		
	Mean	Headline β	t-stat	core β	t-stat	energy β	t-stat
			Currency				
Dcarry	5.34	-0.98	(-1.52)	-4.17	(-2.08)	0.00	(-0.04)
Carry-1	-1.81	0.33	(0.57)	-0.52	(-0.28)	0.06	(0.95)
Carry-2	-0.25	1.60	(2.99)	1.72	(1.03)	0.14	(2.55)
Carry-3	1.12	1.02	(1.92)	-0.04	(-0.02)	0.11	(2.02)
Carry-4	2.53	0.45	(0.74)	-2.50	(-1.34)	0.10	(1.60)
Carry-5	3.43	1.44	(2.28)	-1.28	(-0.65)	0.19	(2.94)
Carry-6	5.56	1.38	(1.87)	-3.62	(-1.60)	0.20	(2.72)
			Commodity				
Live	2.70	1.24	(1.24)	-1.09	(-0.66)	0.15	(1.22)
Indmetal	4.23	4.73	(2.98)	-1.07	(-0.39)	0.66	(3.66)
Premetal	3.41	3.28	(2.65)	-0.22	(-0.11)	0.43	(2.96)
Energy	7.26	16.51	(7.05)	-0.76	(-0.11)	1.78	(7.54)
Agri	0.28	4.20	(3.28)	2.06	(0.96)	0.26	(1.66)
			REIT				
Equity	8.31	0.72	(0.61)	-6.48	(-3.20)	0.35	(2.77)
Mort	4.73	-2.25	(-1.63)	-8.61	(-3.56)	0.04	(0.25)
Hyb	8.20	-1.05	(-0.79)	-6.14	(-2.60)	0.12	(0.79)
			International Stock				
NorthAme	6.82	-0.92	(-0.96)	-5.47	(-3.57)	0.23	(2.02)
Europe	6.60	-0.93	(-0.85)	-6.09	(-3.48)	0.20	(1.56)
FarEast	7.01	-1.33	(-0.99)	-5.05	(-2.32)	0.15	(0.93)

▸ Back

Price Stickiness and Core Inflation

- Flexible and sticky inflation
  - Sticky inflation: a basket of items that change price slowly
  - Flexible inflation: the rest
  - Core inflation and sticky inflation correlation about 0.8

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  - Core inflation and sticky inflation correlation about 0.8

	sticky	t-stat	flexible	t-stat
A. Asset Return Exposures				
Stock	-4.68	(-2.99)	0.25	(0.61)
Trea	-1.12	(-1.86)	-0.93	(-5.93)
Agen	-0.94	(-1.93)	-0.51	(-4.20)
Corp	-1.61	(-2.70)	-0.39	(-2.56)
Curr	-1.14	(-0.69)	0.41	(2.16)
Comm	-1.53	(-0.87)	3.88	(8.51)
REIT	-4.35	(-2.38)	0.61	(1.38)
Intl	-4.95	(-3.27)	0.23	(0.58)
B. Price of Risks				
8 portfolios	-1.50	(-2.61)	0.45	(0.47)
38 portfolios	-1.45	(-3.49)	-0.21	(-0.24)

- Sticky inflation resembles core Back