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Macro-Economic Developments and Accounting Estimates

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Earnings and the Macroeconomy

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Accounting earnings and the macroeconomy

- Internal view: Managers aim to improve revenues and lower costs

$$Earnings = Revenue - Expenses$$

- External view: Firm is a 'nexus of contracts'
  - Manager's aim to take advantage of changes in external environment
  - Strategically change exposure to various macroeconomic factors
  - Corporate decision change "exposures" to steer firm based on macroenvironment

$$Earnings = \beta_0 Inflation + \beta_1 Real\ GDP\ growth + \beta_2 Employment + \beta_3 Population\ growth + \beta_4 Demographic\ changes + \beta_5 Regulatory\ effects + \beta_6 Other\ macro\ factors$$

Choosing Macro Exposure

Managers steer multiple wheels anticipating the constantly changing roads ahead

External view of earnings :

- Offers an alternative model to predict earnings
- Presents an alternative way way to evaluate performance
- Enables better understanding of investor behavior (e.g. Post-earnings-announcement drift)

Earnings prediction models

- Internal-view prediction model:
  - Relatively simple
  - Ignores changes in macro expectations
  - Assumes a stable structural model

$$Earnings(t) = \alpha_0\, Cash\ flow(t-1) + \alpha_1 Accruals(t-1) + \alpha_2 BVE(t-1)$$

- External-view prediction model
  - Allows expectations of macro-activities to change over time
  - Noisy model, if all relevant factors are not considered
  - Difficult to estimate with time-varying macro exposures

$$Earnings(t) = f\{\beta_0 E\big(Inflation(t)\big),$$
$$\beta_1 E\big(Real\ GDP\ growth(t)\big), \beta_2 E\big(Employment(t)\big),$$
$$\beta_3 E(Population\ growth(t), \beta_4 E\big(Demographic\ changes(t)\big),$$
$$\beta_5 E\big(Regulatory\ effects(t)\big), \beta_6 E(Other\ macro\ factors(t))\}$$

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Predominant approach in academic studies

- External-view prediction model
  - Allows expectations of macro-activities to change over time
  - Requires macro-exposures to be relatively stable
  - Noisy model, if all relevant factors are not considered
  - Difficult to estimate with time-varying macro exposures

$$Earnings(t) = f\{\beta_0 E\big(Inflation(t)\big),$$
$$\beta_1 E\big(Real\ GDP\ growth(t)\big), \beta_2 E\big(Employment(t)\big),$$
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Predominant approach in practice (analysts' reports)

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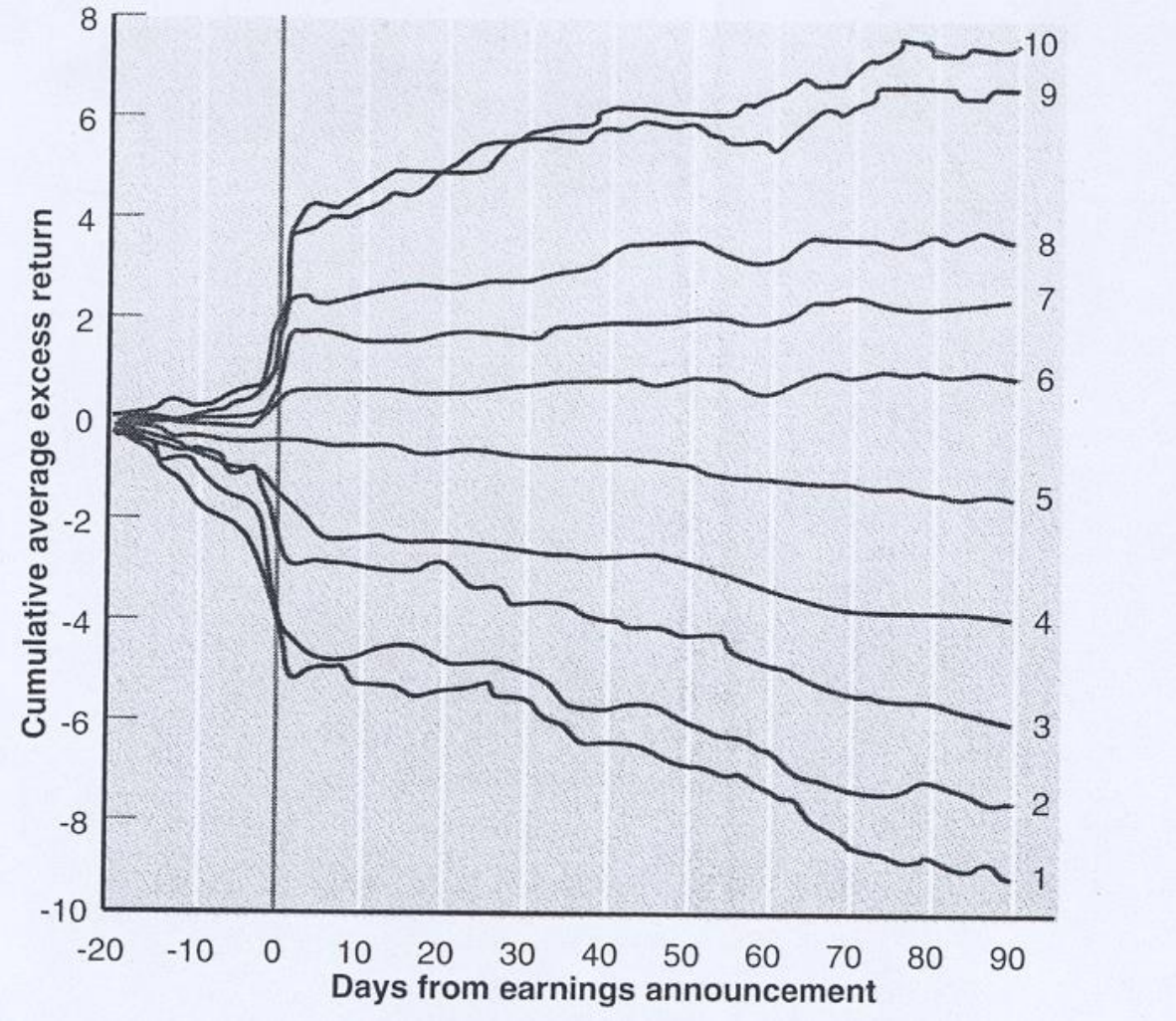
Post-Earnings-Announcement Drift and Inflation Exposure

Post-earnings-announcement drift (PEAD): Price Reactions to Quarterly Earnings Report



1. Global phenomenon
2. Under-reaction to earnings persists for 9 months
3. Exists mainly in illiquid stocks
4. A hedge portfolio that is long on P10 stocks and short on P1 stocks earns about 1% per month in the next few months.
5. Not compensation for risk
6. Investors fail to incorporate earnings autocorrelation
   - But why?
   - Investor and analysts inattention?

Payoffs to PEAD (1972-2005)

$$SUE = \frac{\Delta E_{iq}}{Std\ dev(\Delta E_{iq})}$$

SUE-sorted portfolio	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	PMN = P1-P10	Fama-French 3-factor alpha	t-stat
Average monthly Returns in 3-months post-formation (%)	0.62	0.78	0.77	0.96	1.06	1.22	1.45	1.65	1.77	1.94	1.31	1.42	9.10

Source: Chordia et al. (FAJ, 2009)

Do investors account for inflation exposure?

Chordia and Shivakumar (JAR, 2005)

Changes in earnings contain macro-economic information

$$\Delta E_{it} = \beta_{Ei} INF_t + \varepsilon_{it}$$

ΔE_{it} : Change in earnings for firm i in period t

INF_t : Inflation in period t

β_{Ei} : Exposure of firm i to inflation

ε_{it} : idiosyncratic change in earnings for firm i

Sorting firms in a month on ΔE_{it} (or its standardized variant, SUE) should sort on inflation exposure, β_{Ei}.

Inflation Effects for Earnings

- Why inflation matters?
  - Adjustment costs: Not everyone shifts prices at the same time

- What determines inflation exposure?
  - Bargaining power with customers and suppliers
  - Fixed or floating prices in customer and supplier contracts
  - Elasticity of labour supply
  - Fixed or floating interest rates
  - Hedging contracts

Chordia and Shivakumar (JAR, 2005)

$$\Delta E_{it} = \beta_{Ei} INF_t + \varepsilon_{it}$$

Conjecture

- Firms with high SUE, have high earnings exposure to inflation and do well in the future quarters on account of inflation
- Firms with low SUE, have low inflation exposure and future inflation does not benefit these firms as much. So, perform poorly in future quarters

Testable predictions

- H1: Inflation exposure varies across SUE-sorted portfolios
- H2: If investors ignore β_{Ei} in their earnings forecasts, then future returns should vary predictably across the SUE-sorted portfolios.
    - H3: The returns to SUE portfolios should be predicted by inflation

Inflation Exposure and future monthly returns to SUE-sorted portfolio

Dependent variable:		P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	*PMN =P10-P1*
Inflation	**Coeff**	-0.093	0.004	0.024	0.034	0.040	0.062	0.104	0.162	0.220	0.394	0.49
Exposure	***t*-stat**	-2.52	0.13	0.67	1.29	1.31	2.31	3.47	5.07	5.97	7.93	
Monthly	**Coeff**	0.78	1.00	1.05	1.22	1.37	1.42	1.50	1.61	1.63	1.70	0.92
Returns(%)	**t-stat**	2.46	3.25	3.40	3.91	4.49	4.79	5.11	5.53	5.62	6.00	7.31

Inflation Exposure and future monthly returns to SUE-sorted portfolio

Dependent variable:		P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	PMN =P10-P1
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Supports H1: Inflation exposure varies across SUE-sorted portfolios

Regression of quarter-ahead returns on inflation for SUE-sorted portfolios

	ALL firms	P_1	P_5	P_{10}	F-test
Regression:	**(1)**	**(3)**	**(4)**	**(5)**	
Intercept	−0.677	−2.448	−1.131	0.206	0.00
	(−15.13)	(−8.21)	(−4.60)	(0.67)	
INF$_{q,q}$		−0.352	0.149	0.568	0.00
		(−2.51)	(0.98)	(4.01)	
SUE$_{i,q}$	0.480	−0.063	0.644	0.324	0.00
	(22.95)	(−1.56)	(0.81)	(3.80)	
SUE$_{i,q-1}$	0.124	0.167	−0.208	0.038	0.08
	(4.18)	(2.11)	(−2.27)	(0.40)	
SUE$_{i,q-2}$	0.088	0.233	−0.032	−0.069	0.02
	(2.86)	(2.60)	(−0.35)	(−0.64)	
SUE$_{i,q-3}$	−0.071	0.004	0.100	−0.233	0.27
	(−2.42)	(0.04)	(1.13)	(−2.25)	
MKT$_{q+1}$	0.985	1.000	0.978	0.992	0.41
	(169.43)	(53.49)	(51.37)	(54.75)	
SMB$_{q+1}$	0.605	0.664	0.660	0.527	0.00
	(80.56)	(26.58)	(26.27)	(22.54)	
HML$_{q+1}$	0.456	0.526	0.472	0.380	0.00
	(68.54)	(24.56)	(21.13)	(18.75)	
Adj R^2 (%)	21.22	21.60	20.30	21.40	
No. of obs.	181752	18023	18431	18515	

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Supports H2: If investors ignore β_{Ei} in their earnings forecasts, then future returns should vary predictably across the SUE-sorted portfolios.

Returns to PMN in months sorted by lagged inflation

Hedge-Portfolio PMN = P10 – P1

		Low inflation	Medium inflation	High inflation	High – Low
$INF_{t-2,t-2}$ (%)	**Mean**	0.09	0.34	0.80	0.71
PMN_t (%)	**Mean**	0.48	0.95	1.31	0.83
	***t*-stat**	(2.38)	(5.58)	(4.89)	(2.45)
Fama–French-adjusted returns (%)	**Mean**	0.71	1.02	1.59	0.88
	***t*-stat**	(3.97)	(6.51)	(7.37)	(3.13)

Regression of PMN returns on lagged inflation

	Return-measurement period							
	3-months		6-months		9-months		12 months	
INTERCEPT	3.71	4.39	8.82	9.37	13.33	13.99	16.46	16.75
	(2.47)	(2.95)	(4.37)	(4.77)	(4.59)	(4.94)	(3.84)	(4.08)
INF $_{t-4,\ t-2}$	1.17		2.41		3.51		4.42	
	(2.50)		(3.41)		(3.74)		(4.56)	
INF $_{t-11,\ t-2}$		0.52		0.82		1.07		1.05
		(3.70)		(3.52)		(3.40)		(2.79)
MKT	−0.06	−0.05	−0.11	−0.12	−0.11	−0.14	−0.13	−0.17
	(−1.38)	(−1.29)	(−2.52)	(−2.83)	(−2.26)	(−2.81)	(−2.18)	(−2.72)
SMB	−0.29	−0.30	−0.25	−0.27	−0.23	−0.24	−0.24	−0.24
	(−3.97)	(−4.37)	(−3.71)	(−4.00)	(−3.17)	(−3.34)	(−2.96)	(−2.83)
HML	−0.16	−0.17	−0.06	−0.08	−0.06	−0.09	−0.04	−0.08
	(−2.40)	(−2.64)	(−0.84)	(−1.18)	(−0.77)	(−1.22)	(−0.57)	(−0.98)
SUE$_{pmn,q}$	0.03	0.03	−0.08	−0.08	−0.12	−0.12	−0.14	−0.16
	(0.82)	(0.83)	(−2.01)	(−1.95)	(−3.06)	(−2.89)	(−2.24)	(−2.35)
SUE$_{pmn,q-1}$	−1.17	−1.64	−2.63	−2.98	−3.91	−4.16	−3.99	−3.79
	(−1.70)	(−2.36)	(−2.89)	(−3.27)	(−2.60)	(−2.85)	(−2.18)	(−2.08)
SUE$_{pmn,q-2}$	0.40	0.01	0.46	−0.04	0.94	0.28	−1.01	−1.36
	(0.49)	(0.02)	(0.46)	(−0.04)	(0.75)	(0.21)	(−0.68)	(−0.85)
SUE$_{pmn,q-3}$	0.93	0.81	1.20	1.33	−0.97	−0.51	−1.34	−0.42
	(0.96)	(0.85)	(0.89)	(1.00)	(−0.56)	(−0.30)	(−0.63)	(−0.19)
***F*-test (*p*-value)**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adj R^2 (%)	20.31	23.12	24.94	25.85	28.5	27.43	33.22	28.19

Regression of PMN returns on lagged inflation

	Return-measurement period							
	3-months		6-months		9-months		12 months	
INTERCEPT	3.71	4.39	8.82	9.37	13.33	13.99	16.46	16.75
	(2.47)	(2.95)	(4.37)	(4.77)	(4.59)	(4.94)	(3.84)	(4.08)
INF $_{t-4,\,t-2}$	1.17		2.41		3.51		4.42	
	(2.50)		(3.41)		(3.74)		(4.56)	
INF $_{t-11,\,t-2}$		0.52		0.82		1.07		1.05
		(3.70)		(3.52)		(3.40)		(2.79)
MKT	−0.06	−0.05	−0.11	−0.12	−0.11	−0.14	−0.13	−0.17
	(−1.38)	(−1.29)	(−2.52)	(−2.83)	(−2.26)	(−2.81)	(−2.18)	(−2.72)
SMB	−0.29	−0.30	−0.25	−0.27	−0.23	−0.24	−0.24	−0.24
	(−3.97)	(−4.37)	(−3.71)	(−4.00)	(−3.17)	(−3.34)	(−2.96)	(−2.83)
HML	−0.16	−0.17	−0.06	−0.08	−0.06	−0.09	−0.04	−0.08
	(−2.40)	(−2.64)	(−0.84)	(−1.18)	(−0.77)	(−1.22)	(−0.57)	(−0.98)
SUE$_{pmn,q}$	0.03	0.03	−0.08	−0.08	−0.12	−0.12	−0.14	−0.16
	(0.82)	(0.83)	(−2.01)	(−1.95)	(−3.06)	(−2.89)	(−2.24)	(−2.35)
SUE$_{pmn,q-1}$	−1.17	−1.64	−2.63	−2.98	−3.91	−4.16	−3.99	−3.79
	(−1.70)	(−2.36)	(−2.89)	(−3.27)	(−2.60)	(−2.85)	(−2.18)	(−2.08)
SUE$_{pmn,q-2}$	0.40	0.01	0.46	−0.04	0.94	0.28	−1.01	−1.36
	(0.49)	(0.02)	(0.46)	(−0.04)	(0.75)	(0.21)	(−0.68)	(−0.85)
SUE$_{pmn,q-3}$	0.93	0.81	1.20	1.33	−0.97	−0.51	−1.34	−0.42
	(0.96)	(0.85)	(0.89)	(1.00)	(−0.56)	(−0.30)	(−0.63)	(−0.19)
***F*-test (*p*-value)**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adj R^2 (%)	20.31	23.12	24.94	25.85	28.5	27.43	33.22	28.19

Supports H3: The returns to SUE portfolios should be predicted by inflation

Why do investors ignore inflation exposure?

- Insufficient information to compute inflation-exposure for each firm
  - Significant time-variation in inflation exposure of a firm
  - Substantial time needed to analyse and identify inflation exposure
  - Significant uncertainty remains even after careful analysis
- Cost vs Benefit
  - At firm-level, substantial time needed to obtain marginal forecast improvements
    - Basu et al. (2010) find that analysts' ignore inflation exposures in their forecasts
  - Individual stock trading involves significant idiosyncratic risks
- Trading costs
  - Price impact of trades prevent trading based on inflation exposures unprofitable for illiquid stocks (Chordia et al., 2009)
  - Post-earnings-announcement drift persists

Conclusion

- Understanding the links between macroeconomy and accounting helps to
  - Develop better earnings prediction models
  - Improve our understanding of investor and analyst behavior
  - Aid macroeconomic predictions
  - Conduct deeper analyses of macroeconomic issues

- Literature is still in its infancy
- Significant potential exists for improving our understanding of the links between macroeconomy and accounting