Comovement

Nicholas Barberis
Andrei Shleifer
Jeffrey Wurgler

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Comovement

- there are numerous patterns of comovement in the data
  - common factors in the returns of certain groups of assets
    - e.g. stocks within the same industry
    - e.g. small stocks
    - e.g. value stocks
    - e.g. closed-end funds
- what is the source of this comovement?
  - why do certain assets comove while others do not?

Traditional view

Fundamentals-based comovement

- derived from economies without frictions and with rational investors
- assets comove because their "fundamental values" comove
  - fundamental value = rational forecast of future cash flows discounted at rate appropriate for risk
- in this view, assets comove because of:
  - correlated news about their cash flows
  - correlated changes in their discount rates
    - changes in interest rates
    - changes in risk aversion
    - correlated changes in rational perception of risk
- useful framework for understanding many types of comovement

Evidence on comovement

Twin stocks (Froot/Dabora [99])

- claims to same cash-flow stream, but traded in different locations
  - e.g. Royal Dutch / Shell
  - Royal Dutch, traded primarily in New York, is a claim to 60% of the cash flow
  - Shell, traded primarily in London, is a claim to the remaining 40%
- under traditional view of comovement, expect them to move in lockstep
  - in fact, Royal Dutch comoves more with the U.S. stock market, Shell with the U.K. market

$$r_{RD,t} - r_{SH,t} = \alpha + 0.207\, r_{S\&P,t} - 0.428\, r_{FTSE,t} + \epsilon_t$$

Evidence on comovement ctd.

Closed-end country funds

(Hardouvelis et al. [94], Bodurtha et al. [95])

- funds traded in one location, fund assets in another
- under traditional view of comovement, expect fund returns and NAV returns to move together closely
  - in fact, fund returns comove as much with market where fund is traded as with market where assets are traded

Domestic closed-end funds

(Lee et al. [91])

- closed-end funds invested in large stocks often comove with small stocks

Evidence on comovement ctd.

Small stocks and value stocks (Fama/French [95])

- there is a strong common factor in returns of small stocks and in returns of value stocks (Fama/French [93])
- Fama/French [95] test whether these factors are due to cash-flow news
- do find cash-flow factors but they line up poorly with the return factors

Commodities (Pindyck/Rotemberg [90])

- find strong comovement in price changes of seven commodities
- hard to explain comovement through news about aggregate demand

Category-based comovement

(Barberis/Shleifer [03])

- many investors allocate funds at the level of an asset category
  - simplifies the portfolio problem
  - makes it easier to evaluate money managers
- categories are based on a salient common characteristic
  - impressive past performance often spurs category formation
- categories can be identified by looking at labels on money managers' products
  - e.g. small-cap, large-cap, growth, index

Category-based comovement ctd.

- suppose categories are adopted by noise traders with correlated sentiment
- if the noise traders affect prices

  $\Rightarrow$ assets will comove simply because they are classified into the same category

  – even if fundamentals are uncorrelated

Category-based comovement ctd.

- consider a simple economy with a riskless asset and $2n$ risky assets
  - risky asset i is a claim to a distant cash flow:

$$D_{i,T} = D_{i,0} + \varepsilon_{i,1} + \ldots + \varepsilon_{i,T}$$
$$\varepsilon_t = (\varepsilon_{1,t}, \ldots, \varepsilon_{2n,t})' \sim N(0, \Sigma_D), \text{ i.i.d over time.}$$

  - denote return of asset i as $\Delta P_{i,t}$

Category-based comovement ctd.

- some investors group the risky assets into two categories, X and Y
  - suppose assets 1 through n in category X, assets $n+1$ through $2n$ in Y
  - e.g. "old economy" and "new economy" stocks
- suppose that category-based investors are noise traders, with demand:

$$N_{i,t}^{C} = \frac{1}{n}\left[A_X + u_{X,t}\right], \; i \epsilon X$$
$$N_{j,t}^{C} = \frac{1}{n}\left[A_Y + u_{Y,t}\right], \; j \epsilon Y$$

  - here $u_{X,t}$ and $u_{Y,t}$ are i.i.d over time
- the economy also contains "fundamental traders" who invest at the level of individual assets and act as arbitrageurs

Category-based comovement ctd.

- assume the following cash-flow structure:
  - for an asset i in X :

$$\varepsilon_{i,t} = \psi_M f_{M,t} + \psi_S f_{X,t} + \sqrt{(1 - \psi_M^2 - \psi_S^2)} f_{i,t}$$

  - for an asset j in Y :

$$\varepsilon_{j,t} = \psi_M f_{M,t} + \psi_S f_{Y,t} + \sqrt{(1 - \psi_M^2 - \psi_S^2)} f_{j,t}$$

  where the f shocks are all i.i.d over time, orthogonal to one another

- find that asset returns are then given by:

$$\Delta P_{i,t+1} = \varepsilon_{i,t+1} + \frac{\Delta u_{X,t+1}}{\phi_1} + \frac{\Delta u_{Y,t+1}}{\phi_2}, \; i \epsilon X$$

$$\Delta P_{j,t+1} = \varepsilon_{j,t+1} + \frac{\Delta u_{X,t+1}}{\phi_2} + \frac{\Delta u_{Y,t+1}}{\phi_1}, \; j \epsilon Y$$

- so long as arbitrage is limited in some way, two assets in same category comove not only because of correlated cash-flow news, but because of a correlated sentiment shock

Predictions

- look at predictions about the implications of reclassification into a new category

Prediction I

Suppose that risky asset j, previously a member of Y, is reclassified as belonging to X. Then, assuming a fixed cash-flow covariance matrix Σ_D, the estimate of β_j in the regression

$$\Delta P_{j,t} = \alpha_j + \beta_j \Delta P_{X,t} + v_{j,t},$$

where

$$\Delta P_{X,t} = \frac{1}{n} \sum_{l \epsilon X} \Delta P_{l,t},$$

as well as the R^2 of this regression, increase after reclassification

Predictions

Prediction II

Suppose that risky asset j, previously a member of Y, is reclassified as belonging to X. Then assuming a fixed cash-flow covariance matrix Σ_D, the estimate of $\beta_{j,X}$ in the regression

$$\Delta P_{j,t} = \alpha_j + \beta_{j,X}\Delta P_{X,t} + \beta_{j,Y}\Delta P_{Y,t} + v_{j,t}$$

rises after reclassification, while the estimate of $\beta_{j,Y}$ falls

Habitat-based comovement

- many investors choose to trade only a subset of available securities

  – transaction costs, lack of information

- suppose one group trades only assets 1 through n, another trades only $n+1$ through $2n$

- suppose also that their risk aversion or sentiment changes over time

  $\Rightarrow$ assets comove because they are the primary holdings of a certain subset of investors

- in a simple model, find that prices in such a world are identical to those under category-based comovement

  $\Rightarrow$ delivers the same predictions, interpreted differently

- result again relies on limits to arbitrage

Empirical tests

- need a group of stocks which is a natural category or investor habitat
  - must be frequent and clear changes in group membership
  - membership changes should not cause changes in cash-flow correlations
- we use S&P 500 index
  - popular category, perhaps also natural habitat
  - frequent inclusions/deletions
  - inclusion into index should not cause change in cash-flow covariance matrix

Data

- index inclusions between Sept 22, 1976 and Dec 31, 2000
  - final sample contains 455 usable events
- index deletions between Jan 1, 1979 and Dec 31, 2000
  - final sample contains 76 usable events
- data used before to detect price impact of uninformed demand

Test of Prediction I

- run the regression

$$R_{j,t} = \alpha_j + \beta_j R_{S\&P,t} + v_{j,t}$$

  both before and after the inclusion/deletion event

- compute
  - the average change in β
  - the average change in R^2
- run regressions using daily, weekly and monthly data

- effects should be stronger in more recent data

Sample		N	Univariate		Bivariate	
			$\overline{\Delta\beta}$ (s.e.)	$\overline{\Delta R^2}$ (s.e.)	$\overline{\Delta\beta}_{SP500}$ (s.e.)	$\overline{\Delta\beta}_{nonSP500}$ (s.e.)
Panel A. Daily returns						
Additions	1976-2000	455	0.151*** (0.021)	0.049*** (0.005)	0.326*** (0.027)	-0.319*** (0.033)
	1976-1987	196	0.067*** (0.023)	0. 038*** (0.008)	0.286*** (0.041)	-0.301*** (0.050)
	1988-2000	259	0.214*** (0.032)	0.058*** (0.007)	0.357*** (0.036)	-0.332*** (0.045)
Deletions	1979-2000	76	-0.087* (0.049)	-0.010 (0.007)	-0.511*** (0.111)	0.550*** (0.122)
Panel B. Weekly returns						
Additions	1976-2000	455	0.110*** (0.029)	0.033*** (0.008)	0.174*** (0.053)	-0.119** (0.056)
	1976-1987	196	0.025 (0.036)	0.027** (0.012)	0.137 (0.094)	-0.125 (0.093)
	1988-2000	259	0.173*** (0.043)	0.037*** (0.010)	0.202*** (0.061)	-0.115* (0.069)
Deletions	1979-2000	76	-0.129 (0.105)	-0.015 (0.010)	-0.505*** (0.161)	0.412** (0.169)
Panel C. Monthly returns						
Additions	1976-1998	324	0.042 (0.041)	0.004 (0.014)	0.317*** (0.077)	-0.252*** (0.072)
	1976-1987	172	-0.010 (0.060)	0.006 (0.021)	0.267** (0.127)	-0.167* (0.116)
	1988-1998	152	0.101* (0.066)	0.000 (0.021)	0.375*** (0.113)	-0.348*** (0.107)
Deletions	1979-1998	45	0.006 (0.100)	0.001 (0.022)	0.303 (0.240)	-0.256 (0.252)

Test of Prediction II

- run the regression

  $R_{j,t} = \alpha_j + \beta_{j,S\&P} R_{S\&P,t} + \beta_{j,\text{non-}S\&P} R_{\text{non-}S\&P,t} + v_{j,t}$

  both before and after the inclusion/deletion event

- compute
  - the average change in $\beta_{S\&P}$
  - the average change in $\beta_{\text{non}-S\&P}$
- run regressions using daily, weekly and monthly data
- effects should be stronger in more recent data

Sample		N	Univariate		Bivariate	
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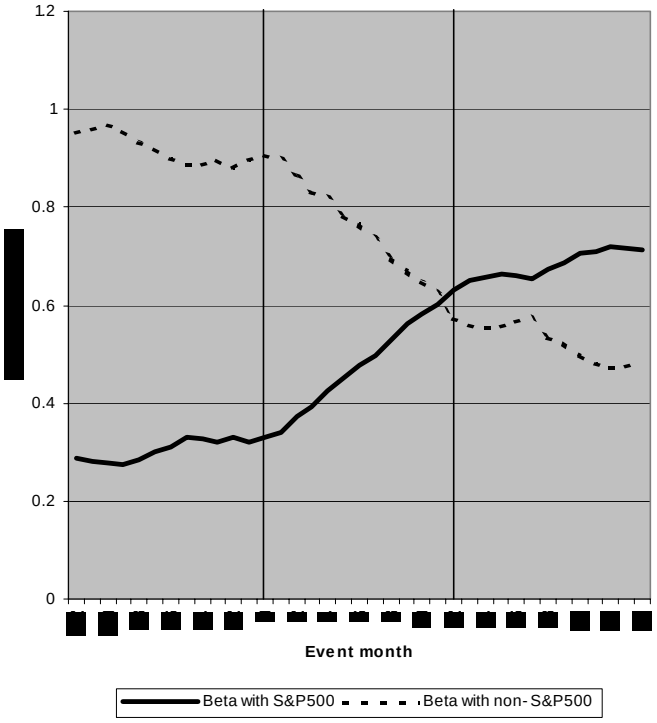
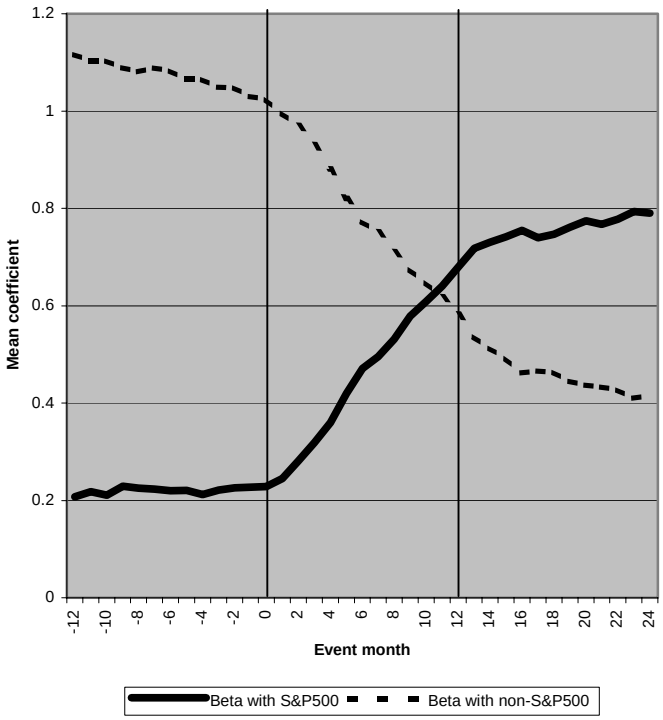
A. Daily Returns

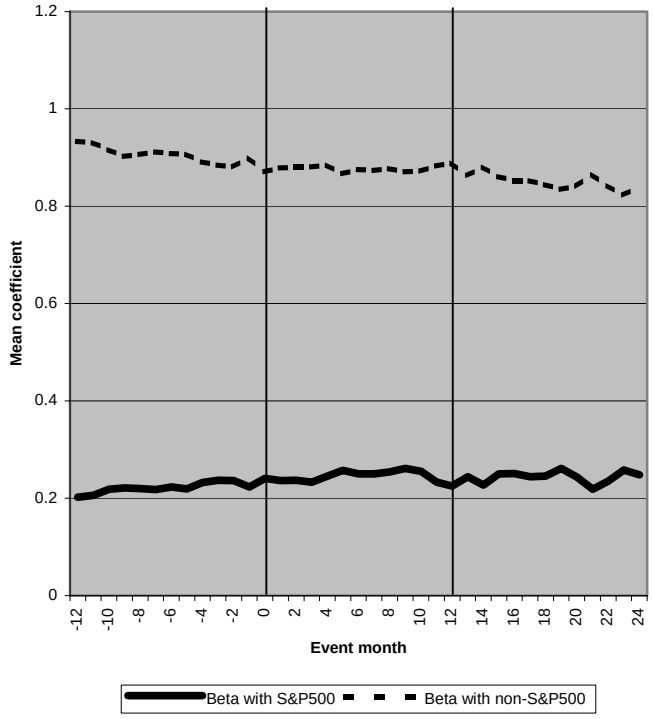
1976-1987 additions with matches (N = 169)



1988-2000 additions with matches (N = 153)



1976-1987 matching firms (N = 169)



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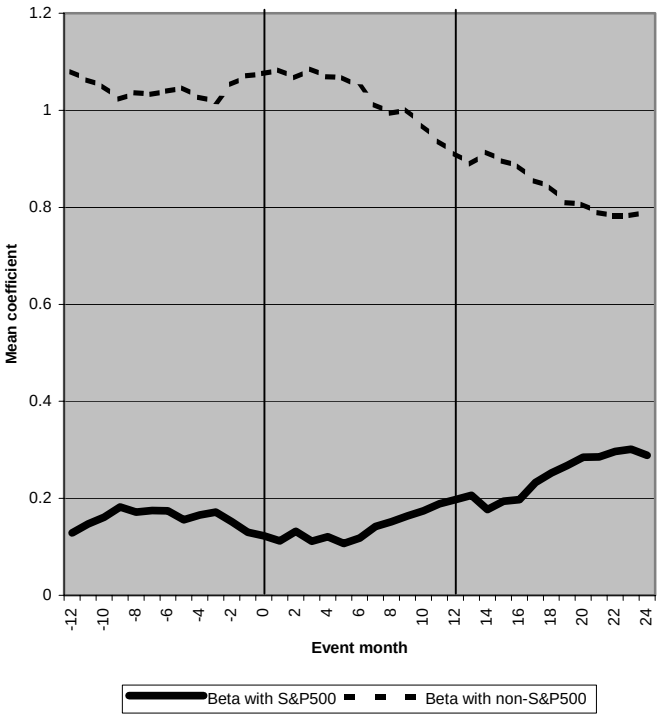

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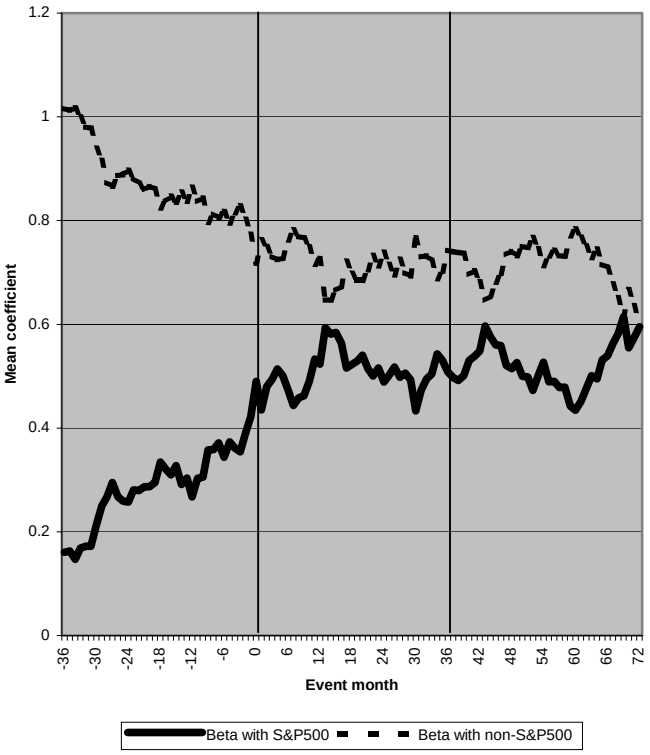

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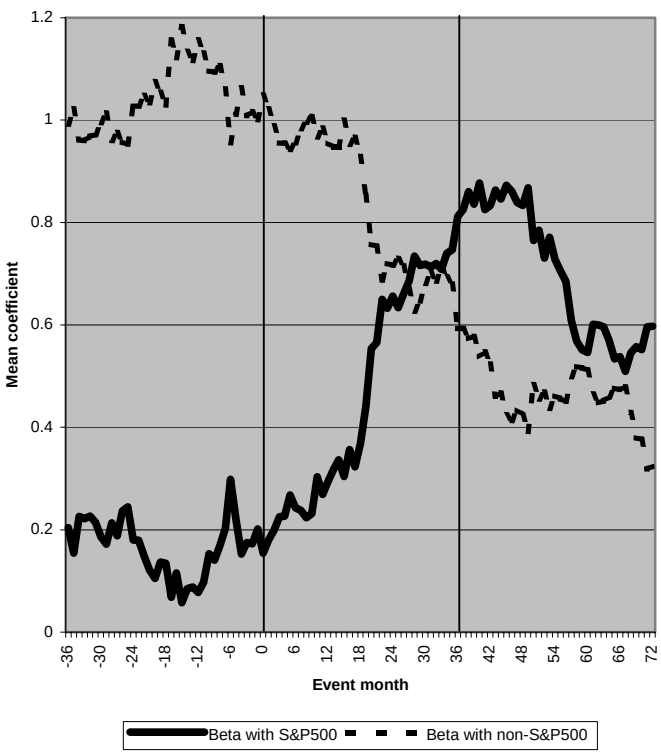

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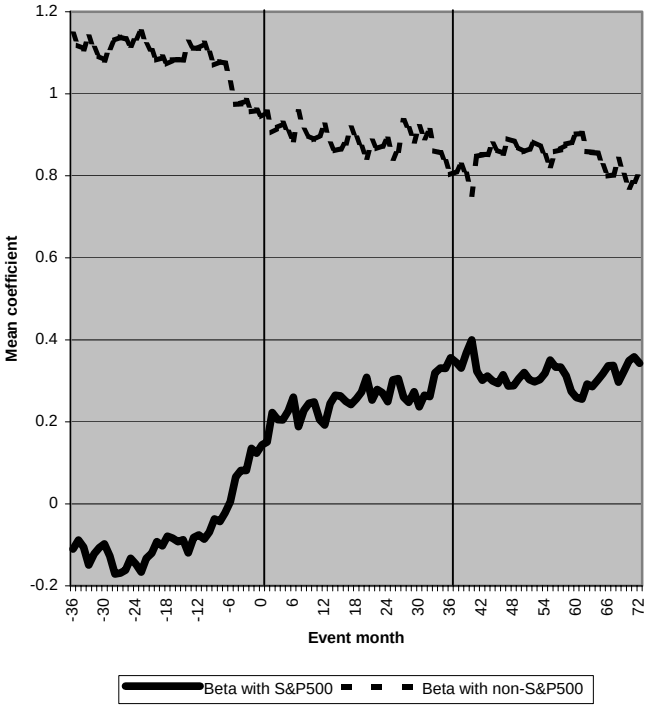

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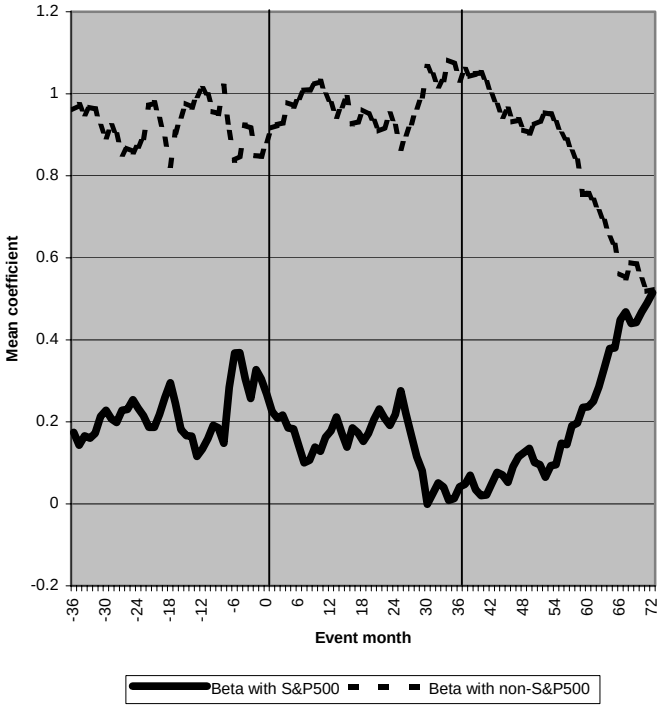

Alternative explanations

Characteristics

- S&P may choose to include stocks which are increasingly demonstrating a particular characteristic
  - if that characteristic is associated with a cash-flow factor

    → could give our result
- e.g. size characteristic

Industry effects

- suppose an industry becomes increasingly important in the economy
  - that industry will make up more of the value of the S&P
  - new inclusions are more likely to come from that industry

    → could give our result

Alternative explanations

- address both these alternatives by finding matching stocks for each event stock
- match on:
  - market cap at time of inclusion
  - *growth* in market cap over the previous 12 months
  - industry

A. Daily Returns

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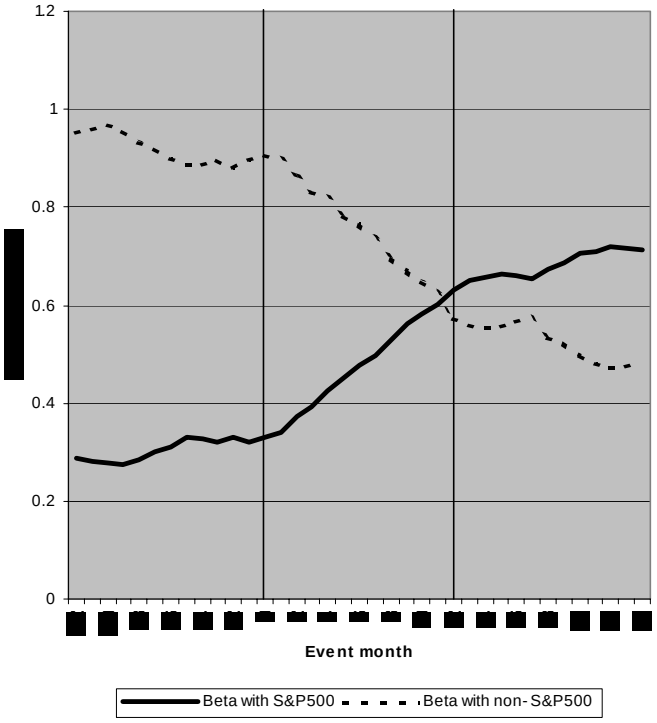

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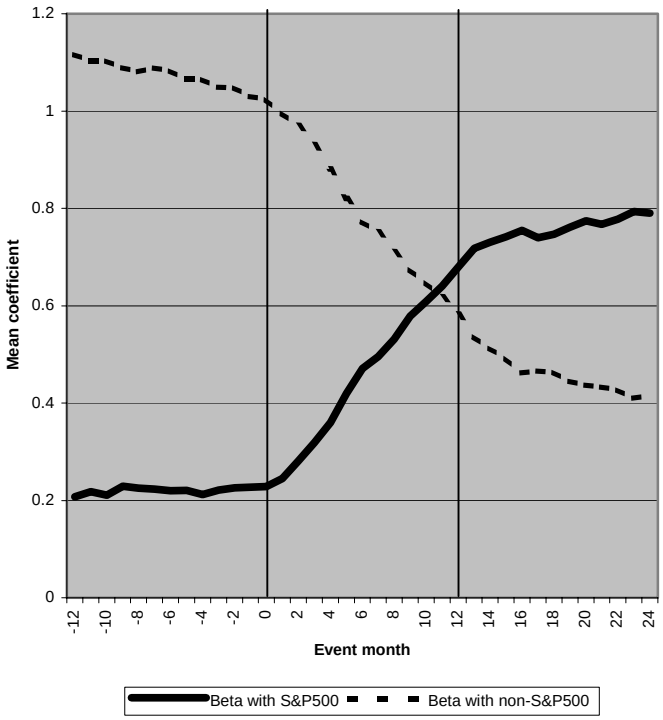

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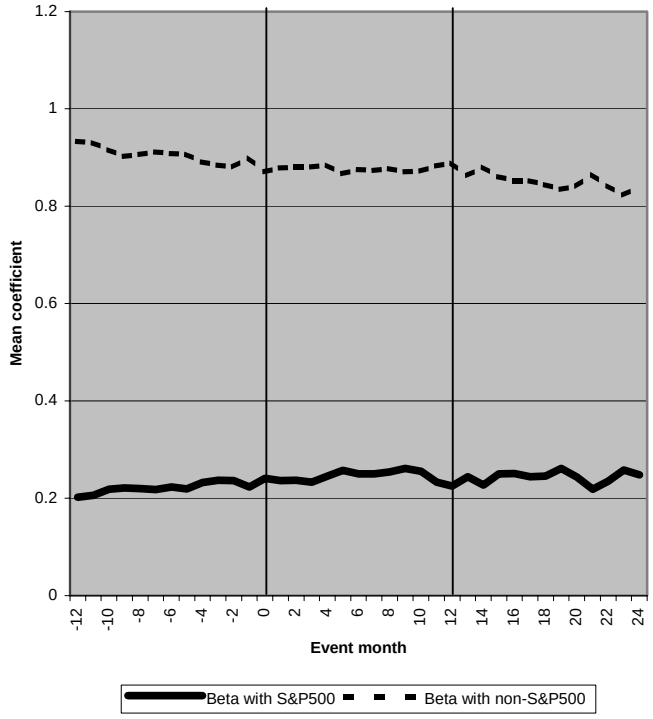

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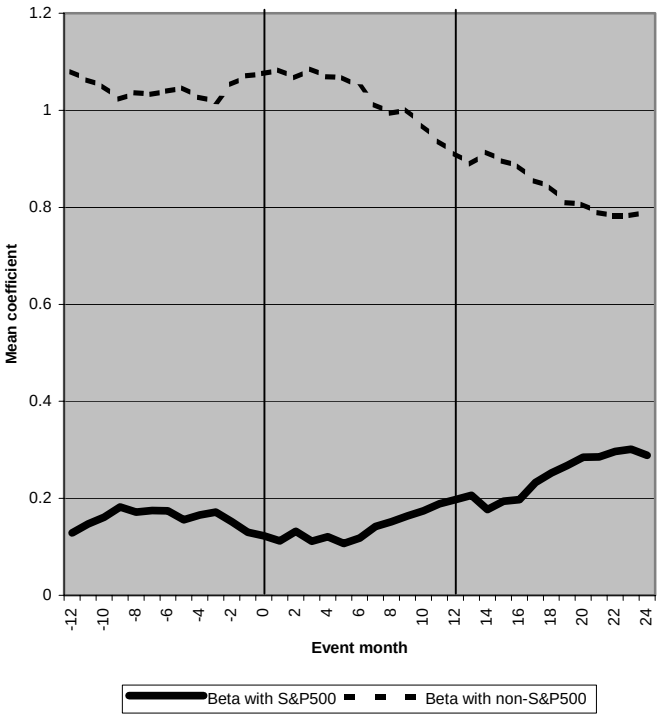

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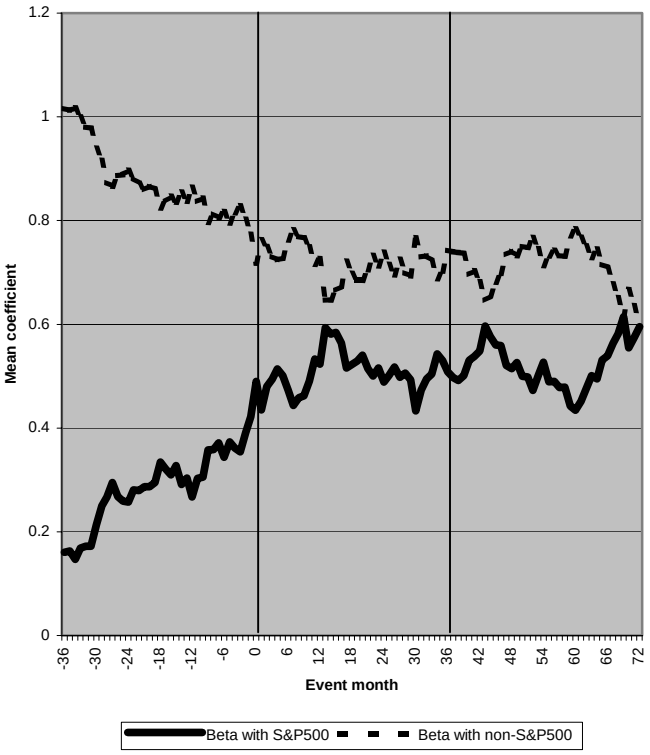

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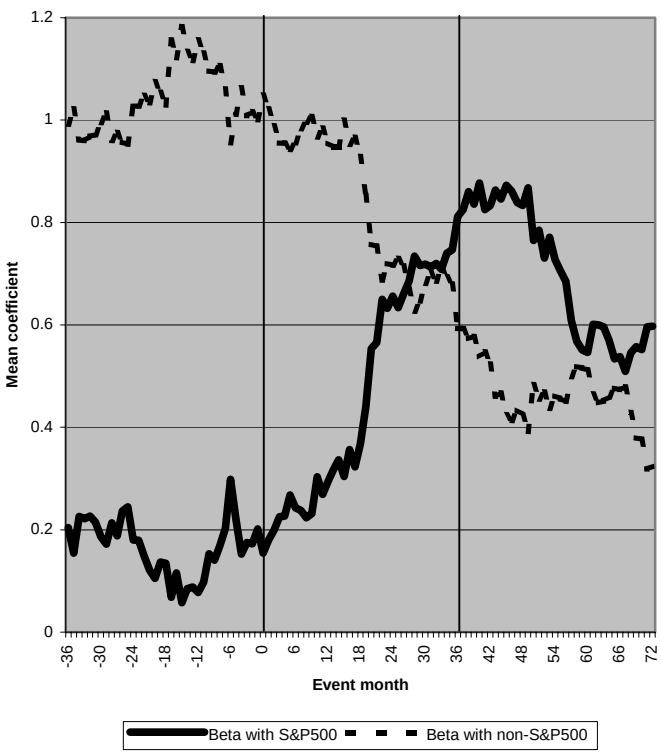

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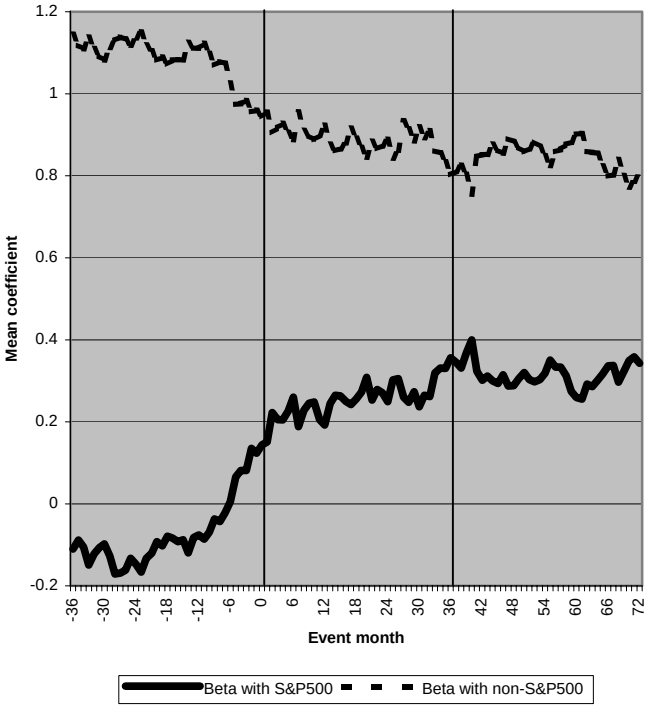

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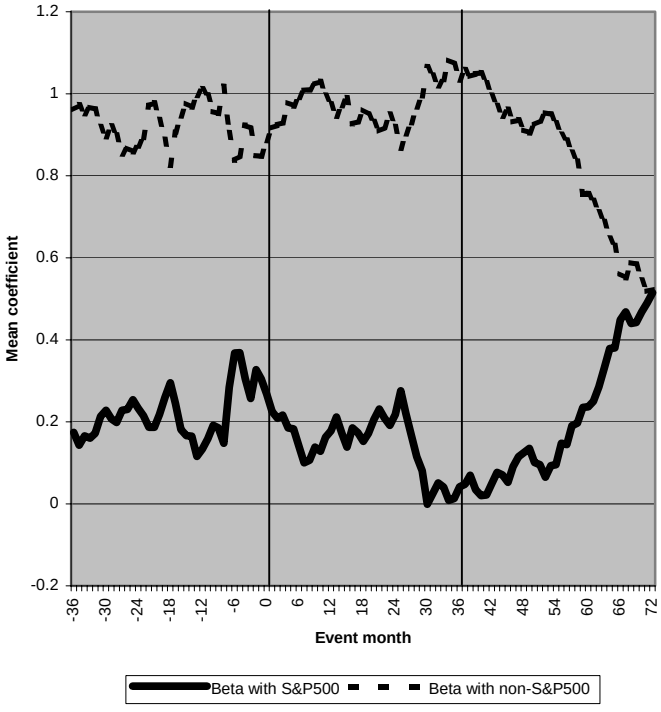


Alternative explanations

Liquidity

- increases in daily betas may be due to asynchronous trading
  - typical included stock trades more frequently after inclusion
- to examine this
  - check whether results hold for the subsample of stocks whose turnover *decreases* after inclusion
  - find that effects are still strong in that subsample

Other implications

- may provide a way of understanding other evidence
  - twin stocks
  - closed-end country funds
  - value stocks, small stocks
  - commodities

Recent developments

Boyer, Working paper, BYU

- finds evidence of category-level comovement among value stocks and among growth stocks
  - i.e. source of common factor in growth stock returns might be category-level sentiment shocks
- finds that stocks recategorized from the S&P-Barra value index to the S&P-Barra growth index start comoving more with the growth index
  - the way the indices are constructed helps control for fundamentals-based explanations

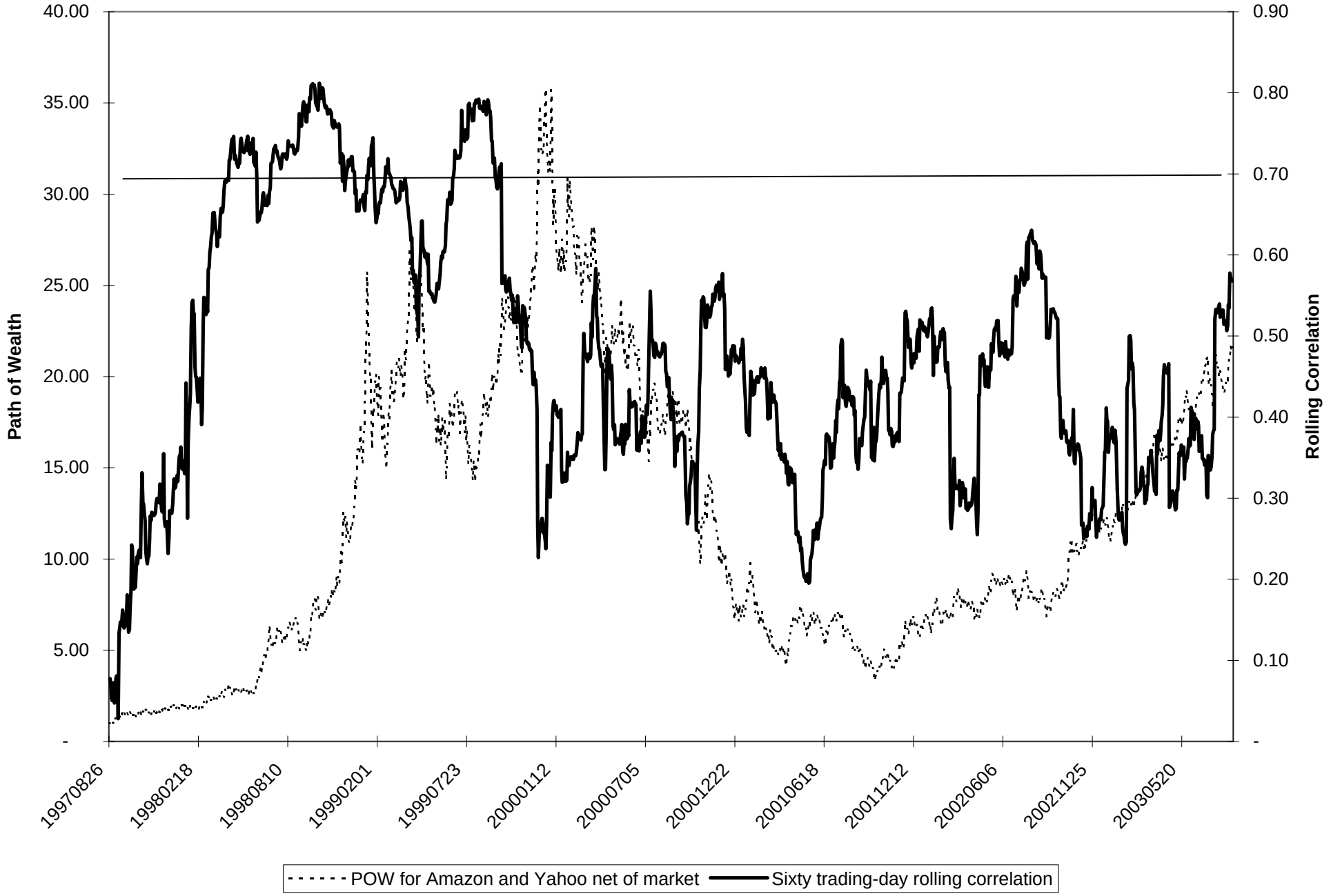
Recent developments

Cornell, JPM, 2004

- one way to detect mispricing is to compare market price with some measure of fair price
- but if noise traders cause excess comovement, may also be able to detect stocks "infected" by irrational sentiment through unusual increases in comovement
- Cornell (2004) makes this observation, and notes that high valuations of internet stocks in late 1990s were also accompanied by unusually high correlations between internet stock returns

Figure 1

Rolling Correlation and Net of Market Path of Wealth for Yahoo and Amazon: August 26, 1997 to August 26, 2003



Conclusion

- develop some alternative theories of comovement
  - category-based comovement
  - habitat-based comovement
- present new evidence in support of these theories
- argue that these theories may help explain existing evidence