UBS

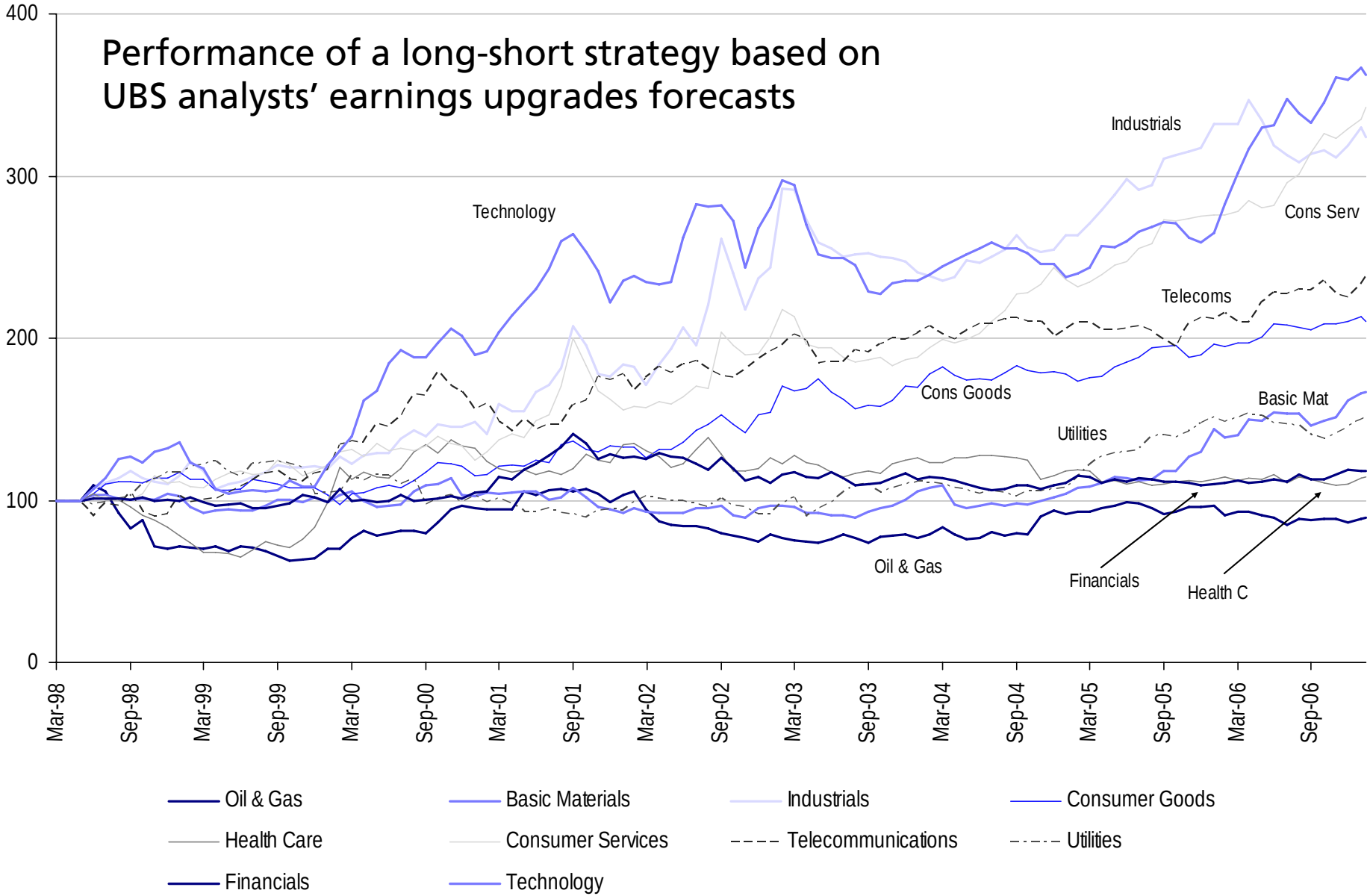
UBS Investment Research

Who should you listen to? A sector decomposition of surprise stock returns

Giuliano De Rossi, Quantitative Analyst
James Sefton, Senior Quantitative Analyst
UBS Quantitative Research (Tel: +44 20 756 81873/79882)

13 March 2007

A preview: Performance of analysts' earnings forecasts



Source: UBS estimates

Outline of the talk

- We decompose return surprises into the amount that can be attributed to either
  a) Cash-flow news or
  b) Discount rate news.
- We discuss the results with respect to a global universe highlighting
  a) Sector differences,
  b) Links to similar results from a residual income model,
  c) Correlations in the returns portfolios constructed on basis of a value screen or a growth screen by sector.
- We discuss the results with respect to a US universe, estimated on quarterly data and augmented with macroeconomic factors, highlighting
  a) those sectors driven by cash flow news at the sector level and those where the majority of news is at a stock level.
  b) those sectors driven by news in the macroeconomy.
- We discuss the implications of the research for alpha generation
  a) Demonstrating the sectors in which a quantitative strategy performs.
  b) Demonstrating the sectors in which strategies based on fundamentals performs.

Cash-Flow or Discount Rate News

- The value of a share is the expected present value of its accruing cash flows

$$P_t = \mathbb{E}_t\left[\sum_{i=1}^{\infty} \frac{D_{t+i}}{\prod_{j=1}^{i}(1+r_{t+j})}\right]$$

- Hence an unexpected change in the value, $P_t - \mathbb{E}_{t-1}(P_t)$ must be due to new information (news) about either
  a) the cash flows (dividends) – Cash-flow news
  b) or the discount rates – Discount rate news.

- If discount rates are constant and known, then all price changes will be due to news about the future cash flows.

Cash Flow or Discount Rate News

- However discount rates may vary in cross-section (a time-varying conditional beta) because the
  - firm's mix between safe and risky projects vary over time (Green, Berk and Naik, 1999) due to investment in new projects.
  - 'value firms' suffer from costly irreversible investment in bad times and therefore more risky (Zhang 2005).
- Or risk premium may vary over time due to investors' changing attitudes towards risk (e.g. Campbell, Cochrane 1999).

  BUT in these cases discount rate news *will be* correlated with cash flow news (but as Campbell and Cochrane note, the correlation can be quite low but not zero).
- Alternatively returns may be forecastable because of systematic biases in investors' expectations
  - In Daniel, Hirshleifer and Subrahmanyan (2000) a fundamental to price ratio is a proxy for mispricing in the cross-section.
  - Barberis, Schleifer and Vishny (1998) and Daniel, Hirshleifer and Subrahmanyan (1998) where herding or overconfidence causes returns to predictable over time.

Data

We used two datasets for our empirical analysis:

- A Global Stock Universe
  - All constituents of the DJ World index.
  - Sample 1992Q1-2006Q3. Estimated on overlapping periods of a year.
  - Accounting data sourced from Worldscope, adjusted prices from Dow Jones.

- A US Stock Universe
  - All US-based constituents of the DJ World index.
  - Data sampled quarterly between 1990Q1-2006Q4.
  - Quarterly, accounting and price data from Compustat, macroeconomic series from the Federal Reserve and Bureau of Economic Analysis.

The Residual Income Model

- We illustrate our approach using a Residual Income Model

$$\underbrace{P_t}_{\text{Price}} = \underbrace{B_t}_{\text{Book value}} + \underbrace{\sum_{i=1}^{\infty} \frac{\overbrace{E_{t+i} - rB_{t+i-1}}^{\text{Residual income}}}{(1+r)^i}}_{\text{Abnormal earnings}}$$

which implies

$$\underbrace{r_t - r}_{\text{Surprise returns}} \approx \frac{B_t}{P_t}(1+g)\underbrace{\Delta\mathbb{E}_t \sum_{i=1}^{\infty} \rho^i \left(ROE_{t+i} - r\right)}_{\text{Cash-flow news}}$$

where $\rho = \frac{1+g}{1+r}$, g is the average growth rate and $\Delta\mathbb{E}_t(.) = \mathbb{E}_t(.) - \mathbb{E}_{t-1}(.)$ is the change in expectations.

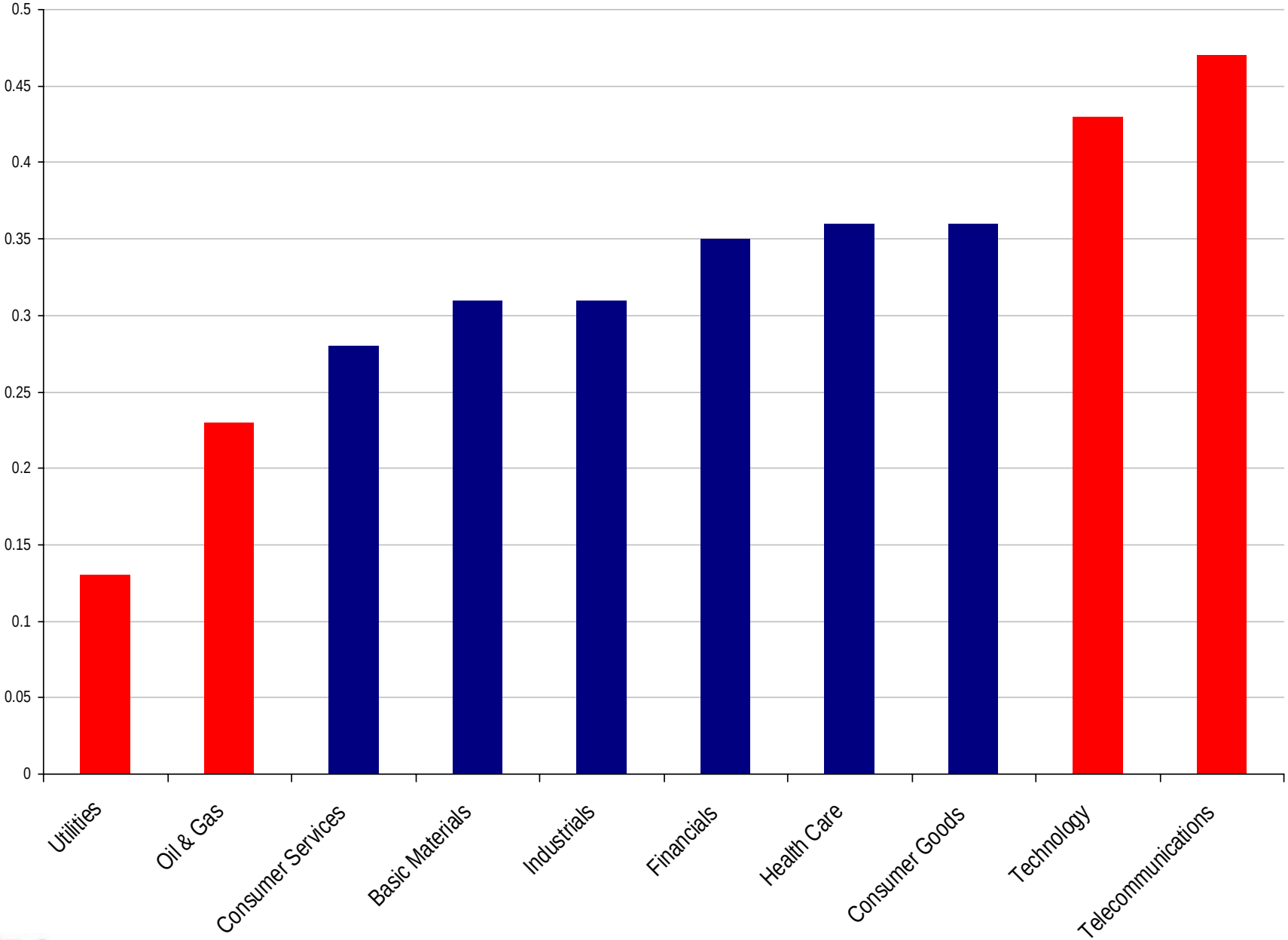
- Assume the discount rate is fixed, and Return on Equity , E_t / B_{t-1} , evolves

$$ROE_t = \alpha + \phi ROE_{t-1} + \varepsilon_t$$

then we can express the variance of cash-flow returns as

$$\text{Var}\left[\Delta\mathbb{E}_t \sum_{i=1}^{\infty} \rho^i \left(ROE_{t+i} - r\right)\right] = \frac{\sigma_\varepsilon^2 (\rho\phi)^2}{1-(\rho\phi)^2}$$

The importance of cash-flow news in explaining return variance: Estimates of ϕ



Source: UBS estimates

The main model: Decomposing surprise stock returns

- By taking a log-linear approximation of the Residual Income Model, Vuolteenaho (2002) was able to drop the assumption of constant discount rates.
- Now the return surprise can be decomposed into cash flow or discount rate news

$$r_t - \mathbb{E}_{t-1}(r_t) = \underbrace{\Delta\mathbb{E}_t \sum_{i=0}^{\infty} \phi^i e_{t+i}}_{\text{Cash Flow News}} - \underbrace{\Delta\mathbb{E}_t \sum_{i=1}^{\infty} \phi^j r_{t+i}}_{\text{Expected Return News}} + \underbrace{\kappa_t}_{\text{approx. error}}$$

where $e_t = \log\left(1 + \frac{ROE_t - R_t^f}{1 + R_t^f}\right)$ and r^f is the risk free rate.

- Further instead of the earlier simple the model describing the evolution of ROE, we use a vector autoregression (VAR)

$$z_{i,t} = \Gamma z_{i,t-1} + u_{i,t}.$$

where u_t are serially uncorrelated errors. The components of $z_{i,t}$ will be **stock return** (the variable we are ultimately interested in), (log) **book to market ratio** and ***ROE***, but also sector-level and macroeconomic factors.

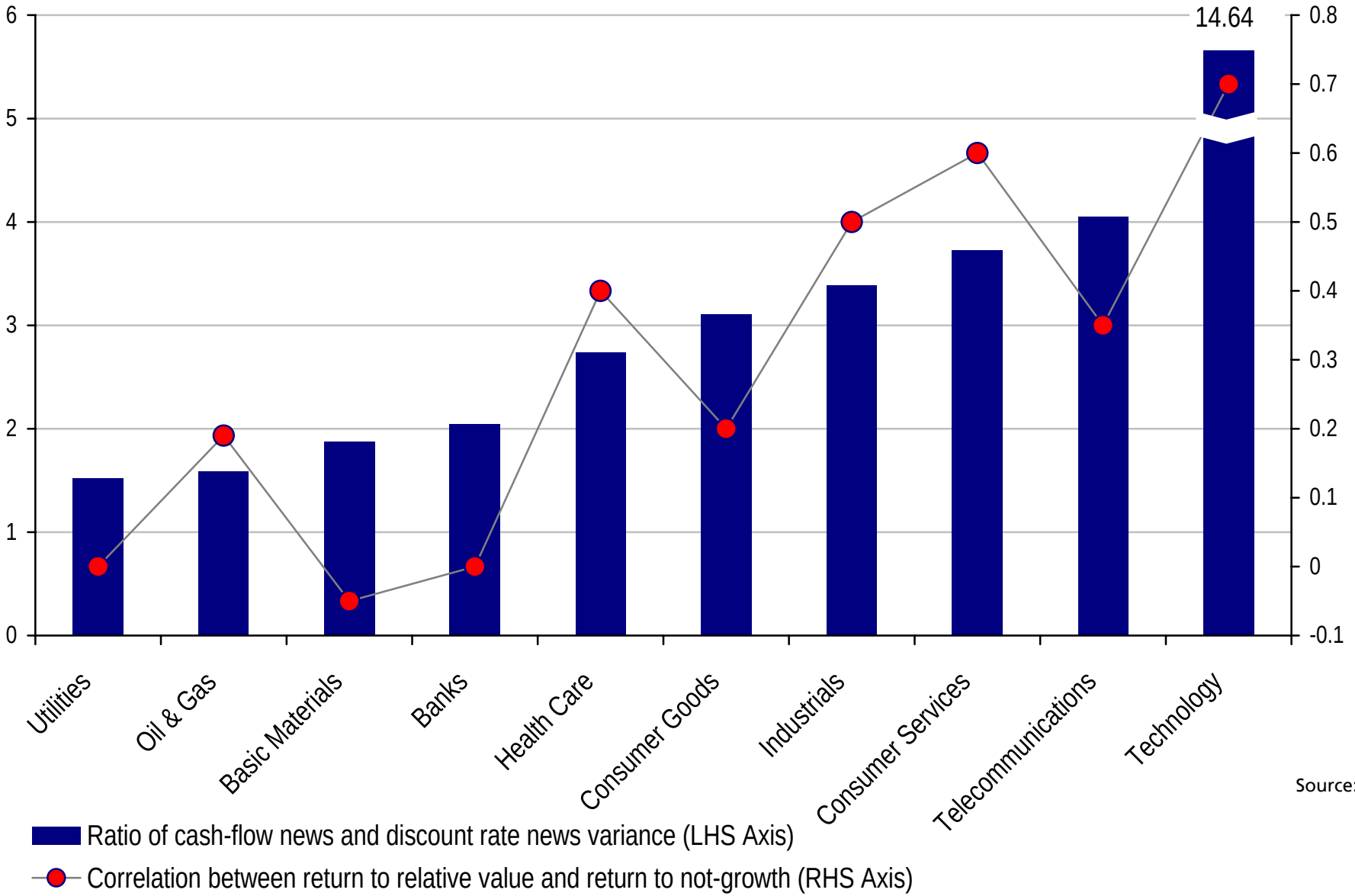
The VAR model: example

- An example: The VAR below was estimated on data for all stocks in the Dow Jones Global Universe over our sample period

$$\begin{bmatrix} r_t \\ B_t / P_t \\ e_t \\ r_t^{Sector} \\ (B/P)_t^{Sector} \\ e_t^{Sector} \end{bmatrix} = \begin{bmatrix} -0.00082 \\ 0.00055 \\ -0.0003 \\ 0.00004 \\ -0.00001 \\ 0.00002 \end{bmatrix} + \begin{bmatrix} 0.074 & 0.088 & 0.320 & 0.167 & 0.410 & 0.516 \\ -0.059 & 0.814 & -0.043 & -0.125 & -0.084 & 0.142 \\ 0.041 & -0.037 & 0.514 & -0.017 & 0.031 & 0.013 \\ 0 & 0 & 0 & 0.198 & 0.348 & 0.799 \\ 0 & 0 & 0 & -0.127 & 0.605 & 0.165 \\ 0 & 0 & 0 & 0.014 & -0.021 & 0.542 \end{bmatrix} \begin{bmatrix} r_{t-1} \\ B_{t-1} / P_{t-1} \\ e_{t-1} \\ r_{t-1}^{Sector} \\ (B/P)_{t-1}^{Sector} \\ e_{t-1}^{Sector} \end{bmatrix} + \begin{bmatrix} u_{1,t} \\ u_{2,t} \\ u_{3,t} \\ u_{4,t} \\ u_{5,t} \\ u_{6,t} \end{bmatrix}$$

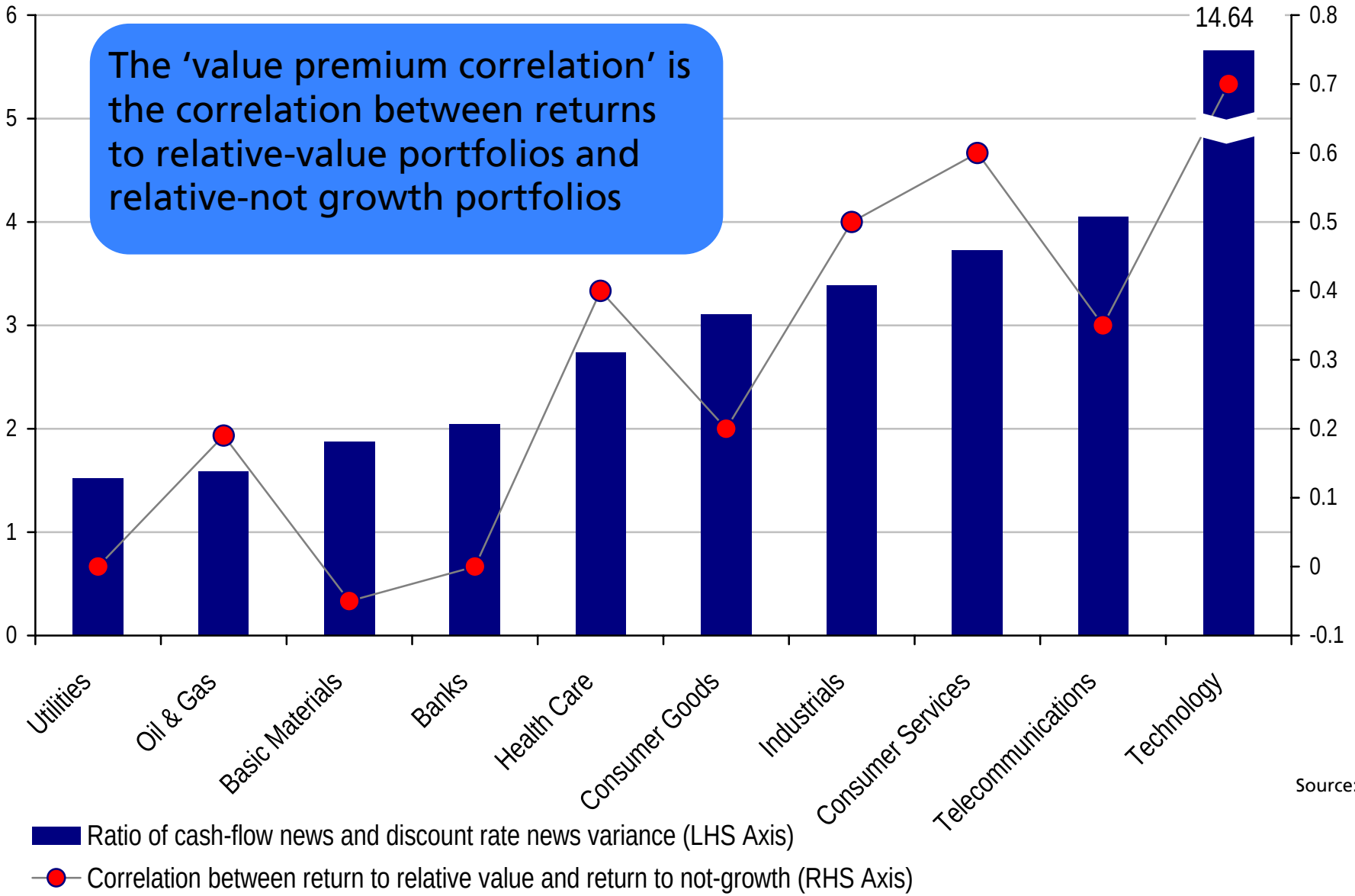
- Similar VARs were estimated for each global industry separately.

Results: Global model



Source: UBS

Results: Global model

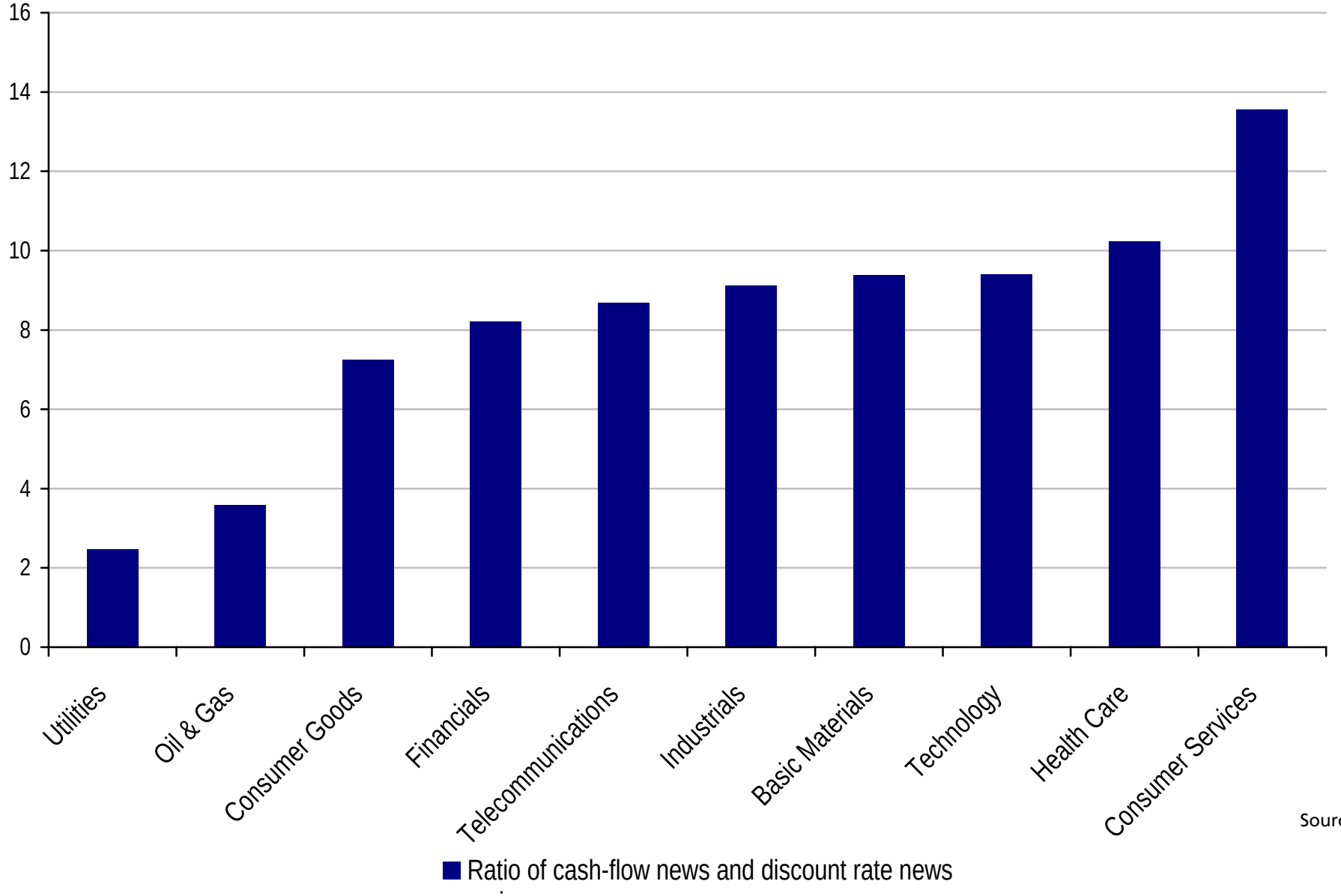


Source: UBS

Deductions at the level of the Global universe

- **Utilities, Oil & Gas sectors and Basic Materials**: Even at the stock level, approximately 50% of the surprise return is due to news about discount rates. This suggests
  - that if discount rate news is important, then returns are forecastable.
  - If returns are forecastable, a quantitative strategy is more likely to deliver significant alpha.
  - As corroboration, in these sectors returns to the value strategy are uncorrelated with the returns to a portfolio of low growth stocks.
  - as returns are only partially driven by cash flow news, a strategy based on fundamental analysis will find it harder to out-perform.
- **Technology, Telecommunications and Consumer Services**: In these sectors, stocks surprise returns are largely driven by cash-flow news.
  - Not just due to the TMT bubble.
  - Suggests a strategy based on fundamental analysis is likely to deliver.
  - Little predictability in returns, and hence simple quantitative strategies unlikely to outperform.

Results for the US market (1)



Source: UBS

Results for the US market (2)

- **Sector-level** cash-flow news (as a proportion of total cash-flow news) is more relevant in highly concentrated sectors.
- The columns display:
  1. Proportion of cash-flow news originating at sector level
  2. Average Herfindahl Hirschman index of concentration (calculated on market capitalization) over the sample period.

	Sector/Total	HH index
Oil & Gas	0.09	1251.23
Basic Materials	0.03	489.93
Industrials	0.03	633.14
Consumer Goods	0.04	440.02
Health Care	0.01	528.91
Consumer Services	0.03	288.07
Telecommunications	0.15	1522.13
Utilities	0.11	260.96
Financials	0.11	209.55
Technology	0.05	602.91
Correlation	0.48	

Source: UBS

Adding macroeconomic factors to the model (1)

- We augment the VAR model with macro factors . Our preferred specification is selected by maximising the Akaike information criterion. This model includes GDP growth, 3M Bill Rate and trade balance changes. and the three-month rate.
- A triangular structure is imposed on the VAR:

$$\begin{bmatrix} \text{Stock Level Variables} \\ \text{Sector Level Variables} \\ \text{Macro Variables} \end{bmatrix}_t = \begin{bmatrix} A_{11} & A_{12} & A_{13} \\ 0 & A_{22} & A_{23} \\ 0 & 0 & A_{33} \end{bmatrix} \begin{bmatrix} \text{Stock Level Variables} \\ \text{Sector Level Variables} \\ \text{Macro Variables} \end{bmatrix}_{t-1} + u_t$$

- For a sanity check;
  - We compare the VAR equilibrium values with historic means of the macro variables
  - We compare our model's predictions for Q1 2007 with UBS forecasts

	Model Equilibrium	Sample Means	Model Forecast for Q1:2007	UBS forecasts
GDP	3.08%	2.93%	0.51% (Qtr)	0.45% (Qtr)
Trade balance	0.00%	-0.06%	-0.02%	0.10%
Short rate	3.55%	4.08%	4.62%	4.85%

Source: UBS. Source for UBS forecasts: "US Economic Perspectives", Feb 16th. The UBS predicted 3-month rate is reduced by 15bp to ensure comparability with the historical figures from the Federal Reserve. UBS forecasts the change in the Trade Balance for good and services, whereas the VAR is for goods only. Mean levels are computed over the whole sample period.

Adding macroeconomic factors to the model (2)

- The significant of the macro variables on the respective sector return **when measured relative to the market** (robust *F*-test results):

	P-value	
All sectors	0.020	**
Oil & Gas	0.298	
Basic Materials	0.020	**
Industrials	0.009	**
Consumer Goods	0.000	**
Health Care	0.129	
Consumer Services	0.005	**
Telecommunications	0.481	
Utilities	0.897	
Financials	0.030	**
Technology	0.657	

Source: UBS

** indicates 5% significance, * 10% significance in the robust *F*-test. Included macro variables are: 10Y rate, industrial production, GDP, trade balance, credit spread, 3M rate.

Discussion of the findings for the US market

- In more concentrated sectors, the relevance of sector-level cash-flow news tends to increase.
- **Utilities, Oil & Gas sectors** : These sectors have the lowest ratio of cash flow to discount rate news. This implies
  - Even in the US returns are forecastable in these sectors.
  - As corroboration, in these sectors returns to the value strategy are uncorrelated with the returns to a portfolio of low growth stocks.
- **Technology, Telecommunications and Consumer Services**: In these sectors, stocks surprise returns are largely driven by cash-flow news.
  - Suggests a strategy based on fundamental analysis is likely to deliver.
  - However a considerable proportion of the news originates at the sector-level. A position in the sector alone would be sufficient to capture this alpha.

Using the US model to design a quantitative strategy

- We simulate a quantitative trading strategy based on our estimated model. This strategy is equivalent to weighted screens on momentum, ROE and Book/Price. The weights are the coefficients implicit within the VAR.
- For each quarter in the sample period, we rank all US stocks within a sector by predicted return one quarter ahead.
  - Buy the top 30% stocks, equally weighted
  - Short the bottom 30% stocks, equally weighted.
  - All portfolios are self-financing

	Mean Excess Return	Annualised Volatility	**Sharpe Ratio**	Momentum weigth	Value weight	Quality weight
Utilities	3.3%	9.0%	**0.37**	-0.0024	0.0056	0.0066
Oil & Gas	9.5%	16.4%	**0.58**	0.0266	0.0128	0.0046
Consumer Services	10.7%	12.8%	**0.84**	0.0030	0.0053	0.0151
Basic Materials	5.6%	14.0%	**0.40**	-0.0049	-0.0030	0.0047
Industrials	10.1%	12.4%	**0.81**	0.0036	0.0109	0.0099
Financials	9.0%	8.0%	**1.12**	-0.0007	0.0053	0.0095
Health Care	13.8%	23.6%	**0.59**	0.0022	0.0131	0.0105
Consumer Goods	9.9%	10.1%	**0.99**	-0.0005	0.0061	0.0124
Technology	13.4%	22.1%	**0.61**	0.0082	0.0195	0.0087

Designing a Macro Strategy using the model

- The output of our forecasting model (VAR) can be combined with macroeconomic views and/or views about sector performances.
- Effectively this is a Bayesian or Black and Litterman approach;
  - The priors are the VAR forecasts
  - These are combined with the strategist views using the covariance matrix implicit in the VAR.
  - We are able to incorporate uncertainty in the strategist's view into the model as well. In the case of the sector views we make the uncertainty proportional to the relevance of cash-flow news.
- As illustration of the methodology we incorporate the UBS US macroeconomic forecasts for 2007:Q1.

  GDP +0.45% Trade bal 0.1% Short rate 4.85%
- And the following subset of sector views

  Oil & Gas 0.00 Technology -2.5% Industrials +2.5%

  These returns are proportional to recommended sector weightings in the UBS Global Equity Strategy document of 9th December 2006. (For the other sectors, the recommended portfolio weights are in line with VAR predictions).

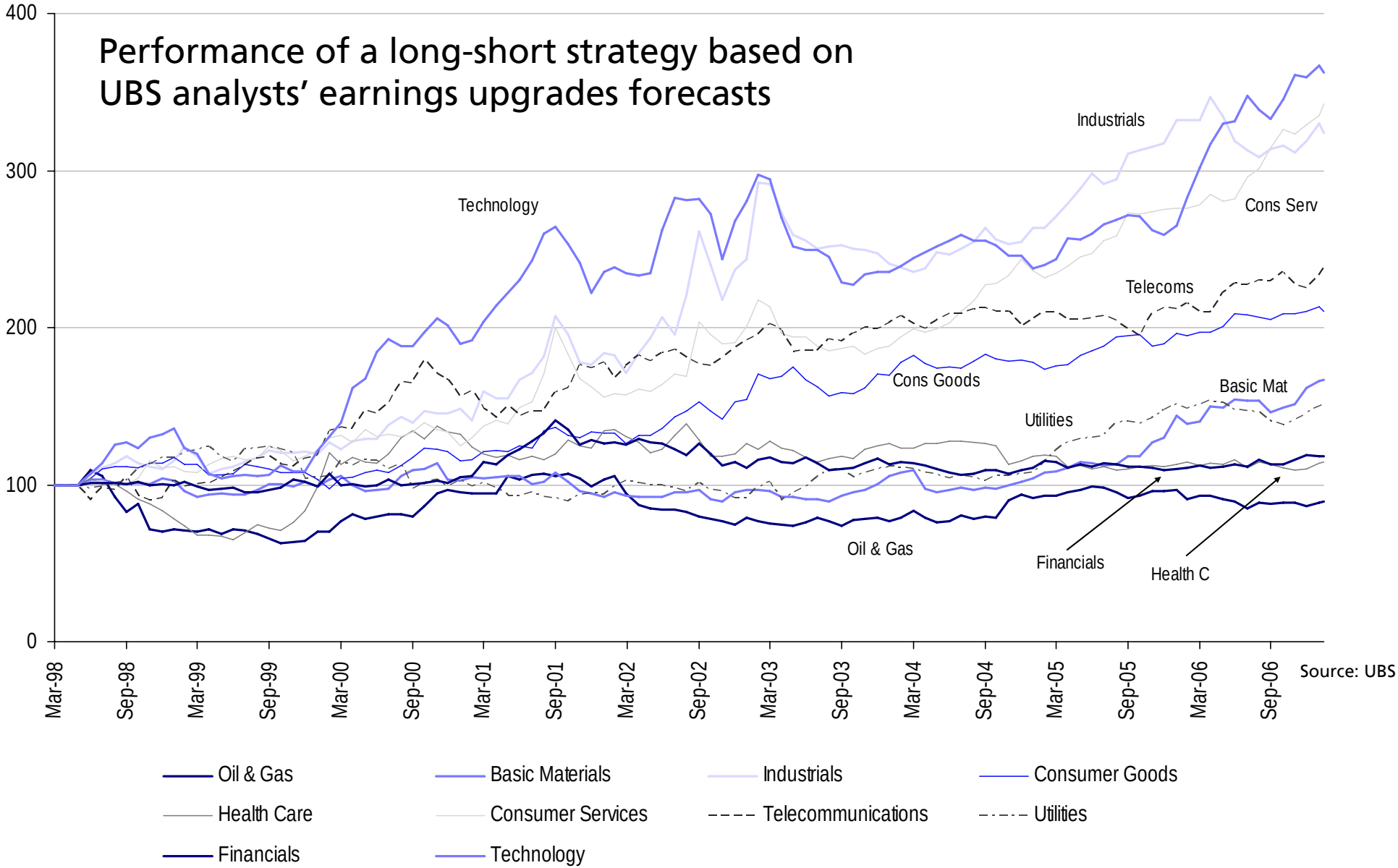
Designing a Macro Strategy using the model (2)

- Large adjustment for Oil & Gas where we attach more importance to the strategist's view.
- Sectors like Health Care and Telecoms adjust because of the correlations among returns.

	Prediction of VAR	Prediction after Combination with Foreacasts
Oil & Gas	-0.137	-0.088
Basic Materials	0.007	0.012
Industrials	-0.006	-0.004
Consumer Goods	0.069	0.069
Health Care	0.034	0.030
Consumer Services	0.048	0.044
Telecommunications	0.088	0.080
Utilities	0.021	0.024
Financials	-0.048	-0.048
Technology	-0.003	-0.011
GDP Growth	0.505	0.452
Change in Trade Balance	0.000	-0.001
3M Bill Rate	4.618	4.834

Source: UBS

And of course, it predicts in which sectors a fundamental strategy is likely to be more successful…



Conclusion

- We measure the relative importance of news about future cash-flows and news about future expected returns in explaining surprise returns.
- In the Utilities and Oil & Gas sectors, the majority of the return variance can be attributed to discount rate news. This suggests a quantitative strategy is more likely to deliver significant alpha.
- As corroboration, sectors where a significant proportion of return variance can be attributed to discount rate news are the very sectors where returns to a relative value strategy is uncorrelated with the returns to a portfolio of low growth stocks.
- For Industrials, Technology, Telecommunications and Consumer Services, return variance is largely driven by cash-flow news. The evidence is that strategies based on fundamental are more likely to outperform in these sectors.
- We illustrate how our model can be used in practice to guide asset allocation, possibly by incorporating macroeconomic views and sector outlooks and/or earnings forecasts at the firm level.

References

- Barberis, N., A. Schleifer and R. Vishny (1998), A model of investor sentiment, Working paper, University of Chicago.
- Berk, J.B., R.C. Green and V. Naik (1999), Optimal investment, growth options, and security returns, *Journal of Finance* 54, 1553-1607.
- Campbell, J.Y., and J.H. Cochrane (1999), By force of habit: A consumption-based explanation of aggregate stock market behavior, *Journal of Political Economy* 107, 205-251.
- Campbell, J.Y., and R.J. Shiller (1988), The dividend-price ratio and expectations of future dividends and discount factors, *Review of Financial Studies* 1, 195-228.
- Daniel, K., D. Hirshleifer and A. Subrahmanyam (1998), A theory of overconfidence self attribution and security market under- and over-reaction, *Journal of Finance* 53, 1839–1885.
- Daniel, K., D. Hirshleifer and A. Subrahmanyam (2001), Overconfidence, arbitrage and equilibrium asset pricing, *Journal of Finance* 53, 921–965.
- Vuolteenaho, T. (2002), What drives firm-level stock returns?, *Journal of Finance*, 57 (1), 233-264.
- Zhang, L. (2005), The value premium, *Journal of Finance* 60, 67-103.

Appendix

UBS

Derivation of Vuolteenaho's Decomposition (1)

- We can write the return as

$$(1 + R_t + r_t^{\text{rf}}) = \left(\frac{P_t + D_t}{P_{t-1}} \right) = \left(\frac{P_t + D_t}{D_t} \right) \left(\frac{D_t}{D_{t-1}} \right) \left(\frac{D_{t-1}}{P_{t-1}} \right)$$

- Campbell and Shiller (1988) take a log-linear approximation, to show

$$r_t + r_t^{rf} = \log\left(1 + e^{-\delta_t}\right) + \Delta d_t + \delta_{t-1}$$

$$\approx \underbrace{\left(\kappa - \rho\delta_t\right)}_{\text{log linear approx}} + \underbrace{\Delta d_t}_{\text{log of dividend growth}} + \underbrace{\delta_{t-1}}_{\text{log of Dividend Yield}}$$

- If returns in any period are higher than expected then *either*
  1) Dividend growth is higher than expected *or*
  2) Yields have fallen.

Derivation of the Decomposition Formula (2)

- Similarly note that the clean surplus accounting relation can be written

$$(1+E_t/B_t)=\left(\frac{B_t+D_t}{B_{t-1}}\right)=\left(\frac{B_t+D_t}{D_t}\right)\left(\frac{D_t}{D_{t-1}}\right)\left(\frac{D_{t-1}}{B_{t-1}}\right)$$

and taking logs implies

$$e_t+r_t^{rf}\approx\underbrace{(\kappa-\rho\gamma_t)}_{\text{log linear approx}}+\underbrace{\Delta d_t}_{\text{log of dividend growth}}+\underbrace{\gamma_{t-1}}_{\text{log(Dividend/Book)}}$$

- Subtract this relation from Campbell and Shiller relation

$$e_t-r_t\approx\rho\underbrace{(\delta_t-\gamma_t)}_{\text{log(Book/Market)}}-\underbrace{(\delta_{t-1}-\gamma_{t-1})}_{\text{lagged log(Book/Market)}}$$

- If ROE is greater than returns then the Book to Market Ratio increases (by an amount related to payout ratios).

Required disclosures & ratings definition

This report has been prepared by UBS Limited, an affiliate of UBS AG (UBS).

For information on the ways in which UBS manages conflicts and maintains independence of its research product; historical performance information; and certain additional disclosures concerning UBS research recommendations, please visit www.ubs.com/disclosures.

UBS Investment Research: Global Equity Ratings Definitions and Allocations

UBS rating	Definition	UBS rating	Definition	Rating category	Coverage[1]	IB services[2]
Buy 1	FSR is > 6% above the MRA, higher degree of predictability	**Buy 2**	FSR is > 6% above the MRA, lower degree of predictability	**Buy**	44%	36%
Neutral 1	FSR is between −6% and 6% of the MRA, higher degree of predictability	**Neutral 2**	FSR is between −6% and 6% of the MRA, lower degree of predictability	**Hold/Neutral**	43%	36%
Reduce 1	FSR is > 6% below the MRA, higher degree of predictability	**Reduce 2**	FSR is > 6% below the MRA, lower degree of predictability	**Sell**	13%	26%

1: Percentage of companies under coverage globally within this rating category.
2: Percentage of companies within this rating category for which investment banking (IB) services were provided within the past 12 months.

Source: UBS; Rating allocations as of 31 December 2006.

Analyst Certification

Each research analyst primarily responsible for the content of this research report, in whole or in part, certifies that with respect to security or issuer that the analyst covered in this report: (1) all of the views expressed accurately reflect his or her personal views about those securities or issuers; and (2) no part of his or her compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by that research analyst in the research report.

Definitions & exceptions

- **KEY DEFINITIONS**

- **Forecast Stock Return (FSR)** is defined as expected percentage price appreciation plus gross dividend yield over the next 12 months.
  Market Return Assumption (MRA) is defined as the one-year local market interest rate plus 5% (a proxy for, and not a forecast of, the equity risk premium).
  Predictability Level The predictability level indicates an analyst's conviction in the FSR. A predictability level of '1' means that the analyst's estimate of FSR is in the middle of a narrower, or smaller, range of possibilities. A predictability level of '2' means that the analyst's estimate of FSR is in the middle of a broader, or larger, range of possibilities.
  Under Review (UR) Stocks may be flagged as UR by the analyst, indicating that the stock's price target and/or rating are subject to possible change in the near term, usually in response to an event that may affect the investment case or valuation.

- **EXCEPTIONS AND SPECIAL CASES**

- **US Closed-End Fund ratings and definitions are:** Buy: Higher stability of principal and higher stability of dividends; Neutral: Potential loss of principal, stability of dividend; Reduce: High potential for loss of principal and dividend risk.
  UK and European Investment Fund ratings and definitions are: Buy: Positive on factors such as structure, management, performance record, discount; Neutral: Neutral on factors such as structure, management, performance record, discount; Reduce: Negative on factors such as structure, management, performance record, discount.
  Core Banding Exceptions (CBE): Exceptions to the standard +/-6% bands may be granted by the Investment Review Committee (IRC). Factors considered by the IRC include the stock's volatility and the credit spread of the respective company's debt. As a result, stocks deemed to be very high or low risk may be subject to higher or lower bands as they relate to the rating. When such exceptions apply, they will be identified in the Companies Mentioned table in the relevant research piece.

Global Disclaimer

This report has been prepared by UBS AG or an affiliate thereof ("UBS"). In certain countries UBS AG is referred to as UBS SA.

This report is for distribution only under such circumstances as may be permitted by applicable law. It has no regard to the specific investment objectives, financial situation or particular needs of any specific recipient. It is published solely for informational purposes and is not to be construed as a solicitation or an offer to buy or sell any securities or related financial instruments. No representation or warranty, either express or implied, is provided in relation to the accuracy, completeness or reliability of the information contained herein, except with respect to information concerning UBS AG, its subsidiaries and affiliates, nor is it intended to be a complete statement or summary of the securities, markets or developments referred to in the report. The report should not be regarded by recipients as a substitute for the exercise of their own judgement. Any opinions expressed in this report are subject to change without notice and may differ or be contrary to opinions expressed by other business areas or groups of UBS as a result of using different assumptions and criteria. The analysis contained herein is based on numerous assumptions. Different assumptions could result in materially different results. The analyst(s) responsible for the preparation of this report may interact with trading desk personnel, sales personnel and other constituencies for the purpose of gathering, synthesizing and interpreting market information. UBS is under no obligation to update or keep current the information contained herein. UBS relies on information barriers to control the flow of information contained in one or more areas within UBS, into other areas, units, groups or affiliates of UBS. The compensation of the analyst who prepared this report is determined exclusively by research management and senior management (not including investment banking). Analyst compensation is not based on investment banking revenues, however, compensation may relate to the revenues of UBS Investment Bank as a whole, of which investment banking, sales and trading are a part.

The securities described herein may not be eligible for sale in all jurisdictions or to certain categories of investors. Options, derivative products and futures are not suitable for all investors, and trading in these instruments is considered risky. Mortgage and asset-backed securities may involve a high degree of risk and may be highly volatile in response to fluctuations in interest rates and other market conditions. Past performance is not necessarily indicative of future results. Foreign currency rates of exchange may adversely affect the value, price or income of any security or related instrument mentioned in this report. For investment advice, trade execution or other enquiries, clients should contact their local sales representative. Neither UBS nor any of its affiliates, nor any of UBS' or any of its affiliates, directors, employees or agents accepts any liability for any loss or damage arising out of the use of all or any part of this report. Additional information will be made available upon request.

United Kingdom, Sweden and Netherlands: Except as otherwise specified herein, this material is communicated by UBS Limited, a subsidiary of UBS AG, to persons who are market counterparties or intermediate customers (as detailed in the FSA Rules) and is only available to such persons. The information contained herein does not apply to, and should not be relied upon by, private customers. France: Prepared by UBS Limited and distributed by UBS Limited and UBS Securities France SA. Germany: Prepared by UBS Limited. Distributed by UBS Limited and UBS Investment Bank AG. UBS Limited is regulated by FSA. UBS Investment Bank AG is regulated by Bundesanstalt fur Finanzdienstleistungsaufsicht.

Spain: Prepared by UBS Limited and distributed by UBS Securities Espana SV SA, a member of the Comision Nacional del Mercado de Valores. Russia: Prepared and distributed by the Moscow Representative Office of UBS Cyprus Moscow Limited. Switzerland: Distributed by UBS AG to persons who are institutional investors only. Italy: Should persons receiving this research in Italy require additional information or wish to effect transactions in the relevant securities, they should contact UBS Italia SIM S.p.A. South Africa: UBS South Africa (Pty) Limited is a member of the JSE Limited. UBS South Africa (Pty) Limited is an authorised Financial Services Provider. United States: Distributed to US persons by either UBS Securities LLC or by UBS Financial Services Inc., subsidiaries of UBS AG; or by a group, subsidiary or affiliate of UBS AG that is not registered as a US broker-dealer (a "non-US affiliate"), to major US institutional investors only. UBS Securities LLC or UBS Financial Services Inc. accepts responsibility for the content of a report prepared by another non-US affiliate when distributed to US persons by UBS Securities LLC or UBS Financial Services Inc. All transactions by a US person in the securities mentioned in this report must be effected through UBS Securities LLC or UBS Financial Services Inc., and not through a non-US affiliate. Canada: Distributed by UBS Securities Canada Inc., a subsidiary of UBS AG and a member of the principal Canadian stock exchanges & CIPF. A statement of its financial condition and a list of its directors and senior officers will be provided upon request. Hong Kong: Distributed by UBS Securities Asia Limited. Singapore: Distributed by UBS Securities Pte. Ltd or UBS AG, Singapore Branch. Japan: Distributed by UBS Securities Japan Ltd to institutional investors only. Australia: Distributed by UBS AG (Holder of Australian Financial Services Licence No. 231087) and UBS Securities Australia Ltd (Holder of Australian Financial Services Licence No. 231098) only to "Wholesale" clients as defined by s761G of the Corporations Act 2001. New Zealand: Distributed by UBS New Zealand Ltd.