Contents

1 Behvioral Finance

1.1 The top-down approach

1.1.1 Investor Sentiment in the Stock Market, Baker et al. 2007

Definition (Standard Finance). They model investors as being unemotional and they always force capital market prices to equal the rational present value of expected future cashflows:

$$VE = \sum_{t=1}^{+\infty} \frac{FCF_t}{(1+r)^t}$$

Definition (Behavioral Finance). They augment the model with two extra assumptions:

1. By delong et al. (1990) investors have sentiments ie a belief about future CF and risks not justified by facts.

2. Shleifer et al. (1997) betting against sentiment investors is costly and risky. Their opponent is the rational investors aka arbitageurs.

Methodology (How to measure IS ?).
(a) The bottom-up approach. Using biases in individual investors psychology ie overconfidence, representativeness and conservatism.

- Advantage. It provides microfoundations for the variation in investor sentiment that the top-down model takes as exogeneous.

(b) The top-down approach and macroeconomics. Built upon two assumptions of Behavioral Finance: sentiments and limits to arbitage. ie we rather emphasize on stocks that are more likely to be affected by sentiment. Eg low cap, younger, unprofitable, high volatility, non-dividend paying, growth companies or stocks of firms in financial distress are likely to be disproportionately senstiive to investor sentiment. In contrast to the "Bond-like" stocks that are less sensitive to sentiment.

- Bond like stocks (Not sensitive to sentiments). Stocks ie companies that provide essentials eg "utilities" for water and electricity and "consumer staples" eg wallmart. They generate a lot of cash but not grow that much.

- Advantage. It is the potential to encompass bubbles, crashes and more everyday patterns in stock prices in a simple and intuitive way.

Why mispricing occurs ? Recollect that in the empirical litterature we have seen that growth stocks are typically overpriced and value stocks underpriced. But on top of that Behavioral finance showcases that:

- A change in sentiment of the irrational traders

- Limit to arbitrage to the rational ones eg short time horizon or cost/risks of trading and short selling may be an impediment.

Experiments.

- Sentiment betas. The β_s measures if prices co-moves with the sentiment.

- Paper. odd-lot index

- Factors constructions. They use six proxies:

1. **Trading volume (aka liquidity).** Baker et al. (2004) shows that irrational investors are more likely to trade when they are optimistic and betting on rising stocks which overall add liquidity.

2. **Dividend premium.** Dividend-paying stocks resemble bonds since we can sort of predict their incomes. What the authors observe in their paper "Appearing and disappearing dividends" in 2003 is that

   - Dividend premium ↘ and the propensity to pay tends to ↘ when sentiment for growth stocks is high.
   - Following crashes for growth stocks appears to favor the "safe" returns on payers. This characterizes the mid 60's to mid 70's.

   As such they define the dividend premium as the difference between the average M/B ratio of dividends payers to non-payers

3. **Closed-end fund discount.** Many authors have argued that if closed-end funds are disproportionately held by retail investors, the avearge discount on closed-end equity funds may be a sentiment index, with the discount increasing when retail investors are bearish (market going down, bullish is when going up).

4. **IPO First-Day returns.** IPO sometimes earn such remarkable returns on their trading day that it is difficult to find an explanation that does not involve investor enthusiasm.

5. **Equity issues over total new issues.** Paper The Equity share in new issues and aggregate stock returns by Baker et al. In particular, firms issue relatively more equity than debt just before periods of low market returns.

6. **IPO Volume.** We observe a rate of over 100 issues per month in some periods and zero issues per month in others. Depending on the "windows of opportunity" that investment bankers speak about.

Note: Some of the sentiment proxies reflect economic fundamentals. Eg IPO volume depends, in parts, on Investment opportunities. To remove such influences, they regress each proxy on a set of macroeconomic indicators. And they use the residuals on these regressions as their sentiment proxies.

- Graphical interpretations. It yields positive sentiments: share turnover (TURN), IPO volume (NIPO), IPO first-day returns (RIPO), and the equity share in new issues (S), and those negatively associated are the closed-end fund discount (CEFD) and the dividend premium (PDND).

$$SENT = -0.23CEFD + 0.23TURN + 0.24NIPO + 0.29RIPO - 0.32PDND + 0.23S$$

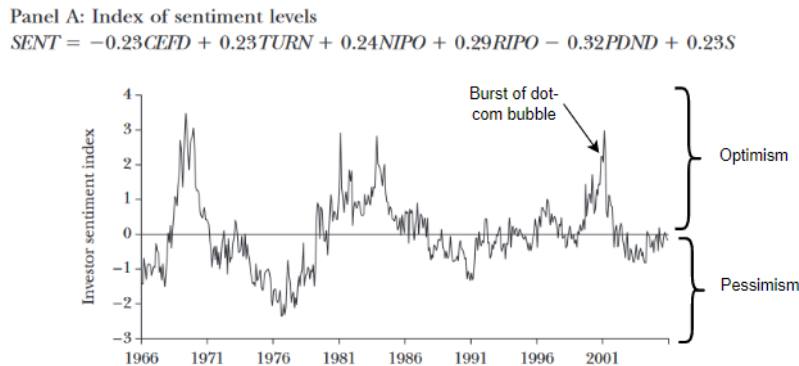This is where we should plot the evolution of IS across time.

Figure 1: Caption

- Sentiment Index to predict stock returns. Here the y-axis measures prices, with P^* denoting fundamental values.

- High sentiment should be associated with high stock variations, particularly for the stocks that are the hardest to value and to arbitrage.

- Low sentiment works in reverse direction. Low sentiment works in the reverse direction.

- In the absence of sentiment, stocks are, on average, assumed to be correctly priced at P∗.
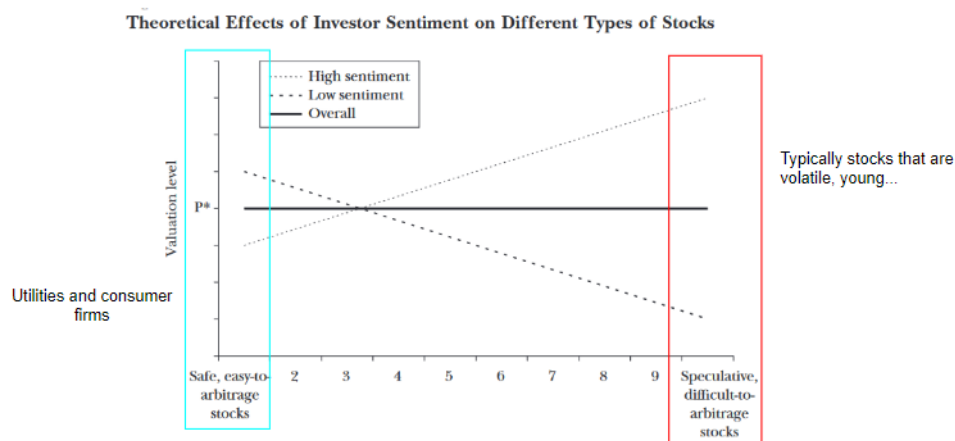
Figure 2: Sentiment "seesaw"

Further they create an empirical version of the sentiment "seesaw" sorting stocks as speculative and difficult to arbitrage as those that are high volatility. The resulting picture (below) says that:

- When sentiment is low, the average future returns of speculative stocks exceed those of bond-like stocks.

- When sentiment is hig, the average future returns of speculative stocks are on average lower than the returns of bond-like stocks.

As such **the fact that riskier stocks sometimes have lower expected returns is inconsistent with classical asset pricing** in which investors bear risk because they are compensated by higher expected return.
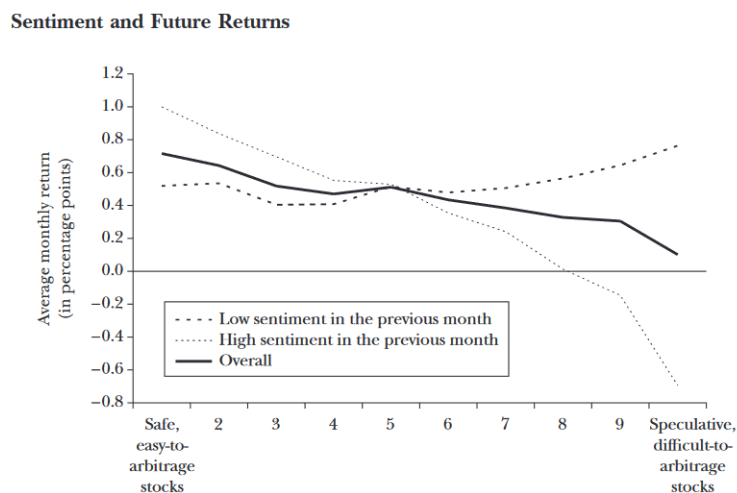
Figure 3: Sentiment "seesaw"

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- Appendix (PCA for time-series).

1.1.2 The short of it: investor sentiment and anomalies (2012)

Motivation. Sentiment-driven investors can cause prices to deport from fundamental values. In theory mispricing should be eliminated by traders seeking to exploit the profit opportunities. But in practice impediments to short-selling play a significant role in limiting the ability of rational traders to exploit overpricing (Miller et al 1977). As a consequence:

$$N_{\text{overpricing}} > N_{\text{underpricing}}$$

It means that the short side of the strategy should responsd but not the long side.

Assumptions.

- The 11 anomalies (momentum, roa, profitability..), which reflect mispricing, should be stronger following high sentiment. If overpricing is more prevalent then it should be more common when sentiment is high. In contrast during low-sentiment period the view of the stocks tend to be the one of the rational investors thus mispricing is less likely.

- Returns on the short-leg portfolio of each 11 anomalies should be lower when sentiment is high (Note that stocks in the short leg are relatively overpriced compared to the stocks in the long leg)

- Investor sentiment should not greatly affect returns on the long-leg portfolio of each 11 anomalies. (Again if there is no underpricing)

- Overpcing/underpricing. Concepts of overpricing and underpricing. We finance our long side by selling stocks short, the spread ie difference in return from one period to the next is our profit. That is the idea of hedge fund to create zero-cost strategies or zero-cost portfolios. But there is three scenarios on how the returns of the zero-cost evolves.
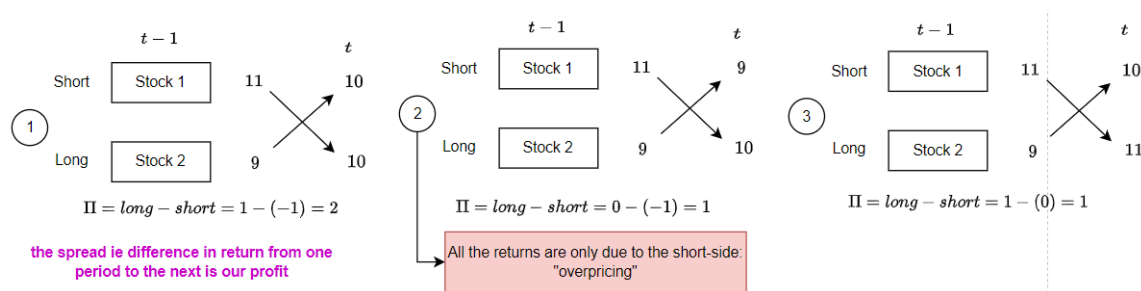

Figure 4: Overpricing is the second case that we test

In the paper they test the second strategy. Second case, whenever the returns can be traced back to the short side, since the short-side is responding. This is also how they formulate the hypothesis. H_1: They test that the long-short portfolios responds (positively) to changes in sentiment. H_2: The short-side responds. H_3: The long-side does not respond.

In the paper section 2.1 they explain why shorting is prohibted.

- Institutional constraints. Eg mutual funds are not allowed to short-sell.

- Transaction costs. can be an impediment to short-sell

- Behavioral biases. Les gens sont plus content quand le cours monte plutôt que parié à sa baisse.

- Methodology.

$$R_{i,t} = \hat{a}_H d_{H,t} + \hat{a}_L d_{L,t} + bMKT_t + cSMB_t + dHML_t + \varepsilon_{1t}$$

Where the d are dummy vectors which describes period of high or low sentiment:

$$d_{1t} = \begin{pmatrix} 1 \\ 1 \\ \vdots \\ 0 \end{pmatrix} = \begin{cases} 1 \text{ if IS is high at t-1} \\ \text{else} \end{cases} \quad ; \quad d_{2t} = \begin{pmatrix} 0 \\ 0 \\ \vdots \\ 1 \end{pmatrix}$$

Visually we stand at time t (second cross) and if the previous cross at time $t-1$ is below the median we set the value $d_{1,H}$ scalar value to zero otherwise one.
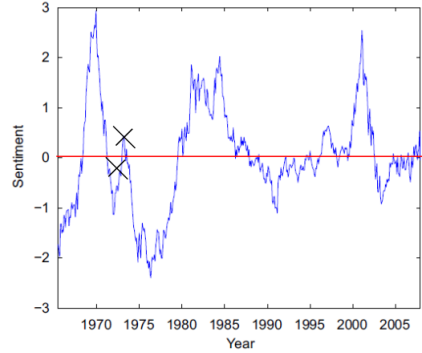

Figure 5: An example of the $d_{H,t}$ vector

Then once we have learnt the $\hat{a}_H$ and $\hat{a}_L$ we can build an hypothesis test:

$$H_{1,0} : (\hat{a}_H - \hat{a}_L) = 0$$
$$H_{1,1} : (\hat{a}_H - \hat{a}_L) > 0$$

This is what they report in the table as the "High-Low". For the H_1 to hold we need to reject $H_1, 0$ otherwise it would mean that sentiment has no effect on the overpricing.

Anomaly	Long leg			Short leg			Long–short		High
	High sentiment	Low sentiment	High –low	High sentiment	Low sentiment	High –low	High sentiment	Low sentiment	High –low
Failure probability	0.77	1.14	−0.38	−1.10	1.25	−2.34	1.86	−0.10	1.96
	(2.16)	(3.74)	(−0.81)	(−1.54)	(2.26)	(−2.60)	(3.25)	(−0.24)	(2.72)
Ohlson's O (distress)	0.42	0.61	−0.19	−0.98	0.61	−1.59	1.40	−0.00	1.40
	(1.14)	(2.06)	(−0.41)	(−1.69)	(1.33)	(−2.15)	(3.81)	(−0.01)	(2.85)
Net stock issues	0.64	0.75	−0.11	−0.50	0.63	−1.13	1.14	0.12	1.02
	(2.22)	(3.04)	(−0.28)	(−1.26)	(2.10)	(−2.28)	(5.71)	(0.88)	(4.20)
Composite equity issues	0.53	0.72	−0.19	−0.28	0.69	−0.97	0.81	0.02	0.79
	(1.93)	(3.08)	(−0.52)	(−0.72)	(2.13)	(−1.91)	(3.19)	(0.13)	(2.46)
Total accruals	0.37	1.07	−0.71	−0.57	0.84	−1.41	0.94	0.23	0.70
	(0.82)	(3.10)	(−1.25)	(−1.06)	(2.22)	(−2.14)	(3.11)	(1.04)	(1.88)
Net operating assets	0.50	0.92	−0.43	−0.57	0.69	−1.26	1.07	0.24	0.83
	(1.36)	(3.01)	(−0.90)	(−1.37)	(2.20)	(−2.41)	(4.66)	(1.29)	(2.84)
Momentum	0.78	1.43	−0.64	−1.24	0.34	−1.58	2.03	1.09	0.93
	(1.69)	(4.12)	(−1.11)	(−2.14)	(0.76)	(−2.16)	(4.49)	(3.12)	(1.64)
Gross profitability	0.59	0.79	−0.20	−0.06	0.64	−0.70	0.65	0.15	0.50
	(1.84)	(2.73)	(−0.47)	(−0.18)	(2.48)	(−1.62)	(2.93)	(0.64)	(1.53)
Asset growth	0.79	1.22	−0.43	−0.60	0.68	−1.27	1.39	0.54	0.85
	(2.14)	(3.26)	(−0.81)	(−1.30)	(1.92)	(−2.20)	(5.04)	(2.34)	(2.37)
Return on assets	0.61	0.66	−0.05	−1.10	0.44	−1.55	1.72	0.22	1.50
	(1.60)	(2.10)	(−0.10)	(−1.78)	(1.00)	(−2.02)	(4.01)	(0.65)	(2.74)
Investment-to-assets	0.44	1.38	−0.94	−0.47	0.78	−1.25	0.91	0.60	0.30
	(1.19)	(4.13)	(−1.90)	(−1.14)	(2.25)	(−2.32)	(4.48)	(2.93)	(1.06)
Combination	0.56	0.95	−0.39	−0.68	0.65	−1.32	1.23	0.31	0.93
	(1.72)	(3.51)	(−0.93)	(−1.54)	(1.96)	(−2.41)	(6.64)	(2.64)	(4.25)

Figure 6: Anomalies during periods of high and low IS

Anomalies.

- n1 and n2: Financial distress: Campbell et al. 2008 finds that firms with high failure probability have lower subsequent returns. They estimate the failure probability using a dynamic logit model.The second anomaly showcases that the O-scores of Ohlson 1980 yields similar results to campbell model.

- Gross profitability premium: Novy Marx has shown that high profitability firms have higher expected returns then low profitable firms.

Note: The first assumption holds if we only look at the "long-short" of table 2 since the slope coefficients of all anomalies are positive and greater than in low sentiment. They did a linear regression on a set of "anomalies" that could be seen as style factors.