University of Zurich
Institute for Empirical Research in Economics

Behavioral Finance and Asset Management

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Sungard December 3rd, 2004.

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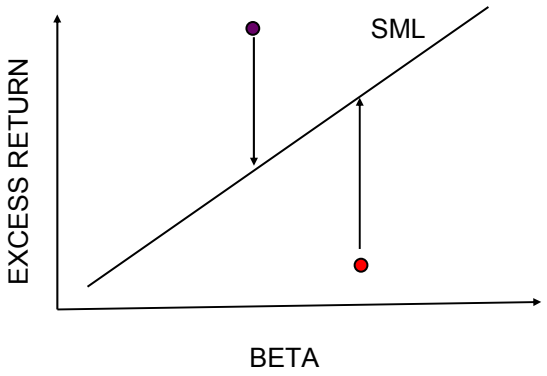
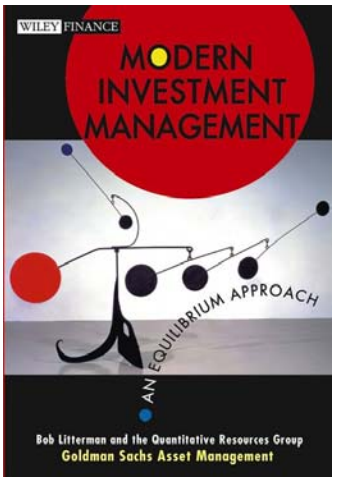
Methods of Traditional Finance

- Optimization Principle
- Anticipation Principle
- Equilibrium Principle

Method of Traditional Finance: Classical Mechanics

"Thus, we view the financial markets as having a **center of gravity** that is defined by the equilibrium of demand and supply." Litterman, page 3.





A Remark from History: The South Sea Bubble

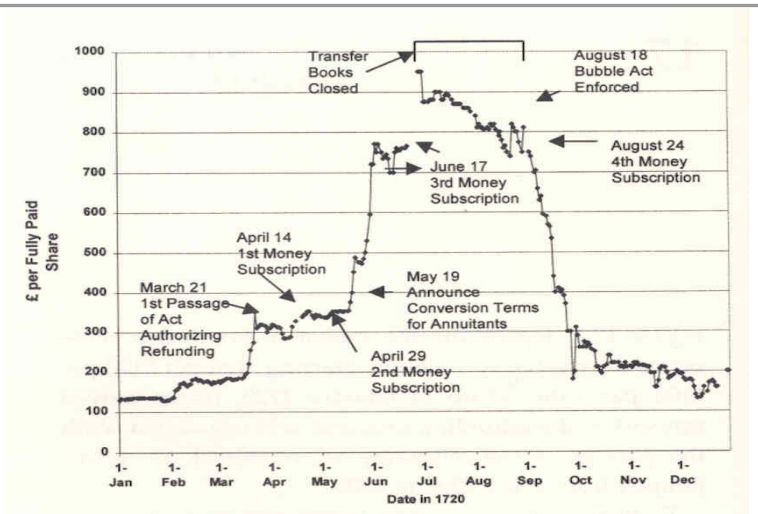
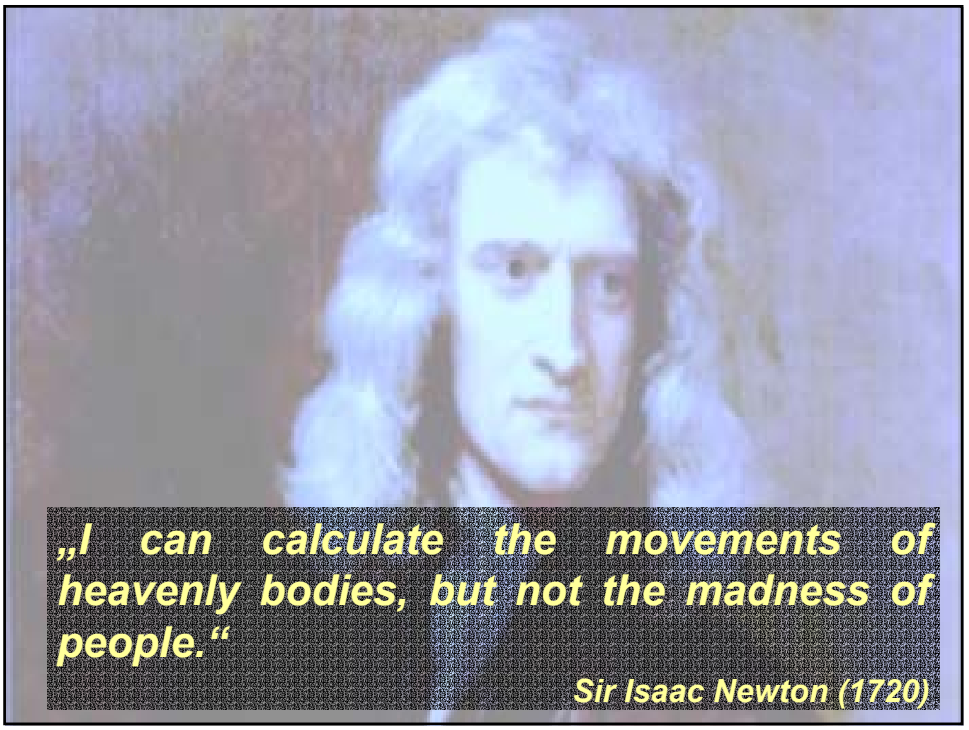


Figure 17.1
Daily South Sea Share Prices, 1720. Data courtesy of Larry Neal.



Methods of Traditional Finance

- Optimization Principle
- Anticipation Principle
- Equilibrium Principle

Methods of Behavioral Finance

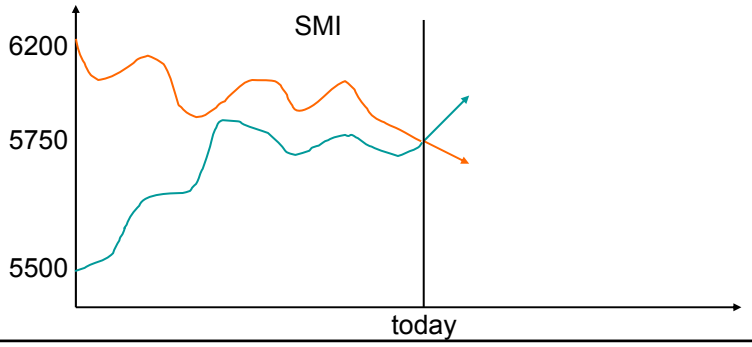
- Heuristics and Satisfying Behavior
- Anticipation Principle
- Equilibrium Principle

Methods of Behavioral Finance

- Heuristics and Satisfying Behavior
- History Matters
- Equilibrium Principle

History Matters

For the future development of the SMI it is **relevant** whether we reached the current level of 5750 coming from 6200 or rather from 5500.



Methods of Behavioral Finance

- Heuristics and Satisfying Behavior
- History Matters
- "Markets can remain irrational longer than you can remain solvent"

The Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel 2002

"for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty"

Daniel Kahneman

- 1/2 of the prize

"for having established laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms"

Vernon L. Smith

- 1/2 of the prize

Contents

A Model of the Behavioral Investor:


Prospect Theory

- Framing
- Loss Aversion
- Mental Accounting
- Get-eventis
- Probability Weighing
- Non-Bayesian Updating

Kahneman, D. and A. Tversky (1979) : "Prospect Theory: An Analysis of Decisions Under Risk", *Econometrica*, 47, 263-291.

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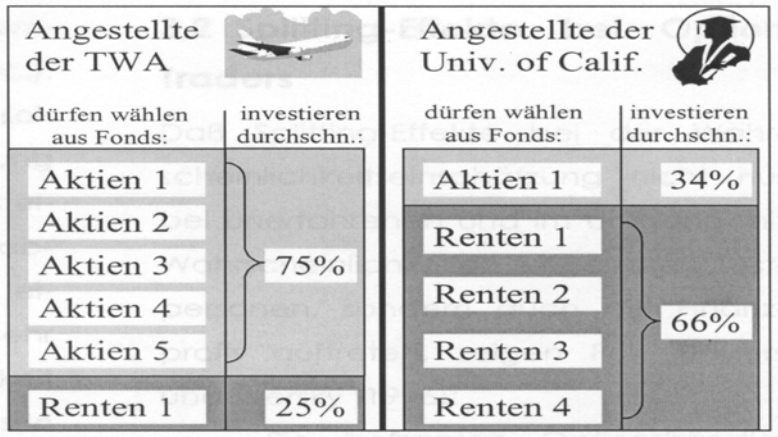
Example Framing: Benartzi and Thaler (1998)



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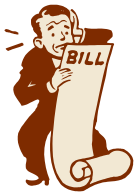
Example: Loss Aversion

Which X does make you indifferent in the following lottery?

Doubling your income with 50% probability.

Loosing X% of your income with 50% probability.

Asking for a Payment Increase:



YOU

THE COIN

Tails

Heads

-X%

+100%

YOUR BOSS

Example: Loss Aversion

Which X does make you indifferent in the following lottery?

Doubling your income with 50% probability.

Loosing X% of your income with 50% probability.

Example: Loss Aversion

Which X does make you indifferent in the following lottery?

Doubling your income with 50% probability.

Loosing X% of your income with 50% probability.

Typical answer: X = 23%.
Expected utility maximizer (with logarithmic utility) chooses X = 71 %.

Typical answer is called LOSS AVERSION

Loss Aversion Can Result in Aversion to Stocks

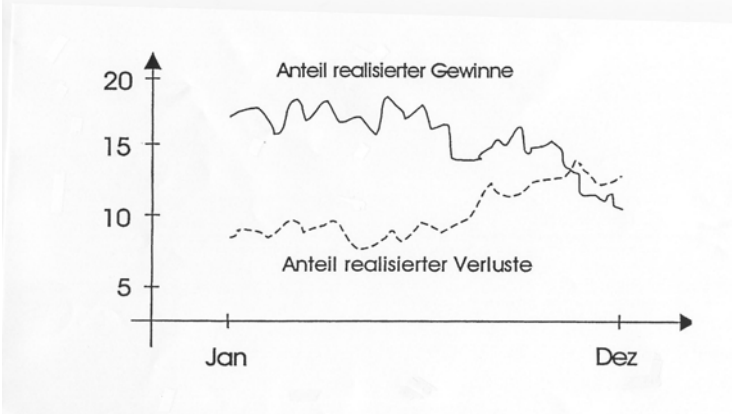
A Loss of 10.000 needs to be compensated by a gain of at least 22.500:

Compare two investors, Nick who calculates the gains and losses in his portfolio every day, and Dick who only looks at his portfolio once per decade. Since, on a daily basis, stocks go down in value almost as often as they go up, Nick's loss aversion will make stocks appear very unattractive to him. In contrast, loss aversion will not have much effect on Dick's perception of stocks since at ten year horizons stocks offer only a small risk of losing money.

Benartzi and Thaler (1995) “Myopic Loss Aversion”, Journal of Political Economy.

Loss Aversion: Disposition effect

Odean (1998): Distinguish between book losses and realised losses



Investors realize gains 1.68 more than they realize losses.

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Mental Accounting

Simplify Investment Decision by Drawing Mental Boundaries

- Bonds versus Stocks versus Options
- Dividends versus Capital Gains
- Home versus Foreign
- Etc.

Example Mental Accounting and Loss Aversion

Test:

Lottery	*Payoff in CHF*
A	(2.400; 100 %)
B	(10.000; 25 %, 0; 75 %)
C	(-7.500; 100 %)
D	(-10.000; 75 %, 0; 25 %)
Choose:	*A or B and C or D ?*

Example Mental Accounting and Loss Aversion

Typical answer: A and D

Lottery	*Payoff in CHF*
A and D	(-7.600; 75% , 2.400; 25%)
B and C	(-7.500; 75%, 2.500; 25%)

100 are left on the table!

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Example: Get Eventis

A= (500 CHF, 50%; 700 CHF, 50%)

Are you ready to pay 600 CHF for playing lottery A?

B = (- 500 CHF, 50%; -700 CHF, 50%)

Are you ready to pay 600 CHF to avoid playing B?

Example: Get Eventis

A= (500 CHF, 50%; 700 CHF, 50%)

Are you ready to pay 600 CHF for playing lottery A?

B = (- 500 CHF, 50%; -700 CHF, 50%)

Are you ready to pay 600 CHF to avoid playing B?

Typical answer: A ⟶ NO! B ⟶ NO!

Implications of Get Eventis: We tend to take more risk after small-medium losses

Example: Nicholas Leeson

He lost 1,4 Billion $ and broke Barings Bank PLC in 1995.

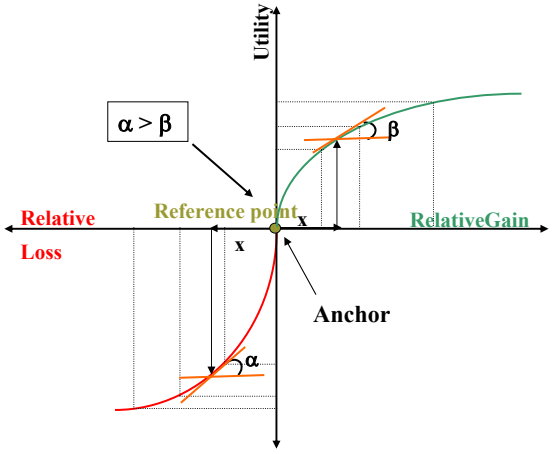
„I gambled on the stock market
to rescue my mistakes and
to save the bank.“

Application

- Give the right incentives to report losses

The Prospect Theory Value Function

Von Neumann Morgenstern Utility



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Probability Weighing

Urn with balls numbered 0,1,…,99.

	0	1-10	11-99
A	50	50	50
B	0	250	50
A`			
B`			

Probability Weighing

Urn with balls numbered 0,1,…,99.

	0	1-10	11-99
A			
B			
A`	50	50	0
B`	0	250	0

Probabilty Weighing

Urn with balls numbered 0,1,…,99.

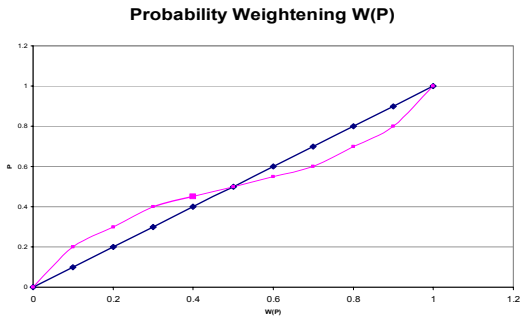
	0	1-10	11-99
A	50	50	50
B	0	250	50
A`	50	50	0
B`	0	250	0

„A ⩾ B because
A has no risk at all
While in B I could get 0.“

„B` ⩾A` because
The small increase
in getting 0 is not worth
to forgo the 250.“

Typical choice A ⩾ B and B` ⩾A`.

Probability Weighing



Possible but unlikely events do get too much weight in our decisions.

Example: The Favorite Longshot-Bias

Question:

Would you rather bet on a 2 to 5 shot and receive a 40% profit if you win or on a 20 to 1 shot where you receive 2000% profit if you win?

Answer:

The public prefers the latter but the expected returns are much higher for the favorites.

Hodges, Tompkins and Ziemba (2003)

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Representativeness Bias (1)

A Test

A fund manager is known to beat the market in 2 of 3 years.

Which of the following protocols is most likely?

a) BLBBB *b) LBLBBB* *c) LBBBBB*

Barberis, Shleifer and Vishny (1998): A Model of Investor Sentiment, JoFE.

Representativeness Bias (2)

a) BLBBB *b) LBLBBB* *c) LBBBBB*

Typical answer b)

but protocoll b) is protocoll a) *and* L at the beginning.

Representativeness Bias explains

Short-Run Momentum and Long-Run Reversal

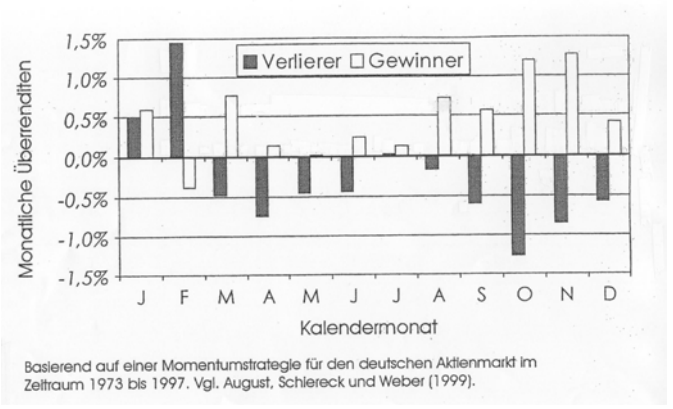
Barberis, Shleifer and Vishny (1998): A Model of Investor Sentiment, JoFE.

Short-Run Momentum: The Trend is Your Friend

Formation Period: 3-12 Months

Holding Period: 3-12 Months

Strategy: Buy Winner, (Short)-Sell Losers



Basierend auf einer Momentumstrategie für den deutschen Aktienmarkt im Zeitraum 1973 bis 1997. Vgl. August, Schlereck und Weber (1999).

Long-Run Reversal (1): Value Investment Pays

Autoren	Untersuchte Länder	Zeitraum	Ergebnis
Lakonishok, Shleifer und Vishny (1994)	USA	4/1963 bis 4/1990	Renditedifferenz zwischen Value- und Growth-Aktien von 3,9 % p.a.
Fama und French (1992)	USA	6/1963 bis 12/1990	Renditedifferenz zwischen Value- und Growth-Aktien von 8,16 % p.a.
Chan, Hamao und Lakonishok (1991)	Japan	1/1971 bis 12/1988	Renditedifferenz zwischen Value-und Growth-Aktien von 4,92 % p.a.
Brouwer, van der Put und Veld (1996)	Deutschland, Frankreich, Niederlande, Großbritannien	6/1982 bis 6/1993	Renditedifferenz zwischen Value- und Growth-Aktien von 5 % p.a.
Wallmeier (2000)	Deutschland	1967 bis 1994	Renditedifferenz zwischen Value- und Growth-Aktien von 7,24 % p.a.

Tabelle 1: Identifikation von Value-Aktien anhand des Kurs-Gewinn-Verhältnisses

Long-Run Reversal (2): Value Investment Pays

Autoren	Untersuchte Länder	Zeitraum	Ergebnis
Lakonishok, Shleifer und Vishny (1994)	USA	4/1963 bis 4/1990	Renditedifferenz zwischen Value- und Growth-Aktien von 9,9 % p.a.
Hawawini und Keim (1995)	USA	4/1962 bis 12/1989	Renditedifferenz zwischen Value- und Growth-Aktien von 10,68 % p.a.
Chan, Hamao und Lakonishok (1991)	Japan	1/1971 bis 12/1988	Renditedifferenz zwischen Value- und Growth-Aktien von 9,48 % p.a.
Brouwer, van der Put und Veld (1996)	Deutschland, Frankreich, Niederlande, Großbritannien	6/1982 bis 6/1993	Renditedifferenz zwischen Value- und Growth-Aktien von 20,8 % p.a.
Wallmeier (2000)	Deutschland	1967 bis 1994	Renditedifferenz zwischen Value- und Growth-Aktien von 7,22 %
Keppler (1991b)	Weltweit	1/1979 bis 12/1989	Das Value-Portfolio schlägt den Index um 3,65 % p.a. und das Growth-Portfolio um 14,8 % p.a.

Tabelle 2: Identifikation von Value-Aktien anhand des Kurs-Cashflow-Verhältnisses

Underreaction (1)

Test

- 100 urns with 1000 balls each
- 45 of those have 700 black and 300 red balls
- 55 of those have 300 black and 700 red balls

- ***Question 1: Probability that a randomly selected urn has more black balls?***

Underreaction (2)

- Then 12 balls are drawn (with returning) from the randomly selected urn
- Result of this drawing: 8 black and 4 red

- ***Question 2: Probability that the randomly selected urn has more black balls?***

Underreaction (3)

- Then 12 balls are drawn (with returning) from the randomly selected urn
- Result of this drawing: 8 black and 4 red
- ***Question 2: Probability that the randomly selected urn has more black balls?***
- Typical answers: 45% and 67%

  Underreaction to new information!
- Correct answer: 96.04%

Bayes‘ Formula

- We look for:

$$p(s/*)=\frac{p(s)\ p(*/s)}{p(s)p(*/s)+p(r)p(*/r)}$$

where $p(s)=45\%$ $p(r)=55\%$

Binomial distribution

$$p(*/s) = \binom{12}{8} (0.7)^8 (0.3)^4$$

$$p(s/*) = \frac{1}{1 + \dfrac{p(r)p(*/r)}{p(s)p(*/s)}}$$

$$p(r)p(*/r) = \frac{55}{45} \frac{\binom{12}{8}(0.3)^8(0.7)^4}{\binom{12}{8}(0.7)^8(0.3)^4} = \frac{11}{9}\left(\frac{0.3}{0.7}\right)^4 = 0.027$$

$$\approx \frac{1}{1.027} \approx 96.04\%$$

Underreaction in Data

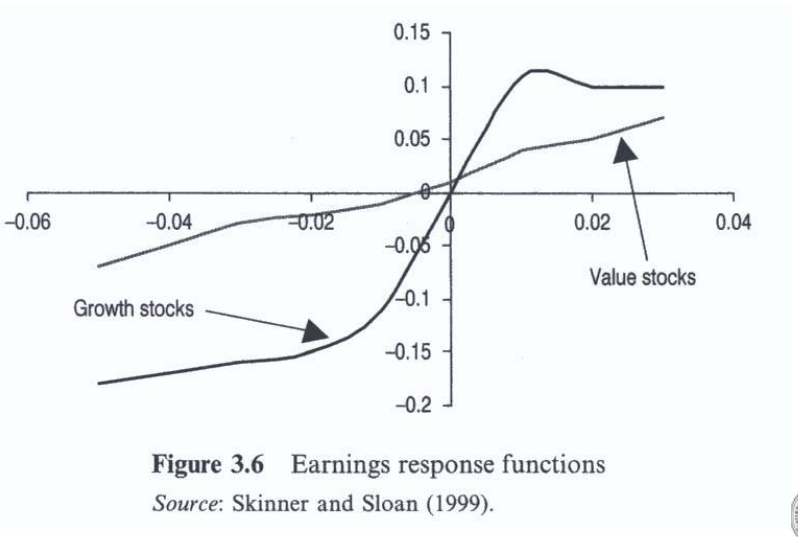


Figure 3.6 Earnings response functions

Source: Skinner and Sloan (1999).

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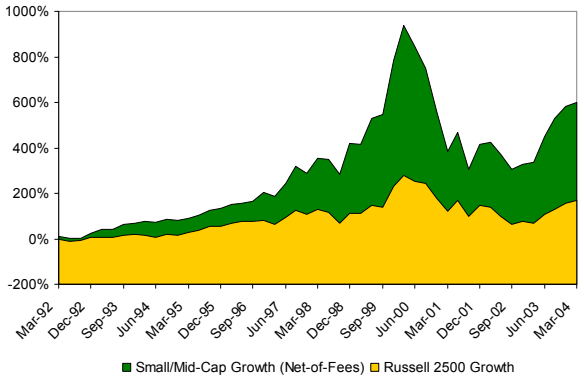
Funds Exploiting Underreaction

Fuller and Thaler Asset Management (FTAM)

Buy stocks of companies with SUE because there will be the "post earnings announcement drift".

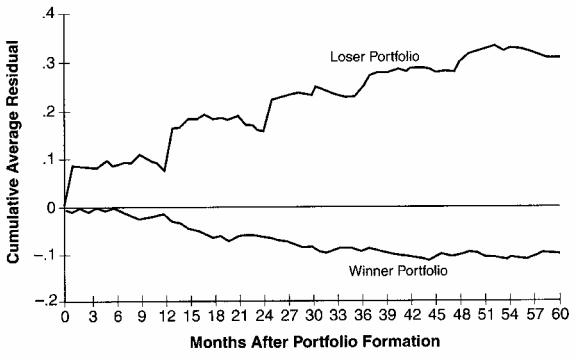


Funds Exploiting Mean Reversion

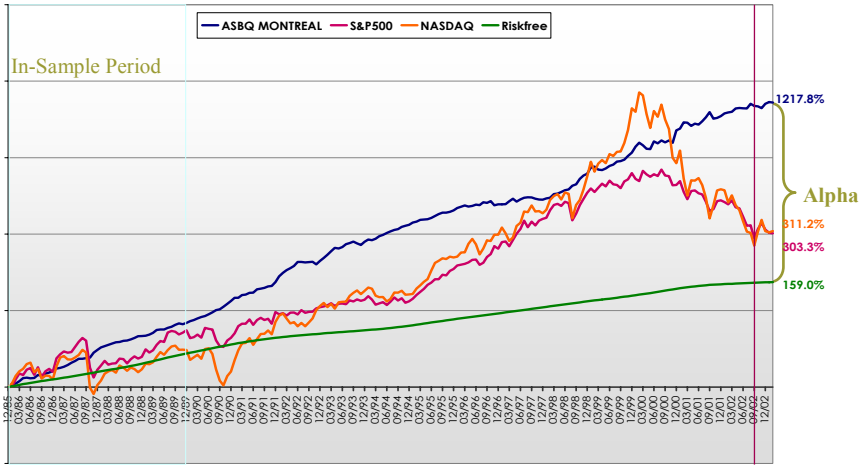
DeBondt und Thaler (1985): Contrarian Strategy

(Formation Period: Last 3 Years.

Holding Period: The next 3-5 Years.)



The AlphaSwiss MONTREAL-Index: Short-Run Momentum and Medium-Run Reversal



The AlphaSwiss MONTREAL-Index describes the back test of the MONTREAL-model.

Funds Exploiting The Favorite Longshot-Bias on Stock Index Options

The Results for 3 Month Options on the S&P 500 and FTSE 100 Futures

Calls

- the favorite deep in the money calls have positive expected value just like the favorites at the racetrack
- the longshots used for covered call and other strategies in high demand have expected losses
- the shape is similar to the racetrack graphs

Puts

- Insurance costs imply that there are losses on all the puts.
- There are only small profits on the deepest in the money puts.
- The losses are more and more as the puts get more and more out of the money just like the racetrack.
- This is consistent with the contentions of Rubinstein and Jackwerth (1996) and Dumas, Fleming and Whaley (1996) that investors view put options as insurance policies and are willing to accept an expected loss to protect their equity holdings.

Expected Returns on Options

Table 3.2: Expected return per $1 bet vs. odds levels: three month options on S&P500 Futures, March 1985 to September 2002, Source: Hodges, Tompkins and Ziemba, 2002

Call Options on the S&P 500 Futures					Put Options on the S&P 500 Futures				
Odds (%)	# Obs	Average Payoff	Std. Dev of Payoff	T-test vs. 1$	Odds (%)	# Obs	Average Payoff	Std. Dev of Payoff	T-test vs. 1$
.95 -1.00	47	1.0010	0.3204	0.02	.95 -1.00	37	0.8998	0.4493	**-1.35***
.90 - .95	60	1.0561	0.4605	0.95	.90 - .95	44	0.8662	0.5872	**-1.50***
.85 - .90	66	1.1231	0.5704	**1.76****	.85 - .90	50	0.8426	0.7265	**-1.53***
.80 - .85	67	1.1407	0.6990	**1.66****	.80 - .85	54	0.7937	0.8120	**-1.86****
.75 - .80	63	1.0938	0.5953	1.25	.75 - .80	53	0.8137	0.8950	**-1.51***
.70 - .75	64	1.1366	0.7732	**1.41***	.70 - .75	51	0.7879	0.9979	**-1.51***
.65 - .70	62	1.1461	0.8648	**1.33***	.65 - .70	53	0.7702	0.9648	**-1.73****
.60 - .65	59	1.1311	0.9972	1.01	.60 - .65	54	0.6215	1.0258	**-2.70******
.55 - .60	58	1.1727	1.1154	1.18	.55 - .60	50	0.8225	1.2458	-1.01
.50 - .55	54	0.9890	1.0410	-0.08	.50 - .55	56	0.5807	1.1377	**-2.76******
.45 - .50	56	1.1365	1.3925	0.73	.45 - .50	51	0.7344	1.4487	**-1.31***
.40 - .45	58	1.2063	1.6012	0.98	.40 - .45	56	0.6785	1.5367	**-1.57***
.35 - .40	51	0.9770	1.7015	-0.10	.35 - .40	56	0.4744	1.2383	**-3.19******
.30 - .35	54	0.9559	1.6041	-0.20	.30 - .35	62	0.6257	1.6791	**-1.76****
.25 - .30	59	1.2923	2.7539	0.81	.25 - .30	64	0.6316	1.8231	**-1.62***
.20 - .25	53	1.1261	2.5378	0.36	.20 - .25	65	0.6426	1.9854	**-1.45***
.15 - .20	55	0.8651	2.0742	-0.48	.15 - .20	64	0.6696	2.2441	-1.18
.10 - .15	56	1.2262	3.6982	0.46	.10 - .15	66	0.6602	2.6359	-1.05
.05 - .10	53	1.5085	5.3370	0.69	.05 - .10	66	0.6432	3.4256	-0.85
.00 - .05	39	0.0123	0.1345	**-44.89******	.00 - .05	57	0.7525	5.6025	-0.33
All Options	69	1.1935	2.4124	0.67	All Options	69	0.6212	2.5247	-1.25

Expected Returns on Options

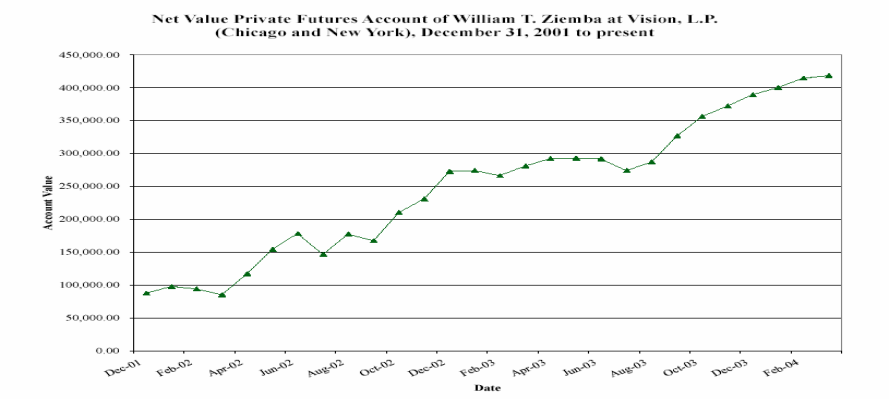
Figure 3.2: Expected return per $1 bet versus odds levels: 3-month calls and puts on S&P500 Futures, March 1985 to September 2002, Source: Hodges, Tompkins and Ziemba, 2002

Expected Return from Skew Trading

Sell over-priced puts and hedge them with short futures and use the proceeds of the put sale to buy calls. Back Testing:

Expected Return from Skew Trading

Sell over-priced puts hedge them with short futures and use the proceeds of the put sale to buy calls. Life:



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4. Conclusion

Traditional Finance: “Nobody can beat the Market”.

Behavioral Finance: “Except for those of us who do!”

→ **Recipe to beat the market:**

1. **Find some behavioral anomaly in the laboratory**
2. **Try to find it also on market data**
3. **Design a strategy to exploit it**
4. **Test it on market data**