Downside Beta and Controlling Risk

Presented at fi360, Chicago, 2012

G. Michael Phillips, Ph.D.
James Chong, Ph.D.

Center for Financial Planning and Investment,
California State University, Northridge
and
MacroRisk Analytics
mphillips@csun.edu
james.chong@csun.edu
info@macrorisk.com

Description of Presentation

- "Based on our recent publications in the *Journal of Wealth Management* and the *Journal of Personal Finance*, we would illustrate how CAPM beta can be seriously misleading. Beginning with an illustration of 39 mutual funds with nearly identical alphas and betas but quite different downside risk exposures, the talk continues to discuss the use of downside beta in investment policy statements and as a threshold variable for portfolio creation. The presentation concludes comparing resulting portfolios to popular "Fama-French 3-factor" and low volatility portfolios."

Introduction

- The use of the standard capital asset pricing model (CAPM) beta to measure risk is well known and widely discussed in the finance literature.
- Lesser known is the concept of using asymmetric betas—estimating one value for an upswing in the market and another value for downswings in the market.
- There is no reason to believe that one value for beta will accurately capture market risk for both an up- and down-market.
- The prevalent use of one estimate of a beta per stock or mutual fund for both up- and down-turns in the market can lead investors to oversimplify the risk characteristics of the investment.

Recent events have emphasized the importance of downside risk and low volatility

- "... investors are not just looking for low variability of return but are also concerned with downside risk, or the probability of losing money" (Bajtelsmit, 2005).
- Concern with downside risk is especially evident after the September 2008 financial crisis (Carter, 2009).

Let's compare some alternative measures

- Lower semi-deviation (compared to standard deviation of returns)
- Sortino ratio (compared to Sharpe ratio)
- Downside beta (compared to beta)

While related, each of these measures a somewhat different thing.

Lower semi-deviation is a measure of the entire historical downside activity of the target, regardless of market activity.

Sortino ratio provides a scaled measure of return per unit of downside risk and is useful for ranking potential investments.

Downside beta, explained in detail below, is related to the covariance between the target series and the down days of the benchmark series.

Traditional CAPM

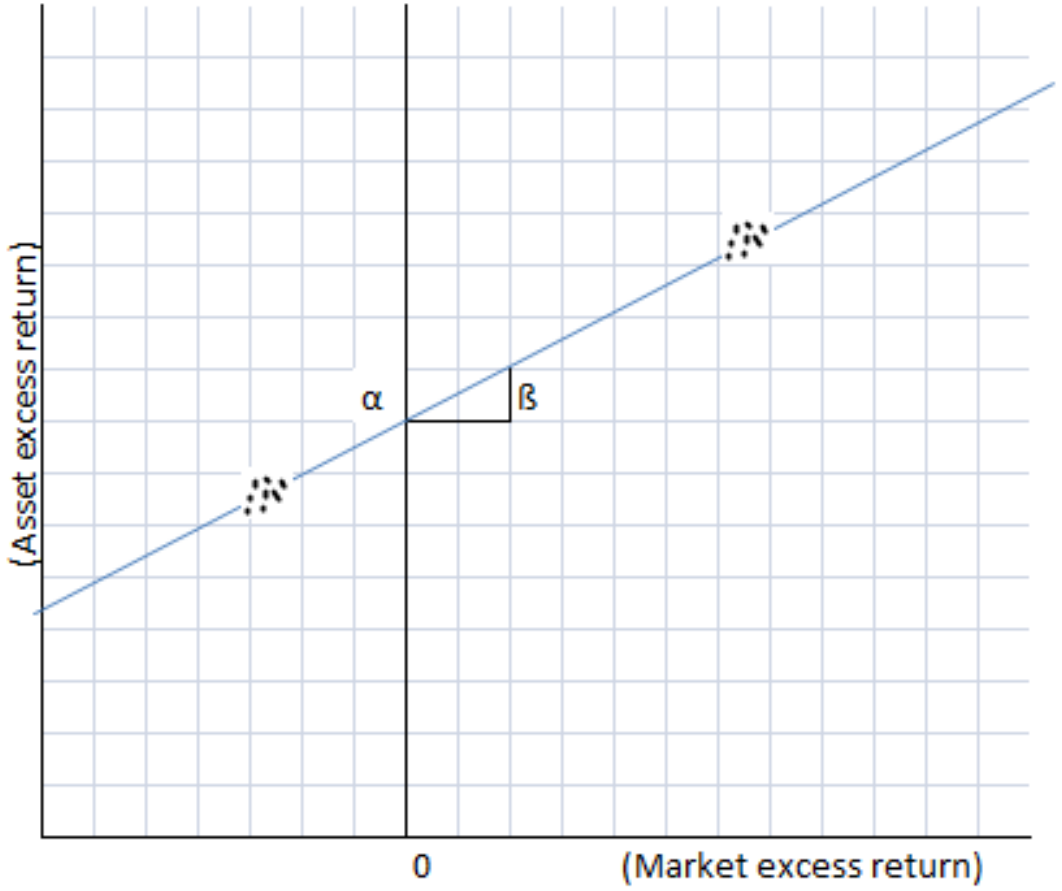
- Capital asset pricing model (CAPM) model
  - Slope of a best-fit line relating an asset's return to a market index return.
  - CAPM relates the excess asset return to the excess benchmark return relative to a risk-free rate of interest.

Traditional CAPM

$$\left(r_j - r_f\right)_t = \alpha_j + ß_j\left(r_m - r_f\right)_t + \varepsilon_t$$

- r_f is the observed risk-free rate (we use the overnight U.S. Federal Funds rate in part because of tax issues).
- r_j is the observed return on asset *j*.
- $\left(r_j - r_f\right)_t$ is the observed excess return on asset *j*.
- α_j is the estimated regression intercept, called alpha.
- $(r_m - r_f)_t$ is the estimated excess return on the market index (here, we used the S&P 500 index).
- ε_t is the unexplained portion of the model.

Figure 1: Basic CAPM equation. Intercept is the estimate of alpha, slope is the estimate of beta.



Dual Beta Model

- An alternative to the traditional CAPM is the dual beta model.
- The dual beta model has separate alpha (intercept) and beta (slope) statistics for each of the two regimes.
- The two regimes are:
  - Up-market: When the market index daily return is non-negative.
  - Down-market: When the market index daily return is negative.

Dual Beta Model

$$\left(r_j - r_f\right)_t = \alpha_j^+ D + ß_j^+ (r_m^+ - r_f)_t D +$$
$$\alpha_j^- (1 - D) + ß_j^- \left(r_m^- - r_f\right)_t (1 - D) + \varepsilon_t$$

- α_j^+, $ß_j^+$, α_j^-, and $ß_j^-$ are the estimated parameters for the up-market and down-market days respectively.
- $r_m^+ = r_m$ on days the market did not decline and where $r_m^- = r_m$ on days it did.
- D = 1 when the market index daily return is non-negative.

Dual Beta Model

  - If there is no asymmetry, and $\alpha_j^+ = \alpha_j^-$ and $ß_j^+ = ß_j^-$, then $\alpha_j^+ = \alpha_j$ and $ß_j^+ = ß_j$.
  - In other words, if there is no asymmetry, then the estimated CAPM, up-market, and down-market parameters will be the same.
- See Morelli (J. Multinational Financial Management, 2007) for supporting literature.

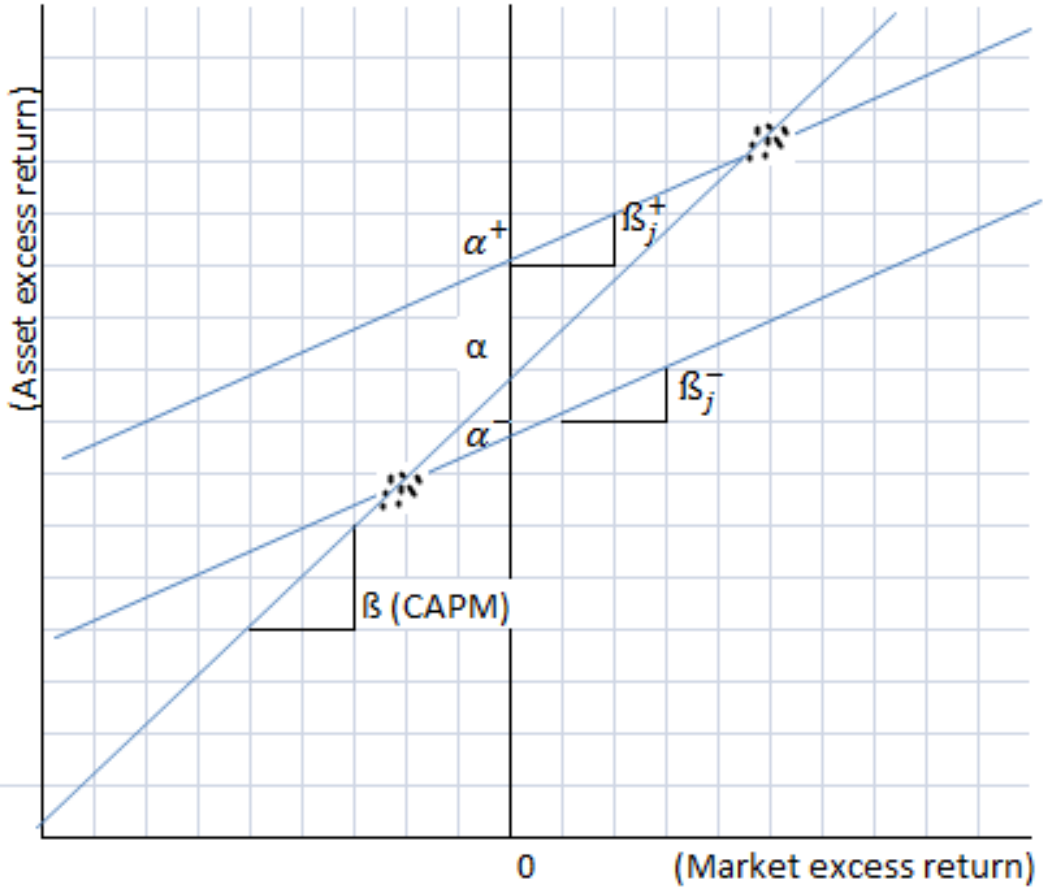
Regime-switching Alphas: Case 1

- First case:
  - Suppose that alpha is higher in the up-market regime than in the down-market regime.
  - As illustrated, the slopes are the same whether the market is rising or falling, but the asset returns are given by different lines with different intercepts (alphas).
  - In such a case, the increase in alpha would translate into a higher estimated CAPM beta.

Regime-switching Alphas: Case 1

- The estimated CAPM beta would be greater than the actual beta in either up-market or down-market conditions but not because of greater risk.
- Rather, the CAPM beta is reflecting the regime-changing alpha.
- This might result in rejecting an otherwise desirable investment.

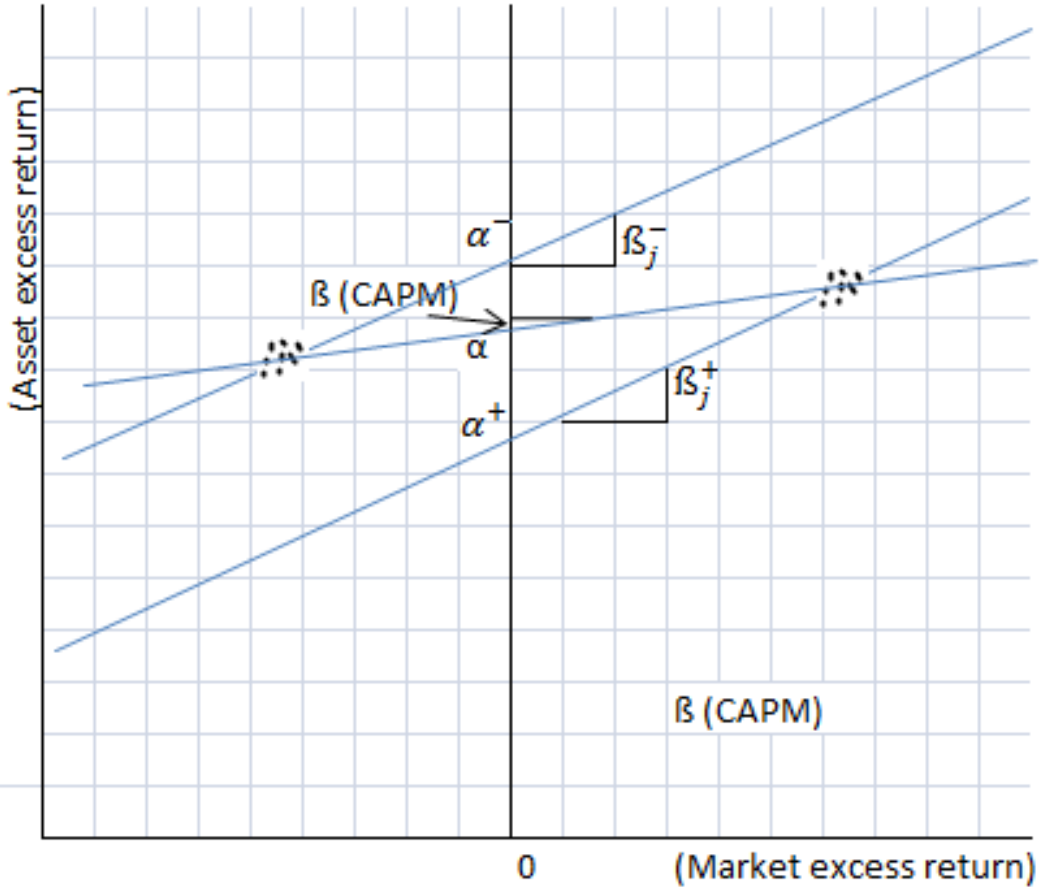
Figure 2: Suppose alpha increases on up-market days but actual beta remains constant. The CAPM estimate of beta will be larger than either of the dual beta estimates and overestimates the asset risk.



Regime-switching Alphas: Case 2

- Second case:
  - Suppose that the alpha declines on up-market days and rises on down-market days.
  - In the illustrated case, the increase in alpha dampens the estimated CAPM beta which is smaller than actual beta in either market regime.
  - This might result in accepting an otherwise undesirable investment.

Figure 3: Suppose alpha decreases on up-market days but actual beta remains constant. The CAPM estimate of beta will be much flatter than either of the dual beta estimates and underestimates the asset risk.



Empirical Results

- Let's obtain estimates of CAPM and dual beta parameters.
- Data, as of October 29, 2010, is provided by MacroRisk Analytics.
  - 23,060 unique assets with alpha and beta parameters estimated for traditional CAPM, up-market, and down-market specifications.
  - A one-year look-back was used on dividend- and split-adjusted returns with S&P 500 as benchmark.

Empirical Results

- Table 1: Composition of the Database.

Asset Type	Count	Percent
ADR Sponsored	309	1.34%
Common Stock	4,505	19.54%
Convertible Preferred Stock	40	0.17%
ETF	843	3.66%
Mutual Fund	16,567	71.84%
Preferred Stock	796	3.45%
Database Total	23,060	100.00%

Empirical Results

- Overall, there were 3,619 (15.7%) cases when the estimated CAPM beta exceeded both up- and down-market beta.

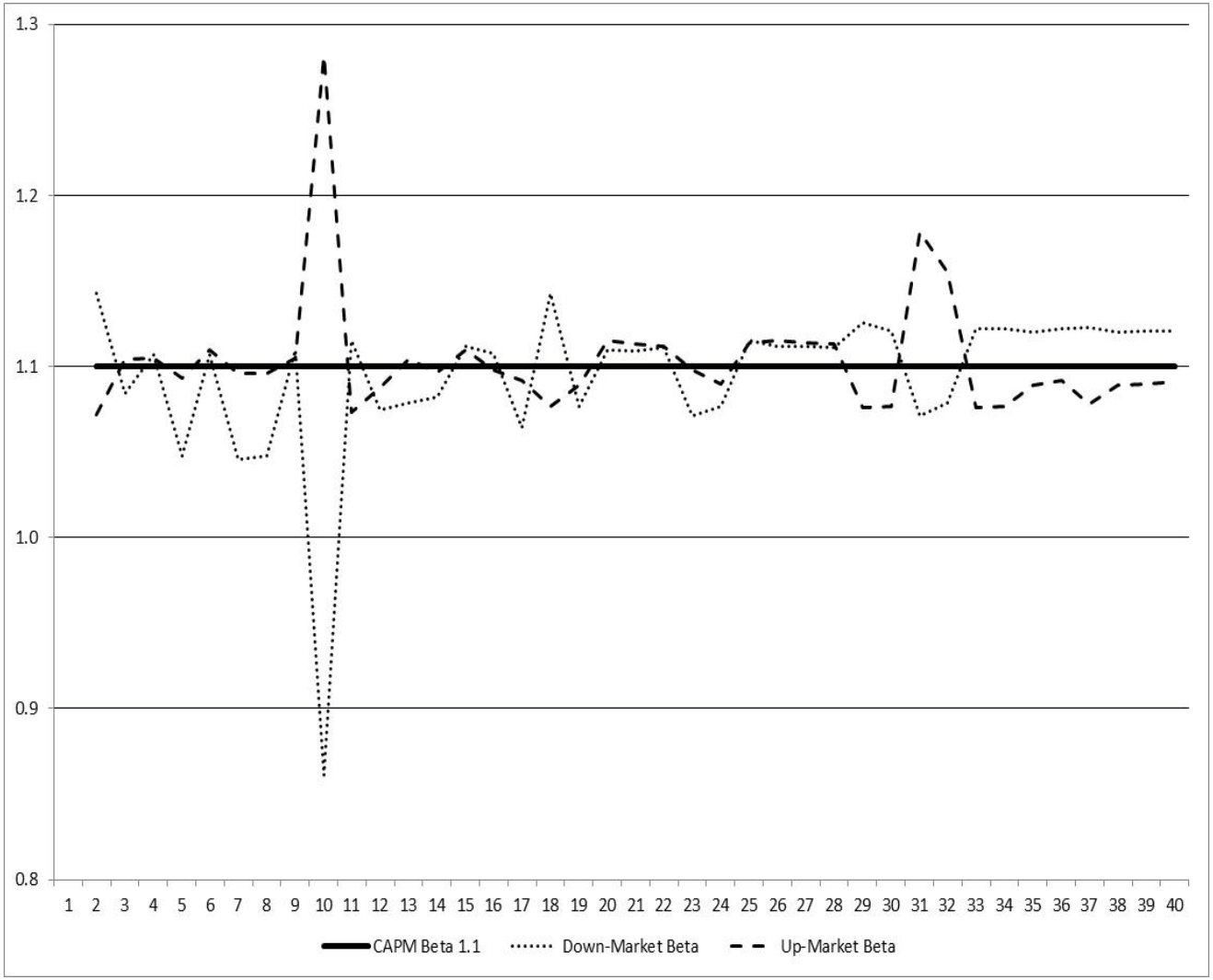
Asset Type	Count	Database Total	Percent
ADR Sponsored	29	309	9.39%
Common Stock	1,001	4,505	22.22%
Convertible Preferred Stock	8	40	20.00%
ETF	134	843	15.90%
Mutual Fund	2,380	16,567	14.37%
Preferred Stock	67	796	8.42%
Total	3,619	23,060	15.69%

Empirical Results

- Similarly, there were 5,811 (25.2%) cases when the estimated CAPM beta was less than either dual beta estimates.

Asset Type	Count	Database Total	Percent
ADR Sponsored	107	309	34.63%
Common Stock	753	4,505	16.71%
Convertible Preferred Stock	12	40	30.00%
ETF	273	843	32.38%
Mutual Fund	4,357	16,567	26.30%
Preferred Stock	309	796	38.82%
Total	5,811	23,060	25.20%

Misleading Betas with 39 Mutual Funds



Misleading Betas with 39 Mutual Funds

- The previous chart shows the up-market and down-market betas for 39 mutual funds.
  - All 39 funds have an overall standard CAPM beta of 1.1 (similar results happen with almost any beta).
  - The chart shows the great variety of up- and down-market betas that can result in a traditional beta with the same value.

MCVIX vs. SSMAX

- Consider two mutual funds, MCVIX (MFS Mid Cap Value Fund) and SSMAX (SEI Institutional Investment Trust-Small/Mid Cap Equity Fund).
  - MCVIX and SSMAX are observations 8 and 9 in the chart, respectively. Both mutual funds have an estimated beta of 1.1. Both funds have the same alphas, 0.02.
  - MCVIX up- and down-market betas = 1.1.
  - SSMAX up- and down-market betas are 1.28 and 0.086 respectively.

MCVIX vs. SSMAX

- An investor who just looked at the typical beta estimate for each fund would think they are the same in terms of risk.
- MCVIX exhibits the same risk whether it is an up- or down-market with a beta of 1.1 but SSMAX is a very different investment, even though it also has a standard CAPM beta of 1.1.

A Statistical Test of Dual Beta in Practice

- Number of instances when the estimated down-market beta exceeded the estimated CAPM beta. (This was so for 12,002 assets, about half of the dataset.)

Asset Type	Count	Database Total	Percent
ADR Sponsored	190	309	61.49%
Common Stock	2,171	4,505	48.19%
Convertible Preferred Stock	29	40	72.50%
ETF	511	843	60.62%
Mutual Fund	8,485	16,567	51.22%
Preferred Stock	616	796	77.39%
Total	12,002	23,060	52.05%

A Statistical Test of Dual Beta in Practice

- Statistically, this would be expected about half the time.
- However, the down-market beta would be expected to be within 10% of the CAPM beta about 95% of the time.
- Therefore, we also report the percentage of time that the down-market beta for the particular asset type exceeded the CAPM beta by more than 10%, thus telling us the percentage of time that the difference was statistically significant.

A Statistical Test of Dual Beta in Practice

- Tabulation of instances when down-market beta exceeded CAPM beta by more than 10%.

Asset Type	Count*	Database Total	Percent
ADR Sponsored	113	309	36.57%
Common Stock	1,477	4,505	32.79%
Convertible Preferred Stock	27	40	67.50%
ETF	262	843	31.08%
Mutual Fund	3,695	16,567	22.30%
Preferred Stock	581	796	72.99%
Total	6,155	23,060	26.69%

* Down-market beta > 1.1 × (CAPM beta)

A Statistical Test of Dual Beta in Practice

- Average ratio of down-market beta to CAPM beta estimates, when down-market beta exceeded CAPM beta (n = 12,002).

Asset Type	Ratio	p-value (H_0: Ratio = 1)	p-value (H_0: Ratio = 1.1)
ADR Sponsored	2.28	0.0001	0.0004
Common Stock	1.50	0.0000	0.0000
Convertible Preferred Stock	-0.41	0.0972	0.0758
ETF	1.10	0.6160	0.9990
Mutual Fund	1.13	0.0170	0.5851
Preferred Stock	1.65	0.0004	0.0028
Average	1.24	0.0000	0.0012

Don’t Ignore Dual Beta

- For these potential investments, relying on just CAPM beta without the accompanying dual beta estimates could be underestimating down-market risk.
- Now let’s proceed to constructing an equity portfolio, with stocks filtered through a down-(and up-)market beta criterion.

Portfolio Construction Using Dual Beta

- We construct portfolios using traditional, up-market, and down-market betas filters.
- We use daily data, from 1/1/06 to 3/4/11, for a total of 1,350 data points.
- The portfolio construction and rebalancing processes were initiated at the beginning of each quarter, using a buy-list of stocks in the S&P 500 index.

Portfolio Construction Using Dual Beta

- Criteria that we impose on the choice of stocks:
  - Standard CAPM beta < 0.7.
  - Down-market beta < 0.7.
  - Combination of down-market beta < 0.7 and up-market beta > 0.7.
- The median beta of NYSE stocks is 0.7.
- Beta estimation using one-year daily returns.
- The portfolio is then constructed with equal weighting on the stock components.

DFA Core Equity 1 Portfolio

- The comparison portfolio is DFEOX (DFA US Core Equity 1 Portfolio), categorized as Large Blend (Morningstar Style Box).
- Fama and French (1992).
  - In addition to beta, they found size (i.e., the return on small stocks minus the return on big stocks) and value (i.e., the return on high book-to-market stocks minus the return on low book-to-market stocks) to be significant in explaining average returns , and proxies for risk.
  - Called FF three-factor model.

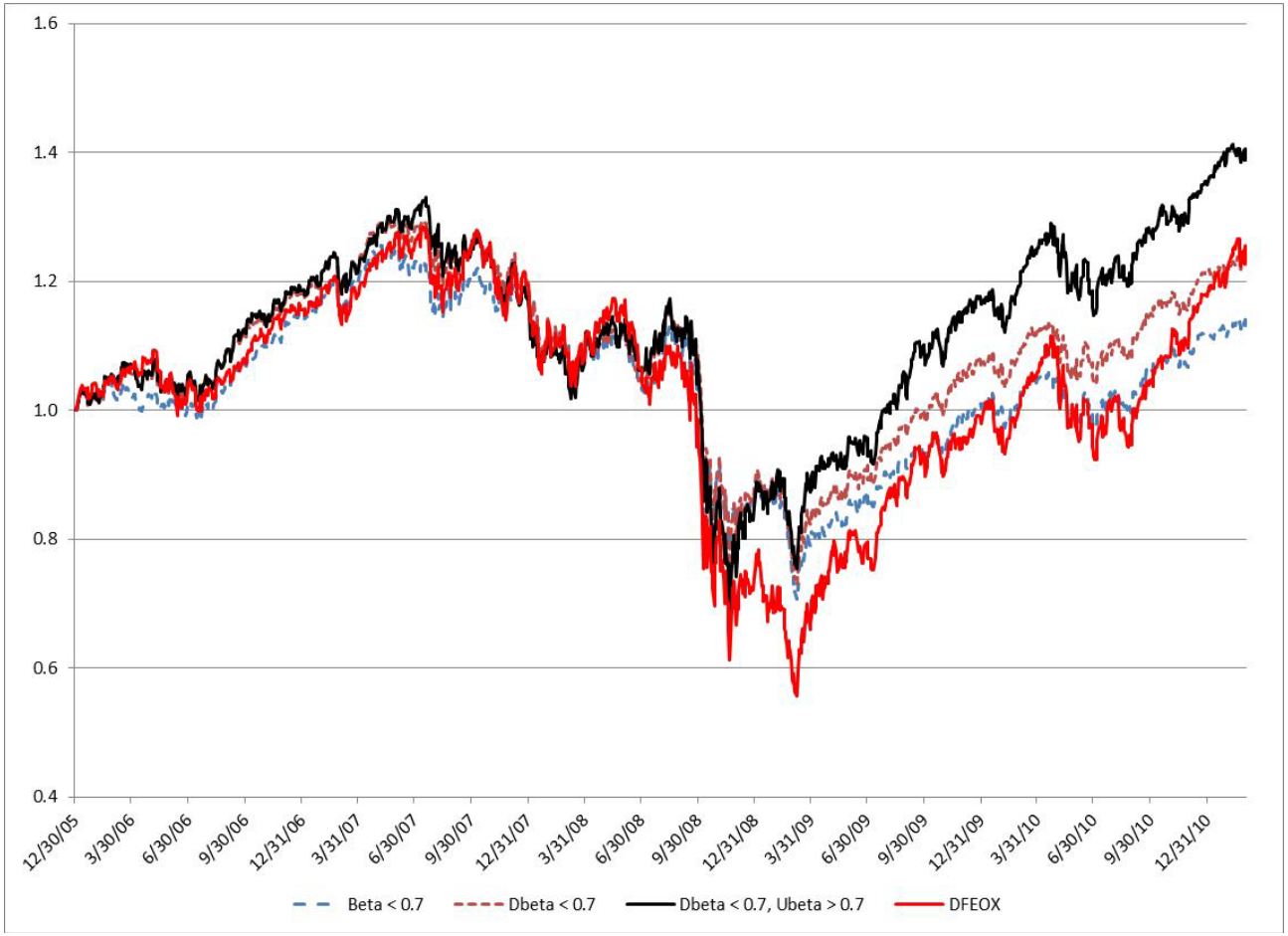
DFA Core Equity 1 Portfolio

- DFA's (http://www.dfaus.com/strategies/us/) "applied core strategies seek to buy the total US market in proportions that provide higher exposure to the risk premiums associated with size and value identified by Fama and French. The total market is defined as the aggregate capitalization of the NYSE, AMEX, and NASDAQ Global Market System companies."

DFA Core Equity 1 Portfolio

- “The total market is weighted by market capitalization (price times shares outstanding), causing large cap growth companies to dominate. The applied core equity strategies alter the weighting of stocks by considering both a company’s market cap and its book-to-market (BtM) ratio. As a result, exposure to the riskier small and value shares that research shows offer higher expected return is increased. To balance out the greater small and value exposure and still include every stock in the market, the weight of large cap and growth stocks is reduced.”

Different Dual Beta Filters (1/1/06 – 3/4/11)



Low Volatility Investing

- Constructing a portfolio with a down-market beta filter is a form of low volatility investing, which has witnessed renewed interest within the investment and academic community.
- The conclusion of various academic studies is that a portfolio of low risk assets not only reduced overall portfolio risk during stock market downturn but also provided healthy returns when the market recovered.

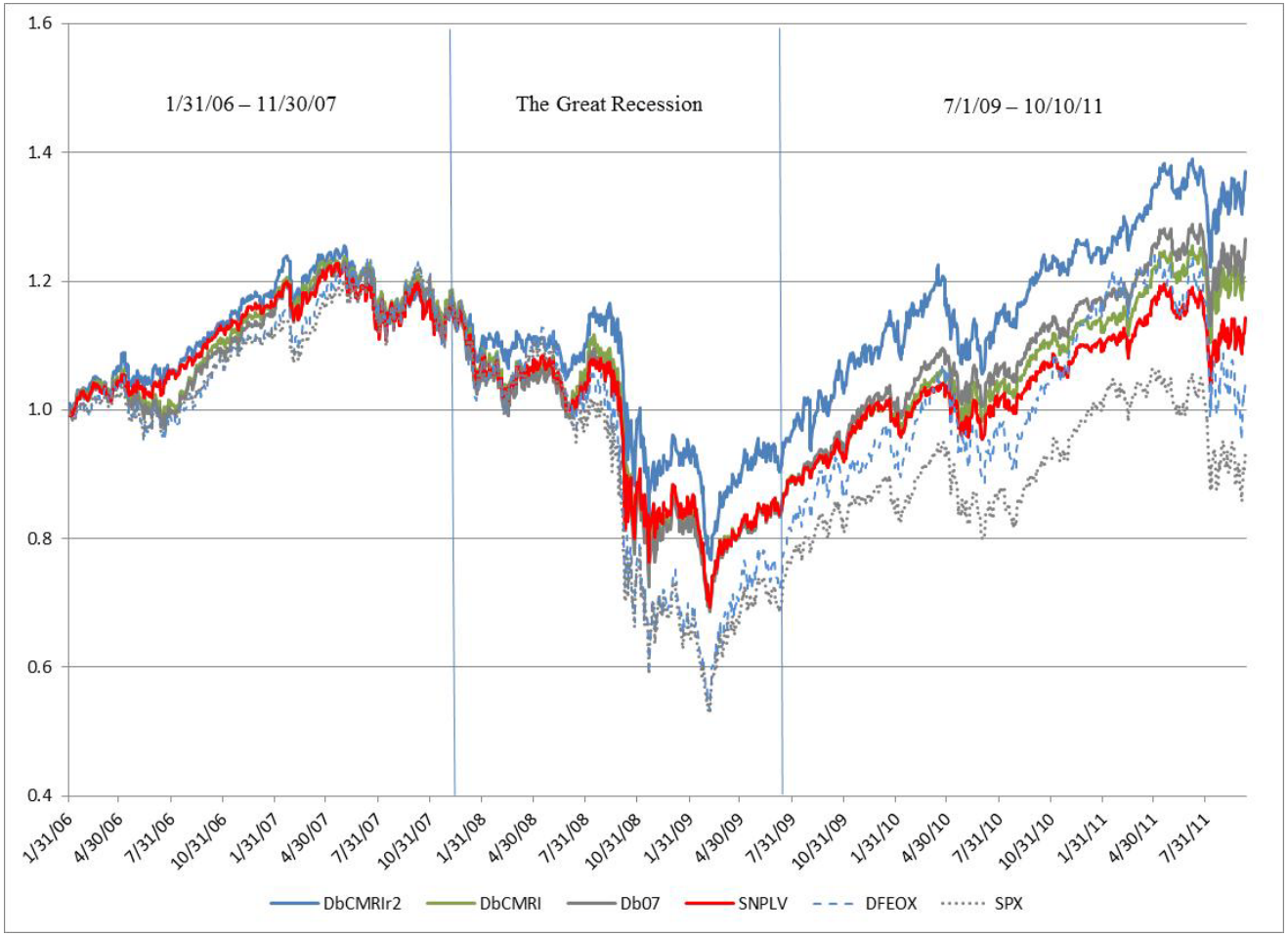
S&P Low Volatility Index

- The S&P 500 Low Volatility Index (SNPLV) was established on 4/20/11.
- It selects the 100 stocks (from the S&P 500 index) that had the lowest standard deviation, estimated over the past 252 trading days.
- The portfolio constituents are then weighted relative to the inverse of their corresponding volatility, with the least volatile stocks receiving the highest weights.

S&P Low Volatility Index

- In addition, SNPLV is rebalanced with an updated list of the 100 least volatile stocks every quarter, on the last business day of January, April, July, and October.
- The SNPLV data is available, from 1/31/06 to 10/10/11, for a total of 1,434 data points, on S&P's website.
- (Ticker for its ETF counterpart is SPLV.)

Different Low Volatility Investments (1/31/06 – 10/10/11)



Other Filters

- The down-market beta portfolio performed well against SNPLV, DFEOX, and SPX.
- By further considering other filters, e.g., economic factors, a portfolio could perform even better, both in terms of risk and return.

5 Types of Risk

- In a soon to be published paper (JFSP, May 2012), we discuss five types of risks that are more relevant to investors than traders and should be considered as part of a UPIA/UPMIFA/prudence review.

“Bubble Risk”

- This is the movement of the asset or portfolio with the whole marketplace. The relation to downside movements in the whole marketplace, particularly short term, is what the downside beta measures.

“Momentum Risk”

- Behavioral finance has reminded us that emotions matter in the marketplace. For whatever reason, there is a tendency for excess high returns to be persistent for “hot stocks” and for excess low returns to be persistent for “dogs”.
- While there are many measures of momentum risk, we favor the ratio of the price (or portfolio value) to the 52-week high value. This is a ratio between 0 and 1.

“Economic Risk”

- We use the Composite MacroRisk Index though others may approach this using APT parameters.
- This reflects the sensitivity of the asset or portfolio to a variety of economic shocks.

“Residual Risk”

- Residual Risk is “any risk remaining to an investment after all other risks have been eliminated, hedged, or otherwise accounted.”
- We use a Residual Risk Index that is based on the residuals from asset valuation models that generally have high explanatory power.
- The measure we use expresses a partial value at risk (1 in 20 expected percentage change in value) due to factors not included in the asset valuation (returns generation) models.

“Attribution Instability Risk”

- “The problem with kittens is that they become cats.” In other words, they change characteristics from the beginning of the holding period to the end. If it is expected, it can be optimized for. If it is unexpected, it could lead to bad outcomes.
- If a fund displays attribution instability, an investor may not know what the characteristics are of that fund over time.
- If a stock displays attribution instability, the management team may not have a coherent strategy and consequently the asset characteristics can’t be projected.
- If an external manager displays attribution instability, the investor may not know what portfolio characteristics will be returned by the external manager.

Downside risk ($ß^{-}$) controls one of the major types of risk, but is generally independent of the others.
The other measures should be separately incorporated into a risk monitoring and control process.

Now, some examples. We'll mostly use funds and ETFs for these examples but it works as well with stocks, preferred stocks, and closed-end funds.

Assets of: Portfolio

Type: Portfolio

Report Date: 03/16/2012

Benchmark: CBOE S&P 500 INDEX S&P 500

Type: Market Index | Symbol: SPX | CUSIP: 648815108 | Market: Market Index

Name	Symbol	Alpha	Up-Market Alpha	Down-Market Alpha	Beta	Up-Market Beta	Down-Market Beta	CAPM R^2	Up-Market CAPM R^2	Down-Market CAPM R^2	Correlation	Up-Market Correlation	Down-Market Correlation
AEGEAN MARINE PETROLEUM NETW	ANW	0.0204	1.9907	-0.2355	1.7371	1.4007	1.7914	0.3351	0.1184	0.2818	0.5789	0.3441	0.5309
CENTRAL FD CDA LTD CLASS A	CEF	0.0672	5.4787	-0.7419	0.2307	-0.2494	0.0902	0.0199	0.0128	0.0017	0.1411	-0.1130	0.0417
CENTRAL GOLDTRUST TR UNIT	GTU	0.2455	1.5829	-0.7334	-0.0157	-0.1212	-0.3128	0.0002	0.0062	0.0415	-0.0139	-0.0786	-0.2038
CLAYMORE EXCHANGE TRD FD TR GUGG SHIPPNG E	SEA	-0.2934	0.5524	-0.5027	1.1019	0.8689	1.1067	0.7162	0.3998	0.6602	0.8463	0.6323	0.8125
DEUTSCHE BK AG LONDON BRH DB 3X LONG UST	LBND	1.2866	0.2838	0.9550	-1.5264	-1.3173	-1.6331	0.4207	0.2147	0.3168	-0.6486	-0.4634	-0.5628
DIREXION FDS MNT NDQBUL2X I	DXQLX	0.2654	-0.1563	0.7265	1.9835	2.0916	2.0135	0.8839	0.7704	0.8605	0.9402	0.8778	0.9276
DIREXION SHS ETF TR 20YR TRES BULL	TMF	1.4944	0.6489	0.2042	-1.8783	-1.6719	-2.1084	0.5036	0.2745	0.4365	-0.7097	-0.5239	-0.6607
OCEANSTONE FUND SHS	OSFDX	-0.0034	0.0503	-0.0888	0.9749	0.9654	0.9587	0.9024	0.7897	0.8643	0.9500	0.8886	0.9297
PIMCO ETF TR 25YR+ ZERO U S	ZROZ	0.7243	0.3759	0.1554	-1.0235	-0.9108	-1.1497	0.4686	0.2480	0.4013	-0.6845	-0.4980	-0.6335
PIMCO FDS PAC INVT MGMT SER RESTATERRETR I	PRRSX	0.2139	-0.2548	0.5397	0.9427	1.0853	0.9449	0.6175	0.4856	0.5203	0.7858	0.6968	0.7213
PIMCO FDS REALEST STRG P	PETPX	0.2110	-0.2948	0.5709	0.9460	1.1042	0.9476	0.6220	0.4986	0.5251	0.7887	0.7061	0.7246
PROFUNDS ULTRA NDQ INVS	UOPIX	0.2336	0.1072	0.4285	1.9007	1.9237	1.9245	0.8725	0.7552	0.8203	0.9341	0.8690	0.9057
PROSHARES TR ULTRA 20YR TRE	UBT	0.8621	0.3947	0.1327	-1.2561	-1.1131	-1.4138	0.5085	0.2761	0.4438	-0.7131	-0.5255	-0.6662
RYDEX DYNAMIC													

The choice of benchmark is important.

- Typically, a market benchmark such as the S&P 500 index is used for computing CAPM statistics and their variants, such as downside beta.
- However, different benchmarks can generate different results. An important task for an investment committee or portfolio manager is to select the correct benchmark for analysis.

Assets of: Portfolio

Type: Portfolio

Report Date: 03/16/2012

Benchmark: RUSSELL 1000 INDEX INDEX

Type: Market Index | Symbol: RUI | CUSIP: 12496H108 | Market: Market Index

Name	Symbol	Alpha	Up-Market Alpha	Down-Market Alpha	Beta	Up-Market Beta	Down-Market Beta	CAPM R^2	Up-Market CAPM R^2	Down-Market CAPM R^2	Correlation	Up-Market Correlation	Down-Market Correlation
AEGEAN MARINE PETROLEUM NETW	ANW	0.0271	2.8435	-0.3755	1.7188	1.3291	1.7470	0.3418	0.1114	0.2890	0.5846	0.3338	0.5376
CENTRAL FD CDA LTD CLASS A	CEF	0.0680	6.9154	-0.7954	0.2288	-0.2823	0.0532	0.0204	0.0173	0.0006	0.1428	-0.1317	0.0253
CENTRAL GOLDTRUST TR UNIT	GTU	0.2448	1.7070	-0.7454	-0.0115	-0.1231	-0.3110	0.0001	0.0066	0.0432	-0.0104	-0.0814	-0.2079
CLAYMORE EXCHANGE TRD FD TR GUGG SHIPPNG E	SEA	-0.2899	0.6351	-0.5220	1.0849	0.8465	1.0827	0.7233	0.3939	0.6837	0.8505	0.6276	0.8268
DEUTSCHE BK AG LONDON BRH DB 3X LONG UST	LBND	1.2664	0.4459	0.5180	-1.4874	-1.3026	-1.6368	0.4161	0.2137	0.3296	-0.6451	-0.4622	-0.5741
DIREXION FDS MNT NDQBUL2X I	DXQLX	0.2775	-0.2237	0.9044	1.9480	2.0753	1.9895	0.8882	0.7819	0.8682	0.9424	0.8843	0.9318
DIREXION SHS ETF TR 20YR TRES BULL	TMF	1.4663	0.9898	-0.0907	-1.8270	-1.6650	-2.0961	0.4964	0.2776	0.4424	-0.7045	-0.5269	-0.6651
OCEANSTONE FUND SHS	OSFDX	0.0014	0.1208	-0.1623	0.9570	0.9362	0.9261	0.9060	0.7826	0.8785	0.9518	0.8846	0.9373
PIMCO ETF TR 25YR+ ZERO U S	ZROZ	0.7141	0.4901	-0.0019	-0.9973	-0.9018	-1.1458	0.4635	0.2475	0.4127	-0.6808	-0.4975	-0.6424
PIMCO FDS PAC INVT MGMT SER RESTATERRETR I	PRRSX	0.2185	-0.2460	0.5147	0.9318	1.0698	0.9308	0.6285	0.4969	0.5294	0.7928	0.7049	0.7276
PIMCO FDS REALEST STRG P	PETPX	0.2156	-0.2899	0.5577	0.9348	1.0889	0.9346	0.6327	0.5096	0.5354	0.7954	0.7138	0.7317
PROFUNDS	UOPIX	0.2448	-0.0796	0.8303	1.8673	1.9314	1.9276	0.8774	0.7886	0.8172	0.9367	0.8881	0.9040

Assets of: Portfolio

Type: Portfolio

Report Date: 03/16/2012

Benchmark: NASDAQ COMPOSITE INDEX COMPOSITE

Type: Market Index | Symbol: COMP | CUSIP: 632990008 | Market: Market Index

Name	Symbol	Alpha	Up-Market Alpha	Down-Market Alpha	Beta	Up-Market Beta	Down-Market Beta	CAPM R^2	Up-Market CAPM R^2	Down-Market CAPM R^2	Correlation	Up-Market Correlation	Down-Market Correlation
AEGEAN MARINE PETROLEUM NETW	ANW	-0.0317	3.5401	0.4528	1.5672	1.0780	1.8209	0.3185	0.0851	0.2891	0.5643	0.2917	0.5376
CENTRAL FD CDA LTD CLASS A	CEF	0.0618	3.9554	-0.6042	0.1976	-0.1825	0.1189	0.0170	0.0077	0.0032	0.1306	-0.0876	0.0566
CENTRAL GOLDTRUST TR UNIT	GTU	0.2482	1.4549	-0.7196	-0.0231	-0.1077	-0.3100	0.0005	0.0062	0.0398	-0.0221	-0.0789	-0.1995
CLAYMORE EXCHANGE TRD FD TR GUGG SHIPPNG E	SEA	-0.3185	-0.1363	0.1453	1.0099	0.8997	1.1577	0.7024	0.4797	0.6241	0.8381	0.6926	0.7900
DEUTSCHE BK AG LONDON BRH DB 3X LONG UST	LBND	1.3609	0.5155	0.1289	-1.3011	-1.1125	-1.5224	0.3569	0.1682	0.2808	-0.5974	-0.4102	-0.5299
DIREXION FDS MNT NDQBUL2X I	DXQLX	0.1648	-0.1956	0.4645	1.9154	2.0069	1.9326	0.9622	0.9291	0.9369	0.9809	0.9639	0.9679
DIREXION SHS ETF TR 20YR TRES BULL	TMF	1.5857	0.8231	-0.2007	-1.5825	-1.3877	-1.8984	0.4173	0.2052	0.3631	-0.6460	-0.4530	-0.6025
OCEANSTONE FUND SHS	OSFDX	-0.0319	-0.0132	0.1836	0.8778	0.8565	0.9277	0.8540	0.7014	0.8042	0.9241	0.8375	0.8968
PIMCO ETF TR 25YR+ ZERO U S	ZROZ	0.7603	0.2432	0.0808	-0.8680	-0.7272	-1.0197	0.3934	0.1738	0.3341	-0.6272	-0.4169	-0.5781
PIMCO FDS PAC INVT MGMT SER RESTATERRETR I	PRRSX	0.1797	-0.3802	1.4060	0.8518	0.9863	0.9571	0.5885	0.4503	0.5406	0.7671	0.6710	0.7352
PIMCO FDS REALEST STRG P	PETPX	0.1769	-0.3946	1.3983	0.8539	0.9948	0.9569	0.5917	0.4512	0.5516	0.7692	0.6717	0.7427
PROFUNDS-	UOPIX												

An interesting choice of benchmark is to use the portfolio itself!

- This can be quite useful for meeting UPIA and UPMIFA requirements to document the impact of each current investment, and of prospective investments, on the portfolio itself.

Assets of: Portfolio

Type: Portfolio

Report Date: 03/16/2012

Benchmark: Portfolio

Type: Portfolio

Name	Symbol	Alpha	Up-Market Alpha	Down-Market Alpha	Beta	Up-Market Beta	Down-Market Beta	CAPM R^2	Up-Market CAPM R^2	Down-Market CAPM R^2	Correlation	Up-Market Correlation	Down-Market Correlation
AEGEAN MARINE PETROLEUM NETW	ANW	-0.2199	-0.6940	5.8144	2.0336	2.2830	2.7268	0.2011	0.1236	0.1698	0.4484	0.3516	0.4121
CENTRAL FD CDA LTD CLASS A	CEF	-0.0935	1.1362	1.3853	0.7849	0.3158	1.3112	0.1009	0.0094	0.1065	0.3176	0.0971	0.3263
CENTRAL GOLDTRUST TR UNIT	GTU	0.1294	-0.1569	0.2121	0.3867	0.5141	0.3645	0.0514	0.0460	0.0180	0.2267	0.2146	0.1343
CLAYMORE EXCHANGE TRD FD TR GUGG SHIPPNG E	SEA	-0.3662	-0.2078	-0.2063	1.0409	0.9213	1.1670	0.2799	0.1241	0.1695	0.5290	0.3522	0.4117
DEUTSCHE BK AG LONDON BRH DB 3X LONG UST	LBND	0.6851	-0.2435	-0.5528	0.4008	0.8727	-0.2557	0.0127	0.0281	0.0022	0.1127	0.1676	-0.0467
DIREXION FDS MNT NDQBUL2X I	DXQLX	0.0337	0.3687	0.2947	1.9017	1.7556	2.0380	0.3557	0.2063	0.1814	0.5964	0.4542	0.4259
DIREXION SHS ETF TR 20YR TRES BULL	TMF	0.7025	0.1122	-0.5827	0.5191	0.8267	-0.1045	0.0168	0.0237	0.0002	0.1298	0.1541	-0.0156
OCEANSTONE FUND SHS	OSFDX	-0.0507	0.1501	0.3226	0.7298	0.6156	0.8926	0.2214	0.0947	0.1371	0.4705	0.3077	0.3703
PIMCO ETF TR 25YR+ ZERO U S	ZROZ	0.3913	-0.1075	-0.4765	0.3081	0.5893	-0.1506	0.0186	0.0363	0.0016	0.1364	0.1904	-0.0404
PIMCO FDS PAC INVT MGMT SER RESTATERRETR I	PRRSX	0.0228	-0.4071	1.7580	1.2076	1.3754	1.5043	0.4436	0.2947	0.4020	0.6661	0.5429	0.6341
PIMCO FDS REALEST STRG P	PETPX	0.0216	-0.4227	1.8079	1.2044	1.3823	1.5043	0.4415	0.2953	0.4038	0.6644	0.5434	0.6355
PROFUNDS [illegible]	UOPIX	0.0182	-0.5687	0.3715	1.8145	1.5934	2.0052	0.3482	0.1829	0.1883	0.5901	0.4277	0.4340

As another example, consider the following results which compare each of the Dow 30 stocks to the DJIA index itself.

Assets of: DJIA 30

Type: Buylist

Report Date: 03/16/2012

Benchmark: DOW-JONES INDUSTRIALS 30 STOCK AVERA

Type: Market Index | Symbol: DJ30IN | CUSIP: 260994009 | Market: Market Index

Name	Symbol	Alpha	Up-Market Alpha	Down-Market Alpha	Beta	Up-Market Beta	Down-Market Beta	CAPM R^2	Up-Market CAPM R^2	Down-Market CAPM R^2	Correlation	Up-Market Correlation	Down-Market Correlation
3M CO	MMM	-0.0895	0.1126	-0.2776	1.1893	1.1413	1.1479	0.8177	0.6911	0.6819	0.9043	0.8313	0.8258
ALCOA INC	AA	-0.4311	-0.4324	-0.2286	1.8239	1.7926	1.9093	0.7582	0.5599	0.6945	0.8707	0.7483	0.8334
AMERICAN EXPRESS CO	AXP	0.1744	0.1306	0.5646	1.2337	1.2171	1.3100	0.7275	0.5038	0.6897	0.8529	0.7098	0.8305
AT&T INC	T	0.1232	0.5574	-0.0459	0.6607	0.5597	0.6534	0.6166	0.2990	0.5684	0.7852	0.5468	0.7540
BANK OF AMERICA CORPORATION	BAC	-0.3692	-0.6613	1.7351	2.0904	2.1593	2.4306	0.5175	0.3205	0.5036	0.7193	0.5661	0.7097
BOEING CO	BA	-0.0155	0.2042	0.1460	1.2388	1.1499	1.3053	0.7676	0.5611	0.6927	0.8761	0.7491	0.8323
CATERPILLAR INC DEL	CAT	-0.0313	-0.0317	-0.3984	1.6034	1.6539	1.4693	0.7927	0.6527	0.6586	0.8903	0.8079	0.8115
CHEVRON CORP NEW	CVX	-0.0063	-0.2467	0.1927	1.1755	1.2562	1.1942	0.7749	0.6043	0.7277	0.8803	0.7774	0.8531
CISCO SYS INC	CSCO	0.0531	-0.5555	0.0532	1.1444	1.4558	1.0428	0.5443	0.3929	0.5219	0.7378	0.6268	0.7224
COCA COLA CO	KO	0.0734	0.4457	-0.0261	0.6684	0.5710	0.6762	0.6602	0.3754	0.5718	0.8125	0.6127	0.7562
DISNEY WALT CO	DIS	-0.0647	0.1827	0.1283	1.2598	1.1552	1.3404	0.7513	0.5083	0.7058	0.8668	0.7129	0.8401
DU PONT E I DE NEMOURS & CO	DD	-0.0799	0.0936	-0.2459	1.3056	1.2642	1.2699	0.7972	0.5572	0.7810	0.8929	0.7465	0.8837
EXXON MOBIL CORP	XOM	-0.0214	-0.0411	-0.1620	1.0605	1.0843	1.0144	0.8130	0.6494	0.7334	0.9017	0.8059	0.8564
GENERAL ELECTRIC CO	GE	-0.0437	0.7184	-0.3539	1.2310	1.0604	1.1900	0.7761	0.4840	0.7452	0.8810	0.6957	0.8633
HEWLETT PACKARD CO	HPQ	-0.4425	-0.2297	-0.6464	1.2962	1.2275	1.2065	0.4433	0.3321	0.2301	0.6658	0.5763	0.4797
HOME DEPOT INC	HD	0.2683	0.4247	0.7507	0.9209	0.8447	1.0256	0.5592	0.2920	0.5439	0.7478	0.5404	0.7375
INTEL CORP	INTC	0.2984	0.3156	0.0658	0.9450	0.9612	0.8910	0.5301	0.3183	0.4148	0.7281	0.5642	0.6440
INTERNATIONAL BUSINESS MACHS	IBM	0.2303	0.1099	0.3411	0.8459	0.8740	0.8580	0.6577	0.4020	0.6762	0.8110	0.6340	0.8223
JOHNSON & JOHNSON	JNJ	0.0738	-0.0578	-0.0598	0.6496	0.7109	0.5968	0.6659	0.4705	0.5770	0.8160	0.6859	0.7596
JPMORGAN CHASE												0.7145	

As an alternative, consider the following example using DFA funds.

(We have no relationship with DFA, but use them as a widely used fund family aimed at investment managers rather than retail investors.)

Assets of: FI360 dfa

Type: Buylist

Report Date: 03/16/2012

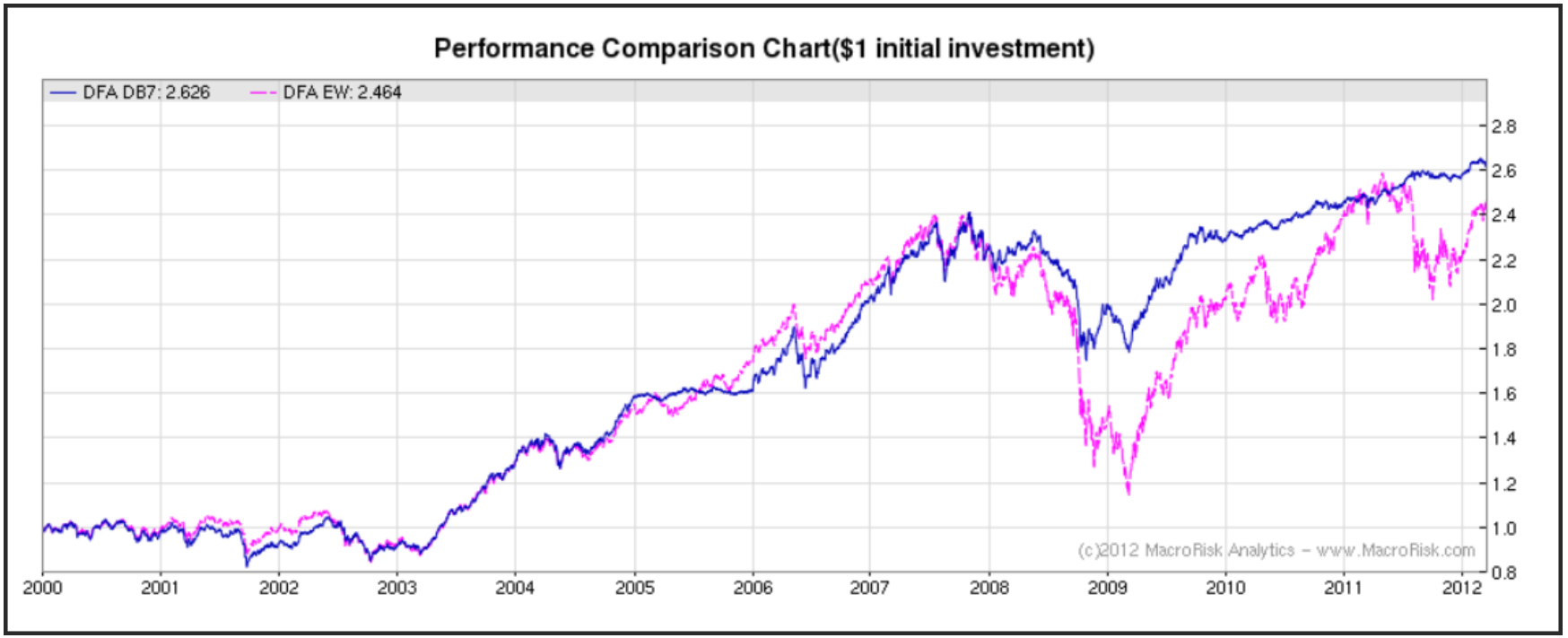
Benchmark: CBOE S&P 500 INDEX S&P 500

Type: Market Index | Symbol: SPX | CUSIP: 648815108 | Market: Market Index

Name	Symbol	Alpha	Up-Market Alpha	Down-Market Alpha	Beta	Up-Market Beta	Down-Market Beta	CAPM R^2	Up-Market CAPM R^2	Down-Market CAPM R^2	Correlation	Up-Market Correlation	Down-Market Correlation
DFA INVT DIMENSIONS GROUP IN ASIA PAC SMLCO	DFRSX	-0.0595	0.1325	-0.0971	1.0558	0.9970	1.0674	0.7726	0.5498	0.7218	0.8790	0.7415	0.8496
DFA INVT DIMENSIONS GROUP IN CSTG& IN SO EQ	DFCCX	-0.0938	0.1753	-0.2270	1.0990	1.0260	1.0899	0.8419	0.6778	0.7700	0.9176	0.8233	0.8775
DFA INVT DIMENSIONS GROUP IN DFA INV GRADE	DFAPX	0.0838	0.0238	0.1648	-0.1043	-0.0917	-0.0931	0.2848	0.1268	0.1604	-0.5337	-0.3560	-0.4005
DFA INVT DIMENSIONS GROUP IN EMER MKT COREQ	DFCEX	-0.0892	0.1032	0.2139	0.9357	0.8449	1.0296	0.7720	0.5354	0.7501	0.8786	0.7317	0.8661
DFA INVT DIMENSIONS GROUP IN EMERGING MKTS	DFEMX	-0.0870	0.0599	0.2197	0.9495	0.8728	1.0390	0.7925	0.5788	0.7637	0.8902	0.7608	0.8739
DFA INVT DIMENSIONS GROUP IN EMGN VAL PRTF	DFEPX	-0.1406	0.0715	0.2161	0.9830	0.8771	1.0952	0.7600	0.5151	0.7407	0.8718	0.7177	0.8607
DFA INVT DIMENSIONS GROUP IN EMRG MKTS VAL	DFEVX	-0.1381	0.0787	0.1976	0.9814	0.8758	1.0895	0.7587	0.5134	0.7376	0.8710	0.7165	0.8588
DFA INVT DIMENSIONS GROUP IN EMRG MKTSOCOEQ	DFESX	-0.0958	0.1136	0.2512	0.9354	0.8356	1.0406	0.7790	0.5380	0.7663	0.8826	0.7335	0.8754
DFA INVT DIMENSIONS GROUP IN ENCHANCD LARGE	DFELX	0.0238	-0.0196	0.0527	0.9826	0.9946	0.9844	0.9685	0.9244	0.9608	0.9841	0.9615	0.9802
DFA INVT DIMENSIONS	DFGEX	0.0163	-0.1473	0.2189	1.0177	1.0601	1.0424	0.8532	0.7414	0.7938	0.9237	0.8611	0.8910

Downside Beta and Portfolio Construction using DFA Funds

- Annual rebalancing, year 2000 to present.
- Buylist comprised of DFA mutual funds.
- Equally weighted portfolio using downside beta < 0.7 as a filter (compared to equally weighted buylist, no filtering).


Performance Comparison Chart($1 initial investment)
DFA DB7: 2.626
DFA EW: 2.464
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
(c)2012 MacroRisk Analytics – www.MacroRisk.com
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

Applications

- Whenever an Investment Policy Statement refers to a beta, consider using the down-market beta instead.
- Incorporate up-market and down-market beta estimates when evaluating potential assets for portfolios.
- Incorporate downside beta along with other risk measurements and tools for a broader assessment of risk.
- Consider using alternative benchmarks including the portfolio itself to get a deeper understanding of how each asset contributes to the portfolio's behavior.

Selected References

- Chong, J., Halcoussis, D., and Phillips, G. M. (2012). Misleading betas: An educational example. Working paper, California State University, Northridge.
- Chong, J., Jennings, W. P., and Phillips, G. M. (2012). Five types of risk and a fistful of dollars: Practical risk analysis for investors. *Journal of Financial Service Professionals*, forthcoming.
- Chong, J., Pfeiffer, S., and Phillips, G. M. (2011). Can dual beta filtering improve investor performance? *Journal of Personal Finance, 10*(1), 63–86.
- Chong, J., and Phillips, G. M. (2011). Beta measures market risk except when it doesn't: Regime-switching alpha and errors in beta. *Journal of Wealth Management, 14*(3), 67–72.

Selected References

- Chong, J., and Phillips, G. M. (2012a). Measuring risk for cost of capital: The downside beta approach. *Journal of Corporate Treasury Management, 4*(4), 344–352.
- Chong, J., and Phillips, G. M. (2012b). Low economic volatility investing. *Journal of Wealth Management*, forthcoming.
- Fama, E. F., and French, K. R. (1992). The cross-section of expected stock returns. *Journal of Finance, 47*, 427–465.
- Morelli, D. (2007). Beta, size, book-to-market equity and returns: A study based on UK data. *Journal of Multinational Financial Management, 17*, 257–272.