

The Performance of Fundamentally Weighted Indices

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Introduction

- Characteristics-based indices (CBIs) have been presented as an alternative to cap-weighting.
- This paper: Assessment of the qualities of such indices

Introduction

	Theoretical	Empirical
“CBIs work”:	<ul style="list-style-type: none">• Treynor (FAJ 2005)• Hsu (JOIM 2006)• Arnott and Hsu (2007 JOIM)• Chen, Chen and Bassett (JBF 2007)	<ul style="list-style-type: none">• Arnott, Hsu, Moore (FAJ 2005)• Siegel, Schwartz and Siracusano (WP 2007)• Schwartz and Siracusano (WP 2007)
“CBI may not work”:	<ul style="list-style-type: none">• Perold (2007 FAJ)• Kaplan (2008 FAJ)	<ul style="list-style-type: none">• Jun and Malkiel (EFM 2008)

Introduction

Questions addressed in this paper:

- Performance of a comprehensive set of indices from different providers
- Single factor analysis
 - comparison to other standard indices
 - consistency over time
- Multi-factor analysis
 - factor tilts including momentum factor
 - optimality of factor “tilts”

Outline

- Data
- Out-Performance of Standard Indices
- Static Factor Models
- Optimal Factor Portfolios
- Conclusion

Data

- Broad Overview of Index Providers

<i>Index Family</i>	<i>FTSE GWA US</i>	<i>DJ US Select Dividend</i>	<i>Intellidex</i>	<i>Wisdom Tree</i>	<i>FTSE RAFI 1000</i>	<i>Mergent Dividend Achievers</i>	<i>VTL Associates Revenue Indexes</i>
Selection by Fundamentals		X	X	X	X	X	X
Fundamental Weighting	X	X		X	X	X	X

Data

- Monthly total returns (i.e. including dividends) on the US stock market index of each provider, eight indices for Wisdom Tree (Providers, Datastream, Bloomberg)
- Value-weighted and equal-weighted NYSE and S&P 500 portfolios (CRSP)
- Industry Portfolios (Kenneth French)
- Fama French factors and Momentum factor (Kenneth French)

Data

Long Term and Short Term Data

	RAFI 1000	VTL	GWA	DJ Select Dividend	Intellidex	WisdomTree Dividend	WisdomTree Large Dividend	WisdomTree HY Equity	WisdomTree Dividend 100	Wisdom Tree Income	Wisdom Tree Income 500	Wisdom Tree Income Low P/E	Wisdom Tree Income 100	Mergent	S&P 500 Value Weighted
	Long Term Data														
Start Date	1965	1998	1994	1992	1992	1964	1964	1964	1964	1989	1989	1989	1989	1983	1964
Date	.11	.01	.01	.02	.12	.01	.01	.01	.01	.01	.01	.01	.01	.02	.01
Number of months	494	108	156	179	169	516	516	516	516	216	216	216	216	287	516
Corr with S&P 500	0.96	0.79	0.95	0.71	0.87	0.94	0.95	0.83	0.82	0.96	0.97	0.82	0.82	0.91	1.00
	Short Term Data														
Start Date	1998.01														
Number of months	108														
Corr with S&P 500	0.91	0.79	0.94	0.66	0.87	0.82	0.83	0.58	0.57	0.94	0.95	0.75	0.73	0.83	1.00

Up to December 2006

Out-Performance of Standard Indices

Return Differences with Standard Indices: Long Term Data

Return Difference	RAFI 1000	VTL	GWA	DJ Select Dividend	Intellindex	WisdomTree Dividend	WisdomTree Large Dividend	WisdomTree HY Equity	WisdomTree Dividend 100	Wisdom Tree Income	Wisdom Tree Income 500	Wisdom Tree Income Low P/E	Wisdom Tree Income 100	Mergent
over S&P 500 Value Weighted	1.88%	6.93%	1.83%	4.23%	4.58%	1.04%	0.51%	2.56%	2.09%	1.07%	0.84%	3.06%	2.70%	0.52%
p-value for difference	0.4%	6.0%	15.5%	12.3%	1.4%	16.5%	48.1%	4.6%	11.6%	25.3%	31.1%	13.5%	19.0%	67.4%
over S&P 500 Equal Weighted	-0.96%	2.09%	-0.61%	1.53%	1.88%	-1.85%	-2.36%	-0.36%	-0.82%	-0.91%	-1.14%	1.04%	0.69%	-1.42%
p-value for difference	15.3%	39.2%	61.0%	46.4%	36.9%	4.8%	2.7%	78.1%	50.8%	35.6%	32.6%	48.5%	65.3%	37.3%
over TMI Value Weighted	1.72%	5.90%	1.64%	4.03%	4.33%	0.88%	0.36%	2.41%	1.93%	1.03%	0.80%	3.02%	2.66%	0.63%
p-value for difference	0.0%	4.2%	7.1%	5.2%	1.4%	10.2%	54.2%	3.2%	8.8%	4.1%	12.7%	5.4%	8.2%	51.9%
over TMI Equal Weighted	-0.91%	1.39%	0.19%	2.24%	2.31%	-1.83%	-2.34%	-0.34%	-0.81%	0.10%	-0.13%	2.08%	1.72%	0.04%
p-value for difference	40.1%	54.4%	93.2%	32.5%	24.6%	14.0%	9.8%	81.4%	57.2%	94.7%	94.5%	22.7%	38.5%	98.2%

Out-Performance of Standard Indices

Relative Drawdown w.r.t. S&P 500: Long Term Data

	RAFI 1000	VTL	GWA	DJ Select Dividend	Intellidex	Wisdom Tree Dividend	Wisdom Tree Large Dividend	Wisdom Tree HY Equity	Wisdom Tree Dividend 100	Wisdom Tree Income	Wisdom Tree Income 500	Wisdom Tree Income Low P/E	Wisdom Tree Income 100	Mergent
Max. Drawdown	21.7%	30.0%	17.3%	43.2%	16.2%	36.2%	31.5%	48.2%	51.6%	24.8%	20.0%	38.6%	39.2%	26.6%
Maximum time under water	88	37	42	41	41	179	178	94	189	151	146	89	65	115
Beginning of longest drawdown	1993.10	1998.01	1994.06	1998.01	1994.03	1986.10	1986.10	1993.10	1986.09	1989.01	1989.01	1993.10	1995.10	1992.01
End of longest drawdown	2001.02	2001.02	1997.12	2001.06	1997.08	2001.09	2001.08	2001.08	2002.06	2001.08	2001.03	2001.03	2001.03	2001.08

Static Factor Models

Single Factor Model and Four Factor Model: Long Term Data

	RAFI 1000	VTL	GWA	DJ Select Dividend	Intellidex	WisdomTree Dividend	WisdomTree Large Dividend	WisdomTree HY Equity	WisdomTree Dividend 100	Wisdom Tree Income	Wisdom Tree Income 500	Wisdom Tree Income Low P/E	Wisdom Tree Income 100	Mergent
R bar	0.91	0.61	0.80	0.43	0.81	0.86	0.84	0.66	0.65	0.87	0.87	0.63	0.61	0.74
Alpha	0.19%	0.57%	0.26%	0.58%	0.48%	0.18%	0.14%	0.36%	0.31%	0.19%	0.17%	0.38%	0.37%	0.22%
t-prob	1%	17%	13%	8%	0%	4%	9%	1%	1%	18%	17%	17%	17%	10%
Beta R _M	0.91	0.83	0.86	0.65	0.84	0.81	0.79	0.68	0.71	0.87	0.87	0.82	0.80	0.79
t-prob	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
R-bar	0.98	0.82	0.97	0.81	0.84	0.95	0.95	0.86	0.86	0.96	0.96	0.87	0.86	0.86
Alpha	0.07%	0.10%	0.19%	0.04%	0.25%	0.03%	0.04%	0.13%	0.05%	0.08%	0.09%	0.13%	0.05%	0.07%
t-prob	4%	60%	2%	79%	3%	42%	29%	8%	43%	34%	26%	44%	69%	46%
Beta R _M	1.02	1.07	0.98	0.97	0.93	0.93	0.93	0.84	0.89	0.98	0.98	1.05	1.06	0.91
t-prob	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Beta SMB	-0.07	0.23	-0.18	-0.03	0.10	-0.16	-0.27	-0.08	-0.09	-0.10	-0.19	0.01	-0.09	-0.37
t-prob	0%	1%	0%	59%	3%	0%	0%	2%	1%	0%	0%	84%	8%	0%
Beta HML	0.35	0.70	0.29	0.76	0.21	0.35	0.30	0.56	0.61	0.28	0.22	0.64	0.65	0.15
t-prob	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7%
Beta Momentum	-0.079	-0.093	-0.143	-0.100	0.058	-0.041	-0.040	-0.094	-0.096	-0.061	-0.053	-0.148	-0.086	0.046
t-prob	0%	2%	0%	0%	17%	15%	13%	0%	0%	2%	1%	1%	2%	29%

Static Factor Models

Summary:

Annualised Alpha in Percent with Different Factor Models

	Long Term Data			Short Term Data		
	Min	Max	Median	Min	Max	Median
Alpha One Factor Model	1.6	6.9	3.4	1.9	7.4	4.9
Alpha Four Factor Model	0.4	3.0	0.9	0.0	2.8	1.2
Alpha vs. Sector Benchmark	-0.8	3.2	0.8	-0.6	3.6	1.8

Static Factor Models

- The value-added is further reduced in practice
- Fee increment of roughly 50 basis points p.a. for fundamental index ETFs vs. Russell 1000 or S&P 500 ETFs
- Index returns do not include transaction costs of managed fund (higher for fundamental indices)
- Ex post track records include the possibility of data snooping

Optimal Factor Portfolios

Out of Sample Global Minimum Variance Benchmark

- We use daily returns for
 - the ten sector indices
 - the four factors
- We compute the minimum-variance portfolio with a calibration period of the past 12 calendar months.
- We obtain the optimal weights and hold this portfolio for the following three calendar months.
- We then repeat the analysis, rolling the sample forward.
- The results is the monthly time series of returns for the minimum variance strategy: January 1965 to December 2006

Optimal Factor Portfolios

Sharpe Ratios: Long Term Data

	RAFI 1000	VTL	GWA	DJ Select Dividend	Intellidex	Wisdom Tree Dividend	Wisdom Tree Large Dividend	Wisdom Tree HY Equity	Wisdom Tree Dividend 100	Wisdom Tree Income	Wisdom Tree Income 500	Wisdom Tree Income Low P/E	Wisdom Tree Income 100	Mergent
Diff. In SR														
w.r.t. FF Factor Portfolio	-0.68	-0.74	-0.67	-0.64	-0.54	-0.70	-0.74	-0.55	-0.62	-0.64	-0.67	-0.57	-0.59	-0.68
p-value for difference	0%	5%	7%	4%	8%	0%	0%	0%	0%	3%	3%	3%	3%	1%
Diff in SR														
w.r.t. Sector Portfolio	-0.44	-0.09	-0.33	-0.21	-0.14	-0.44	-0.48	-0.30	-0.36	-0.35	-0.37	-0.28	-0.30	-0.48
p-value for difference	0%	69%	8%	19%	53%	0%	0%	0%	0%	2%	1%	7%	3%	0%
Sharpe Ratio Index	0.51	0.65	0.72	0.92	0.98	0.50	0.46	0.65	0.58	0.73	0.71	0.80	0.78	0.68
Sharpe Ratio Factor Portfolio	1.18	1.39	1.38	1.55	1.52	1.20	1.20	1.20	1.20	1.38	1.38	1.38	1.38	1.36
Sharpe Ratio Sector Portfolio	0.94	0.74	1.05	1.13	1.11	0.94	0.94	0.94	0.94	1.08	1.08	1.08	1.08	1.16
Mean Excess Return														
Index	7%	11%	10%	13%	13%	7%	6%	8%	8%	10%	9%	12%	11%	9%
Mean Excess Return														
Factor Portfolio	6%	7%	6%	7%	7%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Mean Excess Return														
Sector Portfolio	12%	8%	11%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	13%
Std. Dev. Of Excess Returns														
Index	15%	17%	14%	14%	13%	13%	13%	13%	14%	13%	13%	15%	15%	14%
Std. Dev. Of Excess Returns														
Factor Portfolio	5%	5%	4%	4%	4%	5%	5%	5%	5%	4%	4%	4%	4%	4%
Std. Dev. Of Excess Returns														
Sector Portfolio	12%	11%	11%	10%	10%	12%	12%	12%	12%	11%	11%	11%	11%	12%
Start	1965.11	1998.01	1994.01	1992.02	1992.12	1965.01	1965.01	1965.01	1965.01	1989.01	1989.01	1989.01	1989.01	1983.02
Number of months	494	108	156	179	169	504	504	504	504	216	216	216	216	287

Conclusion

- **Comparison with standard indices**

- All fundamental indices have higher returns than the capitalisation-weighted S&P 500, though the return difference is not statistically significant for most indices.
- When compared to equal-weighted indices, most fundamental indices actually have lower returns.

- **Alphas**

- In the single factor model, the alpha of all fundamental indices is positive, though most of them are not significantly different from zero.
- In the four factor model, the magnitude of alphas is greatly reduced and only three of them are significantly different from zero.

- **Comparison with simple benchmarks**

- Sharpe ratios for out of sample minimum variance portfolios (from sector or factor portfolios) are higher than those of the fundamental indices

Conclusion

- CBIs are value-tilted portfolios.
- When properly adjusting for this tilt, most CBIs do not show any outperformance.
- They may provide investors with a liquid, systematic and relatively cheap alternative to other value-tilted strategies.
- However, it is possible to construct portfolios of factors that beat the CBIs in terms of mean-variance efficiency.