Investing like Warren Buffett

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"If today you could go back in time 40 years and pick only one stock to hold till the present day you should definitely pick Buffett's Berkshire Hathaway" (Frazzini et al. FAJ 2018 "Buffet's alpha").

Some stylized Facts

The numbers of Berkshire Hathway

- Some stylized stats[1]:
  - average annual excess return in the period 1976–2011: 19.0% per annum.
  - over same period, average market excess return 6.1% per annum.
  - realized volatility: high (24.9% vs. 15.8% for market), but Sharpe ratio also high: 76% (against 39% for U.S. stock market).
  - market beta only $\beta^m = 0.7$.
  - information ratio (i.e., performance adjusted for market exposure): 66%.

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[1]These stats and the following slides borrow heavily from Frazzini et al. (2013).

What is the Information Ratio? I

▶ The information ratio is defined as the intercept (α^i) in a regression of monthly excess returns on monthly market excess returns divided by the standard deviation of the residuals.

▶ Recall that the α is a measure of risk-adjusted return (or anomaly return), while the standard deviation of residuals measure the quantity of idiosyncratic risk.

What is the Information Ratio? II

▶ Estimate OLS regression

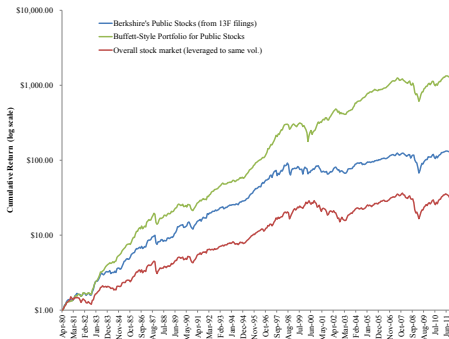$$R_{t+1}^{e,i} = \alpha^i + \beta R_{t+1}^{e,m} + \epsilon_{t+1}^i$$

▶ The information ratio is

$$\mathcal{IR}^i = \frac{\hat{\alpha}^i}{\hat{\sigma}(\epsilon_{t+1}^i)}$$

▶ The $\mathcal{IR}$ is a **measure of performance** adjusted for *market exposure*.

Buffett and Buffett-style cumulated returns

Panel A: Berkshire's Public Stocks and Buffett-Style Portfolio

Note: The SEC Form 13F is a quarterly report that is required to be filed by all institutional investment managers with at least $100 million in assets under management. It discloses their equity holdings.

Skills, Luck, Anomalies? I

▶ Is Buffett's incredible performance a living proof that markets are not perfectly efficient and that skilled investors outperform the market?

▶ Yes/No according to Frazzini, Kabiller and Pedersen (all at AQR, henceforth FKP), "Buffet's Alpha".

Skills, Luck, Anomalies? II

- ▶ The authors find that Buffet's alpha is zero when controlling for multiple risk factors and leverage

- ▶ However, many of the risk factors were discovered by the academic literature only recently ...

- ▶ Can we then replicate Buffet's success?

Buffett vs Mutual Fund Universe

Figure 1

How Berkshire Stacks Up in the Mutual Fund Universe.

This figure shows the distribution of annualized Information Ratios of all actively managed equity funds on the CRSP mutual fund database with at least 30 years of return history. Information ratio is defined as the intercept in a regression of monthly excess returns divided by the standard deviation of the residuals. The explanatory variable in the regression is the monthly excess returns of the CRSP value-weighted market portfolio. The vertical line shows the Information ratio of Berkshire Hathaway.
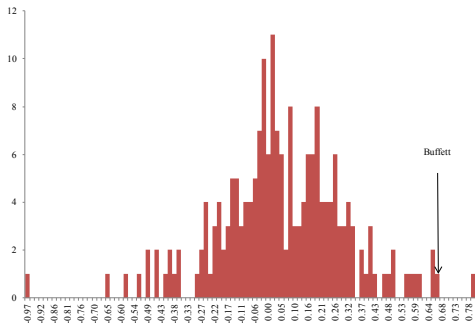
Buffett vs Stocks Universe

Figure 2

How Berkshire Stacks Up in the Common Stocks Universe.

This figure shows the distribution of annualized Information Ratios of all common stock on the CRSP database with at least 30 years of return history. Information ratio is defined as the intercept in a regression of monthly excess returns divided by the standard deviation of the residuals. The explanatory variable in the regression is the monthly excess returns of the CRSP value-weighted market portfolio. The vertical line shows the Information ratio of Berkshire Hathaway.
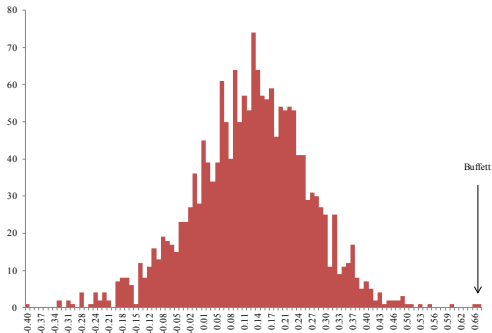
Buffett vs All Stocks and Mutual Funds

	Sample Distribution of Sharpe Ratios				Buffett Performance	
	Number of stocks/funds	Median	95th Percentile	99th Percentile	Maximum	Rank	Percentile
Panel A: SR of Equity Mutual Funds							
All funds in CRSP data 1976 - 2011	3,479	0.242	0.49	1.09	2.99	88	97.5%
All funds alive in 1976 and 2011	140	0.37	0.52	0.76	0.76	1	100.0%
All funds alive in 1976 with at least 10-year history	264	0.35	0.51	0.65	0.76	1	100.0%
All funds with at least 10-year history	1,994	0.30	0.47	0.65	0.90	4	99.8%
All funds with at least 30-year history	196	0.37	0.51	0.72	0.76	1	100.0%
Panel B: SR of Common Stocks							
All stocks in CRSP data 1926 - 2011	23,390	0.195	0.61	1.45	2.68	1360	93.9%
All stocks alive in 1976 and 2011	598	0.32	0.44	0.56	0.76	1	100.0%
All stocks alive in 1976 with at least 10-year history	3,633	0.27	0.45	0.61	0.86	7	99.8%
All stocks with at least 10-year history	9,035	0.26	0.48	0.73	1.12	62	99.3%
All stocks with at least 30-year history	1,777	0.31	0.44	0.57	0.76	1	100.0%

Buffet's Leverage

Buffets' Leverage

- FKP find that high SR + Leverage are key factors of Buffet's success

- FKP estimate monthly leverage as

$$Lev_t = \frac{TA_t - Cash_t}{E_t} \approx 1.6$$

using the *market values* of balance sheet entries (where *TA* are total assets, and *E* equity)

Buffets' Leverage

- Is it just leverage?
- No. Apply 1.6 leverage to market and get annual excess return of 10%, still short of Buffet's 19% per annum

Buffets' Leverage

- How expensive is Buffets' leverage? Not much!
- Berkshire's debt has received AAA credit rating in period 1989–2009.
- However, key feature of low cost of financing is *insurance float*.
- If interested, I highly recommend listening to the Acquired Podcast episode on Berkshire Hathaway
  https://www.acquired.fm/episodes/berkshire-hathaway-part-i

Insurance float

▶ Collecting insurance premia upfront, and later paying a diversified set of claims is like taking a loan.

▶ FKP estimate an annual average cost of insurance float for Berkshire of just 2.2% (3pp less than T-bill rate over same period).

▶ FKP estimate that 1/3 of Berkshire's liabilities are in the form of insurance float.

Buffett's Cost of Leverage

Buffett's Cost of Leverage: The Case of His Insurance Float

This table shows the cost of Berkshire's funds coming from insurance float. The data is hand-collected from Buffett's comment in Berkshire Hathaway's annual reports. Rates are annualized, in percent. * In years when cost of funds is reported as "less than zero" and no numerical value is available we set cost of funds to zero.

	Fraction of years with negative cost	Average cost of funds (Trucated)*	Spread over benckmark rates				
			T-Bill	Fed Funds rate	1-Month Libor	6-Month Libor	10-Year Bond
1976-1980	0.79	1.67	-4.59	-5.65			-5.76
1981-1985	0.20	10.95	1.10	-0.27			-1.28
1986-1990	0.00	3.07	-3.56	-4.61	-4.80	-4.90	-5.30
1991-1995	0.60	2.21	-2.00	-2.24	-2.46	-2.71	-4.64
1996-2000	0.60	2.36	-2.70	-3.10	-3.33	-3.48	-3.56
2001-2005	0.60	1.29	-0.82	-0.96	-1.05	-1.19	-3.11
2006-2011	1.00	-4.00	-5.84	-6.06	-6.29	-6.59	-7.67
Full sample	0.60	2.20	-3.09	-3.81	-3.69	-3.88	-4.80

Decomposing Buffet's Returns

Buffett's Return Decomposition

	Buffett Performance			
	Berkshire Hathaway	Public U.S. stocks (from 13F filings)	Private holdings	Overall stock market performance
Sample	1976-2011	1980-2011	1984-2011	1976-2011
Beta	0.68	0.77	0.28	1.00
Average excess return	19.0%	11.8%	9.6%	6.1%
Total Volatility	24.8%	17.2%	22.3%	15.8%
Idiosyncratic Volatility	22.4%	12.0%	21.8%	0.0%
Sharpe ratio	0.76	0.69	0.43	0.39
Information ratio	0.66	0.56	0.36	0.00
Leverage	1.64	1.00	1.00	1.00
Sub period excess returns:				
1976-1980	42.1%	31.4%		7.8%
1981-1985	28.6%	20.9%	18.5%	4.3%
1986-1990	17.3%	12.5%	9.7%	5.4%
1991-1995	29.7%	18.8%	22.9%	12.0%
1996-2000	14.9%	12.0%	8.8%	11.8%
2001-2005	3.2%	2.2%	1.7%	1.6%
2006-2011	3.3%	3.0%	2.3%	0.7%

What Companies does Buffett pick?

A few Buffet's quotes (I/III)

Whether we are talking about socks or stocks, I like buying quality merchandise when it is marked down, Warren Buffet, 2008

A few Buffet's quotes (II/III)

Ben Graham [the father of "value" investing] *taught me 45 years ago that in investing it is not necessary to do extraordinary things to get extraordinary results*, Warren Buffet, 1994

A few Buffet's quotes (III/III)

It is far better to buy a wonderful company at a fair price than a fair company at a wonderful price, Warren Buffet, 1989

What Companies does Buffett pick?

▶ FKP estimate Buffet's factor exposure

$$R_t^e = \alpha + \beta_1 Mkt_t + \beta_2 SMB_t + \beta_3 HML_t + ...$$
$$... \quad \beta_4 UMD_t + \beta_5 BAB_t + \beta_6 QMJ_t + \epsilon_t$$

where

   ▶ Mkt, SMB, HML are the Fama-French standard factors
   ▶ UMD is the momentum factor
   ▶ BAB is the Betting Against Beta factor
   ▶ QMJ is the Quality Minus Junk factor

Betting Against Beta

- Many investors have leverage and margin constraints (i.e., pension funds, small investors, etc.).

- Constrained investors bid-up high-beta assets, and high-beta assets are associated with low alpha.

- A BAB factor (i.e., long leveraged low-beta assets and short high-beta assets) produces significant risk-adjusted returns.

- When funding constraints tighten, return from BAB is low.

- More constrained investors hold riskier assets.

Quality Minus Junk I

▶ Quality is a characteristic that investors should be willing to pay a higher price for (i.e., profitability, growth, safety, etc.).

▶ The junk characteristics typically refer to aspects like high debt levels, volatile earnings, and aggressive accounting practices.

Quality Minus Junk II

- Empirically, high quality stock do have higher prices, but there is a puzzling modest impact of quality on price.

- Therefore, high quality stocks have high risk-adjusted returns.

- A QMJ factor (i.e., long high quality stocks and short low quality stocks) earn significant risk-adjusted returns.

What Companies does Buffett pick?

▶ A loading on *BAB* (i.e., Betting Against Beta factor) reflects tendency to buy safe (i.e., low beta) stocks but levered to a beta of 1, while shying away from risky (i.e., high-beta) stocks (de-levered to a beta of 1) (Frazzini and Pedersen, 2013)

▶ A loading on *QMJ* (i.e., Quality Minus Junk factor) reflects a tendency to buy high-quality companies (i.e., profitable, growing, safe and with high payout) (Asness, Frazzini and Pedersen, 2013)

What Companies does Buffett pick?

	Berkshire stock 1976 - 2011			13F portfolio 1980 - 2011			Private Holdings 1984 - 20011		
Alpha	**12.1%**	**9.2%**	6.3%	**5.3%**	3.5%	0.3%	5.6%	4.6%	4.9%
	(3.19)	(2.42)	(1.58)	(2.53)	(1.65)	(0.12)	(1.35)	(1.08)	(1.09)
MKT	**0.84**	**0.83**	**0.95**	**0.86**	**0.86**	**0.98**	**0.40**	**0.40**	**0.39**
	(11.65)	(11.70)	(10.98)	(21.55)	(21.91)	(20.99)	(5.01)	(5.01)	(3.94)
SMB	**-0.32**	**-0.32**	-0.15	**-0.18**	**-0.18**	0.00	**-0.29**	**-0.29**	**-0.31**
	-(3.05)	-(3.13)	-(1.15)	-(3.14)	-(3.22)	(0.02)	-(2.59)	-(2.53)	-(2.17)
HML	**0.63**	**0.38**	**0.46**	**0.39**	**0.24**	**0.31**	**0.39**	0.28	0.27
	(5.35)	(2.79)	(3.28)	(6.12)	(3.26)	(4.24)	(3.07)	(1.89)	(1.81)
UMD	0.06	-0.03	-0.05	-0.02	**-0.08**	**-0.10**	0.09	0.04	0.05
	(0.90)	-(0.40)	-(0.71)	-(0.55)	-(1.98)	-(2.66)	(1.13)	(0.52)	(0.55)
BAB		**0.37**	**0.29**		**0.22**	**0.15**		0.16	0.17
		(3.61)	(2.67)		(4.05)	(2.58)		(1.40)	(1.41)
QMJ			**0.43**			**0.44**			-0.05
			(2.34)			(4.55)			-(0.24)
R2 bar	0.25	0.27	0.28	0.57	0.58	0.60	0.08	0.08	0.08

What Companies does Buffett pick?

... being able to explain Buffet's returns using factors from academic papers written decades after Buffet put them into practice does not make Buffet's success any less impressive (FKP, 2013)

A Systematic Buffet Strategy

▶ FKP reverse engineer Buffet's strategy

1. estimate market (i.e., passive) exposure as univariate regression of monthly Berkshire's returns on market (β^{Buffet});

2. capture Buffett's stock selection (i.e., active):

$$
\begin{aligned}
R_t^e - \hat{\beta}^{Buffett} Mkt_t &= \alpha + mMkt_t + sSMB_t + hHML_t + ... \\
&\quad ... \quad uUMD_t + bBAB_t + qQMJ_t + \epsilon_t \quad (1)
\end{aligned}
$$

3. return from Buffet's *active* stock selection:

$$
\begin{aligned}
\hat{R}_t^A &= \hat{m}Mkt_t + \hat{s}SMB_t + \hat{h}HML_t + ... \\
&\quad ... \quad \hat{u}UMD_t + \hat{b}BAB_t + \hat{q}QMJ_t
\end{aligned}
$$

4. rescale to match Buffet's idiosyncratic volatility (σ_I from (1)) to control for leverage

$$
R_t^{A,adj} = \hat{R}_t^A \frac{\sigma_I}{\sigma(\hat{R}_t^A)}
$$

A Systematic Buffet Strategy

▶ To complete our *systematic* replica of Buffet's strategy we need to add risk-free rate and market's exposure

$$R_t^{Buffet-style} = R_t^f + \hat{\beta}^{Buffet} Mkt_t + r_t^{A,adj}$$

▶ The systematic Buffet's-style strategy is a diversified portfolio that matches Berkshire's

  ▶ beta
  ▶ idiosyncratic voltility
  ▶ total volatility
  ▶ relative active loadings

Buffett and Buffett-style cumulated performance (I/II)

Panel A: Berkshire's Public Stocks and Buffett-Style Portfolio
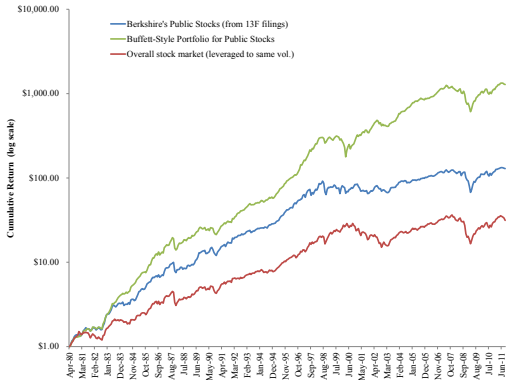
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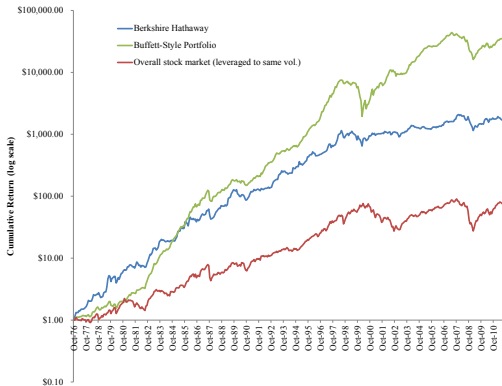
Buffett's Return Decomposition (I/II)

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2001-2005	3.2%	2.2%	1.7%	1.6%
2006-2011	3.3%	3.0%	2.3%	0.7%

Buffett's Return Decomposition (II/II)

Buffett-Style Portfolio			Buffett-Style Portfolio Long Only		
Berkshire Hathaway	Public U.S. stocks (from 13F filings)	Private holdings	Berkshire Hathaway	Public U.S. stocks (from 13F filings)	Private holdings
1981-2011	1985-2011	1988-2011	1981-2011	1985-2011	1988-2011
0.66	0.68	0.29	0.81	0.82	0.89
39.3%	19.3%	17.6%	9.4%	7.5%	9.2%
30.9%	19.2%	28.7%	15.3%	15.4%	16.0%
29.1%	15.8%	28.4%	8.5%	8.0%	8.2%
1.27	1.01	0.61	0.62	0.49	0.58
1.20	0.95	0.56	0.49	0.27	0.47
4.78	2.50	4.17			
84.4%	42.2%		19.1%	27.4%	
30.8%	11.5%	36.9%	2.0%	3.1%	-0.6%
62.6%	34.7%	53.3%	20.9%	19.9%	20.2%
32.7%	22.2%	8.8%	10.5%	10.7%	13.8%
33.6%	20.9%	13.7%	5.8%	4.2%	5.8%
3.8%	5.6%	-9.3%	1.2%	-2.1%	2.1%

Buffett and Buffett-style Portfolios

	Regress Berkshire on Systematic Portfolio			Regress Systematic Portoflio on Berkshire		
	Berkshire Hathaway	Public U.S. stocks (from 13F filings)	Private holdings	Berkshire Hathaway	Public U.S. stocks (from 13F filings)	Private holdings
Sample	1976-2011	1980-2011	1984-2011	1976-2011	1980-2011	1984-2011
Alpha	3.7%	-0.6%	6.4%	**30.4%**	**12.1%**	**15.5%**
	(0.88)	-(0.21)	(1.61)	(5.81)	(4.11)	(2.58)
Loading	**0.32**	**0.56**	**0.11**	**0.55**	**0.70**	**0.26**
	(8.73)	(14.34)	(2.87)	(8.73)	(14.34)	(2.87)
Correlation	0.42	0.63	0.17	0.42	0.63	0.17
R2 bar	0.17	0.39	0.03	0.17	0.39	0.03

Conclusions

▶ Buffet's performance is outstanding as the best among all stocks and mutual funds that have existed for at least 30 years

▶ Sharpe ratio approximately 0.75 (lower than many investors would imagine)

▶ Secret to Buffet's success is his preference for cheap, safe, high-quality stocks with consistent use of leverage to magnify returns
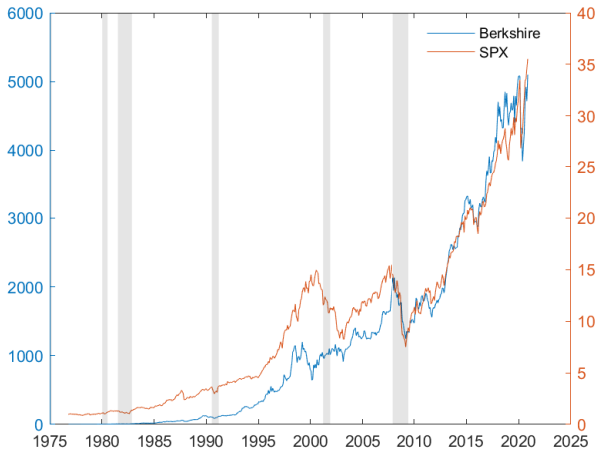
Update 1: Don't miss the two y-axis!!

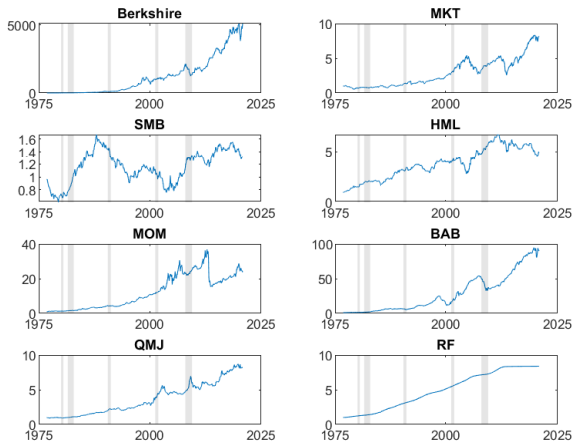Figure: Berkshire and SP500 price indices (rebased to 1)

Update 2

Figure: Cumulated returns factors (different y-scales)