Buffett’s Alpha

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AQR Capital   AQR Capital   Copenhagen Business School, NYU, and AQR

This is the views of the authors, not necessarily those of AQR Capital
Who is Warren Buffett?

- Born in Omaha, Nebraska
- M.S. in Economics, Columbia University
- Buffet-Falk & Co., Omaha, Investment Salesman
- Graham-Newman Corp., New York, Securities Analyst
- Became the Buffett Partnership
- Became the primary shareholder, chairman, and CEO of Berkshire Hathaway
- Became the richest man in the world
Understanding Buffett’s Alpha: Outline

1. Research background: Leverage aversion
   – The low risk anomaly: betting against beta
   – Quality minus junk

2. Can this theory also explain Buffett?
   – Track record: How good is Buffett?
   – Buffett’s Leverage
   – Decomposing Buffett: CEO vs. stock picker
   – Exposures: What type of stocks?
   – Systematic Buffett strategy

3. Beyond Buffett: understanding alpha more broadly
Investors like high returns, but often cannot or will not use leverage (Black, 1972)

- They overweight risky securities, pushing up their prices, and lowering their expected return
- They shun safe securities, lowering their price, and increase their expected return
Proposition (Frazzini and Pedersen 2014). In a market equilibrium with leverage constraints, the required return for any security $s$ is:

$$E_t(r^s_{t+1}) = r^f_t + \psi_t + \beta^s_t \lambda^s_t$$

where the risk premium is

$$\lambda^s_t = E_t(r^M_{t+1}) - r^f_t - \psi_t$$

and $\psi$ is a positive number measuring the importance of leverage constraints.

Source: Betting Against Beta. Frazzini, Pedersen (2010). For illustrative purposes only. Please read important disclosures in the Appendix.
Betting Against Beta: The Original Evidence

Theoretical and empirical security market lines:
- Beta-sorted U.S. equity portfolios, 1931-1965
- Source: Black, Jensen, and Scholes (1972)

Betting Against Beta: Updated Equity Sample

Theoretical and empirical security market lines:
- Beta-sorted **U.S. equity portfolios, 1926-2012**
- Source: Frazzini and Pedersen (JFE 2014)

Source: Betting Against Beta. Frazzini, Pedersen (2010). For illustrative purposes only. Please read important disclosures in the Appendix.
Betting Against Beta: Evidence Across Bonds

Theoretical and empirical security market lines:

- Beta-sorted bond portfolios, 1952-2012
- Source: Frazzini and Pedersen (JFE 2014)

Source: Betting Against Beta. Frazzini, Pedersen (2010). For illustrative purposes only. Please read important disclosures in the Appendix.
Betting Against Beta: Evidence Across Asset Classes

Theoretical and empirical security market lines:
- Overall stock market, overall Treasury bond market, credit market, and commodity market

Source: Leverage Aversion and Risk Parity. Asness, Frazzini, Pedersen (2011). For illustrative purposes only. Please read important disclosures in the Appendix.
Betting Against Beta: Long-Short Factor

The low-beta anomaly can be exploited in
• A long only portfolio
• A long/short factor
• Whether you trade long only or long-short, the factor is a useful tool for performance measurement

Betting Against Beta (BAB) factor:
• Long low-beta securities, leveraged to a beta of 1
• Short high-beta securities, de-leveraged to a beta of 1
• Market neutral

Performance of BAB
• US stocks: 0.78
• International stocks: 0.95
• Strong performance, consistent across time, regions, and asset classes
Betting Against Beta
Evidence From More than 100,000 Assets

Evidence within asset classes: Betting Against Beta

Evidence across asset classes: Leverage Aversion and Risk Parity

Options and leveraged ETFs: Embedded Leverage

Within industries: Low-Risk Investing Without Industry Risk

Source: Betting Against Beta (BAB) Frazzini, Pedersen (2010). For illustrative purposes only. Past performance is not a guarantee of future performance. Please read important disclosures in the Appendix.
Quality Minus Junk

So far: risk measured using stock returns

Risk and other quality characteristics can also be measured using balance sheet data
• Quality Minus Junk (QMJ): a portfolio long high quality and short low quality stocks

Key quality characteristics
• Profitability
• Safety: stable profits
• Growing profits
• Profits paid out to shareholders
The Low Risk Anomaly: Quality Minus Junk

Global evidence that high-quality stocks deliver greater risk-adjusted returns than “junk” stocks
• Quality Minus Junk (QMJ): a portfolio long high quality and short low quality stocks

Outperformance appears especially strong in bear markets – flight to quality

• Source: Asness, Frazzini and Pedersen (2013).
Who Bets Against Beta: Evidence From Actual Portfolios

• Standard CAPM predicts that everyone holds the same portfolio (the market):
  – Violated empirically in a systematic way
• Evidence consistent with theory of leverage constraints
  – Stock selection evidence from Frazzini and Pedersen (2011):

![Chart showing beta for different investment types]

- **Investors with leverage aversion**
  - Stocks held by mutual funds
  - Stocks held by Individual Investors
- **Investors who apply leverage**
  - Stocks bought in leveraged buyouts (LBO)
  - Public stocks held by Berkshire Hathaway
Is the Low Risk Anomaly Relevant to Buffett’s portfolio? What Makes a Stock a “Buffett Stock”?

What the world reads:

"It's far better to buy a wonderful company at a fair price than a fair company at a wonderful price"

What a quant sees:

<table>
<thead>
<tr>
<th>Value</th>
<th>The tendency for relatively cheap assets to outperform relatively expensive ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Beta</td>
<td>The tendency for low risk assets to generate higher risk-adjusted returns than high risk assets</td>
</tr>
<tr>
<td>Quality</td>
<td>The tendency for assets with more stable, sustainable earnings, and lower leverage to outperform</td>
</tr>
</tbody>
</table>

Well-known, well-studied

New understanding, both require leverage to matter

Understanding Buffett’s Alpha: Outline

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   – The Low Risk Anomaly
     • Betting against Beta and Fundamental Risk

2. Can this theory also explain Buffett?
   – Track record: How good is Buffett?
   – Buffett’s Leverage
   – Decomposing Buffett: CEO vs. stock picker
   – Exposures: What type of stocks?
   – Systematic Buffett strategy
How Good is Buffett’s Record?

Sharpe ratio: $SR = \frac{\text{excess return}}{\text{volatility}}$
- Berkshire Hathaway (1976-2011): 0.76
- Berkshire’s public stock holdings: 0.69

Information ratio: $IR = SR(r_t - \hat{\beta} \text{MKT}_t)$
- Berkshire Hathaway (1976-2011): 0.66
- Berkshire’s public stock holdings: 0.56

How does this stack up?

Please see the Appendix for important information. An investment in the above security does not suggest the achievement of a profit or loss, realized or unrealized. This security was selected merely for illustrative purposes.
# How Good is Buffett’s Record?

**Buffett’s track record has been exceptional**

- Berkshire Hathaway has a higher Sharpe ratio than any stock or mutual fund with a history of more than 30 years
- If you could travel back in time and pick one stock, Berkshire Hathaway would be your pick

<table>
<thead>
<tr>
<th>Panel A: SR of Equity Mutual Funds</th>
<th>Sample Distribution of Sharpe Ratios</th>
<th>Buffett Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of Stocks/Funds</td>
<td>Median</td>
</tr>
<tr>
<td>All funds in CRSP data 1976 - 2011</td>
<td>3,479</td>
<td>0.242</td>
</tr>
<tr>
<td>All funds alive in 1976 and 2011</td>
<td>140</td>
<td>0.37</td>
</tr>
<tr>
<td>All funds alive in 1976 with at least 10-year history</td>
<td>264</td>
<td>0.35</td>
</tr>
<tr>
<td>All funds with at least 10-year history</td>
<td>1,994</td>
<td>0.30</td>
</tr>
<tr>
<td>All funds with at least 30-year history</td>
<td>196</td>
<td>0.37</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: SR of Common Stocks</th>
<th>Sample Distribution of Sharpe Ratios</th>
<th>Buffett Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of Stocks/Funds</td>
<td>Median</td>
</tr>
<tr>
<td>All stocks in CRSP data 1926 - 2011</td>
<td>23,390</td>
<td>0.195</td>
</tr>
<tr>
<td>All stocks alive in 1976 and 2011</td>
<td>598</td>
<td>0.32</td>
</tr>
<tr>
<td>All stocks alive in 1976 with at least 10-year history</td>
<td>3,633</td>
<td>0.27</td>
</tr>
<tr>
<td>All stocks with at least 10-year history</td>
<td>9,035</td>
<td>0.26</td>
</tr>
<tr>
<td>All stocks with at least 30-year history</td>
<td>1,777</td>
<td>0.31</td>
</tr>
</tbody>
</table>

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How Good is Buffett’s Record? 1926 – 2011

- Information ratios of all stocks in the CRSP universe with more than 30 years

Buffett
Buffett’s Leverage: The Magnitude of Leverage

Buffett: “I've seen more people fail because of liquor and leverage”

Stylized balance sheet of Berkshire Hathaway:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities and Shareholders’ Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publicly traded equities</td>
<td>Liabilities</td>
</tr>
<tr>
<td>Privately held companies</td>
<td>Equity</td>
</tr>
<tr>
<td>Cash</td>
<td></td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
<td><strong>Total Liabilities</strong></td>
</tr>
</tbody>
</table>

Leverage: \( L_t = \frac{\text{Total Assets} - \text{Cash}}{\text{Equity}} = 1.6 \)

Does Buffett’s risk reflect the use of leverage?

- Volatility of Berkshire Hathaway = 25%
- Volatility of the portfolio of Berkshire’s public stocks: 17%

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Buffett’s Leverage: The Cost of Leverage

36% of liabilities come from insurance float. Cost:

<table>
<thead>
<tr>
<th>Fraction of years with negative cost</th>
<th>Average cost of funds (Truncated)*</th>
<th>Spread over benchmark rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>T-Bill</td>
</tr>
<tr>
<td>1976-1980</td>
<td>0.79</td>
<td>1.67</td>
</tr>
<tr>
<td>1981-1985</td>
<td>0.20</td>
<td>10.95</td>
</tr>
<tr>
<td>1986-1990</td>
<td>0.00</td>
<td>3.07</td>
</tr>
<tr>
<td>1991-1995</td>
<td>0.60</td>
<td>2.21</td>
</tr>
<tr>
<td>1996-2000</td>
<td>0.60</td>
<td>2.36</td>
</tr>
<tr>
<td>2001-2005</td>
<td>0.60</td>
<td>1.29</td>
</tr>
<tr>
<td>2006-2011</td>
<td>1.00</td>
<td>-4.00</td>
</tr>
<tr>
<td>Full sample</td>
<td>0.60</td>
<td>2.20</td>
</tr>
</tbody>
</table>

Other sources of financing include

- Debt
- Deferred income taxes (e.g., based on property, plant and equipment)
- Accounts payable
- Derivatives:
  - Selling options
  - Collects premia up front with no margin requirement
  - Provides Embedded Leverage (Frazzini and Pedersen (2011))

* 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. Please see the Appendix for important information. An investment in the above security does not suggest the achievement of a profit or loss, realized or unrealized. This security was selected merely for illustrative purposes.
Buffett’s Alpha: CEO or Stockpicker?

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<th>Liabilities and Shareholders' Equity</th>
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</tr>
<tr>
<td>Cash</td>
<td></td>
</tr>
<tr>
<td>Total Assets</td>
<td>Total Liabilities</td>
</tr>
</tbody>
</table>

**Returns of**
- Berkshire stock: observed directly
- Publicly traded equities: observed via 13F filings and stock return data
- Privately held companies inferred:

\[
\begin{align*}
    r_{t+1}^{\text{Public}} &= r_{t+1}^{f} - r_{t+1}^{\text{Liabilities}_t^{\text{MV}}} - r_{t+1}^{\text{Equity}_t^{\text{MV}}} - r_{t+1}^{\text{Public}_t^{\text{MV}}} - r_{t+1}^{\text{Cash}_t^{\text{MV}}} \\
    r_{t+1}^{\text{Equity}} &= \left[ w_{t} \left( r_{t+1}^{\text{Private}_t^{\text{MV}}} - r_{t+1}^{f} \right) + (1 - w_{t}) \left( r_{t+1}^{\text{Public}_t^{\text{MV}}} - r_{t+1}^{f} \right) \right] L_{t}
\end{align*}
\]

**Return decomposition:**
- Leverage: \( L_{t} = \frac{\text{Total Assets} - \text{Cash}}{\text{Equity}} \)
- Share of private holdings: \( w_{t} = \frac{\text{Private}_t^{\text{MV}}}{\text{Private}_t^{\text{MV}} + \text{Public}_t^{\text{MV}}} \)

Source: Buffett’s Alpha: Frazzini, Kabiller, Pedersen (working paper). Please read important disclosures in the Appendix. As of 5/18/13.
What Kind of Companies does Buffett Own?

Regression to determine Buffett’s exposures:

\[ r_t = \alpha + \beta_1 MKT_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD_t + \beta_5 BAB_t + \beta_6 QMJ_t + \epsilon_t \]

\( BAB = \) Betting Against Beta (Frazzini and Pedersen (2014))

\( QMJ = \) Quality Minus Junk (Asness, Frazzini, and Pedersen (2012))

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha</td>
<td>12.5% (3.28)</td>
<td>11.1% (2.92)</td>
</tr>
<tr>
<td></td>
<td>7.0% (1.79)</td>
<td>5.5% (2.60)</td>
</tr>
<tr>
<td></td>
<td>4.7% (2.26)</td>
<td>0.1% (0.04)</td>
</tr>
<tr>
<td>MKT</td>
<td>0.84 (11.49)</td>
<td>0.78 (10.49)</td>
</tr>
<tr>
<td>SMB</td>
<td>-0.30 (-2.91)</td>
<td>-0.39 (-3.61)</td>
</tr>
<tr>
<td>HML</td>
<td>0.47 (4.24)</td>
<td>0.30 (2.39)</td>
</tr>
<tr>
<td>UMD</td>
<td>0.06 (0.86)</td>
<td>0.02 (0.29)</td>
</tr>
<tr>
<td>BAB</td>
<td>0.27 (3.12)</td>
<td>0.18 (2.11)</td>
</tr>
<tr>
<td>Quality</td>
<td>1.40 (3.50)</td>
<td>0.16 (3.50)</td>
</tr>
<tr>
<td>R2 bar</td>
<td>0.24</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>0.28</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>0.57</td>
<td>0.62</td>
</tr>
</tbody>
</table>

Buffett’s Skill

Tendency to buy safe (i.e., low-beta) stocks

Tendency to buy high-quality companies (profitable, growing, and paying out dividends)

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Systematic Buffett-Style Portfolio

We can attribute Buffett’s performance to leverage and his focus on safe, high-quality, value stock

- It is natural to consider how well we can do by implementing these investment themes in a systematic way

Regression to determine Buffett’s exposures:

\[ r_t = \alpha + \beta_1 MKT_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD_t + \beta_5 BAB_t + \beta_6 QMJ_t + \varepsilon_t \]

Portfolio construction:

- Use the sub-product of the
  - Estimated regression coefficients and
  - Factor returns
- Rebalance monthly and rescale to hit the same volatility as Buffett to simulate using leverage

Our systematic Buffett-style strategy is a diversified portfolio that we believe matches Berkshire’s beta, idiosyncratic volatility, total volatility, and relative active loadings
A disciplined approach to high quality, low risk stocks may generate strong risk-adjusted and absolute-returns

- Based on Berkshire’s public stocks holdings

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Systematic Buffett-Style Strategy

A disciplined approach to high quality, low risk stocks may generate strong risk-adjusted and absolute-returns

- Based on Berkshire’s Hathaway

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Systematic Buffett-Style Strategy

A disciplined approach to high quality, low risk stocks may generate strong risk-adjusted and absolute-returns

<table>
<thead>
<tr>
<th>Buffett Performance</th>
<th>Overall stock market performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public U.S. stocks (from 13F filings)</td>
<td></td>
</tr>
<tr>
<td>Private Holdings</td>
<td>0.67</td>
</tr>
<tr>
<td>Beta</td>
<td>19.0%</td>
</tr>
<tr>
<td>Average excess return</td>
<td>42.1%</td>
</tr>
<tr>
<td>Total Volatility</td>
<td>24.8%</td>
</tr>
<tr>
<td>Idiosyncratic Volatility</td>
<td>22.4%</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>0.76</td>
</tr>
<tr>
<td>Information ratio</td>
<td>0.06</td>
</tr>
<tr>
<td>Leverage</td>
<td>1.64</td>
</tr>
</tbody>
</table>

Sub period excess returns:

| 1976-1980 | 28.6% | 18.5% | 4.3% | |
| 1981-1985 | 17.3% | 9.7% | 5.4% | |
| 1986-1990 | 29.7% | 22.9% | 12.0% | |
| 1991-1995 | 14.9% | 8.8% | 11.8% | |
| 1996-2000 | 3.2% | 1.7% | 1.6% | |
| 2001-2005 | 3.3% | 2.3% | 1.1% | |
| 2006-2011 | 3.3% | 3.0% | 0.8% | |

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Beyond Buffett: Understanding Alpha Everywhere

Investment styles

Value investing
Low-risk investing
Quality investing
Liquidity provision
Trend-following
Carry trading

Efficiently Inefficient
How smart money invests & market prices are determined
Conclusions

A relatively flat SML can be part of a rational market equilibrium:
• Leverage constrained investors concentrate in risky assets to achieve high unleveraged returns
• Less-constrained investors may earn higher risk-adjusted returns

A few key investment styles drive returns across markets, asset classes, and categories

Buffett’s portfolio and performance can be understood using these factors
• Has a unique access to leverage
• Leverages low-risk, high-quality value stocks
• Short sells options (securities with *Embedded Leverage* (Frazzini and Pedersen (2011)))