BUFFETT'S ALPHA

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ABSTRACT

Berkshire Hathaway has realized a Sharpe ratio of 0.76, higher than any other stock or mutual fund with a history of more than 30 years, and Berkshire has a significant alpha to traditional risk factors. However, we find that the alpha becomes insignificant when controlling for exposures to Betting-Against-Beta and Quality-Minus-Junk factors. Further, we estimate that Buffett's leverage is about 1.6-to-1 on average. Buffett's returns appear to be neither luck nor magic, but, rather, reward for the use of leverage combined with a focus on cheap, safe, quality stocks. Decomposing Berkshires' portfolio into ownership in publicly traded stocks versus wholly-owned private companies, we find that the former performs the best, suggesting that Buffett's returns are more due to stock selection than to his effect on management. These results have broad implications for market efficiency and the implementability of academic factors.

伯克希尔哈撒韦实现了高达 0.76 的夏普比率，此夏普比率高于任何超过 30 年历史的股票或共同基金，并且伯克希尔具有传统风险因素中至关重要的 alpha。 然而，我们发现，当控制 Betting-Against-Beta 和 Quality-Minus-Junk 因素的暴露时，alpha 变得不再重要。 此外，我们估计巴菲特的杠杆平均约为 1.6 比 1。 巴菲特的回报似乎既不是运气也不是魔法，而使用杠杆所得到的奖励，并将重点放在廉价，安全，优质的股票上。 将伯克希尔的投资组合的所有权分为上市股票与全资私人公司，我们发现前者表现最好，表明巴菲特的回报更多地归因于股票选择而不是他对管理股票的影响。 这些结果对市场效率和学术因素的可实现性具有广泛的影响。

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1. Introduction: Understanding the Oracle's Alpha

While much has been said and written about Warren Buffett and his investment style, there has been little rigorous empirical analysis that explains his performance. Every investor has a view on how Buffett has done it, but we seek the answer via a thorough empirical analysis in light of some the latest research on the drivers of returns.[1]

尽管沃伦·巴菲特（Warren Buffett）和他的投资风格已经有了很多的说明和写作，但却没有严格的实证分析来解释他的表现。 每个投资者都对巴菲特的投资风格有自己的理解，但是我们会依据一些关于回报驱动因素的最新研究，并通过彻底的实证分析来寻求答案。

Buffett's success has become the focal point of the debate on market efficiency that continues to be at the heart of financial economics. Efficient market academics suggest that his success may simply be luck, the happy winner of a coin-flipping contest as articulated by Michael Jensen at a famous 1984 conference at Columbia Business School celebrating the 50th anniversary of the book by Graham and Dodd (1934).[2] Tests of this argument via a statistical analysis of the extremity of Buffett's performance cannot fully resolve the issue. Instead, Buffett countered at the conference that it is no coincidence that many of the winners in the stock market come from the same intellectual village,

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[1] Based on the original insights of Black (1972) and Black, Jensen, and Scholes (1972), Frazzini and Pedersen (2013) show that leverage and margin requirements change equilibrium risk premia. They show that investors without binding leverage constraints can profit from Betting Against Beta (BAB), buying low-risk assets and shorting risky assets. Frazzini and Pedersen (2012) extend this finding to derivatives with embedded leverage, Asness, Frazzini, and Pedersen (2012a) to the risk-return relation across asset classes. Asness, Frazzini, and Pedersen (2013) consider fundamental measures of risk and other accounting based measures of "quality," i.e., characteristics that make a company more valuable.

[2] The book by Graham and Dodd (1934) is credited with laying the foundation for investing based on value and quality, and Graham and Dodd were Buffett's professors at Columbia.

"Graham-and-Doddsville" (Buffett (1984)). How can Buffett's argument be tested? Ex post selecting successful investors who are informally classified to belong to Grahamand-Doddsville is subject to biases. We rigorously examine this argument using a different strategy. We show that Buffett's performance can be largely explained by exposures to value, low-risk, and quality factors. This finding is consistent with the idea

巴菲特的成功已经成为市场效率辩论的焦点，这仍然是金融经济学的核心。市场效率论学者表示，他的成功可能只是运气。1984 年，迈克尔·詹森在哥伦比亚商学院发表了一场著名的会议用以庆祝 Graham 和 Dodd 所著书籍 50 周年，而巴菲特就是得益于这场运气博弈大赛的幸运儿。通过统计分析巴菲特表现的极限来对这一论点进行测试并不能完全解决问题。相反，巴菲特在该会议上反驳说，股市中的许多赢家来自同一个知识分子 "格雷厄姆和多德维尔"（Buffett（1984））并不是巧合。巴菲特的论点如何被验证？选择非正式归类为属于 Grahamand-Doddsville 的成功投资者的事后可能会有偏差。我们使用不同的策略严格地检查这个论点。我们发现，巴菲特的表现可以通过价值，低风险和品质因素的暴露来解释。

that investors from Graham-and-Doddsville follow similar strategies to achieve similar results and inconsistent with stocks being chosen based on coin flips. Hence, Buffett's success appears not to be luck. Rather, Buffett personalizes the success of value and quality investment, providing out-of-sample evidence on the ideas of Graham and Dodd (1934). The fact that both aspects of Graham and Dodd (1934) investing – value and quality – predict returns[3] is consistent with their hypothesis of limited market efficiency. However, one might wonder whether such factor returns can be achieved by any real life investor after transaction costs and funding costs? The answer appears to be a clear "yes" based on Buffett's performance and our decomposition of it.

这个发现与来自 Graham-and-Doddsville 的投资者遵循了类似的策略实现了类似的结果并且与基于硬币翻转策略来选择股票得到不同结果的观点是相同的。 因此，巴菲特的成功似乎并不幸运。 相反，巴菲特个人化了价值和质量投资的成功，为 Graham 和 Dodd（1934 年）的想法提供了样本内的证据。 Graham 和 Dodd（1934）投资价值和质量两方面预测回报的事实与他们有限市场效率的假设一致。 但是，有人可能想知道，在交易成本和融资成本之后，任何现实生活投资者是否可以实现这些因素回报？ 基于巴菲特的表现和我们的分解，答案似乎是一个明确的 "是"。

Buffett's record is remarkable in many ways, but just how spectacular has the performance of Berkshire Hathaway been compared to other stocks or mutual funds? Looking at all U.S. stocks from 1926 to 2011 that have been traded for more than 30 years, we find that Berkshire Hathaway has the highest Sharpe ratio among all. Similarly,

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[3] Value stocks on average outperform growth stocks as documented by Stattman (1980), Rosenberg, Reid, and Lanstein (1985), and Fama and French (1992) and high-quality stocks outperform junk stocks on average as documented by Asness, Frazzini, and Pedersen (2013) and references therein.

Buffett has a higher Sharpe ratio than all U.S. mutual funds that have been around for more than 30 years.

巴菲特的记录在许多方面是显着的，但伯克希尔哈撒韦的投资表现与其他股票或共同基金相比是如何更壮观的？ 从 1926 年至 2011 年的所有美国股票已经交易了超过 30 多年，我们发现伯克希尔哈撒韦的夏普比率最高。 同样，巴菲特的夏普也比率高于所有已有 30 多年的美国共同基金。

So how large is this Sharpe ratio that has made Buffett one of the richest people in the world? We find that the Sharpe ratio of Berkshire Hathaway is 0.76 over the period 1976-2011. While nearly double the Sharpe ratio of the overall stock market, this is lower than many investors imagine. Adjusting for the market exposure, Buffett's information ratio[4] is even lower, 0.66. This Sharpe ratio reflects high average returns, but also significant risk and periods of losses and significant drawdowns.

那么这个夏普比率究竟有多大，使巴菲特成为世界上最富有的人之一？ 我们发现，1976 - 2011 年期间，伯克希尔哈撒韦的夏普比率为 0.76。 虽然股票市场总体的夏普比率几乎翻了一倍，但这也远低于许多投资者的想象。 巴菲特的市盈率调整幅度甚至更低，为 0.66。 夏普比例反映了高平均回报，但也有重大的风险和损失周期以及显着的下降。

If his Sharpe ratio is very good but not super-human, then how did Buffett become among the richest in the world? The answer is that Buffett has boosted his returns by

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[4] The 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. Sharpe ratios and information ratios are annualized.

using leverage, and that he has stuck to a good strategy for a very long time period, surviving rough periods where others might have been forced into a fire sale or a career shift. We estimate that Buffett applies a leverage of about 1.6-to-1, boosting both his risk and excess return in that proportion. Thus, his many accomplishments include having the conviction, wherewithal, and skill to operate with leverage and significant risk over a number of decades.

如果他的夏普比例非常优秀但却也并不是最顶尖的，那么巴菲特如何成为世界上最富有的人之一？ 答案是，巴菲特利用杠杆作用提高了回报率，并且在很长一段时间内坚持了一个很好的策略，能够幸存下来的时间很久，而其他人也许被迫进行了（股票）甩卖或职业转移。 我们估计，巴菲特应用了大约 1.6 比 1 的杠杆，提高了他的风险和超额回报率。 因此，他的许多成就包括在几十年的时间里，有信心，有足够的技能和操作的杠杆和重大的风险。

This leaves the key question: How does Buffett pick stocks to achieve this attractive return stream that can be leveraged? We identify several general features of his portfolio: He buys stocks that are "safe" (with low beta and low volatility), "cheap" (i.e., value stocks with low price-to-book ratios), and high-quality (meaning stocks that profitable, stable, growing, and with high payout ratios). This statistical finding is certainly consistent with Graham and Dodd (1934) and Buffett's writings, e.g.:

这是一个关键问题：巴菲特如何选择股票来实现这个带有杠杆的有吸引力的回报率？ 我们确定了他的投资组合的几个一般特征：他购买了 "安全"（低β和低波动率），"便宜"（即价格比低的价值股）和高品质(股票盈利，稳定，增长，支

付率高）。 这个统计发现肯定与 Graham 和 Dodd（1934）和巴菲特的着作一致，例如：

无论我们在谈论袜子还是股票，我都喜欢在标价下购买优质商品

- 巴菲特，伯克希尔哈撒韦公司，2008 年度报告。

Whether we're talking about socks or stocks, I like buying quality merchandise when it is marked down

– Warren Buffett, Berkshire Hathaway Inc., Annual Report, 2008.

Interestingly, stocks with these characteristics – low risk, cheap, and high quality – tend to perform well in general, not just the ones that Buffett buys. Hence, perhaps these characteristics can explain Buffett's investment? Or, is his performance driven by an idiosyncratic Buffett skill that cannot be quantified?

有趣的是，有这些特征的----低风险，廉价和高品质的股票一般表现良好，而不仅仅是巴菲特购买的股票。 因此，也许这些特征可以解释巴菲特的投资表现？或者，他的投资表现是由一种不能量化的特技巴菲特的技能驱动的？

The standard academic factors that capture the market, size, value, and momentum premia cannot explain Buffett's performance so his success has to date been a mystery (Martin and Puthenpurackal (2008)). Given Buffett's tendency to buy stocks with low return risk and low fundamental risk, we further adjust his performance for the BettingAgainst-Beta (BAB) factor of Frazzini and Pedersen (2013) and the Quality Minus Junk (QMJ) factor of Asness, Frazzini, and Pedersen (2013). We find that

accounting for these factors explains a large part of Buffett's performance. In other words, accounting for the general tendency of high-quality, safe, and cheap stocks to outperform can explain much of Buffett's performance and controlling for these factors makes Buffett's alpha statistically insignificant.

捕捉市场，规模，价值和动量溢价的标准学术因素无法解释巴菲特的表现，所以他的成功至今是一个谜（Martin 和 Puthenpurackal（2008））。鉴于巴菲特倾向购买低回报风险和低基本面风险的股票，我们进一步调整了他对 Frazzini 和 Pedersen（2013 年）的 BettingAgainst-Beta（BAB）因子和 Asness, Frazzini 的质量阴谋（QMJ）因子的表现，和 Pedersen（2013）。我们发现，考虑到这些因素能解释了巴菲特表现的很大一部分。换句话说，考虑到高品质，安全和便宜的股票跑赢大涨的趋势可以解释巴菲特的大部分表现，并且控制这些因素使巴菲特的α在统计学上不明显。

To illustrate this point in a different way, we create a portfolio that tracks Buffett's market exposure and active stock-selection themes, leveraged to the same active risk as Berkshire. We find that this systematic Buffett-style portfolio performs comparably to Berkshire Hathaway. Buffett's genius thus appears to be at least partly in recognizing early on, implicitly or explicitly, that these factors work, applying leverage without ever having to fire sale, and sticking to his principles. Perhaps this is what he means by his modest comment:

为了以不同的方式说明这一点，我们创建了一个跟踪巴菲特市场风险和积极的股票选择主题的投资组合，利用与伯克希尔相同的积极风险。我们发现，这一

系统的巴菲特风格的投资组合与伯克希尔哈撒韦相当。 因此，巴菲特的天才似乎至少部分地认识到这些因素的作用，早期的，隐含的或明确的，应用杠杆而不用甩卖，坚持他的原则。 也许这也是他对自己的谦虚的评论所表明的：

本·格雷厄姆 45 年前教我说，投资没有必要做非凡的事情来获得非凡的成果

- 巴菲特，伯克希尔哈撒韦公司，年度报告，1994 年。

Ben Graham taught me 45 years ago that in investing it is not necessary to do extraordinary things to get extraordinary results

– Warren Buffett, Berkshire Hathaway Inc., Annual Report, 1994.

However, it cannot be emphasized enough that explaining Buffett's performance with the benefit of hindsight does not diminish his outstanding accomplishment. He decided to invest based on these principles half a century ago. He found a way to apply leverage. Finally, he managed to stick to his principles and continue operating at high risk even after experiencing some ups and downs that have caused many other investors to rethink and retreat from their original strategies.

然而，也不能太过强调以上几点来解释巴菲特的投资表现是后见之明，而削弱他的杰出成就。 他在半个世纪前就决定基于这些原则进行投资。 他找到了一种合理应用杠杆的方法。 最后，他即使经历了一些引起许多其他投资者重新考虑和撤退原有策略的风波，也设法坚持自己的原则，继续经营高风险的策略。

Finally, we consider whether Buffett's skill is due to his ability to buy the right stocks versus his ability as a CEO. Said differently, is Buffett mainly an investor or a

manager? To address this, we decompose Berkshire's returns into a part due to investments in publicly traded stocks and another part due to private companies run within Berkshire. The idea is that the return of the public stocks is mainly driven by Buffett's stock selection skill, whereas the private companies could also have a larger element of management. We find that both public and private companies contribute to Buffett's performance, but the portfolio of public stocks performs the best, suggesting that Buffett's skill is mostly in stock selection. Why then does Buffett rely heavily on private companies as well, including insurance and reinsurance businesses? One reason might be that this structure provides a steady source of financing, allowing him to leverage his stock selection ability. Indeed, we find that 36% of Buffett's liabilities consist of insurance float with an average cost below the T-Bill rate.

最后，我们认为巴菲特的技能由于他有能力购买正确的股票而不是因为 CEO 的身份。不同的是，巴菲特主要是投资者还是管理者？为了解决这个问题，我们将伯克希尔的回报分解为两部分，一部分因为投资于上市交易股票，另一部分是由于私人公司在伯克希尔经营。这个想法是因为公共股票的回报主要是由巴菲特的股票选择技能驱动的，而私人公司也可以拥有更大的管理要素。我们发现，公共和私人公司都有助于巴菲特的表现，但是公开股的投资组合表现最好，这表明巴菲特的技能主要在于股票选择。为什么巴菲特也严重依赖私人公司，包括保险和再保险业务？一个可能的原因是这种结构提供了稳定的融资来源，使他能够利用自己的选择股票能力。事实上，我们发现，巴菲特的 36％的负债包括平均成本低于 T-Bill 率的保险浮动。

In summary, we find that Buffett has developed a unique access to leverage that he has invested in safe, high-quality, cheap stocks and that these key characteristics can largely explain his impressive performance. Buffett's unique access to leverage is consistent with the idea that he can earn BAB returns driven by other investors' leverage constraints. Further, both value and quality predict returns and both are needed to explain Buffett's performance. Buffett's performance appears not to be luck, but an expression that value and quality investing can be implemented in an actual portfolio (although, of course, not by all investors who must collectively hold the market).

总而言之，我们发现巴菲特开发了一种独特的杠杆方式来投资于安全，高品质，便宜的股票，这些关键特征可以很大程度上解释了他令人印象深刻的表现。巴菲特独特的杠杆作用和其他投资者的杠杆作用受到驱动的所获得的 BAB 回报的想法是一致的。 此外，价值和质量均预测回报，并且两者都能解释巴菲特的表现。巴菲特的表现似乎不是运气，而是表达这种价值和质量投资可以在实际投资组合中实施（尽管当然不是所有投资者必须共同持有市场）。

2. Data Sources

Our data comes from several sources. We use stock return data from the CRSP database, balance sheet data from the Compustat/XpressFeed database as well as handcollected annual reports, holdings data for Berkshire Hathaway from Thomson

Financial Institutional (13F) Holding Database (based on Berkshire's SEC filings), the size and cost of the insurance float from hand-collected comments in Berkshire Hathaway's annual reports, and mutual fund data from the CRSP Mutual Fund Database. We also use factor returns from Ken French's website and from Frazzini and Pedersen (2013) and Asness, Frazzini, and Pedersen (2013). We describe our data sources and data filters in more detail in Appendix B.

我们的数据有多个来源。 我们使用 CRSP 数据库的股票回报数据，Compustat / XpressFeed 数据库的资产负债表数据以及手册年度报告，持有 Thomson Financial Institutional（13F）持有数据库（基于伯克希尔证券交易委员会档案）数据库的 Berkshire Hathaway 的数据，大小 保险费用由伯克希尔哈撒韦公司年度报告中的手段收集意见以及 CRSP 共同基金数据库的共同基金数据进行浮动。 我们还使用肯法国网站，Frazzini 和 Pedersen（2013）和 Asness，Frazzini 和 Pedersen（2013）的因子回报。 我们在附录 B 中更详细地描述我们的数据源和数据过滤器。

3. Buffett's Track Record

Buffett's track record is clearly outstanding. A dollar invested in Berkshire Hathaway in November 1976 (when our data sample starts) would have been worth more than $1500 at the end of 2011. Over this time period, Berkshire realized an average annual return of 19.0% in excess of the T-Bill rate, significantly outperforming the general stock market's average excess return of 6.1%.

巴菲特的业绩明显突出。 1976 年 11 月投资伯克希尔哈撒韦的一美元（当我们的数据样本开始时）将在 2011 年底价值超过 1500 美元。在此期间，伯克希尔实现了超过 T-Bill 的平均年回报率 19.0% 利率大幅超过一般股市平均超额收益 6.1%。

Berkshire stock also entailed more risk, realized a volatility of 24.9%, higher than the market volatility of 15.8%. However, Berskhire's excess return was high even relative to its risk, earning a Sharpe ratio of 19.0%/24.9% = 0.76, nearly twice the market's Sharpe ratio of 0.39. Berkshire realized a market beta of only 0.7, an important point that we will discuss in more detail when we analyze the types of stocks that Buffett buys. Adjusting Berkshire's performance for market exposure, we compute its Information ratio to be 0.66.

伯克希尔股票也带来更多的风险，达到了 24.9％的波动，高于市场波动幅度的 15.8％。 然而，伯克希尔的超额回报值甚至相对于风险值要更高，他的夏普收益率为 19.0％/ 24.9％= 0.76，几乎是市场上的 0.39 的夏普收益率的两倍。 伯克希尔实现了只有 0.7 的市场 beta，当我们分析巴菲特购买的股票类型时，这是我们将更详细地讨论的重要的一点。 调整伯克希尔的市场风险表现，我们将其信息比率计算为 0.66。

These performance measures reflect Buffett's impressive returns, but also that Berkshire has been associated with some risk. Berkshire has had a number of down years and drawdown periods. For example, from June 30, 1998 to February 29, 2000, Berkshire lost 44% of its market value while the overall stock market gained 32%. While many fund managers might have had trouble surviving such a shortfall of 76%, Buffett's

impeccable reputation and unique structure as a corporation allowed him to stay the course and rebound as the internet bubble burst.

这些绩效指标反映了巴菲特的令人印象深刻的回报，而且伯克希尔还面临一些风险。 伯克希尔已经有一些下降的年头和下降期。 例如，从 1998 年 6 月 30 日至 2000 年 2 月 29 日，伯克希尔失去了 44％的市场价值，而整体股市上涨了 32％。虽然许多基金经理可能遇到这样的短缺 76％的困难，但巴菲特作为一家公司的无可挑剔的声誉和独特的结构使他能够随着互联网泡沫破灭而保持原状和反弹。

To put Buffett's performance in perspective, we compare Berkshire's Sharpe and Information ratios to those of all other U.S. common stocks. If Buffett is more of a stock picker than a manager, an even better reference group than other stocks might be the universe of actively managed mutual funds so Table 1 compares Berkshire to both of these groups.

为了展示巴菲特的表现更为透彻，我们将伯克希尔的夏普和信息比率与所有其他美国普通股进行比较。 如果巴菲特更像股票选择者，那么比其他股票更好的参考组可能是一个积极管理的共同基金的世界，所以表 1 比较了伯克希尔与这两个组合。

Buffett is in the top 3% among all mutual funds and top 7% among all stocks. However, the stocks or mutual funds with the highest Sharpe ratios are often ones that have only existed for a short time periods and had a good run, which is associated with a large degree of randomness.

巴菲特在所有共同基金中排名前 3％，所有股票中排名前 7％。

然而，夏普比率最高的股票或共同基金通常是短时间内存在的股票或共同基金，运行良好，这与随机性很大程度相关。

To minimize the effect of randomness, Table 1 also compares Berkshire to all stocks or mutual funds with at least a 10-year or 30-year history. Buffett's performance is truly outstanding seen in this perspective. Among all stocks with at least a 30-year history from 1926 to 2011, Berkshire has realized the highest Sharpe ratio and Information ratio. If you could travel back in time and pick one stock in 1976, Berkshire would be your pick. Figures 1 and 2 also illustrate how Buffett lies in the very best tail of the performance distribution of mutual funds and stocks that have survived at least 30 years.

为了最小化随机性的影响，表 1 还将伯克希尔与所有至少有 10 年或 30 年的历史的股票或共同基金进行比较。 从这个角度看，巴菲特的表现非常出色。 在 1926 年至 2011 年至少有 30 年历史的所有股票中，伯克希尔已经实现了最高的夏普比率和信息比率。 如果您可以及时回来，并于 1976 年选择一个股票，伯克希尔将是您的选择。 图 1 和图 2 还说明了巴菲特如何处于最少 30 年来幸存的共同基金和股票表现分配的最佳尾巴。

4. Buffett's Leverage

Buffett's large returns come both from his high Sharpe ratio and his ability to leverage his performance to achieve large returns at higher risk. Buffett uses leverage to magnify returns, but how much leverage does he use? Further, what are Buffett's sources

of leverage, their terms, and costs? To answer these questions, we study Berkshire Hathaway's balance sheet, which can be summarized as follows:

巴菲特的高回报来自于他的高夏普比率，以及他利用他的表现获得更高风险的大回报的能力。 巴菲特利用杠杆来放大回报，但是他使用了多少杠杆呢？ 此外，巴菲特的杠杆来源，条款和成本是甚么？ 为了回答这些问题，我们研究了伯克希尔哈撒韦的资产负债表，其总结如下：

Stylized Balance Sheet of Berkshire Hathaway

Assets	Liabilities and shareholders' equity
Publicly traded equities Privately held companies Cash	Liabilities Equity
Total assets	Total liabilities

We can compute Buffett's leverage (*L*) as follows:

我们可以计算巴菲特杠杆（L）如下：

$$L_t = \frac{TA^{MV}_t - Cash^{MV}_t}{Equity^{MV}_t}$$

This measure of leverage is computed each month as Berkshire's total assets (TA^M) less the cash that it owns ($Cash^{MV}_t$), relative to Berkshire's equity value ($Equity^{MV}_t$). We would like to compute the leverage using *market values* (which we indicate with the superscript *MV* in our notation), but for some variables we only observe *book values* (indicated with superscript *BV*) so we proceed as follows. We observe the market value of Berkshire's equity as the stock price multiplied by the shares outstanding and the cash holdings from Berkshire's consolidated balance sheet (see Appendix A). Further, the balance sheet also tells us the book value of the total assets (TA^B) and the book value of equity ($Equity^{BV}_t$), which allows us to estimate the market value of the total asset (TA^{MV}_t) as

杠杆率的衡量是每个月计算的，伯克希尔的总资产(TA^{MV}_t)减去了拥有的现金($Cash^{MV}_t$)，除去伯克希尔的股本价值($Equity^{MV}_t$)。 我们想使用市场价值计算□□（我们用上标 MV 表示），但是对于一些变量，我们只观察到理论值（用上标 BV 表示），所以我们如下进行。 我们观察伯克希尔股票的市值，因为股价乘以未偿还股票和伯克希尔合并资产负债表中的现金持有量（见附录 A）。 此外，资产负债表还告诉我们总资产的账面价值(TA^{BV}_t)和权益的账面价值($Equity^{BV}_t$)，这使我们能够估计总资产(TA^{MV}_t)的市场价值 □□□□

$$TA^{MV}_t = TA^{BV}_t + Equity^{MV}_t - Equity^{BV}_t$$

Based on this method, we estimate Buffett's average leverage to be 1.6-to-1. This indicates a non-trivial use of leverage. This magnitude of leverage can help explain why Berkshire realizes a high volatility despite investing in a number of relatively stable businesses.

基于这种方法，我们估计巴菲特的平均杠杆为 1.6 比 1。 这表明不利于杠杆的使用。 这种杠杆幅度有助于解释为什么伯克希尔尽管投资了一些相对稳定的企业，但实现了高波动。

By focusing on total assets to equity, we capture all kinds of liabilities and, as we discuss further below, Berkshire's financing arises from a variety of types of liabilities. The two main liabilities are debt and insurance float and, if we instead compute leverage as $(\text{Equity}_t^{MV} + Debt_t + Float_t)/\text{Equity}_t$ then we estimate an average leverage of 1.4-to-1.

通过把总资产集中在股本上，我们掌握了各种负债，正如我们在下面进一步讨论的那样，伯克希尔的融资来源于各种类型的负债。 两个主要负债是债务和保险浮动，如果我们将杠杆作为$(\text{Equity}_t^{MV} + Debt_t + Float_t)/\text{Equity}_t^{MV}$计算，那么我们估计平均杠杆为 1.4 比 1。

As another expression of Buffett's use of leverage, Berkshire's stock price is significantly more volatile than the portfolio of publicly traded stocks that it owns as we describe in Section 5, Table 2. In fact, Berkshire's 25% stock volatility is 1.4 times higher than the 17% volatility of the portfolio of public stocks, corresponding to a leverage of

1.4 assuming that Berkshire's private assets have similar volatility and ignoring diversification effects. This leverage number is similar to the leverage computed based on the balance sheet variables.

作为巴菲特利用杠杆作用的另一个表现，伯克希尔的股票价格比其所拥有的上市公司组合的波动性明显更加波动，因为我们在表 2 第 5 章节中描述了这一点。实际上，伯克希尔 25％的股票波动是 17％的公开股票组合的波动幅度的 1.4 倍，相当于杠杆 1.4，假设伯克希尔的私人资产具有相似的波动性，忽视多元化效应。此杠杆数字与基于资产负债表变量计算的杠杆相似。

The magnitude of Buffett's leverage can partly explain how he outperforms the market, but only partly. If one applies 1.6-to-1 leverage to the market, that would magnify the market's average excess return to be about 10%, still falling far short of Berkshire's 19% average excess return.

巴菲特杠杆的幅度可以部分地解释他的表现如何超过市场，但仅仅也只是部分原因。 如果对市场应用 1.6 对 1 的杠杆作用，这将使市场的平均超额收益放大至 10％左右，仍远低于伯克希尔 19％的平均超额收益。

In addition to considering the magnitude of Buffett's leverage, it is also interesting to consider his sources of leverage including their terms and costs. Berkshire's debt has benefitted from being highly rated, enjoying a AAA rating from 1989 to 2009. As an

illustration of the low financing rates enjoyed by Buffett, Berkshire issued the first ever negative-coupon security in 2002, a senior note with a warrant.[5]

除了考虑巴菲特的杠杆作用之外，还要考虑他的杠杆来源，包括其条款和成本。 伯克希尔的债务受到高评级的好评，在 1989 年至 2009 年期间享有 AAA 评级。 为了说明巴菲特所享有的低融资利率，伯克希尔在 2002 年发行了首例负债券，这是一张带有手令的高级债券。

Berkshire's more anomalous cost of leverage, however, is due to its insurance float. Collecting insurance premia up front and later paying a diversified set of claims is like taking a "loan." Table 3 shows that the estimated average annual cost of Berkshire's insurance float is only 2.2%, more than 3 percentage points below the average T-bill rate. Hence, Buffett's low-cost insurance and reinsurance business have given him a significant advantage in terms of unique access to cheap, term leverage. We estimate that 36% of Berkshire's liabilities consist of insurance float on average.

然而，伯克希尔的杠杆成本更为异常，是由于其保险浮动。 收取前期保险费，后来支付多元化的索赔就像采取"贷款"。表 3 显示，伯克希尔保险业务浮动的估计平均年度成本仅为 2.2％，低于平均 T-bill 的 3 个百分点 率。 因此，巴菲特的低成本保险和再保险业务使他在获得便宜的期限杠杆方面具有显着的优势。 我们估计伯克希尔的 36％的负债包括平均保险浮动。

Based on the balance sheet data, Berkshire also appears to finance part of its capital expenditure using tax deductions for accelerated depreciation of property, plant and

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[5] See http://www.berkshirehathaway.com/news/may2202.html

equipment as provided for under the IRS rules. E.g., Berkshire reports $28 Billion of such deferred tax liabilities in 2011 (page 49 of the Annual Report). Accelerating depreciation is similar to an interest-free loan in the sense that (i) Berkshire enjoys a tax saving earlier than it otherwise would have, and (ii) the dollar amount of the tax when it is paid in the future is the same as the earlier savings (i.e. the tax liability does not accrue interest or compound).

根据资产负债表资料，伯克希尔也似乎通过税收扣除来资助部分资本支出，以按照国际税法规定的规定对物业，厂房和设备进行加速折旧。 例如，伯克希尔在 2011 年报告了 28 亿美元的递延所得税负债（年度报告第 49 页）。 加速折旧类似于无息贷款，意思是（1）伯克希尔早于其他方式享有税收优惠，以及（ii）将来支付的税金的美元金额与 较早的储蓄（即税务责任不会产生利息或化合物）。

Berkshire's remaining liabilities include accounts payable and derivative contract liabilities. Indeed, Berkshire has sold a number of derivative contracts, including writing index option contracts on several major equity indices, notably put options, and credit default obligations (see, e.g., the 2011 Annual Report). Berkshire states:

伯克希尔的剩余负债包括应付账款和衍生工具合同负债。 事实上，伯克希尔已经出售了一些衍生合约，其中包括对几项主要股票指数编制指数期权合约，特别是期权和信贷违约义务（见例如 2011 年度报告）。 伯克希尔州说：

我们在合同开始日期完全收到了这些合同的保费…除了有限的例外情况，我们的股票指数投资期权和信用违约合约不包含合同的公允价值或内在价值变动的抵押品贴现要求，或降低伯克希尔的信用评级。

- 沃伦·巴菲特，伯克希尔哈撒韦公司，2011 年度报告。

> *We received the premiums on these contracts in full at the contract inception dates … With limited exceptions, our equity index put option and credit default contracts contain no collateral posting requirements with respect to changes in either the fair value or intrinsic value of the contracts and/or a downgrade of Berkshire's credit ratings.*
>
> *– Warren Buffett, Berkshire Hathaway Inc., Annual Report, 2011.*

Hence, Berkshire's sale of derivatives may both serve as a source of financing and as a source of revenue as such derivatives tend to be expensive (Frazzini and Pedersen (2012)). Frazzini and Pedersen (2012) show that investors that are either unable or unwilling to use leverage will pay a premium for instruments that embed the leverage, such as option contracts and levered ETFs. Hence, Buffett can profit by supplying this embedded leverage as he has a unique access to stable and cheap financing.

因此，伯克希尔的衍生品出售可能既可以作为融资来源，也可以作为收益来源，因为衍生品往往昂贵（Frazzini 和 Pedersen（2012））。Frazzini 和 Pedersen（2012）表明，使用杠杆的投资者无法或不愿意将为嵌入杠杆的工具（如期权合约

和杠杆 ETF）支付溢价。 因此，巴菲特可以通过提供这种嵌入式杠杆来获利，因为他有独特的稳定和便宜的融资渠道。

5. Decomposing Buffett: Public Stocks vs. Private Companies

5.分析巴菲特：公共股与私人公司

Berkshire Hathaway stock return can be decomposed into the performance of the publicly traded companies that it owns, the performance of the privately held companies that it owns, and the leverage it uses. The performance of the publicly traded companies is a measure of Buffett's stock selection ability whereas the performance of the privately held companies additionally captures his success as a manager.

伯克希尔哈撒韦股票回报可以分解为其拥有的上市公司的表现，所拥有的私有公司的业绩及其所使用的杠杆。 上市公司的表现是衡量巴菲特股票选择能力的一个指标，而私人控股公司的业绩又显示了他作为经理的成功

To evaluate Buffett's pure stock selection ability, we collect the portfolio of publicly held companies using Berkshire's 13F filings to the Securities and Exchange Commission, and we construct a monthly times series of the market value of all Berkshire's public stocks ($Public_t^{MV}$) as well as the monthly return on this mimicking portfolio (r_{t+1}^{public}). Specifically, at the end of each calendar quarter, we collect Berkshire's common stock holdings from its 13F filing and compute portfolio monthly returns, weighted by Berkshire's dollar holdings, under the assumption that the firm did

not change holdings between reports. The stocks in the portfolio are refreshed quarterly based on the latest 13F, and the portfolio is rebalanced monthly to keep constant weights.

为了评估巴菲特的纯股票选择能力，我们收集使用伯克希尔的 13F 文件到证券交易委员会的公开投资公司的组合，并且我们构建了每个月份的所有伯克希尔公开股票（$Public_t^{MV}$）以及 这个模拟投资组合（r_{t+1}^{public}）的每月回报。 具体来说，在每个日历季度末，我们从伯克希尔的美元持有量加权的 13F 提交和计算投资组合每月收益中收集伯克希尔的普通股，假设该公司没有更改报告之间的持有量。 根据最新的 13F，投资组合中的股票每季度刷新一次，投资组合每月重新平衡以保持不变。

We cannot directly observe the value and performance of Buffett's private companies, but we can back them out based on what we do know. First, we can infer the market value of private holdings (Private$^{MV}_t$) as the residual given that we can observe the value of the total assets, the value of the publicly traded stocks, and the cash (see Buffett's balance sheet above):

我们不能直接观察巴菲特私人公司的价值和表现，但是我们可以根据我们所知道的来支持他们。 首先，我们可以推断私人持股（Private$^{MV}_t$）的市值为残值，因为我们可以观察到总资产的价值，上市股票的价值和现金（见上面的巴菲特的资产负债表）：

$$Private_{MVt} = TA_{MVt} - Public_{tMV} - Cash_{MVt}$$

We then compute the return of these private holdings ($r_{t+1}^{Private}$) in a way that is immune to changes in the public stock portfolio and to splits/issuance using split-adjusted returns as follows:

然后，我们以这样一种方式计算这些私人持股量（$r_{t+1}^{Private}$）的回报率，即不受公共股票投资组合变化的影响，并使用分拆回报分割/发行如下：

$$r_{t+1}^{Private} = \frac{\Delta Private^{MV}}{Private^{MV}_{t+1}}$$

$$= \frac{r_{t+1}^{f} Liabilities^{MV}_{t} + r_{t+1}^{Equity} Equity^{MV}_{t} - Private^{MV}_{t} r_{t+1}^{public} Public^{MV}_{t} - r_{t+1}^{f} Cash^{MV}_{t}}{}$$

Here, r_{t+1}^{f} is the risk-free T-Bill return, r_{t+1}^{Equity} is the return on Berkshire's stock, and the market value of liabilities is estimated as $Liabilities^{MV}_{t} = TA^{MV}_{t} - Equity^{M}$.

在这里，r_{t+1}^{f}是无风险的 T-Bill 回报，r_{t+1}^{Equity}是伯克希尔股票的回报，负债的市场价值估计为 $Liabilities^{MV}_{t} = TA^{MV}_{t} - Equity^{MV}_{t}$.

We note that our estimate of the value of Berkshire's private companies includes the value that the market attaches to Buffett himself (since it is based on the overall value of Berkshire Hathaway). To the extent that there is randomness or mispricing in Berkshire's

stock price (e.g., due to the Buffett-specific element), the estimated value and return of the private companies may be noisy.

我们注意到，我们对伯克希尔私人公司价值的估计包括市场对巴菲特本人的价值（因为它是基于伯克希尔哈撒韦的整体价值）。 如果伯克希尔的股价有随机性或定价偏差（例如，由于巴菲特的特定因素），私人公司的估计价值和回报可能是嘈杂的。

Given our estimates for Buffett's public and private returns as well as his leverage, we can decompose Berkshire's performance. (See the appendix for a rigorous derivation.) Berkshire's excess return can be decomposed into a weighted average of the return on the public stocks and the return of the private companies, leveraged up by *L*:

鉴于我们对巴菲特的公共和私人回报以及他的杠杆作用的估计，我们可以分解伯克希尔的表现。 （参见附录中的严格推导）伯克希尔的超额收益可以分解为公共股票收益和私人公司回报的加权平均数，通过 L 来杠杆化

$$ r_{t+1 Equity} - r_{t+1f} = \left[w_t \left(r_{t+1 private} - r_{t+1} \right) + (1 - w_t) \left(r_{t+1 public} - r_{t+1f} \right) \right] L_t $$

Berkshire's relative weight w_t on the private holdings is naturally given by

伯克希尔的私人拥有量相对权重w_t自然而然的由以下提供：

$$Private_t{}^{MV}$$

$$w_t = \frac{Private_t{}^{MV}}{Private_t{}^{MV} + Public_t{}^{MV}}$$

Empirically, we find that Berkshire owns 63% private companies on average from 1980 to 2011, the remaining 37% being invested in public stocks. Berkshire's reliance on private companies has been increasing steadily over time, from less than 20% in the early 1980s to more than 80% in 2011.

实际上，我们发现伯克希尔平均在 1980 年至 2011 年期间拥有 63％的私人公司，其余的 37％投资于公共股票。 伯克希尔对私营公司的依赖度随着时间的推移不断增加，从 1980 年代初的不到 20％，到 2011 年的 80％以上。

Table 2 shows the performance of both Buffett's public and private positions. We see that both perform relatively well. Both Buffett's public and private portfolios exceed the overall stock market in terms of average excess return, risk, and Sharpe ratio. We see that the public stocks have a higher Sharpe ratio than the private stocks, suggesting that Buffett's skill comes mostly from his ability to pick stocks, and not necessarily his value added as a manager.

表 2 显示了巴菲特公共和私人职位的表现。 我们看到两者表现都比较好。 巴菲特的公共和私人投资组合在平均超额回报，风险和夏普比率方面均超过总体股票市场。 我们看到，公开股票的股票比私人股票高得多，这表明巴菲特的技能主要来自于他选择股票的能力，而不一定是他的经理增值。

Berkshire Hathaway's overall stock return is far above returns of both the private and public portfolios. This is because Berkshire is not just a weighted average of the public and private components. It is also leveraged, which magnifies returns. Further, Berkshire's Sharpe ratio is higher than those of the public and private parts, reflecting the benefits of diversification (and possibly benefits from time-varying leverage and timevarying public/private weights).

伯克希尔哈撒韦的整体股票收益远远高于私人和公共投资组合的回报。 这是因为伯克希尔不仅仅是公共和私人组件的加权平均数。 它也被杠杆化，从而放大回报。 此外，伯克希尔的夏普比率高于公共和私人部分，反映了多样化的好处（可能受益于时变杠杆和时间变化的公共/私人权重）。

6. Buffett's Alpha and Investment Style: What Type of Stocks?

We have seen that Buffett's returns can be attributed to his stock selection and his ability to apply leverage, but how then does he pick his companies? To address this, we consider Buffett's factor exposures:

我们已经看到，巴菲特的回报可以归因于他的股票选择和应用杠杆的能力，但是他如何选择他的公司？ 为了解决这个问题，我们考虑巴菲特的因素风险：

$$r_t - r_t^f = \alpha + \beta_1 \mathrm{MKT}_t + \beta_2 SMB_t + \beta_3 \mathrm{HML}_t + \beta_4 \mathrm{UMD}_t + \beta_5 \mathrm{BAB}_t + \beta_6 QMJ_t + \varepsilon_t$$

As seen in Table 4, we run this regression for the excess return $r_t - r_t{}^f$ of, respectively, Berkshire Hathaway stock, the portfolio of publicly held stocks inferred from the 13F filings, and the portfolio of private companies computed as described above.

如表 4 所示，我们对伯克希尔哈撒韦股票的超额收益$r_t - r_t{}^f$，从 13F 申报中推断出的公开持有股票组合以及上述计算的私人公司组合进行了回归。

For each of these returns, we first run a regression on the market return, *MKT*. Berkshire has a beta less than one and a significant alpha. We next control for the standard factors that capture the effects of size, value (Fama and French (1993)), and momentum (Asness (1994), Carhart (1997), Jegadeesh and Titman (1993)). The size factor small-minus-big (*SMB*) is a strategy of going long small stocks and short large stocks. Hence, a positive loading on *SMB* reflects a tendency to buy small stocks while Berkshire's negative loading reflects a tendency to buy large stocks. The value factor (*HML*) a strategy of buying high-book-to-market stocks while shortselling low-book-tomarket stocks. Berkshire's positive loading therefore reflects a tendency of buying stocks that are cheap in the sense of having a high book value relative to their market value. The last of the four "standard" factors is the momentum factor *UMD*, which corresponds to buying stocks that have been "up" in the sense of outperforming the market, while shorting the stocks that are relatively "down". Berkshire's insignificant loading on *UMD* means that Buffett is not chasing trends in his stock selection.

对于这些回报中的每一个，我们首先对市场收益率 MKT 进行回归。伯克希尔有一个 beta 不到一个和一个重要的 alpha。我们接下来规模因子 SMB，价值因子 HML（Fama 和 French（1993））和动量因子 UMD（Asness（1994），Carhart

（1997），Jegadeesh 和 Titman（1993））的影响的标准因素。规模因子（SMB）是长期小库存和短仓大盘的策略。因此，SMB 的正面负荷反映了买入小股票的倾向，而伯克希尔的负面负荷则反映出买入大盘的倾向。价值因素（HML）是一种购买公司账面价值与市值之比高股票的策略，同时卖出比率低股票。因此，伯克希尔的积极货币反映出购买股票相对于其市场价值具有较高账面价值意义的趋势。四个"标准"因素中的最后一个因素是动量因子 UMD，这相当于在"跑赢市场"意义上的"买入"股票，同时缩短相对"下跌"的股票。伯克希尔在 UMD 上的微不足道的加载意味着巴菲特没有追赶他的股票选择的趋势。

Collectively, these four standard factors do not explain much of Buffett's alpha as seen in Table 4. Since Buffett's alpha cannot be explained by standard factors studied by academics, his success has to date been considered a sign of his unique skill or as a mystery.

总的来说，这四个标准因素并没有解释巴菲特的阿尔法大部分，如表 4 所示。由于巴菲特的阿尔法不能用学术界研究的标准因素来解释，所以他的成功至今被认为是他独特技能或神秘面纱的标志。

Our innovation is to also control for the Betting Against Beta (*BAB*) factor of Frazzini and Pedersen (2013) as well as the quality factor (*QMJ*, "Quality Minus Junk") of Asness, Frazzini, and Pedersen (2013). A loading on the *BAB* factor reflects a tendency to buy safe (i.e., low-beta) stocks while shying away from risky (i.e., high-beta) stocks. Similarly, a loading on the quality *QMJ* factor reflects a tendency to buy highquality

companies, that is, companies that are profitable, growing, safe and have high payout (see Asness, Frazzini, and Pedersen (2013) for details).

我们的创新还分析了 Frazzini 和 Pedersen（2013 年）的 "对赌 beta"因子（BAB，Betting Against Beta），以及 Asness，Frazzini 和 Pedersen（2013 年）的 "质量因子"（QMJ，"Quality Minus Junk"）。BAB 因子的反映了在逃避危险（即高β）股票的同时购买安全（即低β）股票的趋势。同样，质量 QMJ 因素的反映了购买高质量公司的趋势，即公司高利润、高增长、高分红的公司（详见 Asness，Frazzini 和 Pedersen（2013））。

We see that Berkshire loads significantly on the *BAB* and *QMJ* factors, reflecting that Buffett likes to buy safe, high-quality stocks. Controlling for these factors drives the alpha of Berkshire's public stock portfolio down to a statistically insignificant annualized 0.3%, meaning that these factors almost completely explain the performance of Buffett's public portfolio. Hence, a significant part of the secret behind Buffett's success is the fact that he buys safe, high-quality, value stocks. We also explain a large part of Berkshire's overall stock return and the private part in the sense that their alphas become statistically insignificant, although it is worth noting that the point estimate of Berkshire's alpha only drops by about half.

我们看到，伯克希尔在 BAB 和 QMJ 因素方面显着上涨，反映出巴菲特喜欢购买安全，优质的股票。控制这些因素推动了伯克希尔的公开股票投资组合的阿尔法数字下降至年均 0.3％的统计学微不足道，这意味着这些因素几乎完全解释了巴菲特公共投资组合的表现。因此，巴菲特成功背后秘密的一大部分是他购买安

全，高质量的价值股票。 我们还解释了伯克希尔的总体股票回报和私人部分的大部分，意思是它们的阿尔法在统计学上不显着，尽管值得注意的是，伯克希尔的 Alpha 的点估计只下降了一半。

While Buffett is known as the ultimate value investor, we find that his focus on safe quality stocks may in fact be at least as important to his performance. Our statistical finding is consistent with Buffett's own words:

虽然巴菲特被称为最终价值投资者，但我们发现他对安全质量股票的关注实际上对他的表现至关重要。 我们的统计发现与巴菲特自己的话一致：

我可以给你其他个人的 "买卖" 的个人例子，但我相信你得到的照片：以一个很好的价格，以一个公平的价格购买一个公平的价格比一个公平的公司要好得多。

- 巴菲特，伯克希尔哈撒韦公司，1989 年年度报告。

I could give you other personal examples of "bargain-purchase" folly but I'm sure you get the picture: It's far better to buy a wonderful company at a fair price than a fair company at a wonderful price.

– Warren Buffett, Berkshire Hathaway Inc., Annual Report, 1989.

We emphasize again that being able to explain Buffett's returns using factors from academic papers written decades after Buffett put them into practice does not make Buffett's success any less impressive. It is nevertheless interesting to discover the importance of leveraging low-beta, high-quality stocks for the person known as the

"ultimate value investor."

我们再次强调，巴菲特将其纳入实践后数十年的学术论文的因素，可以解释巴菲特的回报并不能使巴菲特的成功不再令人印象深刻。 然而，有趣的是，发现使用低β，高质量的股票为被称为的人的重要性即 "终极价值投资者"。

7. A Systematic Buffett Strategy

Given that we can attribute Buffett's performance to leverage and his focus on safe, high-quality, value stocks, it is natural to consider how well we can do by implementing these investment themes in a systematic way. Whereas Buffett is known as an active stock picker, we will try to go back to Buffett's roots and, in the spirit of Graham and Dodd (1934), focus on systematically implemented screens.

鉴于我们可以将巴菲特的业绩归功于杠杆，并将重点放在安全，高质量，有价值的股票上，因此通过系统地实施这些投资主题，我们可以考虑我们能做多好。而巴菲特被称为活跃的股票选择器，我们将尝试回到巴菲特的根源，本着 Graham 和 Dodd（1934）的精神，重点是系统地实施屏幕。

We consider systematic Buffett-style portfolios that track Buffett's market exposure and active stock-selection themes. First, we capture Buffett's market exposure β^{Buffett} as the slope of a univariate regression of Berkshire's excess returns on the market portfolio. Second, we capture Buffett's stock selection tilts by running a regression of his

monthly beta-adjusted returns on the factors that help explain his performance as described in Section 6:

我们考虑系统性的巴菲特风格投资组合，跟踪巴菲特的市场风险和积极的股票选择主题。 首先，我们将巴菲特的市场风险β^{Buffett}视为伯克希尔在市场组合中超额回报的单一回归的斜率。 其次，我们通过对第 6 节中描述的帮助解释其表现的因素的每月 beta 调整回报率的回归来捕捉巴菲特的股票选择倾斜：

$$r_t - r_t^f - \beta^{\text{Buffett}} MKT_t = \alpha + mMKT_t + sSMB_t + hHML_t + uUMD_t + bBAB_t + qQMJ_t + \varepsilon_t$$

The regression coefficients are equal to those in column 3 of Table 4 with the exception that the market loading is reduced by an amount equal to β^{Buffett}. The right-hand side excluding the alpha and the error term captures Buffett's *active* stock selection tilts:

我们考虑系统性的巴菲特风格投资组合，跟踪巴菲特的市场风险和积极的股票选择主题。 首先，我们将巴菲特的市场风险β巴菲特视为伯克希尔在市场组合中超额回报的单一回归的斜率。 其次，我们通过对第 6 节中描述的帮助解释其表现的因素的每月 beta 调整回报率的回归来捕捉巴菲特的股票选择倾斜：

$$r_t{}^A = m\ MKT_t + s\ SMB_t + h\ HML_t + u\ UMD_t + b\ BAB_t + q\ QMJ_t$$

We rescale this active return series to match Berkshire's idiosyncratic volatility σ_I to simulate the use of leverage and to counter any attenuation bias:

我们重新调整这一积极回报系列，以匹配伯克希尔的特殊波动率σ_I来模拟杠杆的使用并抵制任何衰减偏差：

$$rt^{Active} = rt^A \times \sigma_{I}/\ \sigma_{rtA}$$

Finally, we add back Buffett's market exposure and the risk free return $r_t{}^f$ to construct our systematic Buffett-style portfolio:

最后，我们补充巴菲特的市场风险和无风险回报$r_t{}^f$来构建我们系统的巴菲特风格的投资组合：

$$r_{t\text{Buffet style}} = r_{tf} + \beta_{\text{Buffett}} MKT_t + r_{t\text{Active}}$$

Our systematic Buffett-style strategy is a diversified portfolio that matches Berkshire's beta, idiosyncratic volatility, total volatility, and relative active loadings.

我们系统的巴菲特风格的策略是一个多元化的投资组合，符合伯克希尔的 beta，特殊波动率，总波动率和相对主动负荷。

We similarly construct a Buffett-style portfolio based on the loadings and volatility of Berkshire's public and private equity holdings. (These use the coefficients from columns 6 and 9 in Table 4). Table 2 reports the performance of our systematic Buffettstyle portfolios and Figure 3 shows the cumulative return of Berkshire Hathaway, Buffett's public stocks and our systematic Buffett-style strategies. Finally, Table 5 reports correlations, alphas, and loadings for our systematic Buffett-style portfolios and their actual Buffett counterparts.

我们根据伯克希尔公开和私募股权的负荷和波动性，类似地构建了一个巴菲特风格的投资组合。 （这些使用表 4 中第 6 列和第 9 列的系数）。 表 2 报告了我们的系统性巴菲特投资组合的表现，图 3 显示了伯克希尔哈撒韦，巴菲特的公开股票和我们系统的巴菲特式策略的累积回报。 最后，表 5 报告了我们系统的巴菲特风格投资组合及其实际巴菲特同行的相关性，阿尔法和负荷。

As seen in the tables and figures, the performance of the systematic Buffett-style portfolios are comparable to Buffett's actual return. Since the simulated Buffett-style portfolios do not account for transaction costs and other costs and benefit from hindsight, their apparent outperformance should be discounted. The main insight here is the high covariation between Buffett's actual performance and the performance of a diversified Buffett-style strategy.

如表格和图表所示，系统性的巴菲特风格投资组合的表现与巴菲特的实际回报相当。由于模拟的巴菲特风格的投资组合不考虑交易成本和其他成本，并能从后见之明中

受益，因此明显优于表现。 这里的主要见解是巴菲特的实际表现与多元化巴菲特式战略的表现之间的高度共鸣。

We match the public stock portfolio especially closely, perhaps because this public portfolio is observed directly and its returns are calculated based on public stocks returns using the same methodology as our systematic portfolios. Berkshire's overall stock price, on the other hand, may have idiosyncratic price variation (e.g., due to the value of Buffett himself) that cannot be replicated using other stocks. This idiosyncratic Berkshire variation is even more severe for the private part, which may also suffer from measurement issues.

我们特别关注公共股票投资组合，这可能是因为这个公开投资组合是直接观察的，其回报是使用与我们的系统投资组合相同的方法，基于公共股票收益计算的。另一方面，伯克希尔的整体股票价格可能会有特殊的价格变动（例如，由于巴菲特本身的价值），不能使用其他股票进行复制。 这种特殊的伯克希尔变化对于私人部门来说更为严重，这也可能会受到测量问题的困扰。

The comparison between Berkshire's public stock portfolio and the corresponding Buffett-style portfolio is also the cleaner test of Buffett's stock selection since *both* are simulated returns without any transaction costs or taxes. Indeed, the correlation between our systematic portfolio and Berkshire's public stock portfolio (shown in Table 5) is 75%, meaning that our systematic portfolio explains 57% of the variance of the public stock portfolio. The correlations for the Berkshire's stock price and Buffett's private investments are lower (47% and 27% respectively), but still large in magnitude. Table 5 also shows that our systematic portfolios have significant alphas with respect to their

corresponding Buffett counterpart, while none of the Buffett portfolios have statistically significant alphas with respect to their systematic counterpart. This may be because our systematic portfolios have similar factor tilts as Buffett's, but they hold a much larger number of securities, thus benefitting from diversification.

伯克希尔的公开股票投资组合和相应的巴菲特风格投资组合之间的比较也是巴菲特股票选择的更清洁的测试，因为两者都是没有任何交易成本或税收的模拟回报。事实上，我们的系统投资组合与伯克希尔的公开股票投资组合（如表 5 所示）之间的相关性为 75%，这意味着我们的系统投资组合解释了公共股票投资组合的 57% 的差异。伯克希尔股票价格和巴菲特私人投资的相关性分别较低（分别为 47% 和 27%），但仍处于较大幅度。表 5 还显示，我们的系统投资组合对于其对应的巴菲特对手来说具有重要的意义，而巴菲特投资组合中没有一个与其系统对手相比具有统计上的显着差异。这可能是因为我们的系统投资组合具有与巴菲特相似的因素倾斜，但是它们持有更多的证券，从而受益于多元化。

The Berkshire Hathaway stock return does reflect the incurred transaction costs and possibly additional taxes, so that makes Berkshire's performance all the more impressive. Given Berkshire's modest turnover, transaction costs were likely small initially. As Berkshire grew, so did transaction costs and this could potentially account for some of Berkshire's diminishing returns over time. Further, Berkshire may have been increasingly forced to focus on large stocks. Indeed, Table 4 shows that Berkshire has a negative loading on the size factor SMB, reflecting a tendency to buy large firms. However, Berkshire initially focused on small firms (reflected in a positive SMB loading in the first

half of the time period, not shown), and only became biased towards large stocks in the later time period. Hence, Berkshire's diminishing returns could also be related to capacity constraints.

伯克希尔哈撒韦股票回报确实反映了所发生的交易成本和可能的额外税收，从而使伯克希尔的表现更加令人印象深刻。 鉴于伯克希尔的营业额不大，初期交易成本可能很小。 如伯克希尔的交易成本也在增长，这可能会导致伯克希尔一段时间内的收益递减。 此外，伯克希尔可能已经越来越多地被迫关注大量股票。 事实上，表 4 显示，伯克希尔对 SMB 规模因素负负荷，反映出购买大型企业的倾向。 然而，伯克希尔最初专注于小型企业（反映在上半年的正负面负荷下，未显示），并且在稍后时间内仅偏向大股票。 因此，伯克希尔的收益递减也可能与能力限制有关。

Assessing the impact of taxes on Berkshire's performance is complicated. For Berkshire's private holdings, the joint ownership in a multinational company is associated with tax advantages. For the public stocks, Berkshire could face double corporate taxes, that is, pay tax both indirectly in the portfolio companies' earnings and in Berkshire as it receives dividends or realizes capital gains. However, Berkshire can deduct 70-80% of the dividends received, defer capital gains taxes by holding on to the positions such that gains remain unrealized,[6] and minimize taxes by allocating earnings abroad as a

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[6] For a corporation, capital gains are subject to corporate taxes at 35% (and there is no special provision for long-term capital gains). While capital gains taxes can be deferred from a *cash-flow perspective* as long as they are unrealized, the accrued capital gains tax does nevertheless lead to an expense from a *GAAPaccounting perspective*. Said differently, Berkshire does not *pay* any taxes for unrealized capital gains, but such unrealized capital gains do lower Berkshire's reported *earnings* and hence its book value of equity, while raising the GAAP liability called principally deferred income taxes.

multinational.[7] Hence, it is difficult to assess whether Berkshire is at a tax disadvantage overall.

评估税收对伯克希尔绩效的影响是复杂的。 对于伯克希尔的私人控股来说，跨国公司的共同所有权与税收优势相关。 对于公共股票，伯克希尔需要面对双重公司税，即在投资组合公司的收益和伯克希尔间接支付税收，因为它获得股息或实现资本收益。 然而，伯克希尔可以扣除收到的 70-80％的股息，通过持有未平仓收益的位置来推迟资本利得税，并通过将国外的收益分配为跨国公司来尽量减少税收。因此，很难评估伯克希尔是否处于总体税收优势。

In addition to the systematic long-short portfolios, we also compute a long-only, unleveraged systematic Buffett-style strategy. At the end of each calendar month, we sort securities based on the portfolio weights corresponding to our active tilts r_t^{Active} and construct an equal weighted portfolio that holds the top 50 stocks with the highest portfolio weight. Table 2 shows that these simpler Buffett-style portfolios also perform well, albeit not as well as when we allow short selling.

除了系统化的长期投资组合外，我们还计算出一种长期，无杠杆的系统性巴菲特式策略。 在每个日历月底，我们根据与我们的主动倾斜r_t^{Active}相对应的投资组合权重对证券进行分类，并构建拥有最高组合权重的前 50 名股票的相等加权投资

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[7] For instance, Berkshire's 2011 Annual Report states: "We have not established deferred income taxes with respect to undistributed earnings of certain foreign subsidiaries. Earnings expected to remain reinvested indefinitely were approximately $6.6 billion as of December 31, 2011. Upon distribution as dividends or otherwise, such amounts would be subject to taxation in the U.S. as well as foreign countries. However, U.S. income tax liabilities would be offset, in whole or in part, by allowable tax credits with respect to income taxes previously paid to foreign jurisdictions. Further, repatriation of all earnings of foreign subsidiaries would be impracticable to the extent that such earnings represent capital needed to support normal business operations in those jurisdictions. As a result, we currently believe that any incremental U.S. income tax liabilities arising from the repatriation of distributable earnings of foreign subsidiaries would not be material."

组合。 表 2 显示，这些更简单的巴菲特风格的投资组合也表现良好，尽管不及当我们允许卖空时。

As a final robustness check, we consider Buffett-style portfolios that do not rely on in-sample regression coefficients. Specifically, we create an implementable Buffett-style strategy by only using information up to month t to construct portfolio weights for the next month $t + 1$. As seen in Appendix C, these portfolios have very similar performance and alphas as our full sample Buffett-style portfolios.

作为最后的鲁棒性检查，我们考虑不依赖样本内回归系数的巴菲特风格投资组合。 具体来说，我们创建一个可实施的巴菲特风格的策略，只需使用直到月份 t 的信息来构建下个月的投资组合权重 t+1。 如附录 C 所示，这些投资组合与我们完整的巴菲特风格投资组合的表现非常相似。

In summary, if one had applied leverage to a portfolio of safe, high-quality, value stocks consistently over this time period, then one would have achieved a remarkable return, as did Buffett. Of course, he started doing it half a century before we wrote this paper!

总而言之，如果在这段时间内一直在安全，高质量的价值组合投资组合应用杠杆，那么巴菲特就会取得显着的回报。 当然，在我们写这篇文章之前，他已经开始做了半个世纪！

8. Conclusion

We rigorously study Buffett's record, comparing it to the long-term performance of other stocks and mutual funds, and decomposing Buffett's performance into its components due to leverage, shares in publicly traded equity, and wholly-owned companies. We shed new light on the efficiency of capital markets in two ways: (i) by studying in a novel way the famous coin-flipping debate at the 1984 Columbia conference between Michael Jensen (representing the efficient market economists) and Warren Buffett (representing the people of Graham-and-Doddsville); and (ii) by showing how Buffett's record can be viewed as an expression of the practical implementability of academic factor returns after transaction costs and financing costs.

我们严格研究巴菲特的记录，将其与其他股票和共同基金的长期业绩进行比较，并将巴菲特的表现归因于杠杆率，上市股权和全资子公司的股份。 我们以两种方式揭示了资本市场的效率：（i） 以一种新颖的方式学习 1984 年哥伦比亚大会（代表有效的市场经济学家）与巴菲特（代表 " Graham-and-Doddsville 的人）；和（ii）通过展示巴菲特的记录如何被视为在交易成本和融资成本之后学术因素回报的实际可行性的表达。

We document how Buffett's performance is outstanding as the best among all stocks and mutual funds that have existed for at least 30 years. Nevertheless, his Sharpe ratio of 0.76 might be lower than many investors imagine. While optimistic asset managers often claim to be able to achieve Sharpe ratios above 1 or 2, long-term investors might do well

by setting a realistic performance goal and bracing themselves for the tough periods that even Buffett has experienced.

我们记录了巴菲特的表现如何，在所有存在至少 30 年时间中的股票和共同基金中表现是最好的。 不过，他的夏普比率为 0.76 可能会低于许多投资者的想象。虽然乐观的资产管理者通常声称能够将夏普的比率提高到 1 或 2 以上，但长期投资者可能会通过设定一个现实的表现目标，并在巴菲特经历的艰难时期坚持自己。

In essence, we find that the secret to Buffett's success is his preference for cheap, safe, high-quality stocks combined with his consistent use of leverage to magnify returns while surviving the inevitable large absolute and relative drawdowns this entails. Indeed, we find that stocks with the characteristics favored by Buffett have done well in general, that Buffett applies about 1.6-to-1 leverage financed partly using insurance float with a low financing rate, and that leveraging safe stocks can largely explain Buffett's performance.

从本质上讲，我们发现，巴菲特成功的秘诀在于他倾向于廉价，安全，优质的股票，同时他一贯使用杠杆来放大收益，同时还能够在绝对和相对的大幅度下降。事实上，我们发现，巴菲特赞成的股票一般表现良好，巴菲特大部分利用融资利率低的保险浮动来应用大约 1.6 比 1 的杠杆，利用安全的股票可以大大解释巴菲特的表现。

Buffett has become the focal point of the intense debate about market efficiency among academics, practitioners, and in the media (see, e.g., Malkiel (2012)). The most recent

Nobel prize has reignited this debate and, as a prototypical example, Forbes[8] writes "In the real world of investments, however, there are obvious arguments against the EMH. There are investors who have beaten the market – Warren Buffett." The efficient-market counter argument is that Buffett may just have been lucky. Our findings suggest that Buffett's success is not luck or chance, but reward for a successful implementation of exposure to factors that have historically produced high returns.

巴菲特已经成为关于学术界，从业者和媒体之间市场效率的激烈辩论的焦点（参见，例如，Malkiel（2012））。 最近的诺贝尔奖已经重新引发了这场辩论，作为一个典型的例子，福布斯写道："在投资的现实世界中，有明显的反对 EMH 的论据。 有投资者殴打市场 - 沃伦·巴菲特。"有效市场的反驳是巴菲特可能会幸运的。 我们的研究结果表明，巴菲特的成功不是运气或机会，而是奖励成功实施历史上产生高回报的因素。

At the same time, Buffett's success shows that the high returns of these academic factors are not just "paper returns", but these returns could be realized in the real world after transaction costs and funding costs, at least by Warren Buffett. Hence, to the extent that value and quality factors challenge the efficient market hypothesis, the actual returns of Warren Buffett strengthen this evidence. Further, Buffett's exposure to the BAB factor and his unique access to leverage are consistent with the idea that the BAB factor represents reward to the use of leverage.

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[8] Forbes (11/1/2013), "What is Market Efficiency."

与此同时，巴菲特的成功表明，这些学术因素的高回报不仅仅是 "纸上回报"，而是这些回报可以在交易成本和融资成本之后在现实世界中实现，至少由巴菲特出资。 因此，在价值和质量因素挑战高效市场假说的范围内，巴菲特的实际回报加强了这一证据。 此外，巴菲特对 BAB 因素的曝光以及他独特的杠杆作用与 BAB 因素对利用杠杆作用的回报是一致的。

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Appendix A: Decomposing Berkshire's Return

We start with the definition of private returns:

$$r_{t+1Private} = r_{t+1f}\,\text{Liabilities}_{tMV} + r_{t+1Equity}\text{EquityPrivate}_{tMV} - MV_t\, r_{t+1public}\text{Public}_{tMV} - r_{t+1f}\,\text{Cash}_{MVt}$$

and re-arrange as follows:

$$r_{t+1Equity}$$

$$_{Private}\text{Private}\underline{\qquad\qquad}\text{Equity}^{MV}{}_t + r_{t+1Public}\underline{\qquad\qquad}\text{Public}_t{}^{MV}MV - r_{t+1f}\,\text{Liabilities}\underline{\qquad\qquad}$$

$$= r_{t+1}\qquad\qquad MV\qquad\qquad \text{Equity}_t$$

$$t$$

$$_{private}\underline{\qquad\qquad}\qquad\qquad\text{Public}_{tMV}\qquad _{public}\qquad \text{Pu}$$

$$= r_{t+1}\qquad \text{Private}_{MVt}\quad +\text{Public}_{tMV} + r_{t+1}\,\text{Public}_{tMV} +\text{Public}_{tMV}L_t$$

$$_f\,\text{Liabilities}_t{}^{MV} - \text{Cash}^{MV}{}_t$$
$$\overline{\qquad\qquad\qquad}$$

$$- r_{t+1}\qquad \text{Equity}_{tMV}$$

where we use that

$$\underline{\qquad\qquad}\qquad\underline{\qquad\qquad}$$

$$TA_{MVt} - \text{Cash}_{MVt}\quad \text{Private}_{MVt}\quad +\text{Public}_{tMV}\,L_t = \text{Equity}_{MV}\quad = \quad \text{Equity}_{tMV}$$

$$t$$

The excess return of Berkshire can be written in terms of the weight of the private holdings,

$$Private_t^{MV} \ w_t = \frac{Private_{MV} + Public_{tMV}}{t}$$

as follows:

$$r_{t+1Equity} - r_{t+1f} = w_t \, r_{t+1private} + (1-w_t)_{+1public} \, L_t$$

$$f \quad Liabilities_t^{MV} - Cash_t^{MV} - r_{t+1} \quad \frac{\phantom{Equity_{tMV}}}{+1} Equity_{tMV}$$

$$= w_t \, r_{t+1private} - r_{t+1} + (1-w_t)r_{t+1public} - r_{t+1f} \, L_t$$

$$f \quad Liabilities_t^{MV} - Cash_t^{MV} - r_{t+1} \quad \frac{\phantom{Equity_{tMV}}}{+1-L_t} Equity_{tMV}$$

$$= w_t \, r_{t+1private} - r_{t+1} + (1-w_t)r_{t+1public} - r_{t+1f} \, L_t$$

This equation shows precisely how we decompose Buffett's returns: The Berkshire equity excess return depends on the excess returns of private and public holdings, their relative importance, and the degree of leverage.

Note that our 13F holdings data and mimicking portfolio returns $_{+1}^{public}$ start in 1980. However, our way of estimating returns from private holdings produce very noisy estimates for the first 3 years of the sample. There are several outliers in the imputed $r_{t+1}^{private}$ in the first years of the sample, with several returns exceeding +100% monthly. Therefore, we focus most of the analysis on $r_{t+1}^{private}$ on the period 1984 to 2011 where our method produces less noisy estimates.

Appendix B: Data Sources and Methodology

The data in this study are derived from a variety of sources.

Stock return data

Stock return and price data is from the CRSP database. Our data includes all domestic common stocks (share code 10 and 11) on the CRSP tape between December 1925 and December 2011. To compute Berkshire Hathaway's stock returns we valueweight both share classes A and B based on lagged market capitalization (Berkshire Hathaway introduced a share class B in April 1996). The stock return data for Berkshire Hathaway on the CRSP tape starts in 1976. Hence, we only have data on the last 35 years of Warren Buffett's record. He ran various private investment partnership from 1957 to 1969, started trading Berkshire Hathaway in 1962, took control of Berkshire in 1965, and started using Berkshire as his main investment vehicle after he closed his partnerships in 1969 (Lowenstein (2008)). At the time of writing we have been unable to collect data on Berkshire Hathaway's stock price prior to its introduction on the CRSP tape and Buffett's' partnership performance so our study covers the period 1976 to 2011, which can be viewed as a conservative estimate of Buffett's complete track record and out-ofsample evidence relative to his first almost 20 years of success.

Balance sheet data

Our main source of balance sheet data is the Compustat/XpressFeed database. However, due to the presence of several errors in the cash item (especially in the quarterly reports in the early part of the sample) we check and correct this data with information extracted from the original 10-K company filings as well as information from Berkshire's annual letter to the shareholders. Berkshire holds a significant amount of cash on its

balance sheet, which we hand collect from Berkshire's Annual Report, Form 10K. We make the following adjustments: For the end of 1985, the official cash number includes a significant amount of cash set aside for the purchases of Capital Cities Communications and Scott Fetzer. Therefore, we use the pro forma consolidated balance sheet presented in note (18) on page 42 of the Annual Report. For the end of 1987, we use the restated cash figure mentioned in the 1988 Annual Report note 1(b) page 25. For other balance sheet items, we also focus on annual balance sheet data.

13F holdings data

We download holdings data for Berkshire Hathaway from Thomson Financial Institutional (13F) Holding Database which includes holdings of all US entities exercising investment discretion over $100 million, filed with the SEC. The data on Berkshire's public stock holdings run from 1980 to 2009.

Mutual fund data

We collect mutual fund returns from the CRSP Mutual Fund Database. The data run from 1976 to 2011. We focus our analysis on open-end actively managed domestic equity mutual funds. Our sample selection procedure follows that of Kacperzczyk, Sialm, and Zheng (2008), and we refer to their Appendix for details about the screens that were used and summary statistics of the data.

Appendix C: An Implementable Systematic Buffett Strategy

Table C1 and C2 report returns of implementable systematic Buffett-style portfolios. We construct systematic Buffett-style portfolios tracking Buffett's active bets and having similar market exposure. At the of each calendar month t we run a regression of monthly active (beta-adjusted) returns of Berkshire on a set of portfolios using data up to month $t-1$:

$$r - r^f - \beta MKT = \alpha + m\, MKT + s\, SMB + h\, HML + u\, UMD + b\, BAB + q\, QMJ + \varepsilon$$

Where β is the slope of a univariate regression of Buffett's excess returns on the market portfolio, also computed using data up to month t. The explanatory variables are the monthly returns of the standard value, size, and momentum factors as well as the BAB factor (Frazzini and Pedersen (2013)) and QMJ quality factor (Asness, Frazzini and Pedersen (2013)). To run the time-series regression, we require at least 60 monthly observations. The $t + 1$ Buffett-style portfolio's active return $r_{t+1}{}^{Active}$ is equal to the sum of the returns of the explanatory variables with portfolio weights equal to the regression coefficients rescaled to match the conditional active volatility of Berkshire's return:

$$\tilde{r}_{t+1A} = m_t\, MKT_{t+1} + s_t\, SMB_{t+1} + h_t\, HML_{t+1} + u_t\, UMD_{t+1} + b_t\, BAB_{t+1} + q_t\, QMJ_{t+1}$$

$$r_{t+1}{}^{Active} = \tilde{r}_{t+1A} \frac{\sigma_{t,I}}{\sigma_{t,\tilde{r}_A}}$$

where $\sigma_{t,I}$ is Berkshire's idiosyncratic volatility, estimated using data up to month t. Finally, we add back Buffett's market exposure

$$r_{t+1}{}^s = r_f + \beta_t MKT_{t+1} + r_{t+1}{}^{Active}$$

Note our notation, the subscript t indicates that quantities are known at portfolio formation date t. Our systematic Buffett-style return $r_{t+1}{}^s$ corresponds to the return of a diversified self-financing long-short portfolio matching Berkshire's conditional beta, market-adjusted volatility and relative active loadings at portfolio formation. These portfolios use only information available in real-time. Table C1 and C2 show returns of

Berkshire Hathaway, Berkshire's public stock holdings as well as our systematic Buffettstyle strategy.

In addition to the systematic long-sort portfolios, we also compute a real-time long-only, unlevered systematic Buffett-style strategy. At the end of each calendar month t, we sort securities based on the portfolio weights corresponding to our active tilts computed using data up month t and construct an equal weighted portfolio that holds the top 50 stocks with the highest portfolio weight.

Table C1

Buffett's Return Decomposed into Leverage, Public Stocks, and Private Companies as well as the Performance of an Implementable Systematic Buffett Strategy.

This table reports average annual return in excess of the T-Bill rate, annualized volatility, Sharpe ratio, market beta, Information ratio, and sub-period returns. We report statistics for, respectively, Berkshire Hathaway stock, the mimicking portfolio of Berkshire's publicly traded stocks as reported in its 13F filings, the mimicking portfolio of Berkshire's private holdings, the CRSP value-weighted market return, and a systematic mimicking portfolio of Buffett's strategy. To construct the mimicking portfolio of Berkshire's publicly traded stocks, at the end of each calendar quarter, we collect Berkshire's common stock holdings from its 13F filings and compute portfolio monthly returns, weighted by Berkshire's dollar holdings, under the assumption that the firm did not change holdings between reports. The stocks in the portfolio are refreshed quarterly based on the latest 13F and the portfolio is rebalanced monthly to keep constant weights. The mimicking portfolio of Berkshire's private holdings is constructed following the procedure described Appendix A. The systematic Buffett-style portfolios are constructed from a regression of monthly excess returns. The explanatory variables are the monthly returns of the standard size, value, and momentum factors, the Frazzini and Pedersen (2013) Betting-Against-Beta factor, and the Asness, Frazzini and Pedersen (2013) Quality Minus Junk (QMJ) factor. The procedure is described in Appendix C. Returns, volatilities and Sharpe ratios are annualized. "Idiosyncratic volatility" is the volatility of residual of a regression of monthly excess returns on market excess returns.

	Buffett Performance			Overall stock market performance	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	Berkshire Hathaway	Public U.S. stocks (from 13F filings)	Private holdings
Sample	1976-2011	1980-2011	1984-2011	1976-2011	1981-2011	1985-2011	1988-2011	1981-2011	1985-2011	1988-2011
Beta	0.68	0.77	0.28	1.00	0.66	0.68	0.29	0.81	0.82	0.89
Average excess return	19.0%	11.8%	9.6%	6.1%	39.3%	19.3%	17.6%	9.4%	7.5%	9.2%
Total Volatility	24.8%	17.2%	22.3%	15.8%	30.9%	19.2%	28.7%	15.3%	15.4%	16.0%
Idiosyncratic Volatility	22.4%	12.0%	21.8%	0.0%	29.1%	15.8%	28.4%	8.5%	8.0%	8.2%
Sharpe ratio	0.76	0.69	0.43	0.39	1.27	1.01	0.61	0.62	0.49	0.58
Information ratio	0.66	0.56	0.36	0.00	1.20	0.95	0.56	0.49	0.27	0.47
Leverage	1.64	1.00	1.00	1.00	4.78	2.50	4.17			
Sub period excess returns:										
1976-1980	42.1%	31.4%		7.8%						
1981-1985	28.6%	20.9%	18.5%	4.3%	84.4%	42.2%		19.1%	27.4%	
1986-1990	17.3%	12.5%	9.7%	5.4%	30.8%	11.5%	36.9%	2.0%	3.1%	-0.6%
1991-1995	29.7%	18.8%	22.9%	12.0%	62.6%	34.7%	53.3%	20.9%	19.9%	20.2%
1996-2000	14.9%	12.0%	8.8%	11.8%	32.7%	22.2%	8.8%	10.5%	10.7%	13.8%
2001-2005	3.2%	2.2%	1.7%	1.6%	33.6%	20.9%	13.7%	5.8%	4.2%	5.8%
2006-2011	3.3%	3.0%	2.3%	0.7%	3.8%	5.6%	-9.3%	1.2%	-2.1%	2.1%

Table C1

Performance of Buffett and an Implementable Systematic Buffett-Style Portfolio

This table shows calendar-time portfolio returns. We report statistics for, respectively, Berkshire Hathaway stock, the mimicking portfolio of Berkshire's publicly traded stocks as reported in its 13F filings, the mimicking portfolio of Berkshire's private holdings, the CRSP value-weighted market return, and a systematic mimicking portfolio of Buffett's strategy. To construct the mimicking portfolio of Berkshire's publicly traded stocks, at the end of each calendar quarter, we collect Berkshire's common stock holdings from its 13F filings and compute portfolio monthly returns, weighted by Berkshire's dollar holdings, under the assumption that the firm did not change holdings between reports. The stocks in the portfolio are refreshed quarterly based on the latest 13F and the portfolio is rebalanced monthly to keep constant weights. The mimicking portfolio of Berkshire's private holdings is constructed following the procedure described Appendix A. The systematic Buffett-style portfolios are constructed from a regression of monthly excess returns. The explanatory variables are the monthly returns of the standard size, value, and momentum factors, the Frazzini and Pedersen (2013) Betting-Against-Beta factor, and the Asness, Frazzini and Pedersen (2013) Quality Minus Junk (QMJ) factor. The procedure is described in Appendix C. Alpha is the intercept in a regression of monthly excess return. Alphas are annualized, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold.

	Regress Berkshire on Systematic Portfolio			**Regress Systematic Portoflio on Berkshire**		
	Berkshire Hathaway	Public U.S. stocks Private holdings (from 13F filings)		Berkshire Hathaway	Public U.S. stocks Private holdings (from 13F filings)	
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

Tables and Figures

Table 1

Buffett's Performance Relative to All Other Stocks and Mutual Funds.

This table shows the Sharpe ratio (SR) and Information ratio (IR) of Berkshire Hathaway relative to the universe of common stocks on the CRSP Stock database from 1926 to 2011, and relative to the universe of actively managed equity mutual funds on the CRSP Mutual Fund database from 1976 to 2011. The 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. Sharpe ratios and information ratios are annualized.

	Number of stocks/funds	Sample Distribution of Ratios		99th Percentile	Maximum	Buffett Performance Rank	Percentile
		Median	90th Percentile				
Panel A: SR of Equity Mutual Funds							
All funds in CRSP data 1976 - 2011	3,479		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%

	Number of stocks/funds	Sample Distribution of Information Ratios		99th Percentile	Maximum	Buffett Performance Rank	Percentile
		Median	90th Percentile				
Panel C: IR of Equity Mutual Funds							
All funds in CRSP data 1976 - 2011	3,479		0.39	0.89	2.84	100	97.1%
All funds alive in 1976 and 2011	140	0.050	0.39	0.68	0.81	2	99.3%
All funds alive in 1976 with at least 10-year history	264	-0.025	0.30	0.60	0.81	2	99.6%
All funds with at least 10-year history	1,994	0.022	0.38	0.77	1.22	42	97.9%
All funds with at least 30-year history	196	0.034	0.34	0.66	0.81	2	99.5%
Panel D: IR of Common Stocks							
All stocks in CRSP data 1926 - 2011	23,390	0.089	0.54	1.41	2.91	1510	93.3%
All stocks alive in 1976 and 2011	598	0.183	0.32	0.46	0.66	1	100.0%
All stocks alive in 1976 with at least 10-year history	3,633	0.146	0.36	0.57	0.80	13	99.7%
All stocks with at least 10-year history	9,035	0.136	0.38	0.62	1.07	58	99.4%
All stocks with at least 30-year history	1,777	0.130	0.29	0.43	0.66	1	100.0%

Table 2

Buffett's Return Decomposed into Leverage, Public Stocks, and Private Companies as well as the Performance of a Systematic Buffett Strategy.

This table reports average annual return in excess of the T-Bill rate, annualized volatility, Sharpe ratio, market beta, Information ratio, and sub-period returns. We report statistics for, respectively, Berkshire Hathaway stock, the mimicking portfolio of Berkshire's publicly traded stocks as reported in its 13F filings, the mimicking portfolio of Berkshire's private holdings, the CRSP value-weighted market return, and a systematic mimicking portfolio of Buffett's strategy. To construct the mimicking portfolio of Berkshire's publicly traded stocks, at the end of each calendar quarter, we collect Berkshire's common stock holdings from its 13F filings and compute portfolio monthly returns, weighted by Berkshire's dollar holdings, under the assumption that the firm did not change holdings between reports. The stocks in the portfolio are refreshed quarterly based on the latest 13F and the portfolio is rebalanced monthly to keep constant weights. The mimicking portfolio of Berkshire's private holdings is constructed following the procedure described Appendix A. The systematic Buffett-style portfolios are constructed from a regression of monthly excess returns. The explanatory variables are the monthly returns of the standard size, value, and momentum factors, the Frazzini and Pedersen (2013) Betting-Against-Beta factor, and the Asness, Frazzini and Pedersen (2013) Quality Minus junk (QMJ) factor. The procedure is described in Section 7. Returns, volatilities and Sharpe ratios are annualized. "Idiosyncratic volatility" is the volatility of residual of a regression of monthly excess returns on market excess returns.

	Buffett Performance				Buffett-Style Portfolio			Buffett-Style Portfolio Long Only		
	Berkshire Hathaway	(from 13F filings) 1980-2011	Private holdings 1984-2011	Overall stock market performance 1976-2011	Berkshire Hathaway 1976-2011	stocks (from 13F filings) 1980-2011	Private holdings 1984-2011	Berkshire Hathaway 1976-2011	Public U.S. stocks (from 13F filings) 1980-2011	Private holdings 1984-2011
Sample	1976-2011		1984-2011	1976-2011		1980-2011				
Beta	0.68	0.77	0.28	1.00	0.68	0.77	0.28	0.83	0.82	0.86
Average excess return	19.0%	11.8%	9.6%	6.1%	28.2%	19.3%	14.0%	7.0%	7.9%	7.4%
Total Volatility	24.8%	17.2%	22.3%	15.8%	24.8%	17.2%	22.3%	15.5%	15.1%	15.5%
Idiosyncratic Volatility	22.4%	12.0%	21.8%	0.0%	22.4%	12.0%	21.8%	8.2%	7.7%	7.5%
Sharpe ratio	0.76	0.69	0.43	0.39	1.14	1.13	0.63	0.45	0.52	0.48
Information ratio	0.66	0.56	0.36	0.00	1.07	1.18	0.56	0.24	0.37	0.28
Leverage	1.64	1.00	1.00	1.00	3.73	2.19	3.14			
Sub period excess returns:										
1976-1980	42.1%	31.4%		7.8%	10.2%	27.5%		4.6%	5.6%	6.7%
1981-1985	28.6%	20.9%	18.5%	4.3%	54.8%	30.9%	35.9%	10.5%	13.4%	7.4%
1986-1990	17.3%	12.5%	9.7%	5.4%	23.7%	14.2%	16.0%	2.1%	4.4%	3.5%
1991-1995	29.7%	18.8%	22.9%	12.0%	38.5%	24.1%	24.5%	18.5%	19.0%	18.1%
1996-2000	14.9%	12.0%	8.8%	11.8%	33.2%	22.8%	17.4%	9.2%	9.2%	8.8%
2001-2005	3.2%	2.2%	1.7%	1.6%	33.0%	18.6%	14.1%	4.0%	4.9%	5.7%
2006-2011	3.3%	3.0%	2.3%	0.7%	4.7%	6.1%	-7.5%	0.6%	-0.4%	2.3%

Table 3

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

Table 4 Buffett's Exposures: What Kind of Companies does Berkshire Own?

This table shows calendar-time portfolio returns. We report statistics for, respectively, Berkshire Hathaway stock, the mimicking portfolio of Berkshire's publicly traded stocks as reported in its 13F filings and the mimicking portfolio of Berkshire's private holdings. To construct the mimicking portfolio of Berkshire's publicly traded stocks, at the end of each calendar quarter, we collect Berkshire's common stock holdings from its 13F filings and compute portfolio monthly returns, weighted by Berkshire's dollar holdings, under the assumption that the firm did not change holdings between reports. The stocks in the portfolio are refreshed quarterly based on the latest 13F and the portfolio is rebalanced monthly to keep constant weights. The mimicking portfolio of Berkshire's private holdings is constructed following the procedure described in Appendix A. Alpha is the intercept in a regression of monthly excess return. The explanatory variables are the monthly returns of the standard size, value, and momentum factors, the Frazzini and Pedersen (2013) Betting-Against-Beta factor, and the Asness, Frazzini and Pedersen (2013) Quality Minus Junk (QMJ) factor. Alphas are annualized, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold.

这是伯克希尔公开交易股票的模拟投资组合，如其 13F 文件中所述，以及伯克希尔私募股权投资组合。为了构建伯克希尔公开交易股票的模拟投资组合，在每个日历季度结束时，我们从伯克希尔的美元持有量加权的 13F 文件中收集伯克希尔的普通股，计算投资组合的每月收益，假设公司没有改变报告之间的持股。根据最新的 13F，投资组合的股票每季度刷新一次，投资组合每月重新平衡以保持不变的权重。伯克希尔私人持股的模拟投资组合按照附录 A 中描述的程序构建。Alpha 是每月超额收益回归中的截距。解释变量是 Frazzini 和 Pedersen（2013）Betting-Against-Beta 系数以及 Asness，Frazzini 和 Pedersen（2013）质量减排（QMJ）因素的标准尺寸，价值和动量因子的月度回报。 Alphas 是年化的，t 统计显示在系数估计之下，5％的统计显着性用粗体表示。

| Berkshire stock 1976 - 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

Table 5

Buffett's Returns Versus a Systematic Buffett Strategy

This table shows calendar-time portfolio returns. We report statistics for, respectively, Berkshire Hathaway stock, the mimicking portfolio of Berkshire's publicly traded stocks as reported in its 13F filings, the mimicking portfolio of Berkshire's private holdings, the CRSP value-weighted market return, and a systematic mimicking portfolio of Buffett's strategy. To construct the mimicking portfolio of Berkshire's publicly traded stocks, at the end of each calendar quarter, we collect Berkshire's common stock holdings from its 13F filings and compute portfolio monthly returns, weighted by Berkshire's dollar holdings, under the assumption that the firm did not change holdings between reports. The stocks in the portfolio are refreshed quarterly based on the latest 13F and the portfolio is rebalanced monthly to keep constant weights. The mimicking portfolio of Berkshire's private holdings is constructed following the procedure described Appendix A. The systematic Buffett-style portfolios are constructed from a regression of monthly excess returns. The explanatory variables are the monthly returns of the standard size, value, and momentum factors, the Frazzini and Pedersen (2013) Betting-Against-Beta factor, and the Asness, Frazzini and Pedersen (2013) Quality Minus Junk (QMJ) factor. The procedure is described in Section 7. Alpha is the intercept in a regression of monthly excess return. Alphas are annualized, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold.
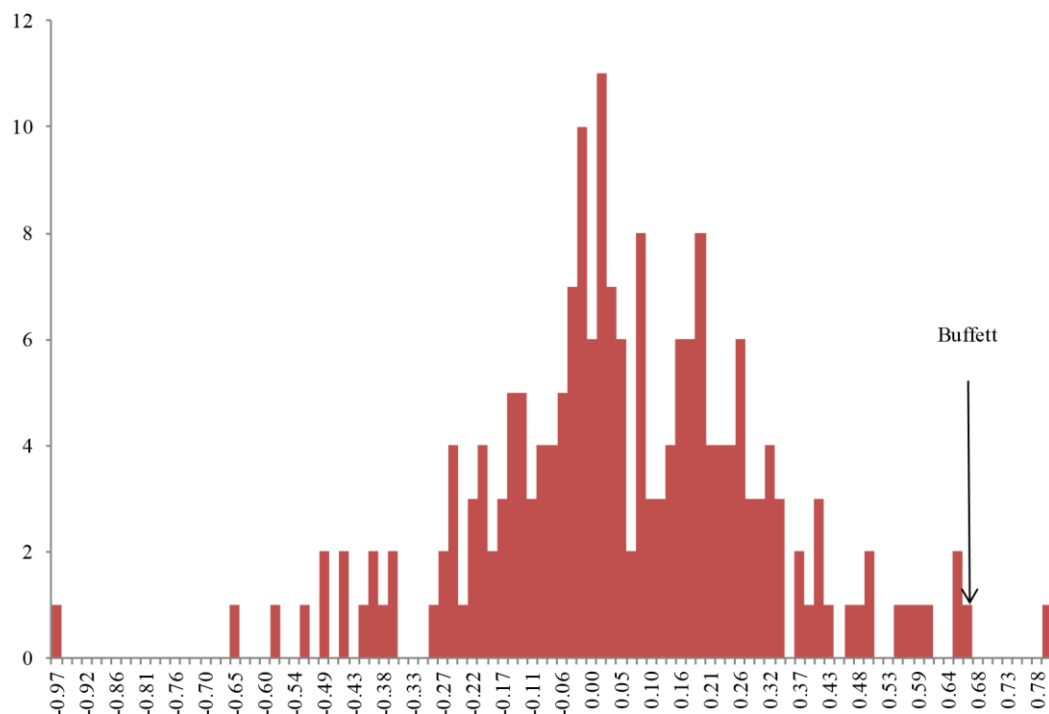
	Regress Berkshire on Systematic Portfolio			Regress Systematic Portoflio on Berkshire		
	Berkshire Hathaway	Public U.S. stocks Private holdings (from 13F filings)		Berkshire Hathaway	Public U.S. stocks Private holdings (from 13F filings)	
Sample	1976-2011	1980-2011	1984-2011	1976-2011	1980-2011	1984-2011
Alpha	5.6%	-2.3%	5.8%	**19.3%**	**10.7%**	**11.4%**
	(1.44)	-(1.05)	(1.40)	(5.07)	(5.00)	(2.78)
Loading	**0.47**	**0.73**	**0.27**	**0.47**	**0.73**	**0.27**

	(10.97)	(20.83)	(5.08)	(10.97)	(20.83)	(5.08)
Correlation	0.47	0.73	0.27	0.47	0.73	0.27
R2 bar	0.22	0.53	0.07	0.22	0.53	0.07

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.
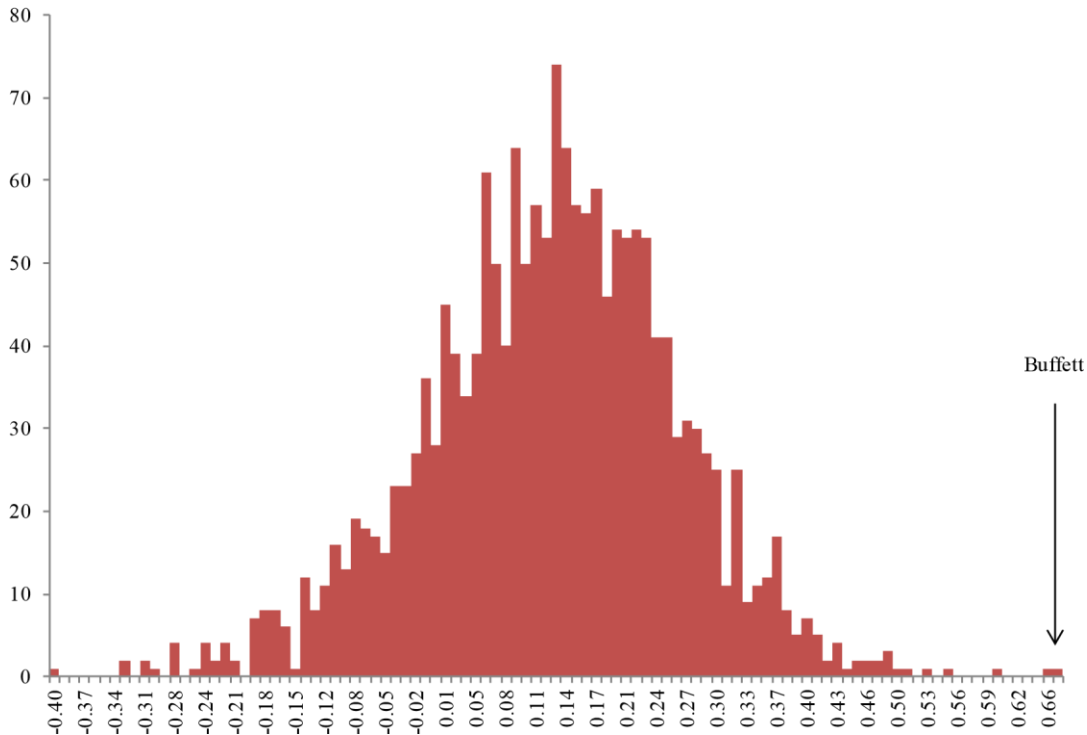

Figure 2

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.

Figure 3 Performance of Buffett and Systematic Buffett-Style Portfolio.

Panel A of this figure shows the cumulative return of Berkshire Hathaway's portfolio of publicly traded stocks (as reported in its 13F filings), a corresponding systematic Buffett-mimicking portfolio, and the CRSP value-weighted market return (leveraged to the same volatility as Berkshire's public stocks). Similarly, Panel B shows the cumulative return of Berkshire Hathaway, a corresponding systematic Buffett-mimicking portfolio, and the CRSP value-weighted market return (leveraged to the same volatility as Berkshire). The systematic Buffett-style strategy is constructed from a regression of monthly excess returns (columns 3 and 6, respectively, in Table 4). The explanatory variables are the monthly returns of the standard market, size, value, and momentum factors as well as the Quality Minus Junk (QMJ) factor of Asness, Frazzini, and Pedersen (20134) and the *BAB* factor of Frazzini and Pedersen (2013). The systematic Buffett-style portfolio excess return is the sum of the explanatory variables multiplied by the respective regression coefficients, rescaled to match the volatility of Berkshire's return.

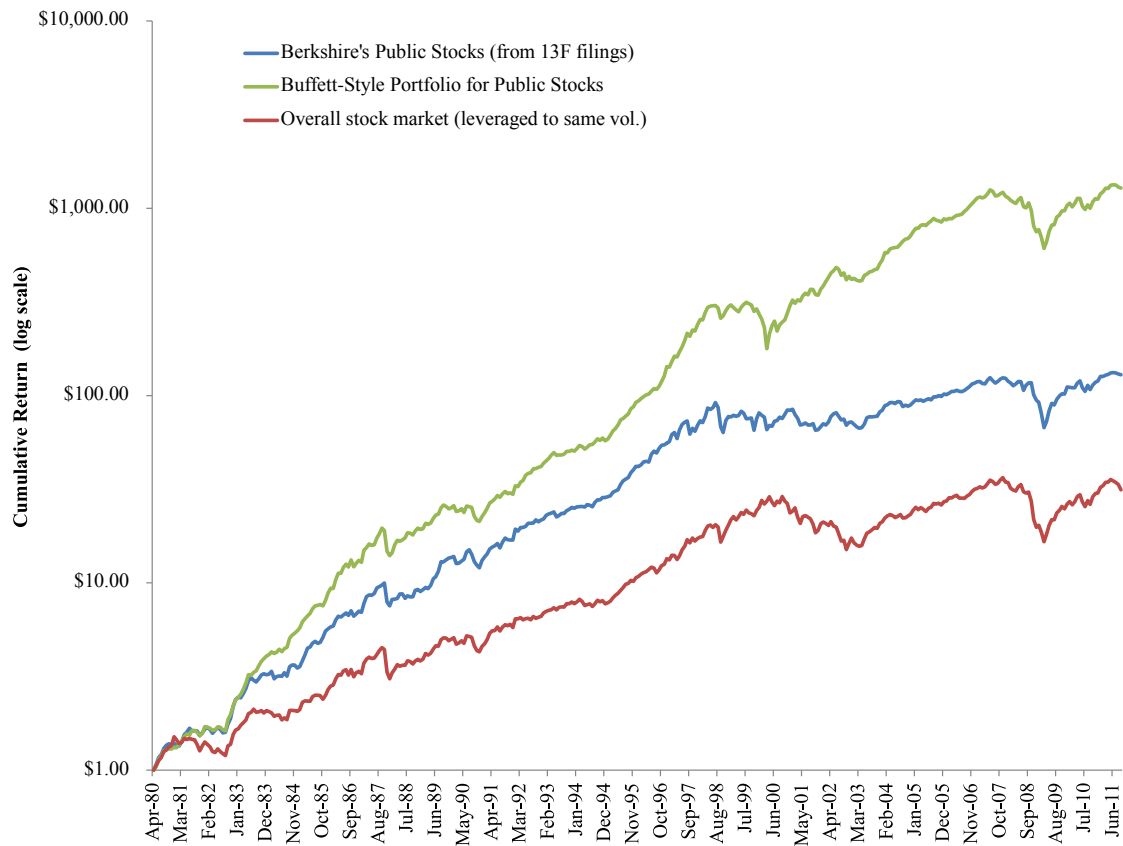**Panel A: Berkshire's Public Stocks and Buffett-Style Portfolio**

Figure 3 (continued)

Panel B: Berkshire Hathaway and Buffett-Style Portfolio