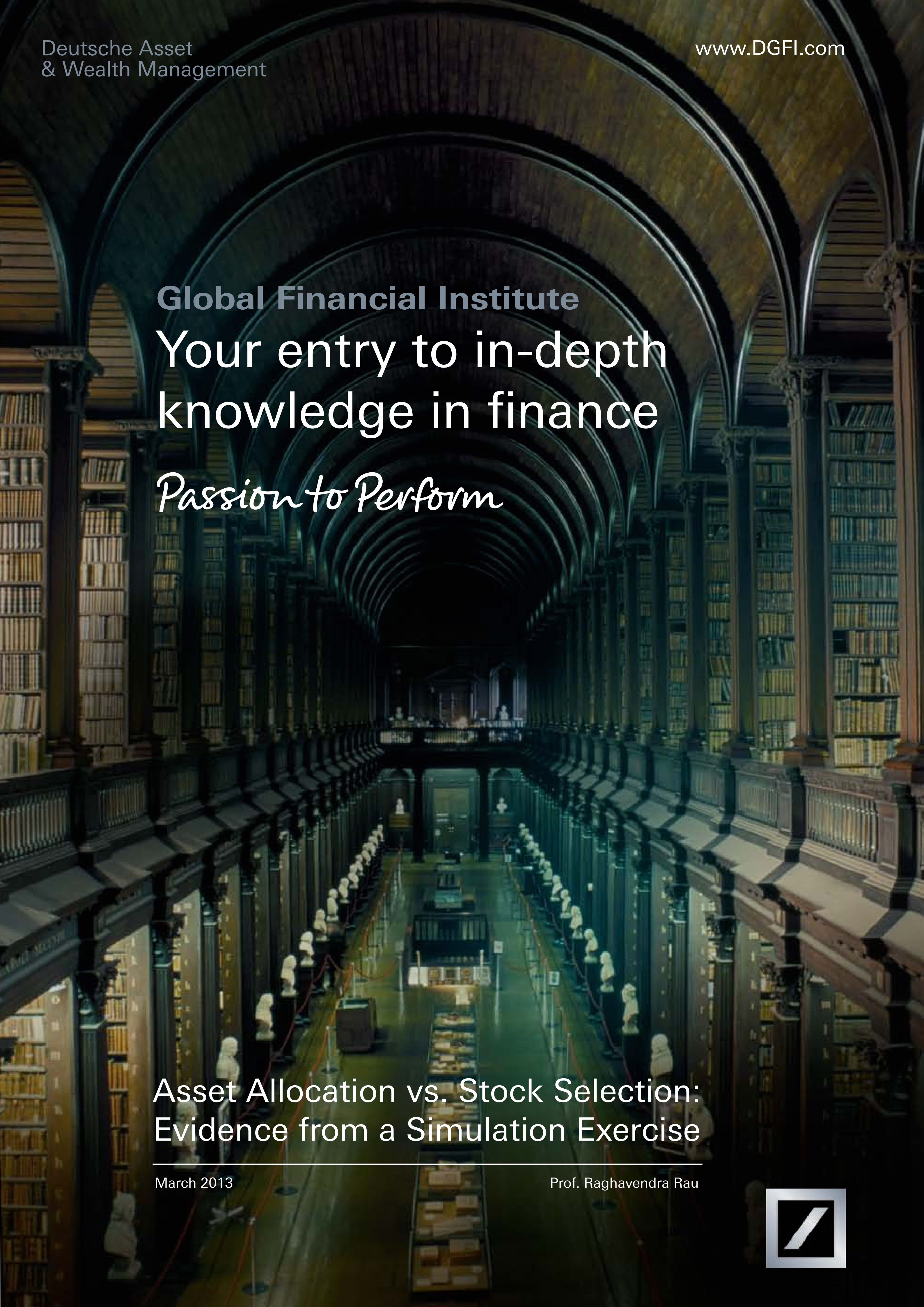


Deutsche Asset
& Wealth Management

www.DGFI.com

Global Financial Institute

Your entry to in-depth knowledge in finance

Passion to Perform

Asset Allocation vs. Stock Selection: Evidence from a Simulation Exercise

March 2013

Prof. Raghavendra Rau

Prof. Raghavendra Rau

Sir Evelyn de Rothschild Professor
of Finance
Judge Business School
University of Cambridge

Email:
r.rau@jbs.cam.ac.uk

Web Page:
Click here

Professor Rau is currently the Sir Evelyn de Rothschild Professor of Finance at the Cambridge Judge Business School. He has taught at a number of universities around the world, including the Institut d'Etudes Politiques de Paris (Sciences PO), Purdue University, the University of California at Los Angeles and most recently, the University of California at Berkeley.

In addition, Professor Rau was Principal at Barclays Global Investors, then the largest asset manager in the world, in San Francisco from 2008-2009.

He is an Editor of Financial Management, and Associate Editor of the International Review of Finance and the Quarterly Journal of Finance. His research interests lie in the area of corporate finance and market efficiency. His research has frequently been covered by the popular press including the New York Times, the Financial Times, the Wall Street Journal, and the Economist, among others. Professor Rau is Head of the School's Finance & Accounting subject group, and a member of the Cambridge Corporate Governance Network (CCGN).

Table of contents

Introduction to Global Financial Institute

Global Financial Institute was launched in November 2011. It is a new-concept think tank that seeks to foster a unique category of thought leadership for professional and individual investors by effectively and tastefully combining the perspectives of two worlds: the world of investing and the world of academia. While primarily targeting an audience within the international fund investor community, Global Financial Institute's publications are nonetheless highly relevant to anyone who is interested in independent, educated, long-term views on the economic, political, financial, and social issues facing the world. To accomplish this mission, Global Financial Institute's publications combine the views of Deutsche Asset & Wealth Management's investment experts with those of leading academic institutions in Europe, the United States, and Asia. Many of these academic institutions are hundreds of years old, the perfect place to go to for long-term insight into the global economy. Furthermore, in order to present a well-balanced perspective, the publications span a wide variety of academic fields from macroeconomics and finance to sociology. Deutsche Asset & Wealth Management invites you to check the Global Financial Institute website regularly for white papers, interviews, videos, podcasts, and more from Deutsche Asset & Wealth Management's Co-Chief Investment Officer of Asset Management Dr. Asoka Wöhrmann, CIO Office Chief Economist Johannes Müller, and distinguished professors from institutions like the University of Cambridge, the University of California Berkeley, the University of Zurich and many more, all made relevant and reader-friendly for investment professionals like you.

Asset Allocation vs. Stock Selection: Evidence from a Simulation Exercise

Prof. Raghavendra Rau
Co-Author: Prof. Kuntara Pukthuanthong
March 2013

Abstract

Is it better for individual investors to select particular securities within an asset class (only equities, for example) or hold broad asset classes and shift the mix among asset classes? The evidence in prior literature is mixed. Using historical data, Brinson, Hood, and Beebower (1991) argue that the latter strategy, asset allocation, is superior to the former strategy, stock selection. However, Kritzman and Page (2002) argue, using a simulation approach, that security selection is significantly better than asset allocation.

The major reason for the differing conclusions from prior papers lies in the relative magnitude of correlation between asset classes versus the correlation within an asset class. If, for example, the correlation between asset classes is lower than the correlation between assets within a particular asset class, the higher degree of correlation among the assets in a particular class results in a higher variance for a portfolio comprising only assets within that asset class. It is easy to demonstrate this theoretically when only two asset classes are considered and each consists of only two securities. In the real world, however, there are multiple asset classes weighted differently among hundreds of securities with different levels of variances and covariances. In a real-world scenario, a bootstrap simulation approach offers the best way to compare the strengths and weaknesses of the two approaches.

In this paper, we investigate whether asset allocation and security selection is more important over a considerably longer time horizon than prior literature. Importantly, our data spans a large spectrum of asset classes, including real estate and commodities, and covers the period from 1991 to 2011, a period that includes both with the dotcom bust in 2001 and the current recessionary period. We argue that it is especially important to measure the relative importance of the two approaches across different market states since correlations rise dramatically in times of market distress, such as the current environment.[1]

We follow Krtizman and Page (2002) in defining the importance of a particular strategy as the extent to which an investment activity causes a dispersion in wealth. Kritzman and Page argue that dispersion is important for both talented and untalented investors. Talented investors can increase their wealth beyond the amount they could achieve by investing passively. Untalented investors also value dispersion since they would prefer to avoid investments that cause negative dispersion.

[1] To contrast with prior literature, Kritzman and Page, for example, use a bootstrap approach over the period from January 1988 to December 2001. They use only three major asset classes: equity (the MSCI equity indexes in Australia, Germany, Japan, the U.K., and the U.S.), and bond and cash indexes in these countries (from JP Morgan). Their sample begins in 1988 after the stock market crash in 1987 and ends right as the dotcom bubble ends in 2001.

1. Data

In this paper, we examine a broad spectrum of asset classes available to institutional investors, including both traditional and non-traditional asset classes such as real estate and commodities, among others. We study the relative importance of asset allocation and security selection using a benchmark portfolio that is 80% invested in traditional asset classes and 20% in non-traditional asset classes.

Our benchmark portfolio consists of 5% cash, 30% bonds, 45% stocks, 10% real estate, and 10% commodities, from January 1991 to December 2011.[2] These weights are based on the 2005-2006 Russell Survey on Alternative Investing, published by the Russell Investment Group. The survey shows that, in 2005, with the observed trend, the typical North American tax-exempt organization would be likely to allocate around 25% to alternative investments in 2007. We use 20% for the weight of real estate and commodities together. The percentage of each asset is based on the market cap of each asset class.

Table 1 describes the asset classes chosen to construct our benchmark portfolio and the weight given to each class. In the table, we also present the sources of data and descriptive statistics. Across the five asset classes, equity yields the highest return of 13.81% per annum during our sample period from 1991 to 2011. Commodities form the second best asset class, while cash yields the lowest return. Not surprisingly, high risk is associated with high return. While equities earn the highest returns, they also have the highest standard deviation of 17.23%. Similarly, commodities earn the second highest returns as well as the second highest standard deviation of 12.42%. As expected, cash has the lowest standard deviation of 1.01%. Across correlations of different assets pairs, cash and bonds have the highest correlation of 34%, whereas bonds and stocks and stocks and real estate have the lowest correlations of between 2-3%. Commodities are negatively correlated with bonds (-19%) and with stocks (-16%). Real estate is also negatively correlated with bonds (-8%).

[2] The survey also includes private equity and hedge funds as alternative asset classes. Due to limited data and application to European investors, we limit our assets to real estate and commodities.

Table 1: Asset Classes in the Benchmark Portfolio
This table reports the weights for each asset class, data sources, and annualized descriptive statistics for the sample period of January 1991 to December 2011.

Weight	Asset class	Source of data	Annualized descriptive statistics		Correlation (monthly)				
			Average (geometric) return	Standard deviation	Cash	Bonds	Stocks	Real Estate	Commodities
5%	Cash	J.P. Morgan World Cash (3 months) J.P. Morgan Australia Cash (3 months) J.P. Morgan Germany Cash (3 months) J.P. Morgan Japan Cash (3 months) J.P. Morgan United States Cash (3 months) J.P. Morgan United Kingdom Cash (3 months)	4.34%	1.01%	1.00				
30%	Bonds	J.P. Morgan World Government Bond J.P. Morgan Australia Government Bond J.P. Morgan Germany Government Bond J.P. Morgan Japan Government Bond J.P. Morgan United Kingdom Government Bond J.P. Morgan United States Government Bond	7.92%	4.95%	0.34	1.00			
45%	Stocks	Individual stock returns of the MSCI equity indexes in 1) MSCI Australia 2) MSCI Germany 3) MSCI Japan 4) MSCI UK 5) MSCI US as constituted at the end of 2011; Individual stock returns are collected from DataStream	13.81%	17.23%	0.12	0.03	1.00		
10%	Real estate	NCREIF national property index	7.56%	7.88%	0.22	-0.08	0.02	1.00	
10%	Commodities	GSCI total return index	12.48%	12.42%	0.14	-0.19	-0.16	0.14	1.00

2. Asset allocation methodology

Following Kritzman and Page, we apply the bootstrapping methodology by randomly choosing an asset mix at the beginning of each of the 21 annual periods starting in January 1991 and computing the corresponding return over the next 12 months. Bootstrapping is a procedure by which new samples are generated from an original dataset by randomly selecting observations from the original dataset. In contrast to Monte Carlo simulations, bootstrapping draws randomly from an empirical sample, while Monte Carlo draw randomly from a theoretical distribution. We do not model manager skill explicitly for either the asset allocation or security selection strategies, as the skill of both managers should be equal on average given the high number of simulations. This simulation procedure allows us to generate random portfolios that represent the available opportunity set. Since these portfolios only require investment in tradable assets, they are also easy to implement.

At the end of each simulation run, we obtained a time series of 252 monthly portfolio returns. We then repeated this procedure 10,000 times, with each repetition representing one sample portfolio. To choose a random asset mix, we made 100 draws with replacement, each draw representing 1% of the portfolio from a pool of five asset classes: 5% cash, 30% bonds, 45% stocks, 10% real estate, and 10% commodities. To illustrate the portfolios generated by this bootstrapping procedure, in Figure 1 we show the distribution of the sample portfolio weights of two asset classes – stocks and real estate – along with their respective benchmark portfolio weights.

Figure 1 shows that the asset allocation drawing method assigns stocks an average weight of around 45%, ranging from 22% to 68%. This average is exactly in line with the benchmark portfolio discussed by the Russell survey. In over 95% of the simulation runs, the stock weight ranges between 35% and 55%, representing a ±13% variation from the benchmark portfolio. Similarly for real estate, the random weight averages around 12%, and ranges between 0% and 24%. In 95% of all cases, the real estate weights change between 7% and 17%, representing a ±7% deviation from the benchmark.

Figure 1: Distribution of weights for the stock and real estate components in the sample portfolios generated by the bootstrap simulation.

To evaluate the importance of asset allocation over time, we estimate the dispersion in the performance of the 10,000 sample portfolios resulting from the different asset mixes randomly selected from distributions like those shown in Figure 1. As the dispersion of the sample portfolio increases, asset allocation should become more important for both skilled and unskilled investors. As argued earlier, skilled investors prefer periods of time when dispersion increases since they can perform better than they would under a passive investment strategy. Unskilled investors, on the other hand, would prefer to avoid these periods.

To summarize, in our bootstrap procedure for asset allocation we:
1. randomly select the JP Morgan cash index, the JP Morgan bond index, the equally weighted MSCI equity index, the NCREIF national property index, or the GSCI total return index from a sample that is weighted 5% cash index, 30% bond index, 45% stock index, 10% real estate index, and 10% commodities index;
2. compute the total returns of the resultant portfolio;
3. place the randomly selected asset back into the sample from which it was drawn (i.e. "replacement");
4. continue to select assets randomly with replacement until 100 assets have been selected;
5. compute the average total return for the 100 selected assets;
6. repeat steps 1 through 5 10,000 times for each month;
7. compute the annualized cumulative returns of the 10,000 portfolios and then rank them.

The bootstrapping procedure computes cumulative returns over 252 months for 10,000 randomly selected asset portfolios in which the component securities within asset classes are fixed. Consequently, the variation in return among the 10,000 portfolios stems only from random variation of the asset mixes in each month.

To summarize, we measure the importance of asset allocation by holding the individual security weights constant and computing the variation in return due solely to the variation in asset allocation around an expected allocation of 5% cash, 30% bonds, 45% stocks, 10% real estate, and 10% commodities.

3. Security selection methodology

As uniform rebalancing rules are critical to establishing a comparison between two investment choices, we design a modified security selection methodology that is strictly uniform with the asset allocation methodology above.

Within the benchmark asset mix of 5% cash, 30% bonds, 45% stocks, 10% real estate, and 10% commodities, we generate 10,000 sample portfolios annually and record their returns over the 12 subsequent months. For each portfolio, we randomly select 100 stocks with replacement – with each constituent of the MSCI equity indexes of Australia, Germany, Japan, the United Kingdom, and the United States assigned an equal probability – and then rescale returns according to their relative market capitalizations. We do this in the same way as we do for asset allocation.

To summarize, in the bootstrap procedure for the security selection strategy for each country we:
1. randomly select a stock from the MSCI equity indexes of Australia, Germany, Japan, the U.K., and the U.S. and calculate its total return;
2. place the randomly selected stock back into the sample from which it was drawn ("replacement");
3. continue to select randomly with replacement until 100 stocks are chosen to obtain a diversified portfolio;
4. compute the average total return of these 100 selected stocks;
5. estimate a portfolio return using a 45% allocation to the randomly selected stocks, 5% to cash, 30% to the bond index, 10% to the real estate index, and 10% to commodities;
6. repeat steps 1 through 5 10,000 times for each month;
7. compute the annualized cumulative returns of the 10,000 portfolios and then rank them.

This bootstrapping procedure produces cumulative returns over 252 months for 10,000 portfolios in which the stock allocation is fixed at 45% but the individual stocks are selected randomly each month. The replacement rule allows stocks to be selected more than once; therefore, the individual stock weights range from 1% to 100% within the fixed 45% stock allocation.

To summarize, we measure the importance of the security selection strategy by holding constant the mix of assets at 5% cash, 30% bonds, 45% stocks, 10% real estate, and 10% commodities and then computing the variation in return due solely to the variation within the stock portfolios.

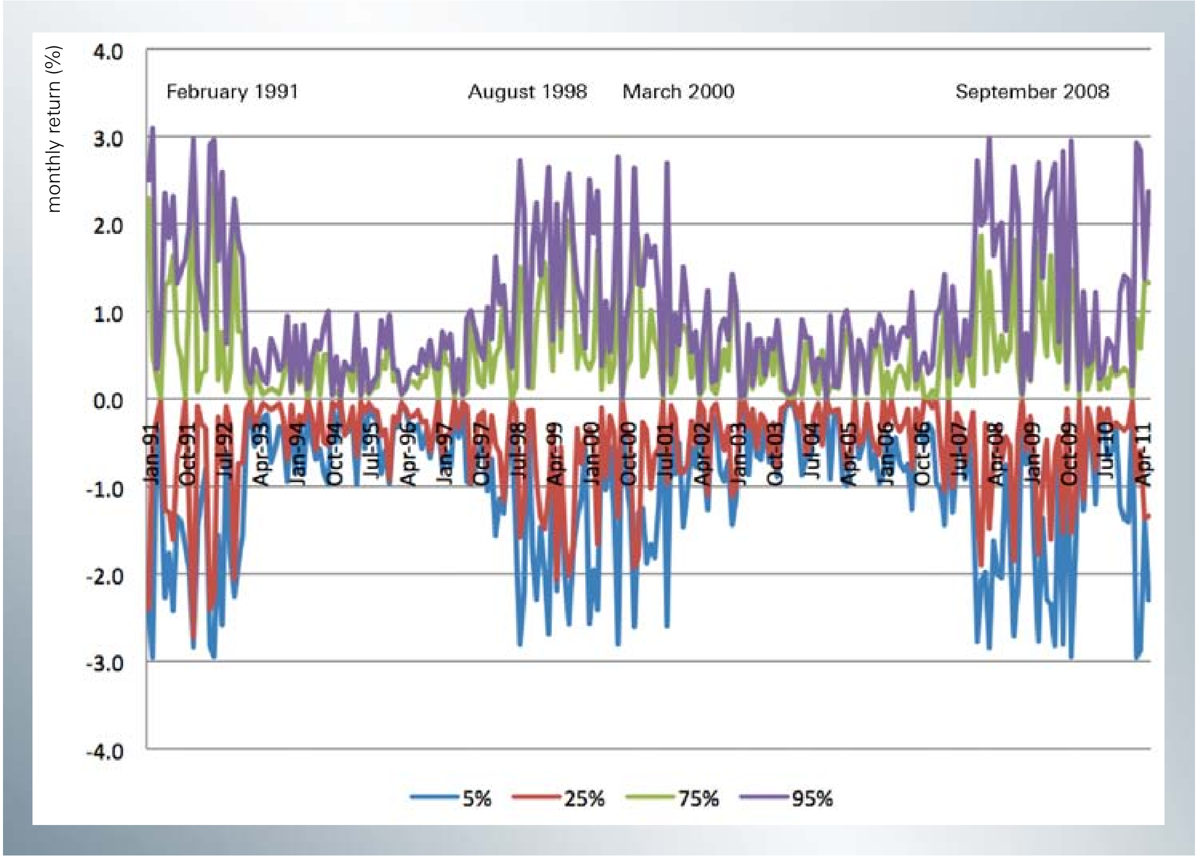
4. Empirical results

In this section, we describe the results from the two strategies separately.

4.1 Asset Allocation

Figure 2 illustrates that random asset allocation among stocks, bonds, cash, and alternative assets (holding constant the individual security weights within the stock component) produces a wider variation of return than individual selection of an asset at random. In the figure, we trace the cross-sectional dispersion in the monthly performance of randomly selected portfolios relative to the benchmark portfolio from different asset mixes over time. Specifically, we show the 5th, 25th, 50th, 75th, and 95th percentiles relative to the median. Simply put, Figure 2 shows the extent to which skilled investors (75th or 95th percentile) would improve upon median performance by engaging in asset allocation. It also shows how far below the median performance unskilled or unlucky investors (25th or 5th percentile) would perform choosing this investment activity. We highlight the months when the asset allocation decision produced the most dispersion.

Figure 2: Asset allocation analysis of 5th, 25th, 75th, and 95th percentile monthly performances relative to the median over the period from January 1991 to December 2011.



The patterns in Figure 2 can be separated into three different regimes where dispersion widens significantly. Each of these regimes coincides with a period of macroeconomic volatility. The first regime, from 1991 to 1992, was a period when cross-sectional dispersion in sample portfolios was significant, and asset allocation was important. In this period, there were two major events: the January to March 1991 period coincided with the Iraqi invasion of Kuwait, and a jump in oil prices. The National Bureau of Economic Research (NBER) also classifies this period as recessionary.

Between the first and second regime is the period from 1993 to 1996 when there was a smaller cross-sectional dispersion, suggesting asset allocation had a low impact on the overall performance of portfolios. There was no major event in this period.

The second regime from 1998 to 2001 was again a period when asset allocation contributed significantly to performance. This period coincided with several macroeconomic events that added considerable uncertainty to asset markets. These macroeconomic events included the Russian default in August 1998, the Internet boom in 1999, and the bursting of the dotcom bubble during the early 2000s. The period from March to November 2001 is also classified by NBER as recessionary.

The third regime, from December 2007 to 2009, coincided with the subprime mortgage crisis and the collapse of Lehman Brothers. During this period, dispersion widened significantly, suggesting the importance of asset allocation for performance. Dispersion narrowed in 2010, but widened again in 2011.

Over the entire sample period, the four most important months for asset allocation activity were February 1991 (the Gulf War), August 1998 (the Russian default), March 2000 (the bursting of the dotcom bubble), and September 2008 (the collapse of Lehman Brothers). Asset allocation contributed significantly to the performance of the sample portfolio during these crisis times. More specifically, the difference between the fifth best sample portfolio (out of one hundred) and the fifth worst was 6.05% in February 1991, 5.53% in August 1998, 4.78% in March 2000, and 5.36% in September 2008. To contrast this with the entire period, the difference between the 5th and 95th percentile sample portfolios for asset allocation over the entire 21-year sample period was 2.02%.

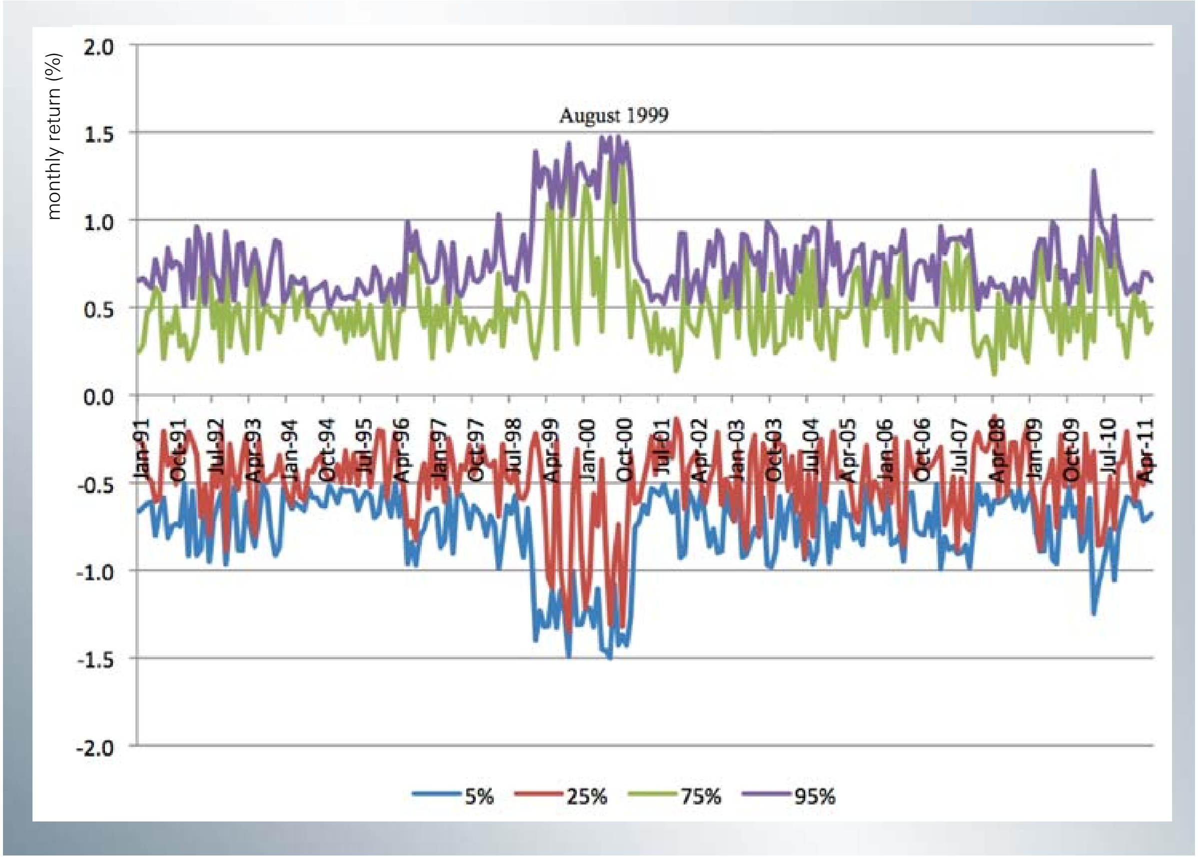
4.2 Security Selection

Figure 3 depicts the cross-sectional dispersion in monthly performance of randomly drawn portfolios using security selection rather than asset allocation. In contrast to Figure 2, the dispersion in this case arises from different security portfolios with the same asset mix instead of different asset mixes with the same security portfolios. As in Figure 2, we highlight the periods when security selection leads to the highest dispersion in cross-sectional performance. We note first that the dispersion for security selection is consistently lower than that of asset allocation over the entire sample period. In addition, the 1991 to 1998 and 2002 to early 2009 periods show a relatively small and stable dispersion in performance. Neither the Gulf War in early 1991 nor the Russian default in August 1998 influenced the way security selection impacts the overall performance of portfolios.

There was a relatively small increase in dispersion during late 2008 and 2010 coinciding with the collapse of Lehman Brothers in 2008 and the subprime mortgage crisis. The Internet boom and bust from 1999 to 2002 contributed the largest dispersion in portfolio performance, suggesting a significant opportunity for security selection. The month with the largest dispersion was August 1999, which is before the bursting of the dotcom bubble. The difference between the 5th and the 95th percentile in this month was 3.00%. The average difference between the 5th and 95th percentile sample portfolios for security selection over the entire 21-year period was 1.54%, which is lower than the average dispersion of 2.02% contributed by asset allocation.

One limitation of our study is that we allow security selection only in stocks and thus we might underestimate the impact of security selection. Waring and Siegel (2003) document low correlations between

Figure 3: Security selection analysis of 5th, 25th, 75th, and 95th percentile quarterly performances relative to the median from January 1991 to December 2011.



alpha activities across asset classes given that the drivers of returns in each of the five asset classes are independent of each other. All in all, it is likely that the dispersion resulting from security selection within other asset classes should not be as high as it is for stocks.

4.3 Comparing asset allocation and security selection directly

Figure 4 compares the dispersion from asset allocation and security selection strategies in a single figure. The graph displays the dispersion of the monthly difference between the 5th and 95th cross-sectional percentile performance developed by the bootstrapping procedure. The greater the difference, the greater the relative importance of a given activity. The figure dramatically illustrates three major differences between security selection and asset allocation. First, security selection creates less dispersion in returns than asset allocation. Thus, asset allocation is likely to be more important for skilled investors. Second, the relative importance of asset allocation and security selection is time-dependent. Finally, the asset-allocation-driven dispersion is more volatile than the dispersion generated by security selection and is high during crises.

The fact that asset allocation potentially generates the most dispersion around average performance does not mean asset allocation is associated with higher absolute risk. Our simulation results in Figure 5 show the absolute risk of asset allocation portfolios is not statistically distinguishable from that of security selection portfolios. Dispersion is a measure of relative performance. It is based on relative volatility instead of absolute volatility. A higher relative volatility is a result of a deviation either towards more-than-average volatility or towards less than average volatility. Thus, a higher relative volatility does not imply higher absolute volatility. Overall, portfolios with greater cross-sectional dispersions are not necessarily riskier than portfolios with less cross-sectional dispersion.

Figure 4: Relative importance of asset allocation and security selection as illustrated by the difference between the 5th and 95th percentile monthly performances.

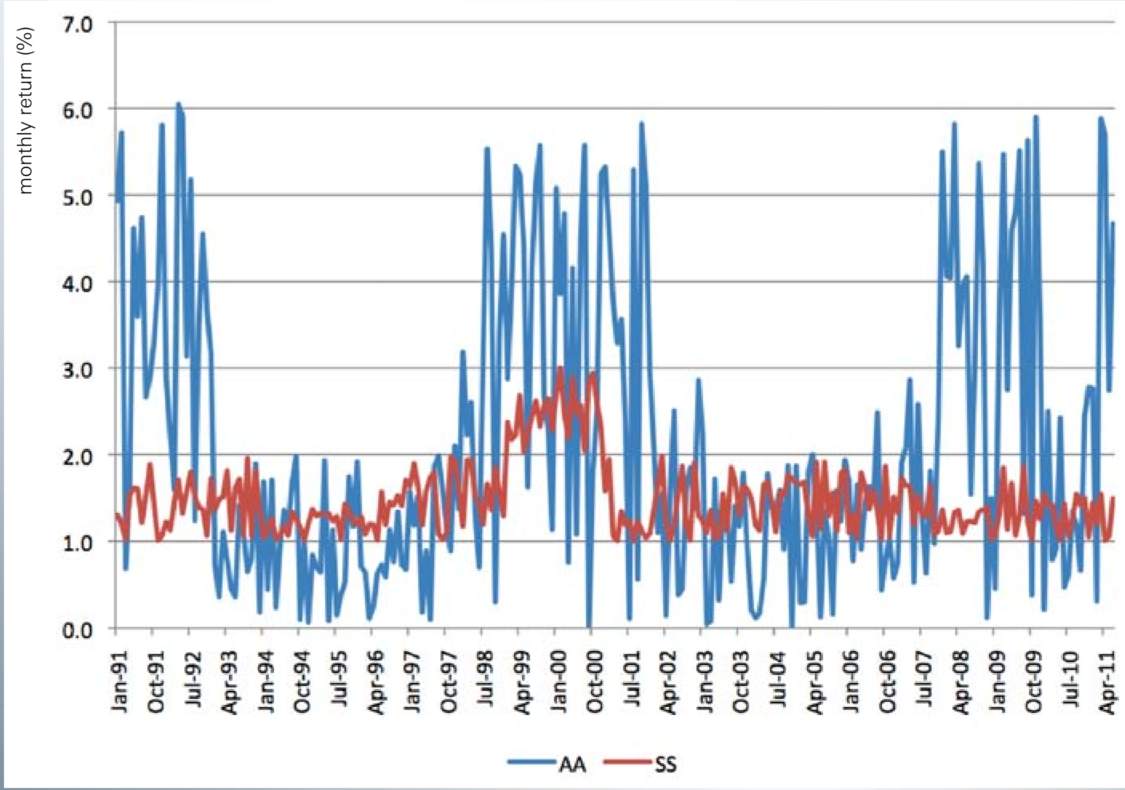
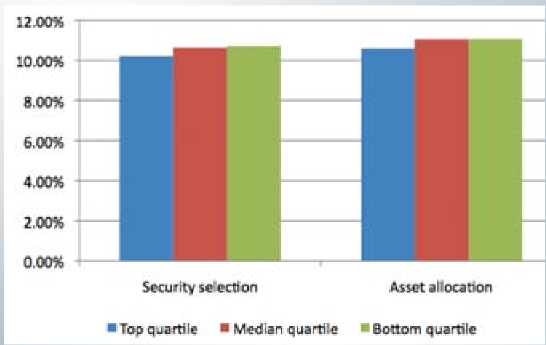


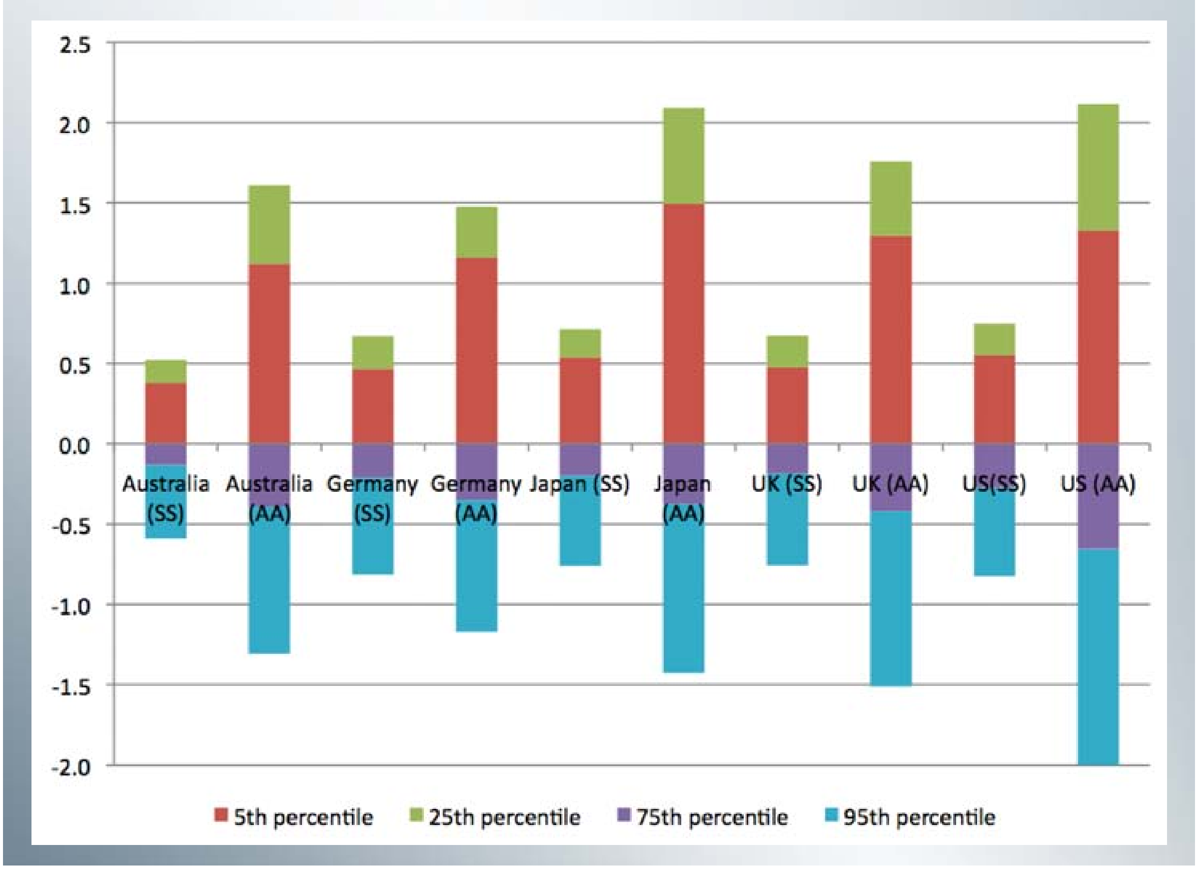
Figure 5: Volatility of asset allocation and security selection portfolios by top-quartile, median, and bottom quartile performance from January 1991 to December 2011.



4.4 Robustness checks

As a robustness check, we evaluate the importance of a given activity in each country (Australia, Germany, Japan, the U.K., and the U.S.) separately. Due to data limitations, we do not include real estate and commodities. Instead, we run the bootstrapping methodology in the same way as in the previous section for three asset classes: stocks, bonds, and cash. We use weights of 60%, 30%, and 10%, respectively, for the three asset classes. Figure 6 depicts the extent to which a skilled investor (75th or 95th percentile) would improve upon average performance by engaging in asset allocation and security selection. Moreover, it illustrates how much the average unskilled investor would under-perform depending on how active the investor was in asset allocation or security selection. Consistent with the above results, the dispersion around average performance from asset allocation is much greater than the dispersion generated by security selection in every country.

Figure 6: Relative importance of asset allocation and security selection across countries, as illustrated by the annualized difference from average of the 5th, 25th, 75th, and 95th percentile performances from January 1991 to December 2011.



5. Conclusions

In this study, we examine the relative importance of asset allocation and security selection after extending the opportunity set from traditional asset classes to a mix of traditional and alternative asset classes. Our study extends prior research in four ways. First, our benchmark portfolio consisting of a 20%-45%-30%-5% mixture of non-traditional asset classes, stocks, bonds, and cash, respectively, represents standard asset mixes for typical North American tax-exempt organizations such as pension funds. Second, our bootstrapping methodology for security selection ensures strict consistency with asset allocation rebalancing rules. Third, we use an unbiased investment universe for the stock component of the portfolio including both U.S. and international stocks. Finally, our sample period is from 1991 to 2011, covering various crises and recessionary periods.

Our results show that asset allocation strategies yield a superior dispersion in returns than security selection strategies, especially during economic crises. The most important periods for asset allocation from 1991 to 2011 were February 1991, during the Gulf War; August 1998, when Russia defaulted; March 2000, the beginning of the bursting of the dotcom bubble; and September 2008, when Lehman Brothers collapsed near the start of the subprime mortgage crisis. By contrast, only the dotcom bubble was an important period for security selection. In general, our results suggest asset allocation is more important than security selection, especially in times of greater volatility in the markets.

6. References

Brinson, G. P., Singer, B. D. and Beebower, G. L. 1991. "Determinants of Portfolio Performance II: An Update." Financial Analysts Journal, May–June, 47(3), 40–48.

Kritzman, Mark and Sébastien Page. 2003. "The Hierarchy of Investment Choice." Journal of Portfolio Management, vol. 29, no. 4 (Summer): 11-23.

Waring, Barton M. and Laurence B. Siegel. 2003. "The Dimensions of Active Management." Journal of Portfolio Management, vol. 29, no. 3 (Spring): 35-51.

Deutsche Asset & Wealth Management represents the asset management and wealth management activities conducted by Deutsche Bank AG or any of its subsidiaries. Clients will be provided Deutsche Asset & Wealth Management products or services by one or more legal entities that will be identified to clients pursuant to the contracts, agreements, offering materials or other documentation relevant to such products or services.

This material was prepared without regard to the specific objectives, financial situation or needs of any particular person who may receive it. It is intended for informational purposes only and it is not intended that it be relied on to make any investment decision. It does not constitute investment advice or a recommendation or an offer or solicitation and is not the basis for any contract to purchase or sell any security or other instrument, or for Deutsche Bank AG and its affiliates to enter into or arrange any type of transaction as a consequence of any information contained herein. Neither Deutsche Bank AG nor any of its affiliates, gives any warranty as to the accuracy, reliability or completeness of information which is contained in this document. Except insofar as liability under any statute cannot be excluded, no member of the Deutsche Bank Group, the Issuer or any officer, employee or associate of them accepts any liability (whether arising in contract, in tort or negligence or otherwise) for any error or omission in this document or for any resulting loss or damage whether direct, indirect, consequential or otherwise suffered by the recipient of this document or any other person.

The opinions and views presented in this document are solely the views of the author and may differ from those of Deutsche Asset & Wealth Management and the other business units of Deutsche Bank. The views expressed in this document constitute Deutsche Bank AG or its affiliates' judgment at the time of issue and are subject to change. The value of shares/units and their derived income may fall as well as rise. Past performance or any prediction or forecast is not indicative of future results.

Any forecasts provided herein are based upon our opinion of the market as at this date and are subject to change, dependent on future changes in the market. Any prediction, projection or forecast on the economy, stock market, bond market or the economic trends of the markets is not necessarily indicative of the future or likely performance. Investments are subject to risks, including possible loss of principal amount invested.

Publication and distribution of this document may be subject to restrictions in certain jurisdictions.

R-30914-1