The Hierarchy of Investment Choice: A Normative Interpretation

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Three questions

1. How important is each investment choice?
2. How valuable is skill for each investment choice?
3. How much skill is required to justify active management for each investment choice?

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Organization

- Previous research and its limitations
- Data and methodology
- Results
- Conclusion

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Previous research and its limitations

- Brinson, Hood, and Beebower (1986) attribute the past performance of 91 large corporate pension plans.
  - They measure policy as the long term asset mix invested in passive benchmarks.
  - They measure timing as deviations from the passive mix invested in passive benchmarks.
  - They measure security selection as deviations from the passive benchmarks within each asset class.
  - Their analysis reveals that 93.6% of return variation is explained by asset mix policy.
- The Brinson, Hood, and Beebower study measures which activities investors choose to emphasize rather than their relative importance.
- It is positive economics– it describes what investors do.
- It reveals nothing about what investors *should* do.

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Previous research and its limitations

- Heston and Rouwenhorst (1994) propose a methodology to isolate the potential impact of investment exposures.
  - They use a two-factor model, which assumes a given stock has a unit exposure to its home country and its sector and a zero exposure to all other countries and sectors.
  - Their methodology produces a pure country portfolio that is sector-neutral and a pure sector portfolio that is country-neutral.
- Heston and Rouwenhorst measure the impact of exposure to countries and sectors. They control for investor behavior, because they use available market returns rather than managed fund returns.
- However, they rule out interaction effects with other countries and sectors.
- Moreover, they assume that exposures are equal for countries and sectors and fixed over time.
- Finally, it is doubtful that the pure country or sector portfolios resulting from their methodology are obtainable.
- It therefore describes what investors should do, but can't!

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Data and methodology

Global Choices

Asset Allocation
Country Allocation
Global Sector Allocation
Country Sector Allocation
Security Selection

Country Specific Choices

Asset Allocation
Sector Allocation
Security Selection

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Data and methodology

Asset Classes

Stocks
Bonds
Cash

Equities

23 Country Indexes
23 Global Sector Indexes
529 Country Sector Indexes
1,512 Securities

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Data and methodology

Countries	Sectors
Australia	Autos & Components
Austria	Banks
Belgium	Capital Goods
Canada	Commercial Services & Supplies
Denmark	Consumer Durables & Apparel
Finland	Diversified Financials
France	Energy
Germany	Food Drug Retailing
Greece	Food Beverage Tobacco
Hong Kong	Healthcare Equipment & Services
Ireland	Hotels Restaurants Leisure
Italy	Household & Personal Products
Japan	Insurance
Netherlands	Materials
New Zealand	Media
Norway	Pharmaceuticals & Biotech
Portugal	Real Estate
Singapore	Retailing
Spain	Software & Services
Sweden	Technology Hardware & Equipment
Switzerland	Telecommunication Services
United Kingdom	Transportation
United States	Utilities

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Data and methodology

Data Sources

Equity Returns:	MSCI
Bond Returns:	J. P. Morgan
Cash Returns:	J. P. Morgan
Securities Weights:	Compustat

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Data and methodology

We customize indexes to ensure additivity:

$$\prod_i w_i^S r_i^S \;\rfloor\; \prod_j w_j^{CS} r_j^{CS} \;\rfloor\; \prod_k w_k^{GS} r_k^{GS} \;\rfloor\; \prod_l w_l^C r_l^C \;\rfloor\; r^w$$

w_i^S = weight of security i within the world index.

r_i^S = total return for security i

w_j^{CS} = weight of country sector j within the world index

r_j^{CS} = total return for country sector j.

w_k^{GS} = weight of global sector k within the world index.

r_k^{GS} = total return for global sector k.

w_l^C = weight of country l within the world index.

r_l^C = total return for country l.

r^w = total return for the world index.

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Data and methodology

- Bootstrapping is a procedure by which new samples are generated from an original data set by randomly selecting observations with replacement from the original data set.
- It differs from Monte Carlo simulation in that it draws randomly from an empirical sample, whereas Monte Carlo simulation draws randomly from a theoretical distribution.
- Bootstrapping allows us to generate random portfolios, which represent the available opportunity set, as opposed to portfolios that have been financially engineered to conform to investor norms.
- Moreover, bootstrapping produces portfolios that we can easily implement, since they merely require investment in tradeable assets.

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Data and methodology

Asset allocation bootstrap:

1. We randomly select 100 asset class returns with replacement 10,000 times from a sample that is weighted 60% stocks, 30% bonds, and 10% cash.
2. The country weights of each asset class are fixed according to their relative capitalization within each asset class.
3. The sector and individual security weights of the equity component are fixed according to their relative capitalization.
4. We repeat these procedures for each year beginning with 1987 and ending with 2001.
5. We calculate the cumulative returns of the 10,000 portfolios and rank them.

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Data and methodology

Country allocation bootstrap:

1. We choose 100 country index returns with replacement 10,000 times from a sample of 23 developed market countries.
2. When we select a return we also select its capitalization in order to scale the returns according to their relative capitalization within the equity component.
3. The exposures to stocks, bonds, and cash are held constant at 60%, 30%, and 10%, so that this simulation is unbiased relative to the asset allocation simulation.
4. Sector and individual security weights are fixed according to their relative capitalization; thus we can implement our simulated portfolios with country index funds.
5. We repeat these procedures for each year beginning with 1987 and ending with 2001.
6. We calculate the cumulative returns of the 10,000 portfolios and rank them.

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Results

We generate four sets of results:

- Cross sectional dispersion in cumulative return
- Cross sectional dispersion in utility
- The value of an option to exchange median performance for good performance
- Skill required to justify active management

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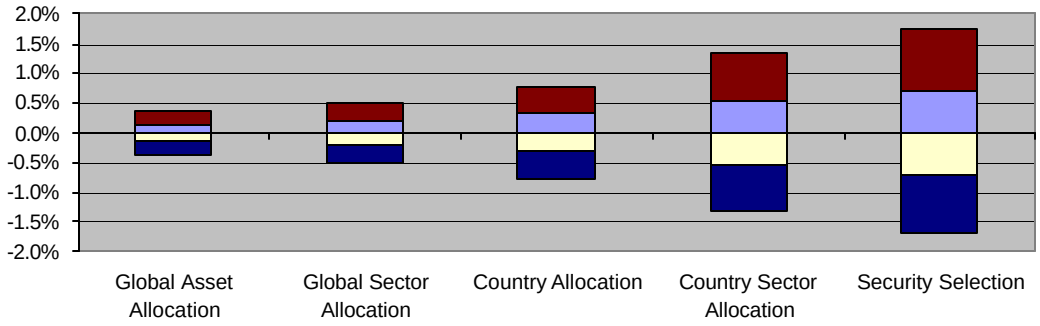
Results

Return dispersion: global choices

Figure 1: Global Choices

5th, 25th, 75th and 95th Percentile Performance Over Horizon
Annualized Difference from Average (1987-2001)



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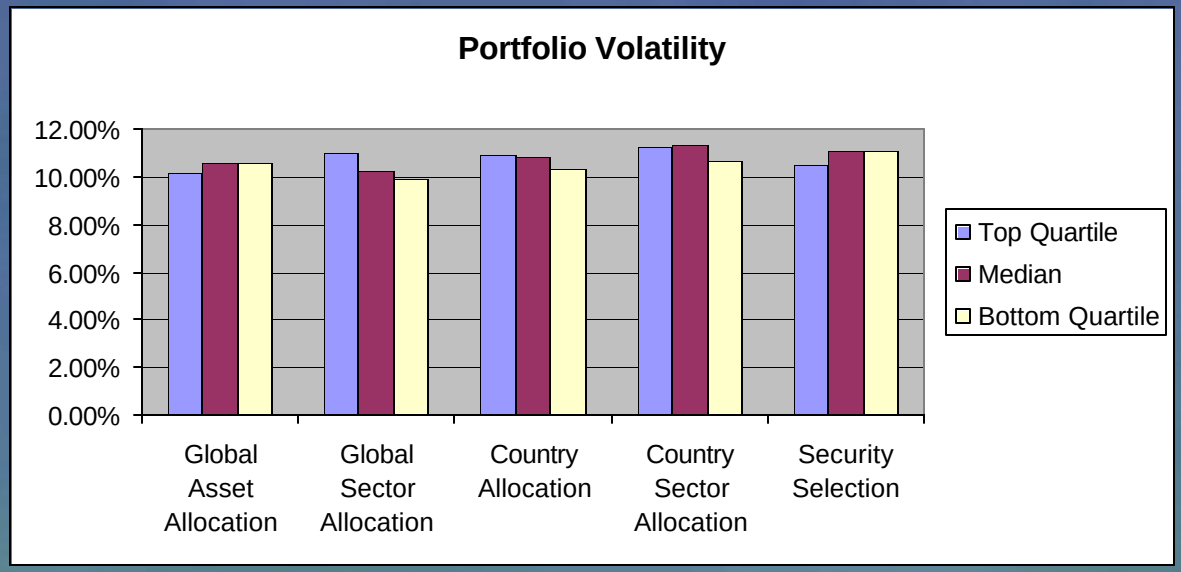
Results

All portfolios have similar risk



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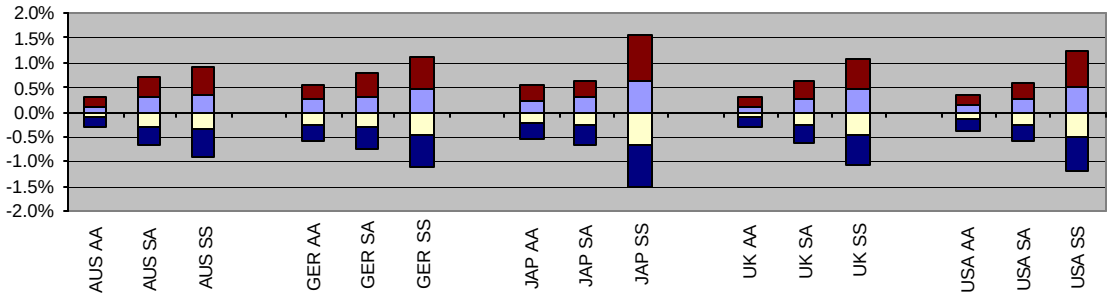
Results

Return dispersion: country specific choices

Figure 2: Country Specific Choices

5th, 25th, 75th and 95th Percentile Performance Over Horizon
Annualized Difference from Average (1987-2001)



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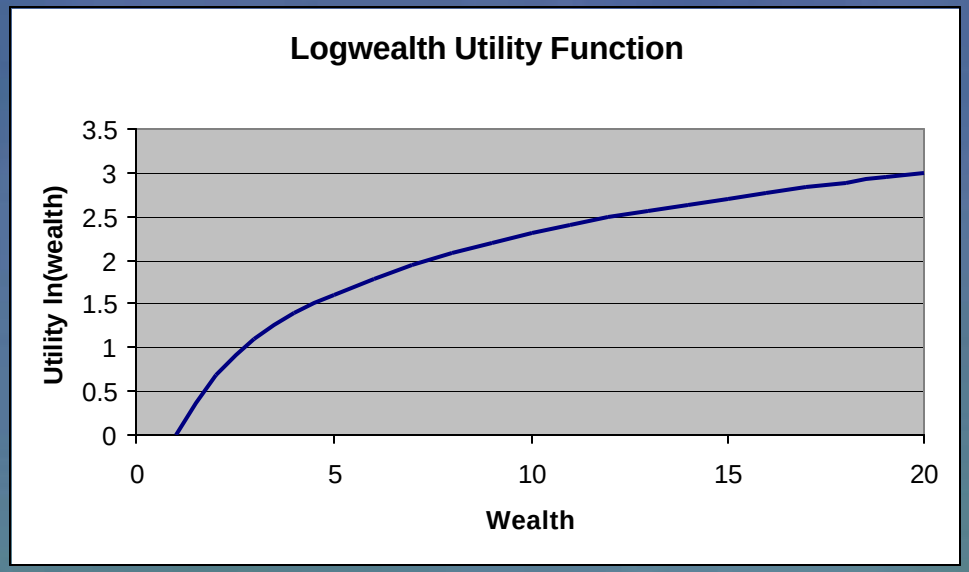
Results

Suppose investors care about utility



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Results

Mean-variance approximation to logwealth utility

$$U \approx \ln(1+m) - \frac{1/2\,s^2}{(1+m)^2}$$

where,

U = utility

ln = natural logarithm

m = arithmetic average of yearly returns of unranked portfolios

s = annualized standard deviation of unranked portfolios

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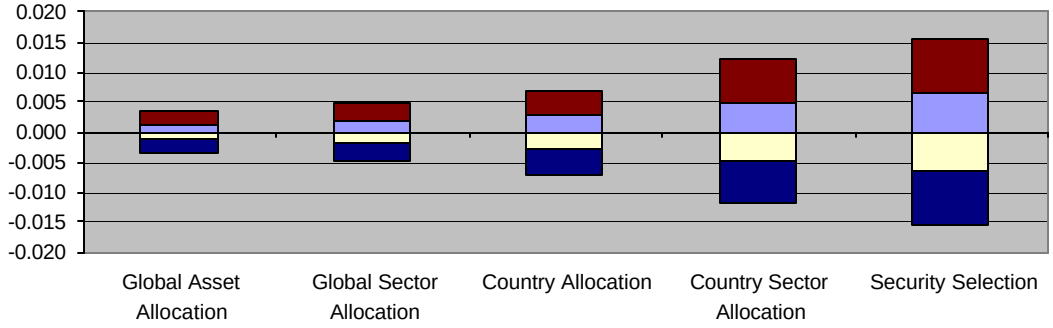
Results

Utility dispersion: global choices

Figure 3: Global Choices

5th, 25th, 75th and 95th Percentile Utility Over Horizon
Annualized Difference from Average (1987-2001)



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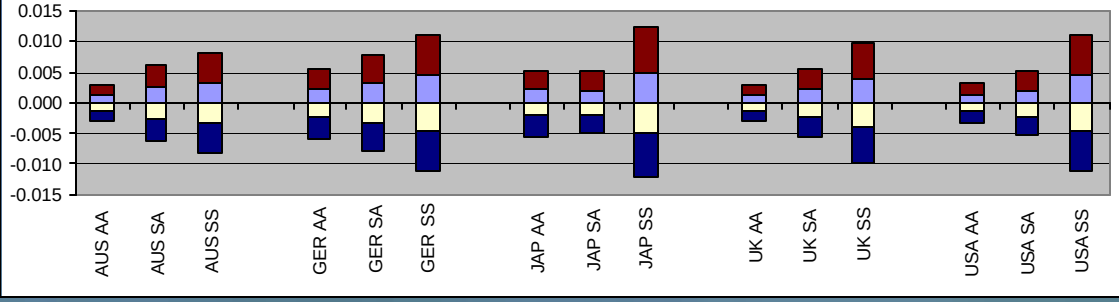
Results

Utility dispersion: country specific choices

Figure 4: Country Specific Choices

5th, 25th, 75th and 95th Percentile Utility Over Horizon
Annualized Difference from Average (1987-2001)



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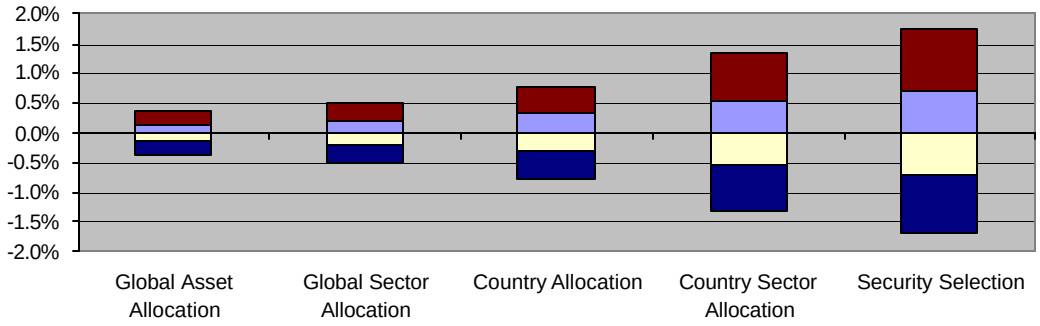
Results

What about global sectors?

Figure 1: Global Choices

5th, 25th, 75th and 95th Percentile Performance Over Horizon
Annualized Difference from Average (1987-2001)



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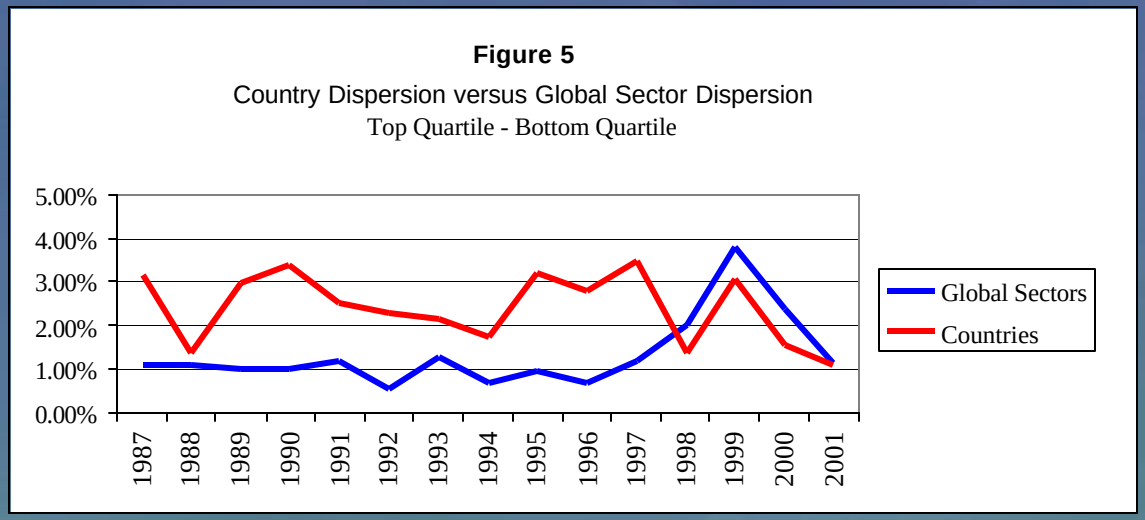
Results

Countries versus sectors: yearly



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Results

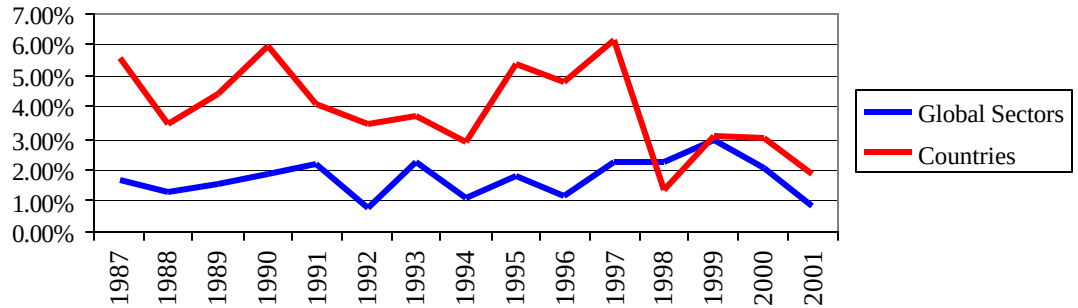
Countries versus sectors: yearly

Figure 6

Country Dispersion versus Global Sector Dispersion

Ex- Information Technology, Telecommunications, and Media

Top Quartile - Bottom Quartile



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Results

The value of an option to exchange average performance for good performance

$$EO = N(d_1) - N(d_2)$$

EO = value of exchange option

V_P = starting value of chosen percentile portfolio

V_M = starting value of median portfolio

N (.) = cumulative normal probability

$d_1 = (\ln(V_P / V_M) + \tfrac{1}{2} s_e^2 t) / (s_e \sqrt{t})$

ln = natural logarithm

s_e = relative volatility between V_P and V_M

t = time remaining to expiration as a fraction of a year

$d_2 = d_1 - s_e \sqrt{t}$

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Results

Option values for global choices

Global Choices Value of an Option to Exchange Median Performance for Top Quartile Performance	
Asset Allocation	0.47%
Country Allocation	1.20%
Global Sector Allocation	0.75%
Country Sector Allocation	1.35%
Security Selection	1.80%

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Results

Option values for country specific choices

Country Specific Choices Value of an Option to Exchange Median Performance for Top Quartile Performance					
	Australia	Germany	Japan	United Kingdom	United States
Asset Allocation	0.29%	0.72%	0.33%	0.47%	0.44%
Sector Allocation	0.77%	0.88%	1.42%	0.82%	0.52%
Security Selection	1.22%	1.47%	1.61%	1.50%	1.94%

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Results

Relative option values for global choices

Global Choices Relative Value of Exchange Options					
	Asset Allocation	Country Allocation	Global Sector Allocation	Country Sector Allocation	Security Selection
Asset Allocation	1.00	2.54	1.58	2.85	3.82
Country Allocation	0.39	1.00	0.62	1.12	1.50
Global Sector Allocation	0.63	1.61	1.00	1.81	2.42
Country Sector Allocation	0.35	0.89	0.55	1.00	1.34
Security Selection	0.26	0.67	0.41	0.75	1.00

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Results

Relative option values for country specific choices

Country Specific Choices Relative Value of Exchnage Options			
Australia			
	Asset Allocation	Sector Allocation	Security Selection
Asset Allocation	1.00	2.66	4.20
Sector Allocation	0.38	1.00	1.58
Security Selection	0.24	0.63	1.00
Germany			
	Asset Allocation	Sector Allocation	Security Selection
Asset Allocation	1.00	1.22	2.03
Sector Allocation	0.82	1.00	1.67
Security Selection	0.49	0.60	1.00
Japan			
	Asset Allocation	Sector Allocation	Security Selection
Asset Allocation	1.00	4.28	4.85
Sector Allocation	0.23	1.00	1.13
Security Selection	0.21	0.88	1.00
United Kingdom			
	Asset Allocation	Sector Allocation	Security Selection
Asset Allocation	1.00	1.74	3.19
Sector Allocation	0.57	1.00	1.83
Security Selection	0.31	0.55	1.00
United States			
	Asset Allocation	Sector Allocation	Security Selection
Asset Allocation	1.00	1.20	4.44
Sector Allocation	0.83	1.00	3.69
Security Selection	0.22	0.27	1.00

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Results

Skill required to justify active management: Global choices

Global Choices Expected Relative Return Necessary to Add 1.00% to Average Performance with 75% Confidence	
Asset Allocation	1.15%
Country Allocation	1.33%
Global Sector Allocation	1.21%
Country Sector Allocation	1.54%
Security Selection	1.71%

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Results

Skill required to justify active management: Country specific choices

Country Specific Choices Expected Relative Return Necessary to Add 1.00% to Average Performance with 75% Confidence					
	Australia	Germany	Japan	United Kingdom	United States
Asset Allocation	1.13%	1.24%	1.23%	1.13%	1.15%
Sector Allocation	1.28%	1.32%	1.26%	1.25%	1.24%
Security Selection	1.36%	1.46%	1.64%	1.44%	1.51%

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Key Results

- Security selection has the greatest potential to impact wealth and utility, while asset allocation has the least potential.
- Security selection skill is the most valuable, while asset allocation skill is the least valuable.
- The emergence of “global sectors” appears to be an artifact of the dot com bubble.
- Security selection requires the most skill to justify active management, while asset allocation requires the least skill.

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Conclusion

- Without specific knowledge of investor skill, the inescapable conclusion of our analysis is that most investors should focus on asset allocation, because it has the least potential for damage.
- However, it may be easier to succeed at some choices than at others.
  - Individual securities markets within countries may be efficiently arbitraged.
  - Country valuations may be less efficiently arbitraged owing to home biases and other sources of segmentation.
- Efficient allocation of investment resources, therefore, depends on both the hierarchy of investment choice and the likelihood of success.

The Hierarchy of Investment Choice: A Normative Interpretation

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The Hierarchy of Investment Choice: A Normative Interpretation

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Abstract

Which investment choice is most important? Is it the allocation among broad asset classes, country allocation, the choice of sectors, or the selection of individual securities? We argue that many investors have a false impression of the relative importance of these choices for two reasons. First, they typically fail to distinguish between the activities investors choose to emphasize and those with the greatest potential to influence investment results. Second, to the extent they measure the potential influence of an investment activity, they often base it on contrived portfolios that are unobtainable. We simulate thousands of realistic portfolios to determine the natural dispersion of performance arising from different investment activities, which enables us to evaluate the hierarchy of investment choice from a normative perspective.

The Hierarchy of Investment Choice: A Normative Interpretation

Introduction

Which investment choice is most important? Is it the allocation among broad asset classes, country allocation, the choice of sectors, or the selection of individual securities? We argue that many investors have a false impression of the relative importance of these choices for two reasons. First, they typically fail to distinguish between the activities investors choose to emphasize and those with the greatest potential to influence investment results. Second, to the extent investors measure the potential influence of an investment activity, they often base it on contrived portfolios that are unobtainable. We simulate thousands of realistic portfolios to determine the natural dispersion of performance arising from different investment activities, which enables us to evaluate the hierarchy of investment choice from a normative perspective.

We organize the paper as follows. We first discuss the rationale for using simulation to assess the relative importance of alternative investment activities. Next we describe the investment choices, our data, and our methodology, with emphasis on the precautions we take to guard against biases that could otherwise compromise the results. We then present our results in terms of return dispersion, utility dispersion and, based on option pricing theory, monetary value. We also compute the expected relative return for each investment choice that is necessary to increase average performance by 1.00% with 75% confidence. We conclude with a summary of our analysis.

We thank Brian Powers for his support in organizing the data.

The Rationale for Simulation

There are two widely cited methodologies used by previous researchers to measure the relative importance of investment choice, but both suffer from serious limitations. The first methodology employed by Brinson, Hood, and Beebower (1986) attributes the performance of actual funds to various investment choices. Their methodology measures which activities investors choose to emphasize rather than the relative importance of these activities. The second methodology, proposed by Heston and Rouwenhorst (1994) isolates the potential impact of investment exposures, but it is unlikely that investors could build portfolios that would capture these exposures as measured.

Brinson, Hood, and Beebower attribute the performance of 91 large corporate pension plans to three investment activities: policy, timing, and security selection. They define the policy return as the return of the long-term asset mix invested in passive asset class benchmarks. They then measure the return associated with deviations from the policy mix assuming investment in passive benchmarks and attribute this component of return to timing. Finally, they measure the return associated with deviations from the passive benchmarks within each asset class and attribute this component of return to security selection. For each of the 91 funds they regress total return through time on these respective components of return. These regressions reveal that asset allocation policy on average across the 91 funds accounts for 93.6% of total return variation through time and in no case less than 75.5%.

It is tempting to conclude from this study that asset mix policy is the most important investment choice, but this conclusion is not warranted. The Brinson, Hood, and Beebower study is positive. It reveals not what investors should or should not do, but rather what they choose to do. Our intent is to provide a normative evaluation of investment choice. Which choices *should* investors emphasize if they are skillful, or equivalently, which choices *should* they avoid if they lack skill? We are therefore interested in the potential impact of investment choice, irrespective of investment behavior.

Heston and Rouwenhorst introduce a methodology to measure the potential impact of country exposure and sector exposure. They use a two-factor model, which assumes a given stock has a unit exposure to its home country and its sector, and a zero exposure to all other countries and sectors. Their methodology produces a pure country portfolio that is sector-neutral and a pure sector portfolio that is country-neutral. Unlike Brinson, Hood, and Beebower, they control for investor behavior, by using available market returns rather than realized fund returns. However, their approach suffers from practical limitations (see Page and Van Royen, 2002). First, it rules out interaction effects with other countries and sectors. A chemical firm in Germany, for example, is assumed to have exposure only to the chemical industry and to its home country. Second, their methodology assumes exposures are equal for countries and sectors and fixed over time. Finally, it is doubtful that the pure country or sector portfolios resulting from their methodology are obtainable. Investment in a country index, for example, would encompass other exposures that would need to be offset in order to capture the pure country effect. Investment in a sector index would pose the same problem. We doubt investors would be able to buy and sell the securities required to isolate a

pure country or sector exposure. We use a bootstrapping simulation to overcome the limitations of both methodologies. We generate thousands of random portfolios that vary only along a single dimension, which represents a particular investment choice. We repeat the process for all investment choices under consideration. We generate these portfolios from a broad universe of available securities. Hence, unlike Brinson, Hood, and Beebower, we decompose the opportunity set of available returns rather than the realized returns of managed funds, which reflect the biases of their investors. And unlike Heston and Rouwenhorst, our methodology yields accessible portfolios that realistically capture time varying interaction effects.

Investment Choice, Data, and Methodology

We wish to analyze five types of global investment choices: asset allocation, country allocation, global sector allocation, country sector allocation, and security selection. These investment choices are relevant to investors who regard their investment universe as the developed world markets. We also analyze three investment choices within several developed market countries: asset allocation, sector allocation, and security selection. These investment choices are relevant to investors who manage domestically within a particular country. We recognize that some investors operate within broader regions such as the Euro zone, but it is easy to infer from the combination of our global analysis and individual country analyses how a regional analysis would turn out. Indeed, there are many other permutations we could consider, but we believe our analysis covers the preponderance of investment choices considered by most institutional investors. Table 1 lists the simulations we perform.

Table 1

Investment Choices

Global Choices	Country Specific Choices
Asset Allocation	Asset Allocation
Country Allocation	Sector Allocation
Global Sector Allocation	Security Selection
Country Sector Allocation	
Security Selection	

We construct the equity indexes to ensure internal consistency between a broader component and its constituents. We begin with annual total return and market capitalization data starting for the year 1987 and ending for the year 2001 for each security within the MSCI World Index. Next, based on the MSCI classification, we construct indexes for the following categories: sectors within countries, countries, global sectors, and world equity.[2] We rely on market capitalization data from Compustat to construct additive indexes.

[2] We use the term sector to refer to MSCI industries of which there are 23.

For example, the weight of State Street Corporation within the Diversified Financials sector equals State Street Corporation's market capitalization divided by the sum of the market capitalization of all firms in the Diversified Financials sector. In turn, the weight of the Diversified Financials sector within the United States equals the sum of the market capitalization of all firms in the Diversified Financials sector divided by the sum of the market capitalization of all firms within the United States. We use the same approach to build equity indexes from the individual security level up to the world index level. Therefore, the weighted sum of the returns of the constituents of any component equals the return of the component, as shown.

$$\sum_i \omega_i^{S} r_i^{S} \equiv \sum_j \omega_j^{CS} r_j^{CS} \equiv \sum_k \omega_k^{GS} r_k^{GS} \equiv \sum_l \omega_l^{C} r_l^{C} \equiv r^{w} \qquad (1)$$

where,

ω_i^{S} = weight of security i within the world index. There were 1512 securities as of July 2002

r_i^{S} = total return for security i

ω_j^{CS} = weight of country sector j within the world index. There are 23 industries and 23 countries, hence 529 possible country sectors.

r_j^{CS} = total return for country sector j.

ω_k^{GS} = weight of global sector k within the world index.

r_k^{GS} = total return for global sector k.

ω_l^{C} = weight of country l within the world index.

r_l^{C} = total return for country l.

r^{w} = total return for the world index.

Because we use only the currently available classification of the MSCI world index, we exclude securities that were present in earlier years but have since vanished; hence our sample suffers from survivorship bias as we simulate portfolios back in time. However, the effect of survivorship bias is less important to us than the imposition of internal consistency across indexes. In any event, the effect of survivorship bias is small. The correlation of our homemade world index with the MSCI published world index over the study period (1987-2001) is 98 percent, based on yearly returns. Table 2 lists the countries and sectors we use in our simulations.

Table 2	
Countries	**Sectors**
Australia	Autos & Components
Austria	Banks
Belgium	Capital Goods
Canada	Commercial Services & Supplies
Denmark	Consumer Durables & Apparel
Finland	Diversified Financials
France	Energy
Germany	Food Drug Retailing
Greece	Food Beverage Tobacco
Hong Kong	Healthcare Equipment & Services
Ireland	Hotels Restaurants Leisure
Italy	Household & Personal Products
Japan	Insurance
Netherlands	Materials
New Zealand	Media
Norway	Pharmaceuticals & Biotech
Portugal	Real Estate
Singapore	Retailing
Spain	Software & Services
Sweden	Technology Hardware & Equipment
Switzerland	Telecommunication Services
United Kingdom	Transportation
United States	Utilities

Our simulations also assume investment in bond and cash indexes, which are listed in Table 3.

Table 3 **Bond and Cash Total Return Indexes**
J. P. Morgan World Government Bond
J. P. Morgan World Cash (3 months)
J. P. Morgan Australia Government Bond
J. P. Morgan Australia Cash (3 months)
J. P. Morgan Germany Government Bond
J. P. Morgan Germany Cash (3 months)
J. P. Morgan Japan Government Bond
J. P. Morgan Japan Cash (3 months)
J. P. Morgan United States Government Bond
J. P. Morgan United States Cash (3 months)
J. P. Morgan United Kingdom Government Bond
J. P. Morgan United Kingdom Cash (3 months)

The government bond indexes consist of regularly traded, fixed rate, domestic government bonds. The cash indexes include euro-currency deposits with relatively constant maturities. The investor is assumed to roll over the deposits every day. We maintain the internal weights of these indexes for all of the simulations. Country, sector, and security variation occurs only within the equity component.

Methodology

We employ a bootstrapping methodology to determine the hierarchy of investment choice from a normative perspective. Bootstrapping is a procedure by which new samples are generated from an original data set by randomly selecting observations from that data set. It differs from Monte Carlo simulation in that it draws randomly from an empirical sample, whereas Monte Carlo simulation draws randomly from a theoretical distribution. This simulation procedure allows us to generate random portfolios, which represent the available opportunity set. Moreover, these portfolios are easy to implement, since they merely require investment in tradeable assets. Here is how we perform the simulations.

For the global asset allocation simulation, we randomly select 100 asset class returns with replacement 10,000 times from a sample that is weighted 60% stocks, 30% bonds, and 10% cash. We therefore generate 10,000 portfolios whose asset mixes vary randomly around an average asset mix of 60% stocks, 30% bonds, and 10% cash. The country weights of each asset class are fixed each year according to their relative capitalization within each asset class. Also, the sector and individual security weights of the equity component are fixed according to their relative capitalization. We repeat these procedures for each year beginning with 1987 and ending with 2001. Then we calculate the cumulative returns of the 10,000 portfolios and rank them. Therefore, variation in cumulative return arises purely from variation in asset mix.

For the country allocation simulation, we choose 100 country index returns with replacement 10,000 times from a sample of 23 developed market countries. When we select a return we also select its capitalization, so that we can scale the returns according to their relative capitalization within the equity component. As a result, the returns of the random portfolios vary symmetrically around the world index return. We hold constant the exposures to stocks, bonds, and cash at 60%, 30%, and 10%, so that this simulation is unbiased relative to the asset allocation simulation. Sector and individual security weights within each country are fixed according to their relative capitalization. Thus our simulated portfolios can be implemented with country-level index funds. This procedure generates 10,000 portfolios for each of 15 years that vary randomly by their country weights within the equity component. We then rank them by cumulative return.

For the simulation of global sector allocation, we randomly select 100 global sector returns with replacement 10,000 times from a sample of 23 global sectors. Again, when we select a return we also select its capitalization, so that we can scale the returns according to their relative capitalization within the equity component. The asset allocation remains constant at 60% stocks, 30% bonds, and 10% cash, and country and individual security weights within each global sector are fixed according

to their relative capitalization. Therefore, we randomly generate 10,000 portfolios each year that vary by their global sector weights within the equity component. Again we rank them by cumulative performance.

We perform the same simulation for country sectors with the exception that we choose randomly from a sample of country sectors rather than global sectors. Hence the number of sectors increases by a factor equal to the number of countries (23 x 23 = 529). Again, when we select a return we also select its capitalization in order to scale the returns according to their relative capitalization within the equity component. The country and sector weights vary according to the random selection of country sectors. The individual security weights within each country sector are fixed according to their relative capitalization. Therefore, we randomly generate 10,000 portfolios each year that vary by their country sector weights within the equity component, and we rank them by cumulative return.

For the security selection simulation we randomly choose 100 individual security returns with replacement 10,000 times from a global sample of 1,512 securities. Again, when we select a return we also select its capitalization in order to scale the returns according to their relative capitalization within the equity component. We hold constant the asset class exposures. The country and sector exposures vary according to the random selection of individual securities. We do this for each of 15 years and rank them by cumulative return.

For the country specific simulations, we repeat all of the global choice simulations except those for country allocation and country sector allocation. We perform these simulations for five developed market countries: Australia, Germany, Japan, the UK, and the USA.

Because when we select returns we scale them according to their relative capitalization, the expected returns of the randomly selected portfolios should correspond very closely to the relevant indexes' returns. Therefore, the dispersion of returns of the randomly selected portfolios represents the natural dispersion around the average performance of a particular investment choice, as opposed to the contrived dispersion of financially engineered portfolios. Next we present the results of the simulations.

Results

Dispersion in Return

We first show the dispersion of the annualized cumulative returns associated with various investment choices. Dispersion of return is important to skillful investors because it enables them to increase wealth beyond what they could expect to achieve from average performance. But dispersion of return is just as important to investors who are unskillful because it exposes them to losses that might arise as a consequence of bad luck.

Figure 1 shows the extent to which a talented investor (top 25% or 5%) could have improved upon average performance by engaging in various investment choices across a global universe. It also shows how far below average performance an unlucky investor (bottom 75% or 95%) could have performed depending on the choice of investment discretion. Contrary to received doctrine, dispersion around average

performance arising from security selection is substantially greater than dispersion around average performance arising from all other investment choices. Moreover, asset allocation, which is widely considered the most important investment choice, produces the least dispersion; thus, from a normative perspective it is the least important investment choice.

Figure 1: Global Choices

5th, 25th, 75th and 95th Percentile Performance Over Horizon

Annualized Difference from Average (1987-2001)

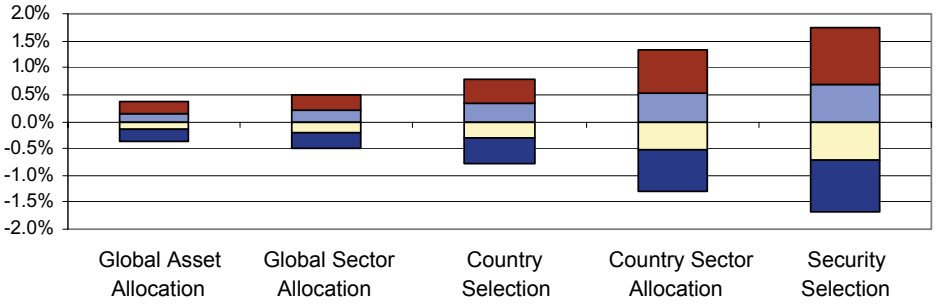
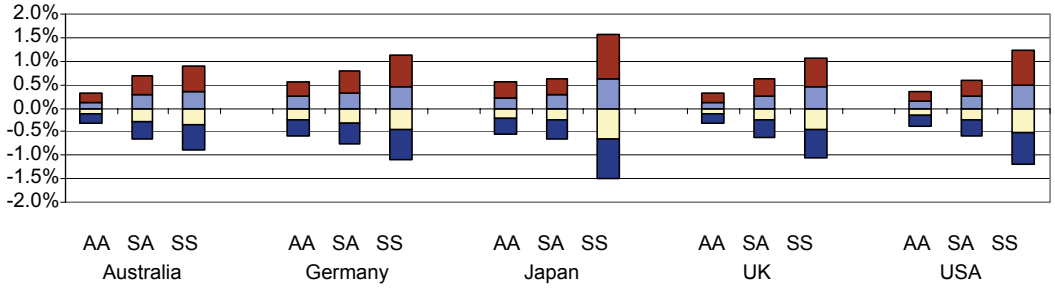


Figure 2 shows the return dispersion associated with investment choice for five developed market countries: Australia, Germany, Japan, the United Kingdom, and the United States. The same pattern prevails within each of these countries' markets.

Figure 2: Country Specific Choices

5th, 25th, 75th and 95th Percentile Performance Over Horizon

Annualized Difference from Average (1987-2001)



Dispersion in Utility

We recognize that return may not be an adequate measure of relative importance because it ignores risk. We address this concern by measuring the dispersion of utility, which encompasses both return and risk. Specifically, we use a mean-variance approximation of log-wealth utility, as shown.[3]

[3] A log wealth utility function assumes utility is equal to the logarithm of wealth, which implies that utility increases with wealth but at decreasing rate. It is one of a family of utility functions that assumes investors have constant relative risk aversion.

$$U = \ln(1+\mu) - \left[\frac{1/2\,\sigma^2}{(1+\mu)^2}\right] \qquad (2)$$

where,

U = utility

ln = natural logarithm

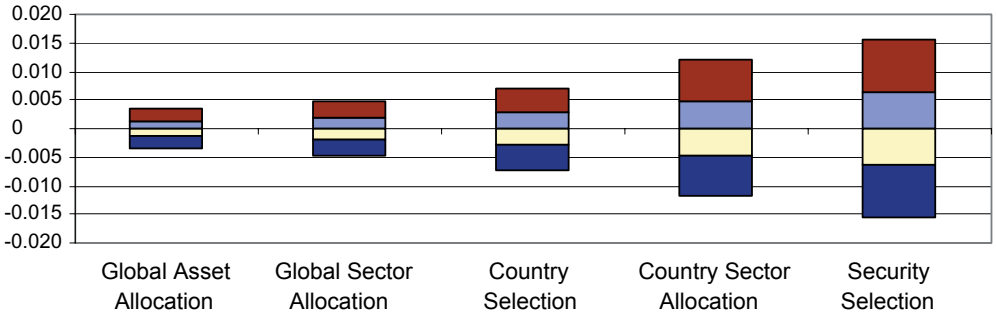
μ = arithmetic average of yearly returns of unranked portfolios

σ = annualized standard deviation of unranked portfolios

Figure 3 shows the dispersion of utility associated with global investment choice. In this case we rank the randomly generated portfolios by utility, which we estimate from the mean and variance of the yearly returns of the randomly generated portfolios. The dispersion of utility, as well as return, is much greater for those portfolios that vary by their security composition than for those portfolios that vary by other investment choices. Again, asset allocation produces the least dispersion.

Figure 3: Global Choices

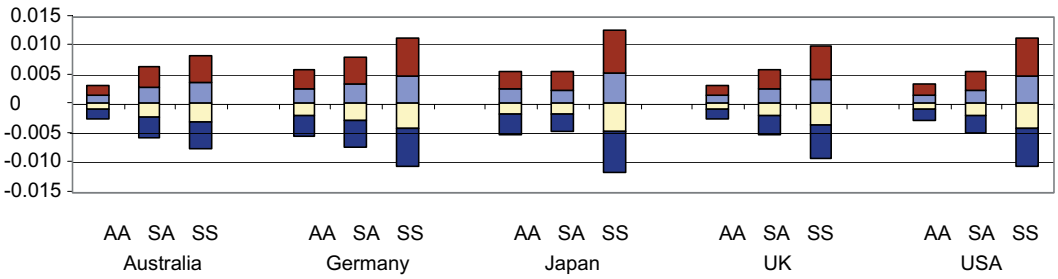
5th, 25th, 75th and 95th Percentile Utility Over Horizon
Annualized Difference from Average (1987-2001)



Next, we show the dispersion in utility associated with investment choice within five developed market countries. The only exception to the hierarchy of investment choice is within Japan. Asset allocation produces slightly more dispersion in utility than sector allocation.

Figure 4: Country Specific Choices

5th, 25th, 75th and 95th Percentile Utility Over Horizon
Annualized Difference from Average (1987-2001)



Countries versus Sectors

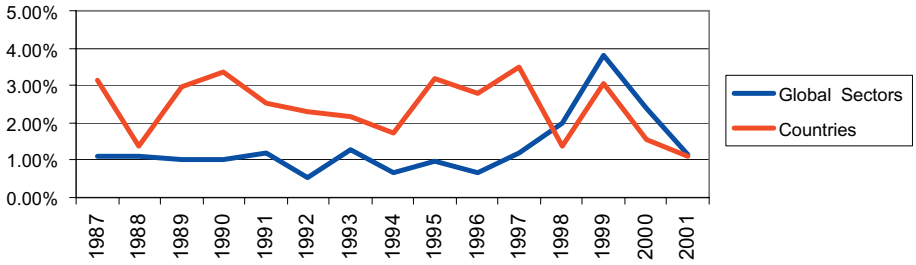
Most investors now believe that stratification by global sectors is more important than stratification by countries. This view is supported by several recent publications (Cavaglia, Brightman, and Aked, 2000, Hopkins and Miller, 2001, and Page and Van Royen, 2002). Our results suggest otherwise. We measure the dispersion (top quartile less bottom quartile) of return due to random country allocation and random global sector allocation year by year.

Figure 5 suggests that global sector allocation has grown in importance relative to country allocation, but it appears that this shift may be transitory. Dispersion associated with global sector allocation rose dramatically from 1996 through 2000 and then dropped sharply, which coincides with the Dot Com Bubble. Perhaps the apparent increase in the importance of global sector allocation is an artifact of the Dot Com bubble and therefore transitory? After all, for the year 2001 country allocation and global sector allocation produced about the same degree of return dispersion.

Figure 5

Country Dispersion versus Global Sector Dispersion

Top Quartile- BottomQuartile



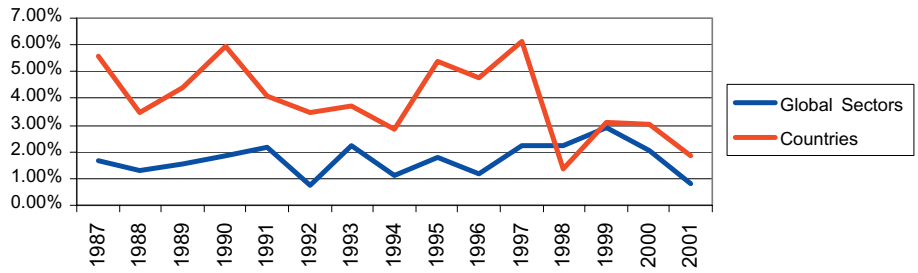
In Figure 6 we again compare return dispersion due to country allocation and global sector allocation, but this time without the "new economy" stocks, which we define as information technology, telecommunications, and media stocks. We exclude these stocks from both the sector indexes and country indexes to ensure that in both cases we use the same list of securities. Without these "new economy" stocks, both country and global sector allocation generate substantially less dispersion. Moreover, except for a single year (1998) dispersion associated with country allocation exceeds dispersion associated with global sector allocation. Those who argue that global sector allocation has emerged as a more important choice than country allocation, in our view, have yet to make their case.

Figure 6

Country Dispersion versus Global Sector Dispersion

Ex-Information Technology, Telecommunications, and Media

Top Quartile - Bottom Quartile



In general, dispersion is greater for those investment choices that include a larger number of assets. However, we do not observe equivalent dispersion for country allocation and global sector allocation, both of which include 23 assets, because dispersion is influenced by several factors. Holding constant other factors, dispersion rises with the number of assets and their average volatility, but it falls with the average correlation among the assets. This explains why asset allocation produces relatively low dispersion. The correlation across asset classes is not sufficiently low to offset the greater number of more volatile constituents within them. (See Kritzman and Page, 2001).

The Value of Investment Choice

Although our measures of dispersion clearly allow us to rank the relative importance of alternative investment activities, they do not readily yield an intuitive description of how much more or less important is one activity compared to another. We therefore measure the monetary value of skill associated with different investment activities by employing a variant of the Black-Scholes option-pricing model to value an exchange option (Margrabe, 1978).

The owner of an exchange option has the right to exchange one risky asset for another. In our case, we wish to determine the value of an option to exchange median performance associated with a particular activity for top quartile performance associated with the same activity. We value exchange options for each investment choice; thus we are able to compare the monetary value of skill associated with each activity.

Equation 3 gives the value of an exchange option, assuming income is reinvested and the starting portfolio values equal 1.00.

$$EO = N(d_1) - N(d_2) \tag{3}$$

where,

$$d_1 = \frac{\left[\ln\left(\frac{V_P}{V_M}\right) + 1/2\,\sigma\varepsilon^{\,2} t\right]}{\sigma\varepsilon\sqrt{t}}$$

$$d_2 = d_1 - \sigma\varepsilon\sqrt{t}$$

EO = value of exchange option

V_P = starting value of chosen percentile portfolio

V_M = starting value of median portfolio

$N(.)$ = cumulative normal probability

ln = natural logarithm

$\sigma\varepsilon$ = relative volatility between V_P and V_M

t = time remaining to expiration as a fraction of a year

Table 4 shows the option premiums, and therefore monetary value, associated with global investment choices, based on the relative volatility of the simulated yearly performance. For example, the value of an option to exchange median global asset allocation performance for top quartile global asset allocation performance equals 0.47% of the portfolio's asset value. The value of an option to acquire top quartile skill as a global security selector by comparison is worth 1.80%, almost four times as much!

Table 4
Global Choices
Value of an Option to Exchange Median Performance for Top Quartile Performance

Asset Allocation	0.47%
Country Allocation	1.20%
Global Sector Allocation	0.75%
Country Sector Allocation	1.35%
Security Selection	1.80%

Next, we show the monetary value associated with investment choices within five developed market countries.

In all countries, the option to acquire top quartile performance from security selection is more valuable than the option to acquire top quartile performance from asset allocation or sector allocation.

Table 5
Country Specific Choices
Value of an Option to Exchange Median Performance for Top Quartile Performance

	Australia	Germany	Japan	UK	US
Asset Allocation	0.29%	0.72%	0.33%	0.47%	0.44%
Sector Allocation	0.77%	0.88%	1.42%	0.82%	0.52%
Security Selection	1.22%	1.47%	1.61%	1.50%	1.94%

Table 6 presents an index of the hierarchy of global investment choice. The index values refer to the relative value of an option to exchange median performance for top quartile performance, assuming the activities for the columns are in the numerator. For example, top quartile skill an asset allocator is 0.39 times as valuable as top quartile skill as a country allocator, whereas top quartile skills as a security selector is 1.50 times as valuable as top quartile skill as a country allocator.

Table 6
Global Choices
Relative Value of Exchange Options

	Asset Allocation	Country Allocation	Global Allocation	Country Sector Allocation	Security Selection
Asset Allocation	1.00	2.54	1.58	2.85	3.82
Country Allocation	0.39	1.00	0.62	1.12	1.50
Global Sector Allocation	0.63	1.61	1.00	1.81	2.42
Country Sector Allocation	0.35	0.89	0.55	1.00	1.34
Security Selection	0.26	0.67	0.41	0.75	1.00

Table 7 presents an index of the hierarchy of investment choice within each of five developed market countries, again based on the comparative value of exchange options. The same pattern prevails with the exception of Japan. Security selection and sector allocation skill are about equally valuable, but both are significantly more valuable than skill as an asset allocator.

Table 7

Country Specific Choices

Relative Value of Exchnage Options

Australia			
	Asset Allocation	Sector Allocation	Security Selection
Asset Allocation	1.00	2.66	4.20
Sector Allocation	0.38	1.00	1.58
Security Selection	0.24	0.63	1.00
German			
	Asset Allocation	Sector Allocation	Security Selection
Asset Allocation	1.00	1.22	2.03
Sector Allocation	0.82	1.00	1.67
Security Selection	0.49	0.60	1.00
Japan			
	Asset Allocation	Sector Allocation	Security Selection
Asset Allocation	1.00	4.28	4.85
Sector Allocation	0.23	1.00	1.13
Security Selection	0.21	0.88	1.00
United Kingdom			
	Asset Allocation	Sector Allocation	Security Selection
Asset Allocation	1.00	1.74	3.19
Sector Allocation	0.57	1.00	1.83
Security Selection	0.31	0.55	1.00
United States			
	Asset Allocation 16	Sector Allocation	Security Selection
Asset Allocation	1.00	1.20	4.44
Sector Allocation	0.83	1.00	3.69
Security Selection	0.22	0.27	1.00

Skill Required to Justify Active Management

Thus far we have demonstrated that security selection is the most important investment choice because it has the greatest potential to impact performance. We have also demonstrated the opposite with respect to asset allocation. Moreover we have quantified the monetary value associated with various investment skills. However, we have yet to suggest which skills investors should emphasize and which they should avoid. The answer to this question depends on the amount of skill required to justify active management and the likelihood that an investor possesses the requisite skill.

Table 8 shows the expected incremental return necessary to add 100 basis points per year to the average return with 75% confidence. For example, an asset allocator should expect to outperform the average asset allocation portfolio by 1.15% per year in order to be 75% confident of adding 100 basis points to average performance. A security selector, by comparison, has a much higher hurdle. He or she should expect to outperform the average security selection portfolio by 1.71% in order to have the same confidence of adding 100 basis points annually. The investment choices for which skill is most highly valued are those that pose the highest hurdle to justify active management.

Table 8

Global Choices

Expected Relative Return Necessary to Add 1.00% to Average Performance with 75% Confidence

Asset Allocation	1.15%
Country Allocation	1.33%
Global Sector Allocation	1.21%
Country Sector Allocation	1.54%
Security Selection	1.71%

The same pattern prevails for country specific investment choice.

Table 9

Global Choices

Expected Relative Return Necessary to Add 1.00% to Average Performance with 75% Confidence

	Australia	Germany	Japan	UK	US
Asset Allocation	1.13%	1.24%	1.23%	1.13%	1.15%
Sector Allocation	1.28%	1.32%	1.26%	1.25%	1.24%
Security Selection	1.36%	1.47%	1.64%	1.44%	1.51%

Summary

Investors have a false impression of the relative importance of different investment activities, because they typically confuse the results investors have achieved through financial engineering with the natural opportunity set presented by the capital markets. And to the extent researchers attempt to measure the potential impact of different investment activities, they often base their results on contrived portfolios that are unobtainable.

We measure the hierarchy of investment choice by simulation. We generate thousands of unbiased random portfolios from millions of simulated investment choices that emphasize a particular activity while neutralizing the impact of other activities. We therefore determine the relative importance of investment activities from a normative perspective: which activities should investors emphasize if they are skillful, or equivalently, which should they avoid if they lack skill? We apply option pricing theory to determine the value of skill associated with different investment activities.

Our results challenge conventional wisdom. We show that asset allocation is the least important investment activity and that skill as an asset allocator is the least valuable skill to possess. In contrast, security selection is the most important investment choice, and skill as a security selector has the greatest value.

Although skill is more highly valued for activities that generate greater dispersion, investors should not engage in these riskier activities unless they expect to achieve a higher incremental return. Therefore, without specific knowledge of investor skill, the inescapable conclusion of our analysis is that most investors should focus on asset allocation, because it is the least demanding investment choice.

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