REITs and Diversification in a Retirement Withdrawal Portfolio

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Abstract

This study uses Monte Carlo simulation to examine the success of the monthly withdrawal of funds from portfolios consisting of U.S. large capitalization stocks, U.S. corporate bonds, and REITs. The objective of this research is to provide an empirical examination of the effect of diversification with REITs on the withdrawal of funds from a retirement portfolio. We compare portfolios consisting of large capitalization stocks and corporate bonds to portfolios consisting of large capitalization stocks, corporate bonds, and REITs. We examine both portfolio compositions using a variety of portfolio weights, fund withdrawal rates, and fund withdrawal periods. The results of the study indicate that, in general, portfolios with REITs had a greater likelihood of sustaining a given number of withdrawals over this time. The results of this study can be used for retirement planning since it provides a historical perspective on the success of various withdrawal rates. The results can also be used to determine the value of the portfolio an individual needs at retirement to fund a given level of withdrawals.

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I. Introduction

With the potential problems surrounding Social Security funding, and the decline of defined benefit retirement plans, more individuals are saving on their own for retirement. Unlike Social Security or defined benefit plans, defined contribution plans make the individual responsible for their own retirement planning. This means more individuals will face the inevitable decisions: When can I retire? And, how much can I withdraw from my retirement savings without depleting my retirement account?

The decision of when to retire is critical to retirement spending. After retirement, most individuals have little earned income. It is often also difficult to re-enter the work force at a salary comparable to the salary earned before retirement. With qualified retirement plans, this decision is even more important. In a qualified retirement plan, assets grow tax-deferred. By delaying retirement, assets in a retirement plan can grow even further to better fund an individual's retirement and reduce the possibility of outliving one's retirement savings. By waiting to delay distributions, an individual can increase the size of their nest egg, or possibly increase retirement withdrawals.

At a given level of return, a higher withdrawal rate increases the likelihood the individual will exhaust retirement savings prematurely. A lower withdrawal rate increases the likelihood the retirement savings will last, but decreases spending in retirement. Most

retirees prefer a larger withdrawal since it provides a greater opportunity for enjoyment of one's golden years.

One area of portfolio diversification that has not been examined is the effect of REITs in a withdrawal portfolio. Modern portfolio theory suggests that diversification should improve portfolio performance. This study examines whether diversification with REITs improves the ability of a portfolio to support the withdrawal of funds from the portfolio. Our results indicate that the inclusion of REITs does increase the ability of a portfolio to support fund withdrawals.

One reason that REITs may benefit a portfolio consisting of stocks is the addition of greater dividends. With higher dividends, each withdrawal will invade less into the principal of the portfolio. For the period 1972 to 2005, REITs had an average monthly income yield of 0.74 percent, almost three times higher than the stock dividend yield of 0.27 percent. Additionally, REITs may add dividend diversification. The correlation between the REIT income yield and stock dividend yield over the same period was –.048.

Although our results generally indicate that a higher of percentage of stocks and REITS in a portfolio translates to a greater success rate for fund withdrawals, individual consumption and risk tolerance is still an important consideration. Our results are an attempt to provide an additional piece of information (beyond just expected return) that may shape the investors risk-return preferences. While the models of Markowitz (1952), Sharpe (1964) and Lintner (1965), among others, rely on expected returns and market risk as the critical information for the investor. However, for investors planning for retirement, it is possible that success rates can be equally as informative with respect to portfolio selection.

The remainder of the paper is organized as follows. The next section reviews the relevant literature. Section III describes our data and analysis; Section IV presents the empirical results; and Section V concludes the paper.

II. Literature Review

Cooley, Hubbard, and Walz (1998, 1999, 2001) have examined the effects on diversification on sustainable withdrawal rates. Using historic market returns, they find that a six to seven percent withdrawal rate appears sustainable for most periods if the portfolio is composed of at least 50 percent equity. If the equity portfolio weight drops below 50 percent, the portfolio withdrawals did not consistently last for 15 years. Their research shows the importance of a diversified portfolio in funding retirement withdrawals. For many withdrawal rates and periods, a portfolio of stocks and bonds has a greater likelihood of successfully funding retirement withdrawals compared to a portfolio consisting of only stocks or a portfolio consisting of only bonds.

Ervin, Filer, and Smolira (2004) examine the question of international diversification in withdrawal portfolios. They use the overlapping period approach to examine portfolios consisting of large capitalization stocks, corporate bonds, and the S&P/IFC Composite Global Index for the period January 1930 to December 2001. They find conflicting evidence for the diversification benefits of international equities. For the entire period, the inclusion of international equities decreases the ability of a portfolio to support withdrawals. However, over the latter part of the sample, the portfolios containing international equities often had a larger terminal value.

Cooley, Hubbard, and Walz (2003) examine the differences in success rates between the overlapping period and Monte Carlo simulation analysis. Using historical

returns for large capitalization stocks and corporate bonds for the 1946-2001 period, they find that in general, both methodologies produce similar success rates. The difference between the methodologies occurs when the withdrawal period is long. When examining a 30-year withdrawal length for this period, there are only 27 overlapping periods in their data, and none of the periods are independent of each other. They suggest that a Monte Carlo simulation may be a better alternative to the overlapping period method because of the limited number of historic returns available.

Although previous research has found diversification benefits using stocks and bonds in a withdrawal portfolio, previous research on the value of REITS in a diversified portfolio has not reached a consensus. For example, Paladino and Herbert (1995) examine the correlation between the returns of the NAREIT index and both the S&P 500 and Russell 2000 indices. Their results indicate a high positive correlation between REIT returns and major stock indices. They conclude that REITs do little to diversify a stock portfolio.

Glascock, Lu, and So (2000) use cointegration analysis to examine REITs, stocks, and bonds for the 1972-1996 period. They find that prior to 1992, REITs are cointegrated with the bond market and are not cointegrated with common stocks. After 1992, they observe that REITs are cointegrated with the stock market. They also find that REITs are cointegrated with inflation during the first period, but not the second period. As a result, they conclude that REITs have become more stock-like in their behavior, and thus may provide less of a diversification benefit.

Other research has found that the correlation between REITs and other asset classes has changed over time. For example, Ghosh, Miles, and Sirman (1996) examine the

correlation of REITs with different stock indices over the 1985-1996 period. They find that when they subdivide the entire period into 4 three-year periods, the correlation between REITs and both large capitalization and small capitalization stocks declines. This suggests that REITs have become a more valuable asset class for diversification.

Similarly, Clayton and MacKinnon (2001) examine the correlations of REITs with stocks and bonds over the 1978-1998 period. They find that the correlation of REITs with other asset classes has changed over time. Their findings are consistent with the growth and maturation of the REIT market. They conclude that after 1992, REITs have become more highly integrated with the unsecuritized property market. This implies REITs can benefit a diversified portfolio.

Lee and Stevenson (2005) examine the diversification benefits of REITs using returns from 1980-2000. They find that the addition of REITs benefits a mixed portfolio, with substantial REIT allocations in efficient portfolios. Their findings also indicate that the benefits of REITs in a diversified portfolio increases for longer holding periods. The increased performance of a diversified portfolio including REITs is due to both increased return as well as reduced risk.

Glascock, Lu, and So (2002) examine the relationship between REIT returns and inflation. Previous research (e.g. Hartzell, Heckman, and Miles, 1987; Titman and Warga, 1989; Chan, Hendershott, and Sanders, 1990, Liu, Hartzell, and Hoesli, 1997) find that there is a negative relationship between REIT returns and inflation. Glasscock, Lu, and So (2002) further examine this question and find that this is the result of the causality between changes in the Federal Funds Rate and inflation. Since they find no causality between changes in the Federal Funds Rate and REIT returns, they conclude that the negative

relationship between REIT returns and inflation is partially derived from the relationship between monetary policy and inflation. They conclude that REITs can be a useful hedge for inflation in a mixed asset portfolio.

Modern portfolio theory proposed by Markowitz (1952) suggests assets which are less than perfectly correlated can reduce the risk of a portfolio without a commensurate loss of return. To date, research on withdrawal portfolios has focused on the diversification effects of U.S. equities, U.S. corporate bonds, and international equities. Given that U.S. equities, corporate bonds, and REITs are less than perfectly correlated, we would expect that the addition of REITs to a withdrawal portfolio should increase the success rate of the portfolio. We extend previous research by examining the effect of REITs on the success of a withdrawal portfolio using Monte Carlo simulation.

III. Data and Analysis

We gathered monthly returns from January 1972 to December 2005 and calculated the mean, standard deviation, and correlation between each of our series. Large capitalization stock and corporate bonds returns were gathered from Ibbotson's *Stocks, Bonds, Bills, and Inflation 2006 Yearbook*. The REIT returns were calculated using the National Association of Real Estate Investment Trusts (NAREIT) Index.

Because of the relatively short history of REIT returns, we use the moments of these historical series to create 10,000 simulated series with the same means, standard deviations, skewness, kurtosis, and correlations of the historical series. Each of the simulated series is comparable to the historical series, but allows us to have both a more observations as well as a longer series of observations.

We use these index returns to construct portfolios to analyze fund withdrawal rates. The basic portfolios are large capitalization U.S. stocks (which represents the S&P 500) and long-term, high-grade U.S. corporate bonds. We examine portfolios with equity weights of 100, 80, 60, 40, 20, and zero percent. The remainder of the portfolio is invested in the bond index.

As our results will show, a portfolio consisting of 80 percent large capitalization stocks and 20 percent corporate bonds generally provides the highest success rate, especially for larger withdrawal rates. To examine the effect of REITs on the success of withdrawals, we begin with a basic portfolio of 80 percent stocks and 20 percent bonds then include REITs in varying portfolio weights. The portfolio weights we examine are 72%/18%/10%, 64%/16%/20%, and 56%/14%/30%, large capitalization stocks/corporate bonds/REITs, respectively. In view of the different retirement life expectancies of retirees, we examine payout periods of 15, 20, 25, and 30 years.

We begin each period with a hypothetical $1,000,000 portfolio[1]. We use fund withdrawal rates from 4 percent to 12 percent per year. We make monthly withdrawals. For example, with a 6 percent withdrawal rate, the annual withdrawal is $60,000 per year, which is withdrawn as $5,000 each month. The withdrawal is considered a success if the portfolio never has a value less than zero. We then calculate the success rate as the number of successful portfolios divided by the number of portfolios with the same withdrawal length and asset weights. We used the 10,000 simulated returns for each combination of portfolio weight, withdrawal rate, and payout period.

[1] Although we begin with an arbitrary amount of $1,000,000, the sustainable withdrawal rate is the same for any beginning portfolio value since we are concerned with a percentage withdrawal.

This method of withdrawal implicitly assumes portfolio rebalancing each month. We do not include rebalancing costs in our analysis. While transaction costs of rebalancing could have potentially been large in the past, current retirees can rebalance at a very low cost by using no-load index mutual funds or exchange-traded funds (ETFs). Taxes on portfolio gains are not considered. If the portfolio is held in a tax-deferred vehicle such as an IRA or 401k, taxes on the gains can be ignored since they are not paid until withdrawal. While taxes on withdrawals must be paid, we have not included taxes in our analysis. For our purposes, the withdrawals are pretax.

IV. Results

Table 1, Panel A presents the correlations between the different asset classes, as well as the summary statistics for each asset class over the 1972-2005 period. The correlation between large capitalization stocks and corporate bonds was the lowest correlation over this period at 0.30. The correlation between corporate bonds and REITs was 0.33, while the correlation between large capitalization stocks and REITs was 0.53. Each of these three asset classes had a negative correlation with inflation.

The summary statistics presented in Panel A show several interesting results. First, large capitalization stocks had a negative skewness over this period. In comparison, Panel B of Table 1 presents the summary statistics for large capitalization stocks, long-term corporate bonds, and inflation over the period 1926-2005. During the longer period, large capitalization stocks exhibited a positive skewness. In fact, from 1972-2005, large capitalization stocks, long-term corporate bonds, and inflation all exhibited less positive skewness than from 1926-2005. The changing dynamics of the different return

distributions also appears in the kurtosis of the distributions. The kurtosis of each series is significantly less over the 1972-2005 period than over the 1926-2005 period.

<<INSERT TABLE 1 ABOUT HERE>>

A major difference between the longer and shorter periods is the long-term corporate bond returns. The past 30 years have seen a bull market for bonds. This is borne out by the monthly return for long-term corporate bonds. Over the 1972-2005 period, the average monthly return for long-term corporate bonds was 0.75 percent, which represents an annual return of over 9 percent. Conversely, the long-term corporate bond monthly return over the 1926-2005 period was 0.49%, which is an annual return of about 6 percent.

The large difference in the moments of the return series is somewhat problematic. If the bull market in long-term corporate bonds continues, a withdraw portfolio consisting of 100 percent long-term corporate bonds will support withdrawals with a relatively high success rate.

The decades of 1970s, 1980s, and 1990s have seen the largest returns for corporate bonds over the past eight decades. In part, the high bond returns were driven by the 13.02 percent annual bond return during the 1980s. These bond returns are the result of the decline in interest rates, which is not sustainable since interest rates cannot be negative. Because of this, we feel the bull market in bonds is not sustainable for the long term.

One advantage of a Monte Carlo simulation is that the parameters of the return series can be altered, allowing for sensitivity testing. While we examined the success rates using the return distributions from 1972-2005, we do not feel the results can be extended to a more general conclusion. Since the returns for REITs are not available prior to 1972, we first used a Monte Carlo simulation using the moments for the return series for the 1972-

2005 period. [2] Next, we used the moments for large capitalization stocks and long-term corporate bonds for the period 1926-2005. These return distributions are used with the correlations and return distribution for REITs we estimated for the 1972-2005 period.

Large Capitalization Stock and Corporate Bond Portfolios

Table 2 presents our results with nominal withdrawals for portfolios consisting of large capitalization stocks and corporate bonds. Consistent with previous research, for relatively low withdrawal rates, a portfolio consisting of a large portion of bonds has the highest success rate of supporting withdrawal portfolios. When the withdrawal rate or withdrawal period is increased, a portfolio more heavily weighted toward stocks performs better.

The results of this table show why the results using the return series from 1972-2005 overstate the success rates for bond portfolios. For example, with a 12 percent withdrawal rate a 15 year withdrawal period, Table 2 shows that the success rate of a portfolio consisting of 100 percent long-term corporate bonds is 7.5 percent. Our results using the 1972-2005 long-term corporate bonds indicate a success rate of 46.2 percent. This shows effect of the bull market for bonds during the last 30 years on a withdrawal portfolio. Since we do not feel the bull market for bonds is sustainable, using the returns series for long-term corporate bonds for the 1972-2005 period overstates the success rates an investor would experience going forward.

<<INSERT TABLE 2 ABOUT HERE>>

This importance of diversification is clearly shown in Table 2, especially for moderate withdrawal amounts. An 8 percent withdrawal for 20 years has a success rate of

[2] The results using the returns from 1972-2005 are included in the Appendix.

91.2 percent for a 100 percent equity portfolio. The success rate increases to 93.5 percent when the portfolio consists of 20 percent corporate bonds and 95.7 percent when the portfolio consists of 40 percent corporate bonds. For withdrawal rates from 5 to 10 percent per year, a portfolio of 80 percent stocks and 20 percent bonds has a greater success rate than a 100 percent stock portfolio. Using these same withdrawal rates, a portfolio with 80 percent stock /20 percent bond weights has a higher success rate than a portfolio with 60 percent stock /40 percent bond weights for the longer withdrawal periods. For shorter withdrawal periods, the 60 percent stock / 40 percent bond portfolio has a slightly higher success rate.

In general, for a low withdrawal rate, a portfolio invested more heavily in bonds has a higher success rate. As the withdrawal rate is increased, a greater percentage investment in stocks is necessary to achieve a higher success rate. Because of the nature of this relationship, an optimum portfolio weight depends in large part on individual risk preference and tolerance. Given this, there are numerous possible portfolio combinations we could examine when including REITs in the portfolio. Because of the success rate for a portfolio heavily invested in stocks for higher withdrawal rates and longer withdrawal periods, we will examine a base portfolio of 80 percent stocks / 20 percent bonds. REITs are added to this base portfolio with different portfolio weights.

Large Capitalization Stock, Corporate Bond, and REIT Portfolios

Table 3 presents the results for a base investment portfolio that consists of 80 percent stocks and 20 percent corporate bonds. We then introduce REITs to this portfolio in different weights. The addition of REITs improves the ability of the portfolio to support withdrawals. For example, if we examine a 12 percent withdrawal for 15 years, the

stock/bond portfolio has a success rate of 59.1 percent. If 30 percent of the portfolio weight consists of REITs, the success rate increases to 62.4 percent.

<<INSERT TABLE 3 ABOUT HERE>>

One of the most surprising results from adding REITs to the portfolio is the improved success rate of the withdrawals as more REITs are added to the portfolio. Although the increase in success rate is sometimes marginal, for every withdrawal rate and withdrawal period, we find that as we increase the weight of REITs in the portfolio, the success rate never decreases, and usually increases.

Even using the return distribution for the 1926-2005 period, there is evidence of the benefits of diversification with long-term corporate bonds. When we examine moderate withdrawal rates of 6 to 8 percent and withdrawal periods less than 20 years, the inclusion of 20 to 40 percent long-term corporate bonds increases the success rate of withdrawals. For longer periods and higher withdrawal rates, the success rate drops when long-term corporate bonds are added to the all-equity portfolio.

When we add REITs to the withdrawal portfolio, the success rate of the withdrawal portfolio increases even further. Table 5 shows the results for portfolios constructed from large capitalization stocks and long-term corporate bond return distributions from 1926-2005, and the REIT return distribution from 1972-2005. For withdrawal rates less than 10 percent, the inclusion of REITs increases the success rate of the withdrawal portfolio. Although the success rate increases as the weight of REITs in the portfolio increases from 10 percent to 20 percent to 30 percent, the largest jump occurs when the portfolio weight of REITs increases from 10 to 20 percent. This increase in the portfolio weight of REITs increases the success rate of the withdrawal portfolio by 1 to 3 percent depending on the

withdrawal rate and withdrawal period. Increasing the portfolio weight of REITs from 20 to 30 percent also generally increases the success rate of the withdrawal portfolio, although the increase in the success rate is often only about 0.5 percent.

Varying Correlation

One of the factors that will influence the success rates for the portfolios is the correlation between the assets of the portfolio. Previous research has indicated that the correlations between the asset classes used vary through time. The initial Monte Carlo distributions were created using the correlations between the assets over the entire 1972-2005 period. To examine how varying correlation affects our results, we examined the results for different correlations.

To determine the appropriate correlations, we calculated the 60 month correlation between large capitalization stocks, long-term corporate bonds, REITs, and inflation on a rolling basis for the period 1972-2005. On other words, we calculated the correlations using returns between January 1972 and December 1976. We then calculated the correlations between February 1972 and January 1977. This resulted in 350 correlations. We then used the 90^{th} percentile correlations and the 10^{th} percentile correlations and re-estimated the return series. These results are presented in the Appendix. Our findings indicate that there is very little change in the success rates for specific portfolios. In most cases, the success rate for the 90^{th} percentile correlations decreases by 1 to 2 percent, while the 10^{th} percentile correlations increase the success rates by 1 to 2 percent.

Real Withdrawals

We next examined the ability of each portfolio to support real withdrawals. For the real withdrawals, each withdrawal was increased by the contemporaneous monthly

inflation rate. Table 4 shows the results for real withdrawals and a portfolio of large capitalization stocks and long-term corporate bonds. As expected, the success rates drop dramatically, especially for high withdrawal rates and long withdrawal periods. For example, a portfolio consisting of 80 percent stocks / 20 percent bonds successfully supports a 10 percent withdrawal rate 53.8 percent of the time for nominal withdrawals. With real withdrawals the success rate falls to 24.2 percent.

<<INSERT TABLE 4 ABOUT HERE>>

Even with real withdrawals, for moderate withdrawal rates and longer withdrawal periods, a diversified portfolio consisting of 80 percent stocks / 20 percent bonds tends to have the highest success rates. For lower withdrawal rates and shorter withdrawal periods, a portfolio consisting of a greater percentage of bonds supports the withdrawal portfolio.

In Table 5, we show the success rates for real withdrawals for the base portfolio of 80 percent stocks / 20 percent bonds with varying portfolio weights for REITs. As with nominal withdrawals, we find that adding 10 percent REITs to the portfolio increases the success rate of the portfolio by 1 to 2 percent. Adding more REITs further increases the success rate of the withdrawal portfolio, but the success rate appears to increase at a decreasing rate.

<<INSERT TABLE 5 ABOUT HERE>>

REITs do not appear to provide an effective inflation hedge in a withdrawal portfolio. For example, consider a 9 percent withdrawal rate for 24 years. The nominal results indicate a success rate of 70.4 percent. In a portfolio of 64 percent stocks / 16 percent bonds / 20 percent REITs, the success rate is 74.0 percent, an increase of 3.6 percent. Using real withdrawals, the success rate for the 80 stock / 20 percent bond

portfolio is 40.3 percent, and the success rate for the 64 percent stocks / 16 percent bonds / 20 percent REIT portfolio is 41.6 percent, and increase of only 1.3 percent. While the introduction of REITs still increases the success rate for real withdrawals, the increased success rate is not as large.

V. Conclusions

Using Monte Carlo simulation and returns from January 1926 through December 2005, we examine the probability a retirement portfolio will last for different fund withdrawal periods and different fund withdrawal percentages. Two portfolio constructions are examined: Portfolios of U.S. large capitalization stocks and U.S. corporate bonds, and portfolios with REITs, U.S. large capitalization stocks, and U.S. corporate bonds. We examine each of these portfolios for varying weights of each asset for different withdrawal rates and different withdrawal lengths.

The results of the study indicate that for a domestic portfolio consisting of at least 60 percent U.S. stocks, and a nominal withdrawal rate of 6 to 7 percent is generally sustainable for a period as long as thirty years. A portfolio consisting of 80 percent U.S equities is preferable for higher withdrawal rates. The addition of REITs to the withdrawal portfolio increases the success rate of the portfolios. In fact, a portfolio consisting of 20 or 30 percent REITs provides the best success rates for many of the withdrawal rates and lengths examined, although the increase in the portfolio weight of REITs from 20 to 30 percent appears to provide only marginal benefit. For most withdrawal rates and withdrawal periods, a portfolio consisting of 64 percent equity, 16 percent long-term corporate bonds, and 20 percent REITs appears to provide the highest success rate. Additionally, we find that while the inclusion of REITs in a withdrawal portfolio increases

the success rate for both nominal and real withdrawals, the increased success rate is lower for real withdrawals. Thus, the potential inflation hedge provided by REITs is relatively low for a withdrawal portfolio.

The withdrawal rate of funds is ultimately a decision for the individual based on consumption and risk tolerance. This research improves our understanding of what withdrawal rate an individual can choose and still have confidence they will not outlive their retirement portfolio. Additionally, we find evidence that the introduction of REITs in a withdrawal portfolio reduces the shortfall risk, that is, the risk of the withdrawing too much and eliminating the entire portfolio value. An understanding of the success of different withdrawal rates is also critical to the decision of when an individual should retire. By estimating the amount needed in retirement, an individual can choose a withdrawal rate, and then calculate the amount of funds needed at retirement.

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Table 1
Panel A

Panel A shows the correlation between each asset class for the 1972 to 2005 period and the summary statistics for each asset class over this period. The statistics are calculated using monthly returns.

	Equity	Bonds	Inflation	REIT
Equity	1.00	0.30	–0.158	0.53
Bond		1.00	–0.160	0.33
Inflation			1.00	–0.16
REIT				1.00

	Mean	Std. Dev.	Skewness	Kurtosis
Equity	0.99%	4.42%	–0.3606	2.1148
Bond	0.75%	2.66%	0.2565	3.0425
Inflation	0.39%	0.35%	0.6029	1.0741
REIT	0.94%	4.43%	0.1037	6.4916

Panel B

Panel B shows the summary statistics for large capitalization stocks, long-term corporate bonds, and inflation over the period 1926 to 2005. The statistics are calculated using monthly returns.

	Mean	Std. Dev.	Skewness	Kurtosis
Equity	1.06%	5.55%	0.4039	9.8395
Bond	0.49%	2.03%	0.3624	6.4027
Inflation	0.26%	0.53%	1.2273	15.3948

Table 2

Table 2 presents the success rates for portfolios constructed of U.S. large capitalization stocks and corporate bonds. Withdrawals are in nominal terms. For equities and corporate bonds, the average return used is the average return from 1926-2005.

100% Equities

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.7%	99.1%	97.8%	95.3%	91.2%	85.6%	78.5%	70.1%	61.6%
20 Years	99.3%	97.8%	95.3%	90.8%	84.4%	76.9%	68.1%	58.9%	49.7%
25 Years	98.8%	96.7%	93.1%	87.1%	79.8%	71.4%	62.2%	52.5%	43.3%
30 Years	98.3%	95.9%	91.2%	84.8%	76.8%	68.1%	58.6%	48.7%	40.0%

80% Equities and 20% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100.%	99.6%	98.9%	97.0%	93.5%	87.6%	79.5%	69.5%	59.1%
20 Years	99.7%	99.1%	97.0%	92.8%	86.4%	77.4%	66.5%	55.3%	43.7%
25 Years	99.5%	98.0%	95.0%	89.0%	80.5%	70.4%	58.5%	46.6%	36.2%
30 Years	99.3%	97.2%	93.1%	86.2%	76.9%	65.8%	53.8%	42.5%	32.3%

60% Equities and 40% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.9%	99.6%	98.5%	95.7%	89.3%	79.6%	66.9%	52.4%
20 Years	99.9%	99.6%	98.2%	94.6%	87.1%	76.3%	61.8%	46.9%	33.4%
25 Years	99.8%	99.1%	96.3%	90.2%	80.0%	66.4%	50.7%	36.7%	25.0%
30 Years	99.6%	98.5%	94.7%	86.5%	74.6%	59.5%	44.4%	31.2%	20.6%

40% Equities and 60% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.9%	99.3%	96.7%	90.0%	77.3%	59.2%	40.7%
20 Years	100%	99.8%	99.2%	95.5%	86.7%	70.9%	50.8%	32.7%	18.8%
25 Years	99.9%	99.5%	97.2%	89.8%	75.5%	55.3%	36.0%	20.9%	10.8%
30 Years	99.9%	99.1%	94.8%	84.8%	67.0%	46.1%	28.0%	15.3%	7.6%

20% Equities and 80% Corporate Bonds

Start Hear	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	100%	99.6%	97.0%	87.8%	67.7%	42.7%	21.9%
20 Years	100%	99.9%	99.2%	94.7%	80.5%	56.2%	31.0%	13.7%	5.2%
25 Years	100%	99.6%	96.6%	84.7%	64.1%	34.2%	15.4%	5.8%	1.7%
30 Years	99.9%	99.0%	92.4%	74.3%	47.0%	23.1%	9.3%	3.1%	0.8%

100% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.9%	98.9%	92.7%	74.0%	46.3%	21.2%	7.5%
20 Years	100%	99.9%	97.8%	85.9%	60.3%	30.6%	11.5%	3.1%	0.7%
25 Years	99.9%	98.7%	89.3%	64.5%	32.6%	12.0%	3.2%	0.8%	0.2%
30 Years	99.8%	95.7%	78.0%	46.2%	18.5%	5.8%	1.3%	0.3%	0%

Table 3

Table 3 presents the success rates for portfolios constructed of U.S. large capitalization stocks, corporate bonds, and REITs. Withdrawals are in nominal terms. For equities and corporate bonds, the average return used is the average return from 1926-2005.

72% Equities, 18% Corporate Bonds, and 10% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.8%	99.3%	97.6%	94.6%	89.2%	81.4%	71.2%	60.4%
20 Years	99.8%	99.3%	97.6%	94.0%	87.9%	79.2%	68.5%	56.7%	44.4%
25 Years	99.6%	98.6%	95.8%	90.8%	82.5%	72.2%	60.3%	47.8%	36.7%
30 Years	99.5%	98.0%	94.4%	88.0%	79.0%	67.7%	55.5%	43.2%	32.6%

64% Equities, 16% Corporate Bonds, and 20% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.9%	99.4%	98.1%	95.3%	90.5%	82.9%	72.9%	61.6%
20 Years	99.9%	99.5%	98.1%	94.9%	89.5%	80.6%	69.9%	57.8%	45.2%
25 Years	99.7%	99.0%	96.5%	91.9%	84.1%	74.0%	61.7%	49.0%	37.3%
30 Years	99.6%	98.5%	95.3%	89.4%	80.6%	69.6%	56.6%	44.1%	33.1%

56% Equities, 14% Corporate Bonds, and 30% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.9%	99.5%	98.4%	95.9%	91.2%	83.7%	74.1%	62.4%
20 Years	99.9%	99.6%	98.4%	95.5%	90.3%	81.9%	71.4%	58.9%	45.9%
25 Years	99.8%	99.2%	97.1%	92.6%	85.3%	75.2%	62.8%	49.7%	37.7%
30 Years	99.7%	98.8%	95.9%	90.5%	81.8%	70.9%	57.7%	44.7%	33.5%

Table 4

Table 4 presents the success rates for portfolios constructed of U.S. large capitalization stocks and corporate bonds. Withdrawals are in real terms. For equities and corporate bonds, the average return used is the average return from 1926-2005.

100% Equities

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.0%	97.0%	93.2%	87.2%	79.8%	70.2%	60.7%	50.4%	40.8%
20 Years	97.0%	92.6%	85.4%	76.6%	66.6%	55.8%	45.4%	35.9%	27.9%
25 Years	94.4%	88.0%	79.1%	69.0%	57.9%	46.8%	37.3%	28.9%	21.9%
30 Years	92.1%	84.2%	74.3%	63.4%	52.2%	41.9%	33.0%	24.8%	18.8%

80% Equities and 20% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.6%	98.2%	95.2%	89.3%	80.8%	69.5%	57.2%	45.0%	33.8%
20 Years	98.1%	94.3%	87.2%	76.8%	64.6%	51.2%	38.7%	28.2%	20.2%
25 Years	96.2%	89.6%	79.3%	67.0%	53.2%	40.3%	29.3%	20.5%	14.0%
30 Years	93.9%	85.4%	73.5%	59.7%	46.0%	34.2%	24.2%	16.7%	10.8%

60% Equities and 40% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.9%	99.3%	96.6%	90.9%	80.9%	66.4%	50.7%	36.0%	24.2%
20 Years	99.2%	95.6%	88.2%	75.0%	58.5%	42.2%	28.1%	17.6%	10.2%
25 Years	97.2%	90.5%	77.8%	61.4%	44.0%	18.0%	18.0%	10.4%	5.7%
30 Years	95.0%	84.9%	69.4%	51.2%	35.0%	12.9%	12.9%	7.0%	4.0%

40% Equities and 60% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.6%	97.8%	91.5%	78.4%	58.5%	38.6%	22.3%	11.5%
20 Years	99.5%	96.6%	87.2%	69.2%	46.7%	27.3%	14.0%	6.7%	2.7%
25 Years	98.0%	89.6%	71.9%	48.6%	28.3%	14.1%	6.3%	2.5%	0.9%
30 Years	95.2%	81.4%	58.6%	35.8%	18.6%	8.6%	3.4%	1.3%	0.5%

20% Equities and 80% Corporate Bonds

Start Hear	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.9%	98.2%	89.9%	69.8%	43.1%	20.8%	8.2%	2.7%
20 Years	99.7%	96.2%	81.3%	54.1%	27.0%	10.4%	3.2%	0.8%	0.2%
25 Years	97.6%	84.0%	55.8%	27.4%	10.1%	2.9%	0.7%	0.2%	0.1%
30 Years	92.2%	68.7%	36.5%	14.4%	4.3%	1.1%	0.2%	0.1%	0%

100% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.6%	96.0%	79.1%	49.9%	22.2%	7.4%	1.8%	0.4%
20 Years	99.2%	89.9%	62.3%	29.1%	9.3%	2.1%	0.4%	0.1%	0%
25 Years	92.2%	64.0%	28.6%	8.4%	1.8%	0.3%	0%	0%	0%
30 Years	78.2%	39.4%	12.4%	2.7%	0.5%	0.1%	0%	0%	0%

Table 5

Table 5 presents the success rates for portfolios constructed of U.S. large capitalization stocks, corporate bonds, and REITs. Withdrawals are in real terms. For equities and corporate bonds, the average return used is the average return from 1926-2005.

72% Equities, 18% Corporate Bonds, and 10% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.7%	98.8%	96.0%	90.8%	82.4%	71.2%	58.9%	46.0%	34.2%
20 Years	98.6%	95.3%	88.8%	78.5%	66.2%	52.3%	39.4%	28.4%	20.0%
25 Years	96.9%	91.1%	81.2%	68.7%	54.5%	40.9%	29.7%	20.5%	13.6%
30 Years	95.1%	87.0%	75.5%	61.2%	47.3%	34.9%	24.2%	16.3%	10.5%

64% Equities, 16% Corporate Bonds, and 20% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.8%	99.1%	96.7%	91.6%	83.9%	72.8%	59.7%	46.5%	34.4%
20 Years	99.1%	96.1%	89.8%	80.2%	67.4%	53.5%	39.9%	28.3%	19.8%
25 Years	97.5%	92.2%	83.0%	70.2%	56.0%	41.6%	30.0%	20.3%	13.3%
30 Years	95.8%	88.4%	77.2%	63.0%	48.3%	35.1%	24.3%	16.2%	10.3%

56% Equities, 14% Corporate Bonds, and 30% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.8%	99.3%	97.1%	92.5%	84.9%	73.9%	60.8%	47.3%	34.7%
20 Years	99.2%	96.6%	90.7%	81.3%	68.6%	54.3%	40.4%	28.5%	19.7%
25 Years	98.0%	92.9%	84.0%	71.3%	56.9%	41.9%	30.1%	20.2%	12.9%
30 Years	96.3%	89.6%	78.5%	64.2%	49.2%	35.3%	24.6%	15.9%	10.0%

APPENDIX

APPENDIX Table 1

This table presents the success rates for portfolios constructed of U.S. large capitalization stocks and corporate bonds. Withdrawals are in nominal terms. For equities and corporate bonds, the average return used is the average return from 1972-2005.

100% Equities

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.9%	99.4%	98.0%	95.1%	90.2%	83.1%	74.0%	63.5%
20 Years	100%	99.4%	97.9%	94.7%	89.2%	81.3%	71.5%	60.4%	49.2%
25 Years	99.7%	98.8%	96.4%	91.7%	84.7%	75.2%	64.3%	52.9%	41.9%
30 Years	99.6%	98.2%	95.1%	89.6%	81.6%	71.5%	60.2%	48.7%	38.0%

80% Equities and 20% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100.%	100%	99.8%	99.2%	97.3%	93.2%	86.3%	76.5%	64.5%
20 Years	100%	99.8%	99.1%	97.0%	92.3%	84.5%	73.7%	60.8%	44.5%
25 Years	99.9%	99.6%	98.2%	94.6%	87.9%	77.8%	65.3%	51.7%	38.7%
30 Years	99.3%	99.3%	97.3%	92.7%	84.7%	73.4%	60.4%	46.7%	34.2%

60% Equities and 40% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	100%	99.7%	98.7%	95.6%	89.0%	78.3%	64.1%
20 Years	100%	100%	99.7%	98.4%	94.7%	86.9%	74.7%	59.4%	43.5%
25 Years	100%	99.9%	99.2%	96.6%	90.3%	79.4%	64.6%	48.3%	33.2%
30 Years	100%	99.8%	98.6%	94.9%	86.9%	74.3%	58.5%	42.3%	28.0%

40% Equities and 60% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	100%	99.9%	99.3%	96.8%	90.2%	78.1%	61.3%
20 Years	100%	100%	99.9%	99.1%	95.9%	87.7%	73.4%	55.2%	36.8%
25 Years	100%	100%	99.6%	97.5%	91.2%	78.7%	61.0%	41.9%	25.5%
30 Years	100%	99.9%	99.2%	95.6%	87.2%	72.3%	53.4%	34.8%	20.2%

20% Equities and 80% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	100%	99.9%	99.3%	96.5%	88.7%	74.1%	54.9%
20 Years	100%	100%	99.9%	99.0%	95.2%	85.1%	68.0%	47.4%	28.6%
25 Years	100%	100%	99.6%	97.0%	89.1%	73.6%	53.1%	33.0%	17.8%
30 Years	100%	99.9%	99.0%	94.8%	83.8%	65.5%	44.4%	25.8%	13.1%

100% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	100%	99.8%	98.4%	93.5%	82.6%	65.7%	46.2%
20 Years	100%	100%	99.7%	97.7%	91.1%	77.4%	58.1%	38.1%	21.8%
25 Years	100%	100%	98.7%	93.8%	81.9%	63.3%	42.6%	24.9%	12.8%
30 Years	100%	99.7%	97.4%	89.8%	74.6%	54.1%	34.0%	18.6%	9.0%

APPENDIX Table 2

This table presents the success rates for portfolios constructed of U.S. large capitalization stocks, corporate bonds, and REITs. Withdrawals are in nominal terms. For equities and corporate bonds, the average return used is the average return from 1972-2005.

72% Equities, 18% Corporate Bonds, and 10% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.9%	99.4%	97.7%	94.0%	87.4%	77.6%	65.4%
20 Years	100%	100%	99.3%	97.5%	93.2%	85.6%	74.8%	61.7%	48.0%
25 Years	100%	99.7%	98.5%	95.3%	89.0%	79.1%	66.4%	52.5%	39.0%
30 Years	99.9%	99.5%	97.8%	93.5%	85.9%	74.8%	61.4%	47.3%	34.4%

64% Equities, 16% Corporate Bonds, and 20% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.9%	99.5%	98.0%	94.5%	88.0%	78.4%	66.0%
20 Years	100%	99.9%	99.4%	97.8%	93.7%	86.4%	75.5%	62.3%	48.3%
25 Years	100%	99.7%	98.7%	95.8%	89.6%	79.9%	67.1%	52.9%	39.2%
30 Years	99.9%	99.6%	98.0%	94.1%	86.7%	75.6%	62.0%	47.7%	34.5%

56% Equities, 14% Corporate Bonds, and 30% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.9%	99.5%	98.1%	94.7%	88.4%	78.6%	66.3%
20 Years	100%	99.9%	99.5%	97.96%	93.9%	86.7%	75.8%	62.6%	48.4%
25 Years	100%	99.8%	98.8%	95.9%	89.9%	80.2%	67.4%	53.1%	39.2%
30 Years	100%	99.6%	98.1%	94.3%	87.0%	75.9%	62.3%	47.8%	34.5%

Appendix Table 3
Panel A

Panel A shows the 90th percentile correlation between each asset class for the 1972 to 2005 period. The correlations are from 60 month rolling correlations.

	Equity	Bonds	Inflation	REIT
Equity	1.00	–0.077	–0.361	0.035
Bond		1.00	–0.260	0.128
Inflation			1.00	–0.337
REIT				1.00

Panel B

Panel B shows the 10th percentile correlation between each asset class for the 1972 to 2005 period. The correlations are from 60 month rolling correlations.

	Equity	Bonds	Inflation	REIT
Equity	1.00	0.574	–0.019	0.743
Bond		1.00	–0.011	0.507
Inflation			1.00	0.030
REIT				1.00

APPENDIX Table 4

This table presents the success rates for portfolios constructed of U.S. large capitalization stocks and corporate bonds. Withdrawals are in nominal terms. Correlations are the 90th percentile correlations. For equities and corporate bonds, the average return used is the average return from 1926-2005.

100% Equities

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.7%	99.1%	97.6%	95.0%	90.8%	85.0%	77.9%	69.4%	60.5%
20 Years	99.2%	97.8%	95.0%	90.2%	84.0%	75.8%	66.8%	57.7%	48.7%
25 Years	98.7%	96.4%	92.6%	86.6%	79.0%	70.0%	60.5%	51.3%	42.4%
30 Years	98.2%	95.4%	90.8%	84.1%	76.1%	66.7%	57.0%	48.1%	39.4%

80% Equities and 20% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.9%	99.6%	98.7%	96.5%	92.6%	86.2%	78.1%	67.6%	57.0%
20 Years	99.6%	98.7%	96.3%	91.7%	84.7%	75.4%	64.2%	53.1%	42.3%
25 Years	99.3%	97.7%	94.1%	87.6%	78.7%	68.1%	56.4%	45.4%	35.3%
30 Years	98.9%	96.8%	92.1%	84.3%	74.8%	63.5%	51.9%	41.1%	31.4%

60% Equities and 40% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.8%	99.4%	97.7%	94.2%	87.1%	77.3%	64.0%	50.5%
20 Years	99.9%	99.3%	97.5%	93.0%	84.6%	73.2%	59.1%	45.2%	32.8%
25 Years	99.6%	98.5%	94.9%	87.7%	77.0%	63.3%	48.5%	35.5%	24.7%
30 Years	99.4%	97.6%	92.7%	83.7%	71.1%	56.9%	42.7%	30.5%	20.7%

40% Equities and 60% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.8%	98.7%	95.0%	87.2%	73.7%	56.9%	39.7%
20 Years	99.9%	99.8%	98.3%	93.4%	83.1%	67.2%	48.8%	32.3%	19.2%
25 Years	99.9%	99.1%	95.5%	86.6%	71.4%	52.7%	35.0%	21.2%	11.6%
30 Years	99.7%	98.2%	92.5%	80.4%	63.0%	44.4%	27.9%	16.2%	8.5%

20% Equities and 80% Corporate Bonds

Start Hear	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.9%	99.3%	95.4%	84.5%	64.8%	42.4%	22.3%
20 Years	100%	99.9%	98.8%	92.5%	77.1%	53.8%	31.2%	14.7%	6.1%
25 Years	99.9%	99.4%	94.8%	81.3%	58.1%	34.3%	16.1%	6.8%	2.5%
30 Years	99.8%	98.2%	89.8%	70.5%	45.5%	23.7%	10.3%	4.0%	1.4%

100% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	100%	99.1%	92.8%	74.4%	46.1%	21.4%	7.4%
20 Years	100%	99.9%	98.0%	86.2%	59.8%	30.3%	10.8%	3.3%	0.7%
25 Years	100%	98.9%	89.4%	63.8%	32.8%	11.7%	3.3%	0.7%	0.1%
30 Years	99.8%	95.8%	77.7%	46.0%	19.1%	5.7%	1.3%	0.3%	0%

APPENDIX Table 5

This table presents the success rates for portfolios constructed of U.S. large capitalization stocks, corporate bonds, and REITs. Withdrawals are in nominal terms. Correlations are the 90th percentile correlations. For equities and corporate bonds, the average return used is the average return from 1926-2005.

72% Equities, 18% Corporate Bonds, and 10% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.9%	99.7%	99.0%	97.0%	93.3%	87.2%	79.2%	68.8%	57.9%
20 Years	99.7%	98.8%	96.9%	92.6%	85.7%	76.6%	65.5%	54.0%	42.7%
25 Years	99.4%	98.1%	94.7%	88.5%	79.9%	69.4%	57.6%	46.0%	35.6%
30 Years	99.1%	97.3%	92.9%	85.6%	76.1%	64.7%	52.8%	41.6%	31.6%

64% Equities, 16% Corporate Bonds, and 20% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.9%	99.7%	99.2%	97.4%	93.8%	88.0%	80.1%	69.7%	58.5%
20 Years	99.8%	99.1%	97.3%	93.3%	86.7%	77.5%	66.6%	54.6%	43.0%
25 Years	99.4%	98.4%	95.1%	89.3%	80.8%	70.5%	58.7%	46.3%	35.8%
30 Years	99.3%	97.8%	93.6%	86.5%	77.1%	65.9%	53.8%	41.9%	31.9%

56% Equities, 14% Corporate Bonds, and 30% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.9%	99.8%	99.2%	97.6%	94.2%	88.7%	80.8%	70.5%	58.8%
20 Years	99.8%	99.2%	97.5%	93.7%	87.0%	78.5%	67.4%	55.1%	43.2%
25 Years	99.5%	98.5%	95.6%	89.9%	81.7%	71.5%	59.4%	46.6%	35.8%
30 Years	99.4%	97.9%	93.9%	87.2%	77.8%	66.9%	54.4%	42.1%	31.8%

APPENDIX Table 6

This table presents the success rates for portfolios constructed of U.S. large capitalization stocks and corporate bonds. Withdrawals are in real terms. Correlations are the 90th percentile correlations. For equities and corporate bonds, the average return used is the average return from 1926-2005.

100% Equities

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.0%	96.8%	93.1%	87.3%	79.0%	69.5%	59.8%	49.4%	39.9%
20 Years	96.9%	92.4%	85.2%	76.0%	65.2%	54.9%	44.4%	35.0%	27.3%
25 Years	94.5%	87.7%	78.6%	67.9%	56.5%	46.1%	36.5%	28.2%	21.3%
30 Years	92.3%	83.9%	73.9%	62.3%	51.4%	41.1%	31.9%	24.2%	18.3%

80% Equities and 20% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.5%	98.1%	94.8%	88.7%	79.3%	68.0%	55.4%	43.8%	32.7%
20 Years	98.0%	93.8%	86.2%	75.2%	62.1%	49.4%	37.5%	27.4%	19.4%
25 Years	95.7%	88.6%	77.8%	64.7%	51.3%	39.0%	28.5%	20.0%	13.4%
30 Years	93.4%	84.0%	71.7%	57.6%	44.5%	33.0%	23.2%	15.9%	10.5%

60% Equities and 40% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.9%	99.0%	96.1%	89.7%	78.8%	64.2%	48.9%	34.6%	23.4%
20 Years	98.8%	95.0%	86.4%	72.4%	56.4%	40.4%	27.2%	17.1%	10.2%
25 Years	96.6%	88.6%	75.2%	58.5%	42.0%	27.9%	17.6%	10.2%	5.9%
30 Years	93.9%	82.5%	66.7%	48.9%	33.7%	21.4%	12.6%	7.2%	4.2%

40% Equities and 60% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.9%	99.6%	97.1%	89.8%	75.7%	56.5%	37.1%	22.0%	11.5%
20 Years	99.4%	95.6%	84.6%	66.2%	44.7%	26.7%	14.1%	6.9%	3.3%
25 Years	97.0%	87.3%	68.5%	46.4%	27.2%	14.2%	6.5%	3.2%	1.2%
30 Years	93.4%	78.0%	55.8%	34.5%	18.1%	8.7%	4.0%	1.7%	0.7%

20% Equities and 80% Corporate Bonds

Start Hear	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.8%	97.5%	88.0%	67.4%	41.9%	20.6%	8.6%	3.0%
20 Years	99.6%	95.1%	78.8%	51.6%	26.3%	10.8%	3.6%	1.1%	0.4%
25 Years	96.7%	81.6%	53.2%	26.6%	10.3%	3.3%	1.0%	0.3%	0%
30 Years	90.5%	65.6%	35.6%	14.1%	4.8%	1.4%	0.4%	0%	0%

100% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.8%	96.7%	80.2%	49.4%	21.2%	6.4%	1.6%	0.3%
20 Years	99.4%	90.8%	62.2%	27.8%	8.3%	1.9%	0.3%	0%	0%
25 Years	93.2%	64.0%	27.4%	7.6%	1.6%	0.2%	0%	0%	0%
30 Years	78.1%	38.7%	11.3%	2.3%	0.3%	0%	0%	0%	0%

APPENDIX Table 7

This table presents the success rates for portfolios constructed of U.S. large capitalization stocks, corporate bonds, and REITs. Withdrawals are in real terms. Correlations are the 90th percentile correlations. For equities and corporate bonds, the average return used is the average return from 1926-2005.

72% Equities, 18% Corporate Bonds, and 10% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.6%	98.4%	95.3%	89.5%	80.5%	69.1%	56.4%	44.4%	33.0%
20 Years	98.3%	94.6%	87.2%	76.5%	63.5%	50.1%	37.9%	27.4%	19.2%
25 Years	96.3%	89.6%	79.0%	66.0%	52.1%	39.5%	28.4%	19.7%	13.2%
30 Years	94.1%	84.9%	72.8%	59.0%	45.3%	33.2%	23.2%	15.9%	10.4%

64% Equities, 16% Corporate Bonds, and 20% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.7%	98.6%	95.8%	90.1%	81.4%	70.0%	57.1%	44.7%	33.1%
20 Years	98.5%	95.1%	88.0%	77.5%	64.5%	50.5%	38.0%	27.5%	18.8%
25 Years	96.8%	90.4%	79.9%	67.2%	52.7%	39.7%	28.6%	19.5%	13.1%
30 Years	94.6%	85.9%	73.9%	60.1%	45.8%	33.4%	23.0%	15.6%	10.2%

56% Equities, 14% Corporate Bonds, and 30% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.7%	98.8%	96.2%	90.6%	82.2%	70.7%	57.6%	44.8%	33.2%
20 Years	98.7%	95.5%	88.6%	78.2%	64.9%	51.1%	38.2%	27.3%	18.5%
25 Years	97.1%	90.9%	80.8%	67.8%	53.6%	39.8%	28.5%	19.3%	12.9%
30 Years	95.1%	86.7%	75.1%	61.1%	46.0%	33.4%	23.1%	15.4%	10.0%

APPENDIX Table 8

This table presents the success rates for portfolios constructed of U.S. large capitalization stocks and corporate bonds. Withdrawals are in nominal terms. Correlations are the 10th percentile correlations. For equities and corporate bonds, the average return used is the average return from 1926-2005.

100% Equities

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.6%	99.1%	97.8%	95.2%	91.4%	86.1%	79.3%	71.2%	62.2%
20 Years	99.2%	97.8%	95.1%	90.8%	85.1%	77.6%	68.9%	59.8%	50.4%
25 Years	98.6%	96.6%	92.9%	87.6%	80.6%	72.1%	63.0%	53.7%	44.0%
30 Years	98.1%	95.6%	91.1%	85.4%	77.7%	68.9%	59.6%	50.1%	40.6%

80% Equities and 20% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100.%	99.6%	99.1%	97.5%	94.4%	89.3%	81.4%	71.6%	60.5%
20 Years	99.7%	99.1%	97.3%	94.9%	87.9%	79.4%	68.3%	56.7%	45.1%
25 Years	99.6%	98.4%	95.7%	90.3%	82.7%	72.4%	60.7%	48.6%	37.2%
30 Years	99.3%	97.8%	94.0%	87.9%	79.2%	68.3%	56.2%	43.9%	33.0%

60% Equities and 40% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.8%	99.1%	97.0%	91.8%	83.2%	70.2%	54.6%
20 Years	100%	99.9%	99.0%	96.2%	90.2%	79.7%	65.2%	49.2%	34.1%
25 Years	100%	99.5%	97.8%	92.9%	83.8%	69.9%	53.7%	38.1%	24.4%
30 Years	99.9%	99.1%	96.3%	89.6%	78.7%	63.8%	46.9%	31.7%	19.7%

40% Equities and 60% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	100%	99.8%	98.6%	93.7%	82.2%	63.2%	41.4%
20 Years	100%	100%	99.8%	98.0%	90.9%	76.5%	54.1%	32.8%	16.3%
25 Years	100%	99.9%	99.0%	93.8%	80.8%	59.8%	37.1%	19.0%	8.7%
30 Years	100%	99.8%	97.7%	89.2%	72.7%	49.3%	28.0%	13.1%	5.5%

20% Equities and 80% Corporate Bonds

Start Hear	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	100%	99.9%	98.8%	91.5%	72.4%	44.4%	19.8%
20 Years	100%	100%	99.8%	97.6%	85.0%	59.5%	30.7%	10.8%	3.3%
25 Years	100%	99.9%	98.7%	89.2%	65.4%	35.0%	12.6%	3.8%	0.9%
30 Years	100%	99.7%	96.3%	79.0%	49.4%	21.3%	6.8%	1.9%	0.3%

100% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.9%	98.9%	92.3%	73.9%	46.5%	21.8%	7.9%
20 Years	100%	99.8%	97.5%	85.7%	59.6%	30.8%	11.5%	3.5%	0.8%
25 Years	99.4%	98.7%	89.0%	63.8%	33.4%	12.3%	3.6%	0.9%	0.2%
30 Years	99.7%	95.7%	77.2%	46.7%	19.4%	6.1%	1.5%	0.3%	0%

APPENDIX Table 9

This table presents the success rates for portfolios constructed of U.S. large capitalization stocks, corporate bonds, and REITs. Withdrawals are in nominal terms. Correlations are the 10th percentile correlations. For equities and corporate bonds, the average return used is the average return from 1926-2005.

72% Equities, 18% Corporate Bonds, and 10% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.8%	99.5%	98.6%	96.4%	92.3%	84.8%	75.4%	63.6%
20 Years	99.9%	99.6%	98.5%	95.9%	91.1%	82.8%	72.4%	59.5%	46.9%
25 Years	99.9%	99.2%	97.4%	93.1%	86.2%	76.4%	64.5%	51.0%	38.3%
30 Years	99.8%	98.8%	96.3%	91.3%	83.2%	72.3%	59.1%	46.2%	34.0%

64% Equities, 16% Corporate Bonds, and 20% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.7%	99.2%	97.7%	94.4%	87.8%	78.3%	66.2%
20 Years	100%	99.8%	99.2%	97.4%	93.6%	86.1%	75.6%	62.6%	48.6%
25 Years	99.9%	99.6%	98.4%	95.5%	89.4%	79.8%	67.5%	53.0%	39.3%
30 Years	99.9%	99.4%	97.8%	93.9%	86.4%	75.4%	62.5%	47.8%	34.6%

56% Equities, 14% Corporate Bonds, and 30% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	100%	99.9%	99.5%	98.5%	95.8%	90.1%	80.9%	68.2%
20 Years	100%	99.9%	99.5%	98.3%	95.3%	88.6%	78.2%	64.6%	49.9%
25 Years	100%	99.8%	99.1%	96.8%	91.7%	82.4%	69.6%	55.0%	40.3%
30 Years	100%	99.7%	98.5%	95.5%	89.1%	78.4%	64.6%	49.3%	35.0%

APPENDIX Table 10

This table presents the success rates for portfolios constructed of U.S. large capitalization stocks and corporate bonds. Withdrawals are in real terms. Correlations are the 10th percentile correlations. For equities and corporate bonds, the average return used is the average return from 1926-2005.

100% Equities

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.0%	97.1%	93.6%	88.2%	80.6%	71.3%	61.4%	60.0%	41.3%
20 Years	97.0%	92.7%	86.4%	77.5%	67.2%	56.9%	46.1%	36.2%	27.7%
25 Years	94.5%	88.4%	80.3%	69.9%	58.9%	47.9%	37.3%	28.6%	21.3%
30 Years	92.3%	85.3%	75.6%	64.9%	53.4%	42.4%	32.7%	24.6%	18.2%

80% Equities and 20% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.6%	98.7%	96.1%	91.3%	82.7%	71.7%	59.2%	46.0%	34.5%
20 Years	98.6%	95.3%	88.9%	79.1%	66.4%	52.8%	39.7%	28.2%	19.0%
25 Years	96.9%	91.1%	81.8%	69.2%	55.3%	41.4%	29.3%	19.8%	13.3%
30 Years	94.9%	87.2%	76.2%	62.3%	47.5%	34.9%	23.6%	16.1%	10.4%

60% Equities and 40% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.9%	99.6%	98.1%	93.5%	84.3%	69.9%	52.6%	36.4%	23.1%
20 Years	99.6%	97.3%	91.0%	78.8%	61.7%	43.6%	27.5%	16.2%	8.8%
25 Years	98.5%	93.0%	81.5%	64.9%	45.8%	28.6%	17.0%	9.1%	4.8%
30 Years	96.9%	88.4%	73.9%	54.6%	36.0%	21.3%	11.9%	6.1%	3.0%

40% Equities and 60% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.9%	99.2%	95.0%	83.1%	62.5%	39.2%	20.4%	9.2%
20 Years	99.9%	98.7%	91.3%	74.0%	49.1%	26.3%	11.7%	4.6%	1.5%
25 Years	99.3%	93.5%	76.9%	51.8%	27.4%	11.9%	4.6%	1.4%	0.4%
30 Years	97.8%	86.1%	63.9%	36.4%	16.9%	6.8%	2.2%	0.7%	0.2%

20% Equities and 80% Corporate Bonds

Start Hear	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.9%	99.3%	92.8%	73.2%	43.9%	18.7%	6.2%	1.7%
20 Years	99.9%	98.2%	88.1%	56.2%	25.9%	8.6%	2.2%	0.5%	0.1%
25 Years	99.1%	87.5%	58.9%	26.4%	8.3%	1.9%	0.4%	0%	0%
30 Years	95.6%	72.3%	37.4%	12.7%	3.1%	0.5%	0.1%	0%	0%

100% Corporate Bonds

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.6%	95.0%	78.0%	49.4%	23.4%	8.3%	2.2%	0.6%
20 Years	98.9%	89.0%	61.3%	29.6%	10.2%	2.8%	0.6%	0.1%	0%
25 Years	91.2%	62.8%	29.1%	9.3%	2.2%	0.4%	0.1%	0%	0%
30 Years	76.8%	40.2%	13.4%	3.3%	0.6%	0.1%	0%	0%	0%

APPENDIX Table 11

This table presents the success rates for portfolios constructed of U.S. large capitalization stocks, corporate bonds, and REITs. Withdrawals are in real terms. Correlations are the 10th percentile correlations. For equities and corporate bonds, the average return used is the average return from 1926-2005.

72% Equities, 18% Corporate Bonds, and 10% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.8%	99.3%	97.6%	93.6%	86.0%	75.2%	61.7%	47.5%	34.9%
20 Years	99.2%	97.1%	91.9%	82.6%	69.8%	55.2%	41.1%	28.2%	18.7%
25 Years	98.2%	93.9%	85.1%	73.0%	57.8%	43.1%	30.0%	19.5%	12.6%
30 Years	96.9%	90.4%	80.0%	65.9%	50.4%	36.2%	23.8%	15.7%	9.7%

64% Equities, 16% Corporate Bonds, and 20% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	99.9%	99.7%	98.5%	95.4%	88.8%	78.2%	64.1%	49.2%	35.2%
20 Years	99.6%	98.1%	94.1%	85.6%	72.8%	57.2%	42.4%	28.3%	18.1%
25 Years	98.9%	95.7%	88.1%	76.0%	60.9%	44.9%	30.2%	19.3%	11.9%
30 Years	98.1%	93.3%	83.3%	69.1%	52.4%	36.9%	24.0%	15.0%	8.8%

56% Equities, 14% Corporate Bonds, and 30% REITs

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100%	99.8%	99.0%	96.6%	90.8%	80.2%	66.0%	50.5%	35.2%
20 Years	99.8%	98.8%	95.4%	87.8%	75.3%	59.3%	43.4%	28.4%	17.7%
25 Years	99.4%	97.0%	90.5%	78.3%	62.8%	46.0%	30.6%	19.0%	11.2%
30 Years	98.8%	94.8%	85.8%	71.8%	54.5%	38.0%	24.2%	14.4%	8.3%