

## International Diversification and Retirement Withdrawals

Danny M. Ervin  
Salisbury State University

Larry H. Filer  
Old Dominion University

Joseph C. Smolira<sup>1</sup> (contact author)  
Belmont University  
School of Business  
1900 Belmont Boulevard  
Nashville, TN 37221  
615.460.6463  
joe.smolira@belmont.edu

07/21/2004

*Mid-American Journal of Business*, Vol. 20 No. 1, 55-62.

---

<sup>1</sup> We would like to thank Greg Faulk, Gipsie Ranney, and two anonymous reviewers for comments on a previous version of this paper. We would also like to thank Kathleen Wright for programming assistance.

## **International Diversification and Retirement Withdrawals**

### *Abstract*

This study evaluates the success of the monthly withdrawal of funds from hypothetical retirement portfolios for the period January 1930 to December 2001. The objective of this research is to provide an empirical examination of the historical effect of global diversification on the withdrawal of funds from a retirement portfolio. We compare portfolios consisting of U.S. stocks and U.S. corporate bonds, and portfolios consisting of global stocks and U.S. corporate bonds. 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 a higher equity portion had a greater likelihood of sustaining a given number of withdrawals over this time. Additionally, for much of the 1930 to 2001 period, including international stocks in a withdrawal portfolio decreased the likelihood the withdrawals lasted for a given period. However, the inclusion of international stocks does increase the terminal value of retirement portfolios after withdrawals during the latter part of the period under study. 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. This can assist in the retirement timing decision.

## **International Diversification and Retirement Withdrawals**

### 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.

This study evaluates the success of various fund withdrawal rates for different withdrawal periods and different portfolio compositions for the period 1930 to 2001. The portfolios examined in this study consist of the S&P 500 Index, S&P/IFC Global Stock Index, and U.S. long-term corporate bonds with various portfolio weights. The fund withdrawal rates are from 4 percent to 12 percent, and the withdrawal periods are 15, 20, 25, and 30 years.

Modern portfolio theory suggests that diversification should improve portfolio performance. This study examines whether diversification with international stocks improves the ability of a portfolio to support the withdrawal of funds from the portfolio. Our results indicate that the inclusion of international stocks actually decreases the ability of a portfolio to support fund withdrawals. However, in the later years of our data, portfolios consisting of international stocks perform comparably to portfolios of domestic U.S. stocks, and often have a greater terminal value at the end of the withdrawal period.

We should note two caveats. First, the purchase of a life annuity guarantees to the retiree that his/her retirement portfolio will last until death by transferring risk to an insurance company. The insurance company then has to be concerned about the fund withdrawal rate. However, the issues discussed in this paper, when to retire, and how much to withdraw, remain since they must be addressed by the insurance company as opposed to the retiree. Furthermore, as Bodie (2003) discusses, individuals do not generally voluntarily annuitize their retirement accounts. Once annuitized, the investment becomes illiquid. As a result, the investor does not have access to the cash used to purchase the annuity. There are several reasons an individual may desire liquidity, such

as the potential need to pay for a nursing home, or the desire to leave the terminal balance of the retirement account to their heirs, which cannot be accomplished by an annuity.

Second, although our results generally indicate that a higher of percentage of stocks 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. Indeed, the models of Markowitz (1952), Sharpe (1964) and Lintner (1965), among others, rely on expected returns 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.

## Literature Review

Bierwirth (1994) examines fund withdrawals from a retirement portfolio consisting of 20 percent U.S. Treasury bills, 40 percent long-term government bonds, and 40 percent large capitalization common stocks. Using data from 1926 to 1992, his analysis focused on the historical dollar withdrawal amount an investor could make without invading principal assuming a 27-year retirement period. His results indicate the Depression-era was in fact favorable for withdrawals, generating some of the better income withdrawals. His results also show the importance of the timing of returns. A major determinant of whether a portfolio can support withdrawals is the rate of return early in the fund withdrawal period. If the returns are too low, or negative, early in the withdrawal period the portfolio value may fall to a level that makes it impossible to recover.

More recently, Cooley, Hubbard, and Walz (1998, 1999, 2001, henceforth CHW) have examined the question of sustainable withdrawal rates. CHW (1998) analyze annual withdrawals from portfolios consisting of U.S. large capitalization stocks and U.S. corporate bonds for the 1926 to 1995 period. They find that a six to seven percent withdrawal rate appears sustainable for most periods if the portfolio is comprised 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. Examining the sub-period 1946-1995, they find the likelihood a portfolio will support withdrawals increases slightly for some withdrawal percentages and lengths, but actually decreases for other withdrawal percentages and lengths.

CHW (1999, 2001) extend their previous research by examining the effect of monthly withdrawals on the sustainability of retirement portfolios. In general, for withdrawal rates of seven percent or less, the sustainability of a retirement portfolio is about the same for annual or monthly withdrawals. If the withdrawal rate exceeds seven percent, monthly withdrawals are less likely to last when compared to annual withdrawals.

CHW (1998, 1999, 2001) also show 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. This result is consistent with Markowitz (1952).

Markowitz (1952) brought forth the concept that a diversified portfolio has less risk if the assets are not perfectly correlated. The returns from less than perfectly

correlated assets will tend to offset each other, reducing the total risk of the portfolio. Grubel (1968) and Levy and Sarnat (1970) find that U.S. stock returns and international stock returns are not perfectly correlated, so international diversification should provide a benefit to investors. Previous research has focused on the effects of domestic diversification for a U.S. investor. The findings of Grubel (1968) and Levy and Sarnat (1970) indicate that a U.S. investor can better diversify his/her portfolio by investing in international stocks.

Other researchers have questioned the value of international diversification. Siquefield (1996) found that during the 1970-1994 period, a diversified portfolio of the EAFE index and the S&P 500, or a portfolio including the EAFE index, the S&P 500, and long-term corporate bonds did not increase return or reduce portfolio risk compared to a domestic U.S. portfolio.

Solnik, Boucelle, and Le Fur (1996) examined the correlation coefficient between U.S. stock returns and foreign stock returns during the 1961-1994 period. During this period, the correlation of returns ranged from 0.20 to 0.75. Their findings indicate the volatilities of U.S. and foreign markets were also correlated, that is, when the U.S. market becomes more volatile, foreign stock markets also become more volatile. While they find no apparent pattern of an increasing correlation among the U.S. market and foreign markets, correlation does appear to increase during bear markets. Despite the increased correlation during bear markets, they do find that international diversification reduced portfolio risk in all periods they examined. They therefore recommend a portfolio allocation of 20 percent foreign stocks.

Campbell, Koedijk, and Kofman (2002) use daily data on the S&P 500, FTSE 100, CAC 40, DAX 100, and 10-year U.S. government bonds from May 1990 to December 1999 to derive a conditional correlation between these markets. They find that large negative returns in these international stock markets tend to coincide more frequently than would be expected. Their results also confirm the findings of Solnik, Boucelle, and Le Fur (1996) that the correlation among the U.S. stock markets and foreign stock markets increases during a bear market.

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. Research on the effect of international stocks on the diversification does not give a definitive answer, but it does indicate several potential results that may affect the benefits of an internationally diversified portfolio. First, the correlation among the U.S. and foreign markets is not constant. Therefore, a portfolio that is diversified in one period may not be diversified in another period unless the weights of the portfolio assets are changed. Second, the correlation among U.S. stock markets and foreign stock markets appears to increase during times of market turmoil or bear markets. This implies that when investors need the effects of a low correlation the most, the correlation increases, to the detriment of the investor.

The results from previous research do not definitively resolve the effects of international diversification. This study adds to previous literature by examining the historical performance of internationally diversified portfolios. We specifically address the performance of portfolios comprised of U.S. stocks, global stocks, and U.S. corporate



bonds by examining how international diversification affects the withdrawal of funds from a retirement portfolio.

## Data and Analysis

Similar to CHW (1999), we use monthly returns from January 1930 to December 2001 for our analysis. Large capitalization stock returns, corporate bonds returns, and inflation were gathered from Ibbotson's *Stocks, Bonds, Bills, and Inflation 2002 Yearbook*. The international index used was the S&P/IFC Composite Global Index. The S&P/IFC Composite Global index classifies companies according to domicile. The return data from individual countries is converted at the current period exchange rate to form a dollar index. Therefore, the index incorporates both the gains (losses) from the home currency appreciation (depreciation).

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 compared to portfolios constructed from the S&P/IFC Global Index and long-term, high-grade U.S. corporate bonds. We examine portfolios with equity weights of 20, 40, 60, and 80 percent. The remainder of the portfolio is invested in the bond index. We also examine portfolios constructed of large capitalization U.S. stocks and the S&P/IFC Global Index.

In view of the different retirement life expectancies of retirees, we examine payout periods of 15, 20, 25, and 30 years. We use rolling periods in our testing. For example, the first 30-year period begins January 1930 and ends in December 1959. The next 30-year period begins February 1930 and ends in January 1960. With 71 years of data we get 671 rolling 15-year payouts, 611 rolling 20-year payouts, 551 rolling 25-year

payouts, and 347 rolling 30-year payouts. We have elected to begin the rolling withdrawal period in every month rather than at the beginning of every year to examine the timing factor in retirement withdrawals.

Previous research such as CHW (2001) has excluded the period prior to 1946 because of the Great Depression and World War II economies. Other research such as Bierwirth (1994) and CHW (1998, 1998) include this period. We feel two factors support the inclusion of this period. First, recent research (such as Siegel (2002)) has argued that the market risk premium during the most of the 1900s was historically too high. Including this data adds a relatively low market risk premium period to our study. Second, ignoring part of the available data is a form of data mining. While it can be argued the 1930-1945 period should be ignored because of the unique economy that is unlikely to be repeated, it can also be argued we should also exclude the bull market of the 1990s since it was also a very unique period that is unlikely to be repeated.

We begin each month with a hypothetical \$1,000,000 portfolio<sup>1</sup>. We use fund withdrawal rates from 4 percent to 12 percent per year. Similar to CHW (1999), we analyze monthly withdrawals. At 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, and has a terminal value of zero or greater. 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.

---

<sup>1</sup> Although we begin with an arbitrary amount of \$1,000,000, the sustainable withdrawal period is the same for any beginning portfolio value since we are concerned with a percentage withdrawal.

We also account for the effects of inflation in fund withdrawals. The effects of inflation can greatly affect the necessary withdrawals. For example, at a 3.5 percent inflation rate and a 30-year retirement period, \$1 in buying power at the beginning of the period has about \$0.35 in buying power at the end of the period. We account for the effects of inflation in the year after it has occurred. For example, assume a 6 percent withdrawal rate and 3 percent inflation rate the first year. The first year withdrawals would be \$60,000, or \$5,000 per month. The second year withdrawals would increase by 3 percent to \$61,800, or \$5,150 per month. While individuals can increase withdrawals to match expected inflation, the implementation of expected inflation in empirical work is problematic due to the heterogeneity in forming these expectations. Therefore, individuals in our analysis change withdrawals in subsequent periods in response to actual realizations of inflation at the end of the current period.

The beginning withdrawal amount is not adjusted for inflation. While \$1,000,000 today is certainly worth less in real terms than the same amount in 1930, the real value in 1930 does not matter since we are looking at percentage withdrawals. If the initial portfolio value is increased/decreased to account for inflation, it will increase/decrease the dollar withdrawal amount as well. As a result, the date at which the portfolio is no longer able to sustain withdrawals will remain unchanged.

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.

## Results

Table 1 presents the results for the U.S. stock/U.S. corporate bond and global stock/U.S. corporate bond portfolios. As expected, a higher withdrawal rate decreases the success rate of a portfolio lasting for the period in question. More interesting is the comparison of the U.S. stock and global stock portfolios.

<<INSERT TABLE 1 ABOUT HERE>>

There are 144 paired portfolios presented in Table 1. In only two instances does the global stock/U.S. bond portfolio have a greater success rate in sustaining withdrawals than the U.S. stock/U.S. bond portfolio. The two instances for a 20% equity / 80% bond portfolio, a 9 percent withdrawal rate, and a 20 year or 30 year withdrawal period. In all other instances the portfolio including U.S. large capitalization stocks has at least the same, if not greater, success rate of sustainable withdrawals. The portfolios including U.S. stocks often had a success rate nearly twice that of the comparable portfolio that includes global stocks.

For example, a portfolio with 80 percent U.S. stocks and 20 percent U.S. bonds and a 10 percent withdrawal rate had an 82 percent success rate in lasting for 15 years. The comparable portfolio consisting of global stocks had only a 42 percent success rate in lasting for 15 years. Similarly a 60 percent U.S. stock / 40 percent U.S. bond portfolio with an 8 percent withdrawal rate had a 65 percent success rate in lasting for 30 years. The comparable global stock / bond portfolio had only an 18 percent success rate.

Table 2 shows the success rates for portfolios composed of U.S. stocks and global stocks. While a portfolio of U.S. stocks supports withdrawals rather well, the global stock index has not historically supported fund withdrawal portfolios with the same success rate. An increased weight of global stocks in an all equity portfolio reduces the success rate for every withdrawal rate and every withdrawal period. For example, a 100% U.S. stock portfolio has a success rate of 70 percent assuming 9 percent withdrawals. A 100% global stock portfolio has only an 18 percent success rate under the same conditions.

<<INSERT TABLE 2 ABOUT HERE>>

A comparison of Table 1 and Table 2 does indicate the need for diversification, at least for domestic investors. A portfolio consisting of 80% U.S. stock / 20% bonds has a greater success rate for most withdrawal rate and withdrawal period assumptions than does the 100% U.S. stock portfolio. The same is not true for portfolios of global stocks and U.S. bonds. Adding U.S. bonds to a global stock portfolio actually decreases the success rate for all equity portfolios, especially for high withdrawal rates and longer withdrawal periods.

Diversification effects are also shown by comparing the success rates from Table 1 and Table 2. The U.S. stock / U.S. bond portfolios and the U.S. stock / global stock portfolios have similar success rates for withdrawal rates below 7 percent for portfolios with at least 40 percent U.S. stock. When the withdrawal rates increase beyond 7 percent, the U.S. stock / global stock portfolios often exhibit a higher success rate than the comparable U.S. stock / U.S. bond portfolios. Thus, for a portfolio of U.S. stocks, at lower withdrawal rates, global stocks provide a diversification benefit that appears to be similar to U.S. bonds.

Table 3 presents the success rates for real withdrawals. In these portfolios, the withdrawal amount was increased by the inflation rate to maintain a constant real withdrawal amount. The success rate drops for each portfolio since the withdrawal amount increases. Similar to the nominal withdrawal, the success rate for portfolios consisting of U.S. stock is often significantly greater than the success rate for the comparable portfolio of global stocks. For example, a 4 percent withdrawal rate for a 30 year withdrawal has an 83 percent success rate for a portfolio comprised of 40% U.S. stocks / 60% bonds, while the comparable global stock / bond portfolio has only a 32 percent success rate.

<<INSERT TABLE 3 ABOUT HERE>>

Figure 1 shows the terminal dollar value for the 60% U.S. stock / 40% U.S. bond portfolio compared to the 60% global / 40% U.S. bond portfolio assuming a 7 percent withdrawal rate, and a 25 year withdrawal period. Several important results are shown in this figure. During the 1930-1950 period, we find that this withdrawal rate fails only 11 times for the 60% U.S. stock / 40% U.S. bond portfolio, a 95 percent success rate. Even during this period of apparent market distress, a 7 percent withdrawal rate is often successful.

<< INSERT FIGURE 1 ABOUT HERE>>

Examining the portfolios containing global stocks, for withdrawal periods beginning January 1930 to April 1958, the 60% global stock / 40% bond portfolio is successful only for withdrawal periods beginning January 1932 to March 1933. Over the same period the comparable portfolios with U.S. stock are almost 100 percent successful.

Even though the global portfolios perform poorly in the early part of the sample, during the 1960s and early 1970s, the performance of the global portfolio is better than the comparable U.S. stock portfolio in many instances. For example, for a 60% U.S. stock / 40% bond portfolio with a beginning withdrawal date of January 1967, the portfolio survived for 25 years, with a terminal balance of just under \$552,000. The comparable global stock portfolio had a terminal balance slightly over \$1 million.

Figure 2 shows the terminal dollar value for the 40% U.S. stock / 60% U.S. bond portfolio compared to the 40% global / 60% U.S. bond portfolio assuming a 7 percent withdrawal rate, and a 25 year withdrawal period. During the period January 1930 to December 1957, the 40% U.S. stock / 60% U.S. bond portfolio failed only 7 times, a 97 percent success rate. The comparable global portfolios had a success rate of only 5 percent.

<< INSERT FIGURE 2 ABOUT HERE >>

Taken together, Figure 1 and Figure 2 graphically show the retirement timing factor. This cannot be overlooked in portfolio withdrawals. Examining the 60% U.S. stock / 40% bond portfolios, a 7 percent withdrawal beginning in July 1931 would be successful, with about \$460,000 remaining. However, if the withdrawal period began in July 1932, the terminal balance would be over \$1.2 million. The biggest percentage difference in withdrawal periods beginning one month apart for a 60% U.S. stocks / 40% U.S. bond portfolio occurred in 1965. A 25 year withdrawal period beginning in June 1965 had only \$176,000 remaining, while a withdrawal period beginning one month later in July 1965 had about \$375,000 remaining.

The largest percentage difference in terminal value for withdrawal periods one month apart for the 40% U.S. stock / 60% U.S. bond portfolios occurred in 1956. A 7 percent withdrawal beginning in May 1956 would have had \$726 remaining at the end of 25 years. A 25 year withdrawal period beginning in June 1956 would have had a terminal value of \$87,312. The largest dollar difference occurred in 1939. A portfolio withdrawal beginning in September 1939 had a terminal value of about \$804,000. For an individual beginning withdrawals in October 1939, the terminal value would have been about \$474,000.

The importance of timing in a fund withdrawal portfolio is shown by the dramatic peaks and troughs in Figure 1 and Figure 2. If timing were unimportant, the graphs should be relatively smooth, without sharp up and down spikes. As both figures show, even a one month difference in beginning withdrawals can make a major difference in the terminal value of a withdrawal portfolio.

## Conclusions

Using monthly returns from January 1930 through December 2001, we examine the probability a retirement portfolio will last for different fund withdrawal periods and different fund withdrawal percentages. Three possible portfolio constructions are examined: A portfolio of U.S. large capitalization stocks and U.S. corporate bonds, a portfolio of the S&P/IFC Composite Global Index and U.S. corporate bonds, and a portfolio of U.S. large capitalization stocks and the S&P/IFC Composite Global Index. Each portfolio is examined with varying portfolio weights.

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. For the entire period, the results show that a portfolio consisting of the S&P/IFC Composite Global Index and U.S. corporate bonds would have been less successful in providing fixed withdrawals from a retirement portfolio. However, in recent years, portfolios consisting of global stocks have often had higher terminal values than U.S. stock portfolios.

We also find there is significant evidence of the importance of timing the retirement decision. The decision to delay retirement can not only add to the individual's portfolio value, but if the returns are poor in the beginning of the fund withdrawal period the investor is more likely to experience a complete loss of funds. The difference in terminal values often varies by more than 10 percent for withdrawals beginning one month apart.

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. 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. If the retirement fund is insufficient, an individual must either work longer or reduce consumption in their retirement years.

**Table 1**

Table 1 presents the percentage success rates for portfolios constructed of U.S. large capitalization stocks and U.S. corporate bonds compared to portfolios consisting of global stocks and U.S. corporate bonds. Withdrawals are in nominal terms.

## 80% U.S. Equities and 20% Corporate Bonds versus 80% Global Index and 20% Corporate Bonds

	4%		5%		6%		7%		8%		9%		10%		11%		12%	
15 Years	100	vs. 100	100	vs. 98	100	vs. 91	99	vs. 79	98	vs. 61	95	vs. 50	82	vs. 42	71	vs. 35	59	vs. 27
20 Years	100	vs. 97	100	vs. 80	99	vs. 67	98	vs. 52	94	vs. 43	79	vs. 32	64	vs. 25	52	vs. 16	42	vs. 9
25 Years	100	vs. 79	99	vs. 67	98	vs. 51	97	vs. 40	86	vs. 31	66	vs. 23	52	vs. 17	41	vs. 11	29	vs. 3
30 Years	100	vs. 70	99	vs. 53	98	vs. 38	96	vs. 28	79	vs. 20	72	vs. 15	45	vs. 12	37	vs. 8	21	vs. 1

## 60% U.S. Equities and 40% Corporate Bonds versus 60% Global Index and 40% Corporate Bonds

	4%		5%		6%		7%		8%		9%		10%		11%		12%	
15 Years	100	vs. 100	100	vs. 100	100	vs. 95	100	vs. 84	99	vs. 64	94	vs. 51	79	vs. 41	63	vs. 35	50	vs. 26
20 Years	100	vs. 100	100	vs. 89	100	vs. 69	99	vs. 53	92	vs. 43	72	vs. 32	54	vs. 25	41	vs. 14	21	vs. 2
25 Years	100	vs. 93	100	vs. 71	99	vs. 51	98	vs. 41	77	vs. 28	55	vs. 20	39	vs. 15	16	vs. 4	5	vs. 0
30 Years	100	vs. 74	100	vs. 53	99	vs. 38	95	vs. 25	65	vs. 18	46	vs. 13	23	vs. 8	7	vs. 1	1	vs. 0

## 40% U.S. Equities and 60% Corporate Bonds versus 40% Global Index and 60% Corporate Bonds

	4%		5%		6%		7%		8%		9%		10%		11%		12%	
15 Years	100	vs. 100	100	vs. 100	100	vs. 99	100	vs. 91	100	vs. 66	92	vs. 50	68	vs. 39	46	vs. 32	24	vs. 16
20 Years	100	vs. 100	100	vs. 96	100	vs. 74	100	vs. 55	84	vs. 38	56	vs. 30	27	vs. 20	14	vs. 6	8	vs. 2
25 Years	100	vs. 99	100	vs. 76	100	vs. 51	93	vs. 35	58	vs. 24	22	vs. 17	9	vs. 6	3	vs. 0	1	vs. 0
30 Years	100	vs. 88	100	vs. 57	100	vs. 38	77	vs. 20	34	vs. 14	6	vs. 9	3	vs. 2	1	vs. 0	0	vs. 0

## 20% U.S. Equities and 80% Corporate Bonds versus 20% Global Index and 80% Corporate Bonds

	4%		5%		6%		7%		8%		9%		10%		11%		12%	
15 Years	100	vs. 100	100	vs. 100	100	vs. 100	100	vs. 95	100	vs. 70	80	vs. 44	35	vs. 34	22	vs. 21	15	vs. 13
20 Years	100	vs. 100	100	vs. 100	100	vs. 84	96	vs. 54	43	vs. 34	23	vs. 24	14	vs. 11	6	vs. 4	4	vs. 3
25 Years	100	vs. 100	100	vs. 88	100	vs. 52	41	vs. 27	21	vs. 20	10	vs. 9	2	vs. 1	0	vs. 0	0	vs. 0
30 Years	100	vs. 99	100	vs. 56	89	vs. 35	20	vs. 14	9	vs. 9	2	vs. 3	0	vs. 0	0	vs. 0	0	vs. 0

**Table 2**

Table 2 presents the percentage success rates for portfolios constructed of U.S. large capitalization stocks and global stocks. Withdrawals are in nominal terms.

## 100% U.S. Equities

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100	99	99	98	97	93	83	75	66
20 Years	100	99	98	97	94	82	69	59	51
25 Years	99	98	97	96	88	73	59	48	40
30 Years	99	98	97	96	84	70	55	45	38

## 80% U.S. Equities and 20% Global Index

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100	100	99	98	97	95	91	73	53
20 Years	100	99	98	97	95	90	66	51	42
25 Years	100	99	98	96	93	78	52	39	27
30 Years	100	98	97	95	92	68	47	34	16

## 60% U.S. Equities and 40% Global Index

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100	100	100	99	96	93	87	66	49
20 Years	100	100	99	96	92	86	57	36	23
25 Years	100	99	97	93	87	61	38	17	9
30 Years	100	98	96	91	83	49	24	7	2

## 40% U.S. Equities and 60% Global Index

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100	100	100	97	93	85	70	51	33
20 Years	100	100	96	90	76	62	36	24	16
25 Years	100	98	91	78	66	37	22	14	6
30 Years	100	96	86	68	51	23	14	8	2

## 20% U.S. Equities and 80% Global Index

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100	100	98	89	79	67	48	39	32
20 Years	100	95	79	73	52	41	31	22	15
25 Years	98	81	71	56	38	27	21	14	7
30 Years	93	71	61	40	28	19	13	9	3

## 100% Global Index

	4%	5%	6%	7%	8%	9%	10%	11%	12%
15 Years	100	95	84	76	59	48	42	35	29
20 Years	91	77	64	51	41	33	25	19	12
25 Years	76	63	51	40	32	25	20	13	7
30 Years	64	51	40	29	24	18	14	10	7



Figure 1

Terminal Dollar Value for 60% Equity Portfolios with a 7% Withdrawal Rate

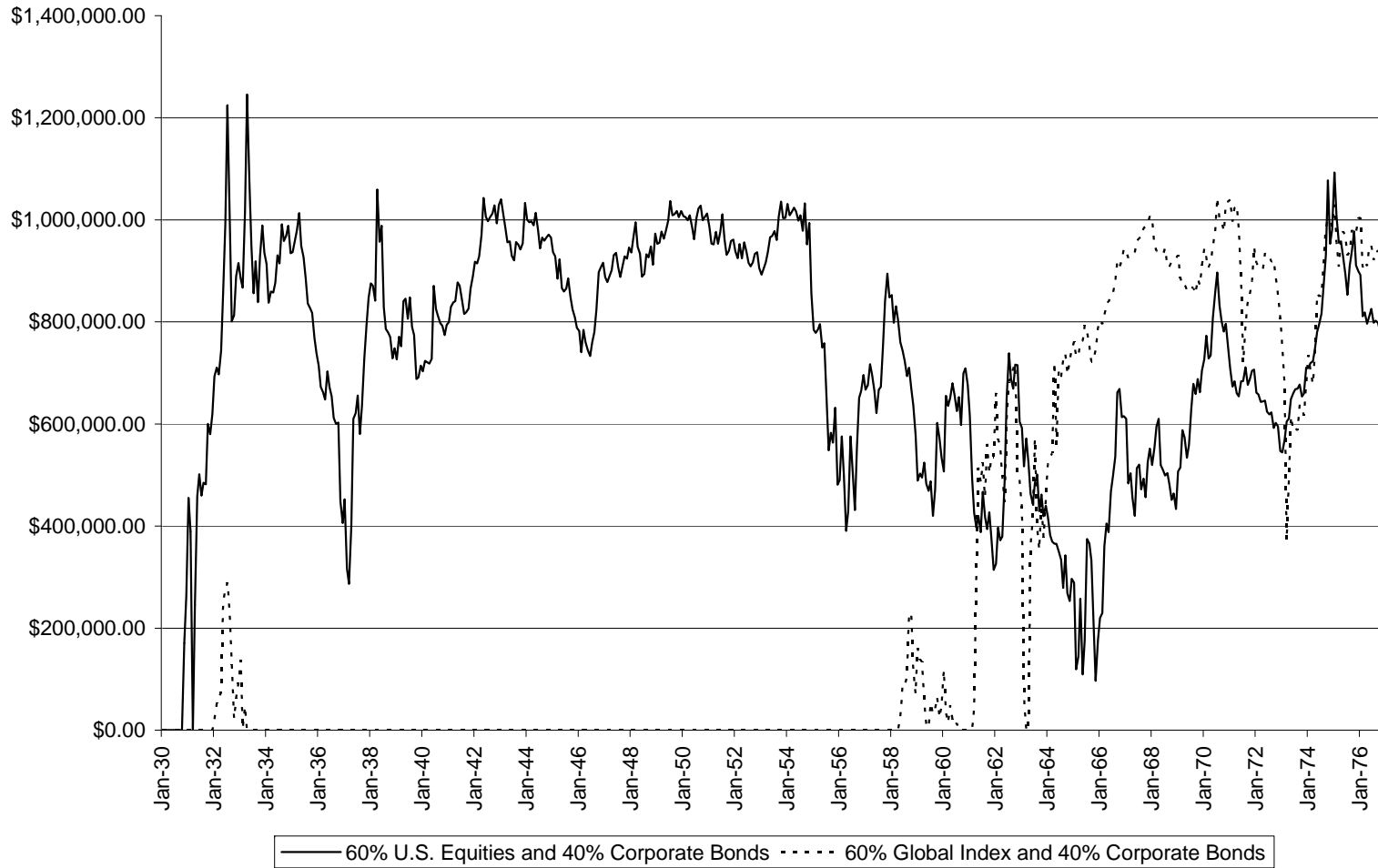
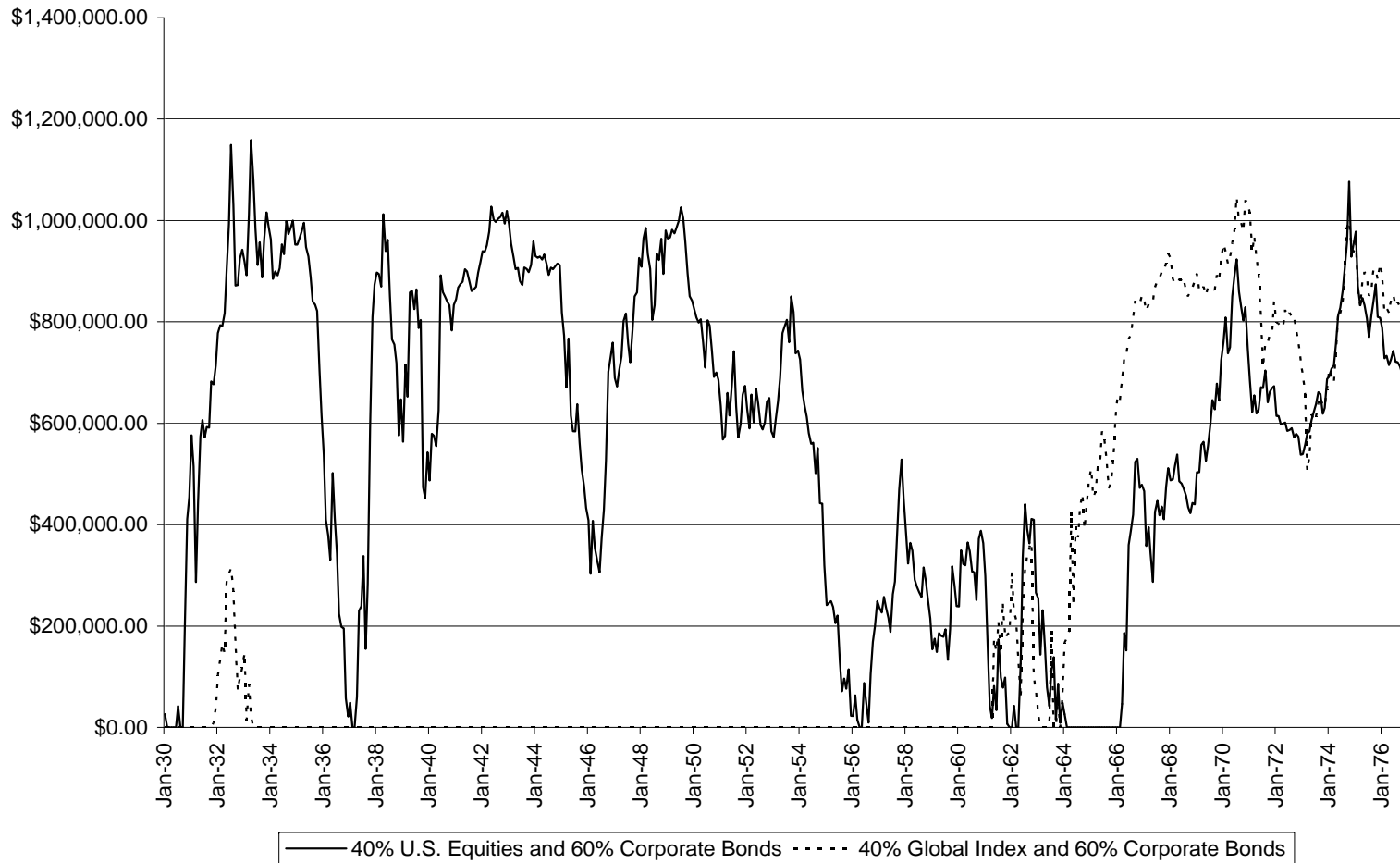


Figure 2

Terminal Dollar Value for 40% Equity Portfolios with a 7% Withdrawal Rate



## Bibliography

- Bierwirth, Larry, 1994, Investing for Retirement: Using the Past to Model the Future, *Journal of Financial Planning*, 7, 1, 14-25.
- Bodie, Zvi, 2003, Thoughts on the Future: Life-Cycle Investing in Theory and Practice, *Financial Analysts Journal*, 59, 1, 24-29.
- Campbell, Rachel, Kees Koedijk and Paul Kofman, 2002, Increased Correlation in Bear Markets, *Financial Analysts Journal*, 58, 1, 87-94.
- Cooley, Philip L., Carl M. Hubbard, and Daniel T. Walz, 1998, Retirement Savings: Choosing a Withdrawal Rate That Is Sustainable, *AALJ Journal X* (3), 16-21.
- Cooley, Philip L., Carl M. Hubbard, and Daniel T. Walz, 1999, Sustainable Withdrawal Rates From Your Retirement Portfolio, *Financial Counseling and Planning* 10 (1), 39-47.
- Cooley, Philip L., Carl M. Hubbard, and Daniel T. Walz, 2001, Withdrawing Money from Your Retirement Portfolio Without Going Broke, *Journal of Retirement Planning* 4(4), 35-42.
- Grubel, Herbert G., 1968, Internationally Diversified Portfolios: Welfare Gains and Capital Flows, *The American Economic Review*, 58, 5, 1299-1314.
- Ibbotson Associates, 2002, *Stocks, Bonds, Bills, and Inflation Yearbook*, Ibbotson Associates, Chicago, IL.
- Levy, Haim and Marshall Sarnat, 1978, International Diversification of Investment Portfolios, *The American Economic Review*, 60, 4, 668-675.
- Lintner, John, 1965, The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets, *Review of Economics and Statistics*, 47, 1, 13-37.
- Markowitz, Harry M., 1952, Portfolio Selection, *Journal of Finance*, 7, 1, 77-91.
- Sharpe, William, 1964, Capital Asset Prices: A Theory of Market Equilibrium, *Journal of Finance*, 19, 3, 425-442.
- Siegel, Jeremy J., 2002, *Stocks for the Long-Run*, McGraw-Hill, New York, NY.
- Sinquefeld, Rex A., 1996, Where Are the Gains from International Diversification, *Financial Analysts Journal*, 52, 1, 8-14.

Solnik, Bruno, Cyril Boucelle and Yann Le Fur, 1996, International Market Correlation and Volatility, *Financial Analysts Journal*, 52, 5, 17-33.