



The Zacks Advantage Approach to Automated Index Investing

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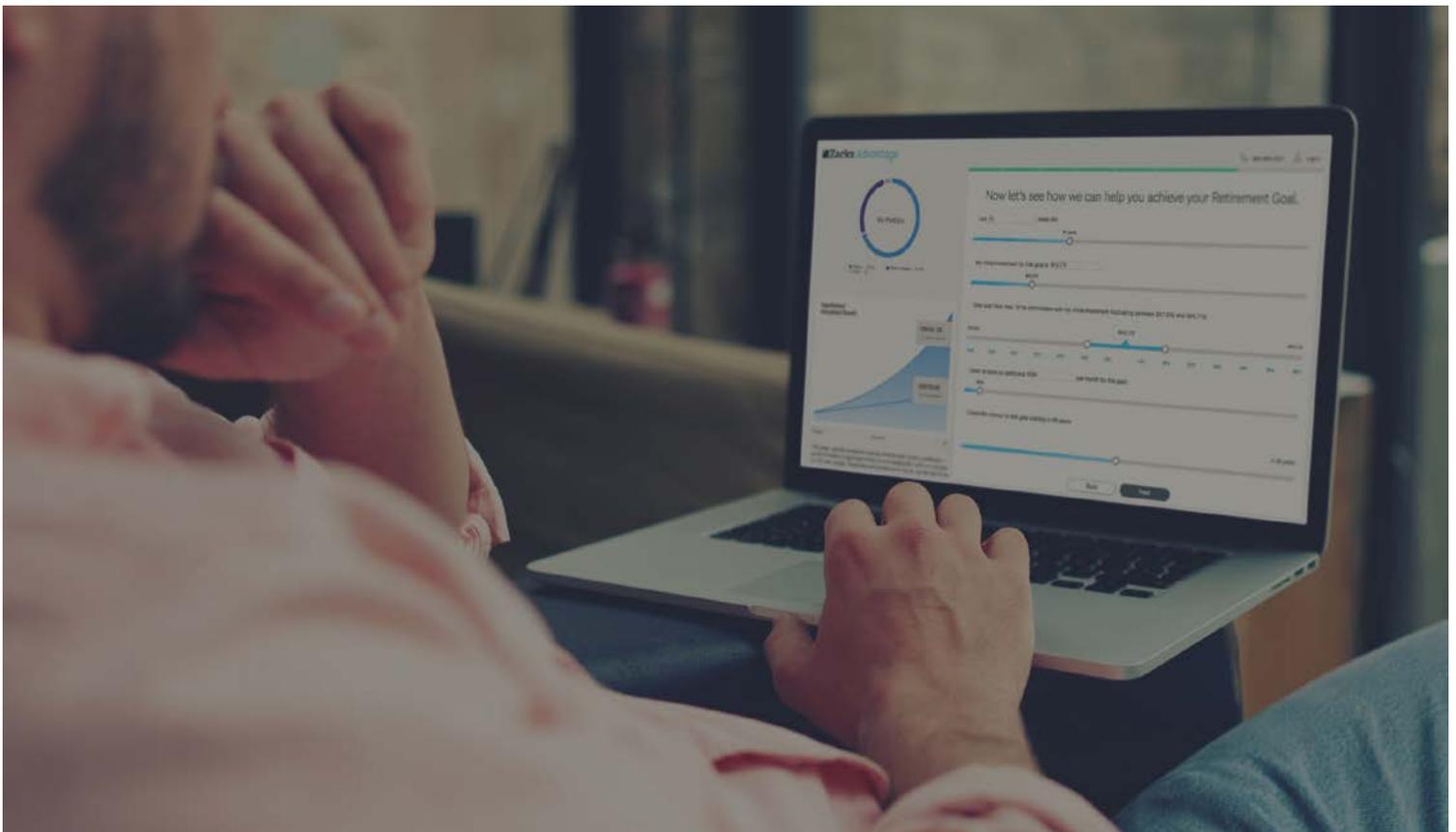
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Executive Summary

- » Asset Allocation is the foundation of the Zacks Advantage investment philosophy. A balanced, professionally managed mix of investments—diversified across asset classes and with a low fee structure—is an effective way to grow wealth and mitigate risk.
- » “Index Investing” provides investors with cost effective access to various asset classes, and is proven to produce favorable long-term returns (as we will illustrate in this paper)
- » The Zacks Advantage model utilizes index investing to build investment portfolios across various risk profiles. Our approach is designed to combine low cost diversification with professional management, to enhance long-term performance results.

Introduction

Asset allocation—or the method of allocating an investment portfolio across different asset classes such as large-cap stocks, small-cap stocks, international stocks, government and corporate bonds, real estate, commodities, cash, and so on—has been the cornerstone of investing for decades. The goal of asset allocation is simple and proven: reduce risk and drive long-term performance through broad-based exposure to non-correlated asset classes.

Investors have a variety of options available in the pursuit of a diversified portfolio across asset classes: hiring an active manager(s) to purchase individual securities that represent different styles, sizes, sectors, and regions; a piecemeal approach of purchasing multiple mutual funds with varying mandates; or, building a portfolio of indexed ETFs, each of which should provide comprehensive exposure to a different asset class, style, sector, or region.

This paper will establish the case for using index fund investing (ETFs) as an effective and efficient method for building a diversified portfolio. Recently published research (Ferre, Benke, 2013) establishes that index funds—when combined together in a portfolio—have a higher probability of outperforming actively managed mutual funds, and they also found that the probability of an index fund portfolio outperforming increased the longer the time period held (from 5 years to 15 years).

Mutual funds were long heralded (1980s – 1990s) as the retail investor’s key to effective diversification, but studies increasingly show that—due to the compounding effect of substantial fees coupled with the inability for mutual fund managers to outperform consistently over time—they may be far from an optimal long-term solution. Mark Carhart exhaustively studied mutual fund performance for his 1997 doctoral thesis at the University of Chicago Booth School of Business, and he observed that although some mutual funds outperformed, mutual fund managers on average did not exhibit superior investment skill.

Similar findings were found in the S&P Dow Jones Indices, LLC bi-annual report titled S&P Indices Versus Active Funds (SPIVA) Scorecard that compares actively managed equity and bond funds to S&P Dow Jones indexes and other indexes. They also publish S&P Persistence Scorecard, and Vanguard has The Case for Indexing, and all of these studies generally point to a common finding: **active fund managers have a very difficult time keeping up with their index benchmarks. While some managers do outperform, it is typically not by much and not for long.**¹

The gradual shift to index investing appears to be largely underway, but investors still face challenges. Among them are: deciding which ETFs to purchase; how to properly allocate a portfolio across style, sector, region, and size to effectively mix non-correlated asset classes; how to create an asset mix that has a risk profile (equity exposure and type of equity exposure) matching that of the investor; and how to manage the asset allocation over time to respond to changing market conditions and shifting investment objectives.

The **Zacks Advantage** platform, and our approach to automated index investing, seeks to address each of these challenges directly. We have identified efficiently constructed, low cost ETFs that correspond to key asset classes, and we have constructed several portfolios that we actively manage using our proprietary adaptive 10-year forecasting model. In other words, the **Zacks Advantage** approach is to build a broadly diversified portfolio of ETFs pursuant to an investor’s needs and risk tolerance, but also to actively manage the portfolio with our *quantitative and qualitative models, investment insight, and 30+ years of collective investment management experience*.

This paper reviews the time tested benefits for asset allocation and diversification, discusses the methodology for strategic allocation using theories and models, builds the case for index investing as an effective and efficient method for generating favorable risk-adjusted returns, and establishes the Zacks Advantage platform as an actively managed, performance-driven approach to automated index investing.

Asset Allocation and the Case for Diversification

The goal of asset allocation in an investment portfolio is to reduce risk through diversification. Strategic diversification offers substantial benefits via broad-based exposure to non-correlated asset classes, enabling investors to generate alpha in robust markets while managing risk in market downturns— all with the ultimate end of growing wealth over long periods of time (20+ years).

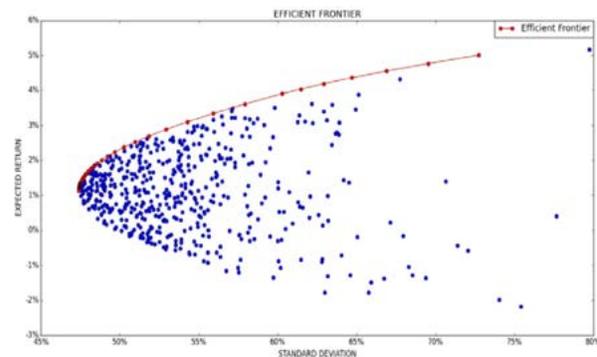
Indeed, a diversified portfolio is designed to hedge invested capital during market downturns, while also offering shorter recovery periods via broad market recovery participation. This can be demonstrated in a performance comparison of a portfolio with 100% stocks vs. a portfolio with 50% stocks and 50% bonds. In 2008, the stock-only portfolio would have fallen by 37%, while a 50-50 stock/bond portfolio would have dropped by 16%. In this case, the stock-only portfolio must grow by 59% to break-even, while the diversified portfolio must only grow by 19% to break even.

A portfolio that goes even further and diversifies across multiple uncorrelated asset classes can provide higher risk-adjusted returns than a single asset. The risk-adjusted performance difference that a diversified portfolio can deliver—relative to any of its individual parts—is often called “the only free lunch in finance.” The “free lunch” concept was formally expressed by the efficient frontier theory and is based upon the insight that diversification can deliver benefits over time at no additional cost. The concept of Efficient Frontier was first introduced by Harry Markowitz in his 1952 groundbreaking paper titled “Portfolio Selection” published in The Journal of Finance. Markowitz’s work serves as the foundation for Modern Portfolio Theory (MPT), which concludes that an investor can reduce portfolio risk by including a low correlated mix of investments.

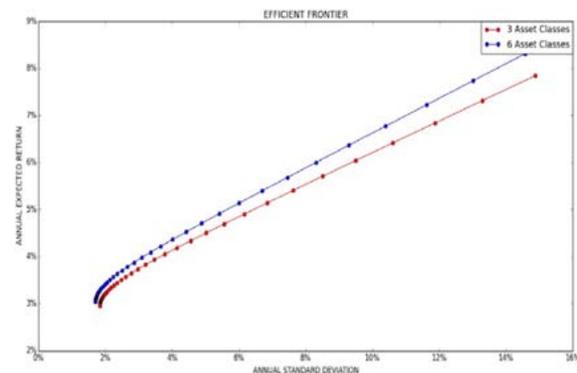
For every desired risk level, the highest possible expected return is created via specific allocation of assets in the portfolio. This portfolio is referred to as an ‘optimal’ portfolio, with the frontier formed from these portfolios corresponding to different risk levels called an ‘Efficient Frontier’. The Efficient Frontier (chart on the next page) represents the highest possible expected return for a given level of risk for the investor. The entire portfolio space is called the ‘Markowitz Bullet,’ owing to its shape.

When compared, two portfolios show how efficient frontier can be pushed upwards by adding additional uncorrelated asset classes to the portfolio. The red line represents efficient frontier of conventional portfolio constructed from of 3 core assets (US Stocks, US Bond and Emerging Markets); the blue line represents the efficient frontier of a further diversified portfolio constructed from 6 asset classes including REITS (Real Estate Investment Trust), Emerging Market Bonds, and US Investment Grade Bonds in addition to the 3 core conventional assets. The benefit of including more uncorrelated asset classes is evident, and higher returns for every specified risk level can be realized.

Beyond the passive asset allocation approached established by MPT (Modern Portfolio Theory), layering on a tactical asset allocation approach to a balanced diversified portfolio has the potential to boost long-term returns and further reduce portfolio risk.



Source: Zacks Investment Management/Bloomberg



Source: Zacks Investment Management/Bloomberg

Strategic Portfolio Asset Allocation

A diversified portfolio can lower investment risk, and when coupled with a framework for strategic, tactical asset allocation, can also lead to greater long-term portfolio performance.

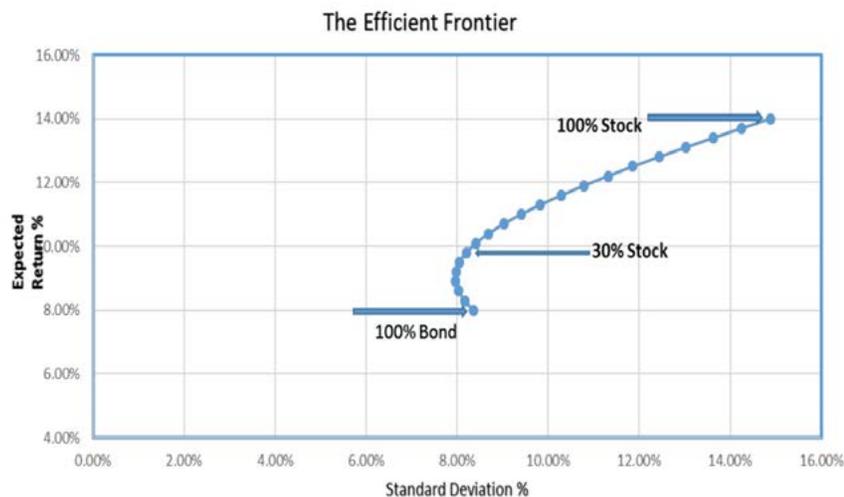
Strategic allocation is the intersection between an investor's needs weighed against the expectations and forecasts for capital market return outcomes. While a diversified portfolio is an essential component to long-term wealth creation, asset allocation has proven to be the primary driver of performance.

A 1986 study published by Brinson, Hood and Beebower (“Determinants of Portfolio Performance”) concluded that 94% of the variability of returns generated by 91 of the largest U.S. defined benefit pension plans were created with strategic asset allocation. Similarly, in 1999, Blake, Lehman and Timmermann concluded similar findings in the U.K., where strategic asset allocation was responsible for more than 99% of the variation returns in 300 of the largest U.K. defined benefit plan (1986-1994).

Mean-Variance Optimization

Mean-Variance Optimization is the process of identifying each level of return for a portfolio with the lowest level of risk and the corresponding asset allocation. The Mean Variance Optimization theory published by Markowitz (1952, 1959) is a cornerstone theory of financial economics and the most widely used model today.

The chart below demonstrates the benefits of Mean-Variance Optimization.



Source: Zacks Investment Management/Bloomberg

The horizontal axis represents the risk measured by standard deviation of a portfolio, while the vertical axis represents the expected return of a portfolio. All portfolios on the efficient frontier are the best portfolios possible, generating highest expected return for given the level of risk. The portfolio with lowest level of risk is represented by a Global Minimum Variance Portfolio (the portfolio with the lowest variance). The Efficient Frontier is the part of the Mean Variance that lies above Global Minimum variance. MVO and the Efficient Frontier can be generated on a constrained or unconstrained basis. MVO is performed on a constrained basis to best determine portfolio risk/reward outcomes.

The Zacks Advantage Strategic Asset Allocation Approach

Zacks Investment Management developed our own strategic approach for allocating assets within investment portfolios.

The first step in the process is to apply the MVO (Mean Variance Optimization) within a portfolio based upon the Modern Portfolio Theory (MPT) of investing. Mean Variance Optimization assumes that asset classes can be analyzed from their expected return, standard deviation and correlation.

Capital Market Assumption and the Formation of Future Return Expectations

Many of our industry peers use a constant return expectation in their portfolio asset allocation models. We prefer a method that applies a long-term forecast, updated monthly, to determine our portfolio expected rate of return. The long-term forecast is driven by an in-depth analysis of contemporaneous macroeconomic conditions.

Managing asset allocation based on a constant—or on very narrow, short-term—range of return expectations does not account for unforeseen major market dislocations (like 2008), which can set in motion a rapid reset of market forecast expectations. Using a long-term forecasting model populated with market outliers is a more inclusive approach, and can be critical in determining the probability of success for an investor reaching their estimated (predicted) long-term investment goals.

When analyzing rolling 10-year realized returns for the S&P 500 Index (broad equity market index), the results support use of a wide range of returns as part of an expected return model—because realized returns have varied significantly over time. The table below underscores the wide distribution of annualized returns investors have realized over the period 1928 – 2015.

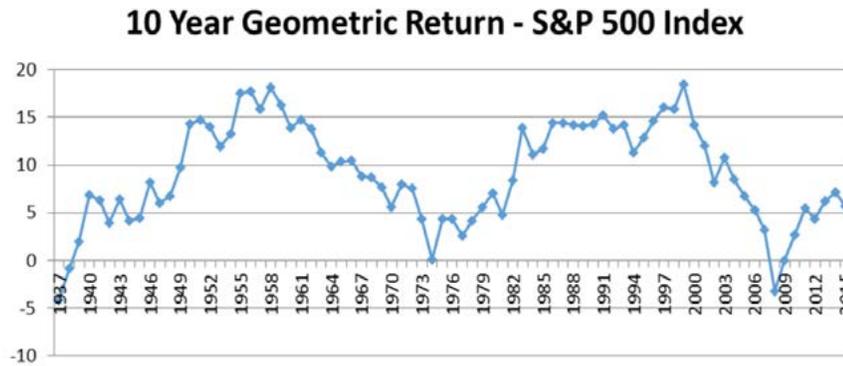
Distribution of 10-year Annualized Returns: S&P 500 1928-2015	Median	8.47%
	Minimum	-4.16%
	10th Percentile	3.12%
	25th Percentile	5.51%
	50th Percentile	8.67%
	75th Percentile	14.10%
	90th Percentile	15.36%
	Max	18.42%

Source: Zacks Investment Management/Bloomberg

Median distribution returns for the S&P 500 for the dataset is 8.67%; however, the actual distribution of returns reflects a much wider range than the median. The actual distribution range is between a minimum of -4.16% to maximum of 18.42%.

This data suggests that using a narrow, or static, range for forecasting expected returns is not ideal when predicting potential long-term returns of a given portfolio.

Performance Varies Too Greatly to Use Static or Narrow Return Expectations



Source: Zacks Investment Management/Bloomberg

A similar analysis for 10-Year US Treasury Bonds shows the distribution has a central tendency of 4.7%. The return fluctuates between .74% and 12.3% with the 10-year annualized return peaking in 1989.

Distribution of 10-year Annualized Returns:	
10 year US Treasury Bond	Median 4.66%
	Minimum 0.74%
	10th Percentile 1.88%
	25th Percentile 2.36%
	50th Percentile 3.51%
	75th Percentile 6.55%
	90th Percentile 8.72%
	Max 12.30%

Source: Zacks Investment Management/Bloomberg

Rolling 10-Year Annualized Return of 10-Year US Treasury Bonds



Source: Zacks Investment Management/Bloomberg

The inclusion of a wider range of data points in our expected return computation is core to our equity market forecast process, which informs our asset allocation decisions.

Equity Market Forecast Process

Because of the aforementioned limitations in equity/bond forecast strategies (too reliant on constant or narrow expected returns), Zacks Investment Management developed a proprietary forecasting model. We draw from academic and proprietary research to develop model assumptions.

Zacks Advantage Equity Market Forecast

We use proprietary factors for our Equity Market Forecast model in the form of:

$$E[R] = \alpha + \beta_1 F_1 + \beta_2 F_2 + \dots + \beta_n F_n + \epsilon$$

where:

α is a constant

$E[R]$ is the expected return

F_i are shortlisted factors

β_i are respective factor loadings ϵ is white noise, $N(0, \sigma^2)$

Zacks Advantage proprietary equity portfolio forecasts are estimated on a monthly basis and compared with a forecast benchmark to manage long-term asset allocation. The forecast benchmark is reset when the forecast model parameters trigger a re-allocation of portfolio assets.

Zacks Advantage: Indexing with Experience

This paper has established the case for an index investing approach, but the challenges for individual investors still remain:

- » How to choose ETFs from the rapidly expanding menu of options;
- » How to properly allocate a portfolio across style, sector, region, and size to effectively mix non-correlated asset classes;
- » How to create an asset mix that has a risk profile (equity exposure and type of equity exposure) matching that of the investor;
- » How to manage asset allocation over time to respond to changing market conditions and shifting investment objectives.

The Zacks Advantage platform for index investing seeks to address and solve these investor challenges. Our tactical adaptive portfolio seeks to yield higher returns with lower volatility than the passive MPT (Modern Portfolio Theory) allocation, by reducing risk during large market downturns and accelerating portfolio market participation during cyclical market recoveries (we expand on this later in the paper). We breakdown each investor challenge below.

How to choose ETFs form rapidly expanding menu of options

Our ETF selection process utilizes the proprietary Zacks ETF Ranking system. The Zacks ETF ranking system takes into account asset class forecasts and looks at several ETF specific factors, such as expense ratios and bid-ask spreads, to give a comprehensive account of a fund's investment profile.

This 'Ranking' method is built for a one-year outlook and seeks to find ETFs that are likely to outperform. The funds are ranked on the traditional Zacks Rank scale of #1 (Strong Buy) to #5 (Strong Sell), and we currently evaluate a variety of funds across asset classes including equities, commodities, fixed income and currency.

Our selection process takes into consideration six (6) core factors: momentum, duration, credit ratings, yields, and ETF holdings. Each ETF is assigned a score for each of the above factors and then total score is arrived at by adding the weighted scores of all factors, using the factor weights assigned by our proprietary ranking model. Total score is used to assign rating from #1 through #5 within an asset class.

The Zacks ETF Rank and Risk ratings have a time horizon of 6 months. However, we continually assess the ranks and ratings and update them every quarter.

How to properly allocate a portfolio across style, sector, region, and size to effectively mix non-correlated asset classes.

Zacks Advantage portfolios are divided into two main investment groups – Equity and Fixed Income. Equity provides investors with capital appreciation, dividend income and inflation protection. Stocks are also tax efficient as capital gains are taxed at a lower rate than income from bonds. International stocks as a group provide additional diversification and risk control, capital growth and inflation protection.

Fixed Income provides the portfolio with a hedging mechanism, stability (low historical volatility), and a steady predictable income stream.

Equities and Bonds have low or negative correlations, and within the class of bonds, investment grade bonds provide benefits of government bonds in addition to higher yields as a payoff for accepting credit risk. International Bonds provide the benefits of additional diversification, particularly as fiscal policy and monetary policy are rarely synchronized across countries. Real Estate securities provide income, inflation protection, and diversification.

Correlation Matrix												
Large Cap	1.00											
Small Cap	0.92	1.00										
Emerging Market	0.73	0.64	1.00									
U.S. Treasury: 1-3 year	-	-	-	1.00								
U.S. Government Intermediate	0.31	0.33	0.24	0.86	1.00							
U.S. Treasury 7-10 Year	-	-	-	0.29	0.32	0.28	0.68	0.95	1.00			
U.S. Corporate Investment Grade	0.35	0.26	0.40	0.16	0.43	0.48	0.6	0.5	0.3	1.0		
Global Aggregate Bond	0.30	0.20	0.36	0.47	0.57	0.52	0.6	0.5	0.3	0.7	1.0	
Emerging Market Credit	0.61	0.54	0.72	0.22	0.14	0.13	0.5	0.3	0.8	0.7	0.9	1.0
U.S. Corporate High Yield	0.75	0.71	0.70	0.30	0.21	0.21	0.6	0.3	0.8	0.7	0.9	1.0
U.S. Select REIT	0.74	0.76	0.46	0.17	0.08	0.06	0.4	0.3	0.5	0.7	0.9	1.0
Global Select REIT	0.81	0.78	0.58	0.18	0.08	0.06	0.4	0.4	0.6	0.7	0.9	1.0

Zack Advantage Asset Correlation Matrix (June 2016)

Overview of Zacks Advantage Strategies

Zacks Advantage currently offers investors three core investment strategies with variable risk delineations within each strategy.

Total Taxable Return strategy has 12 portfolios ranging from conservative allocation to an aggressive mix.

Total Return Municipal strategy has 12 portfolios ranging from conservative allocation to an aggressive mix.

Income Taxable strategy has 3 portfolios ranging from conservative allocation to an aggressive mix.



The Zacks Advantage Investment Committee

Mitch Zacks

**Principal and Managing Director
Zacks Investment Management**

Mitch Zacks is a managing principle of the firm and is a primary expert on quantitative investing, has personally developed many of the proprietary models we use in the management of our strategies. Mitch has written two books on quantitative investment strategies, *Ahead of The Market*, which details the Zacks method for spotting stocks early in any economy, and *The Little Book of Stock Market Profits: The Best Strategies of All Time Made Better*, which was published in 2011 and was one of the top selling investment books at that time. Prior to joining Zacks, Mitch was a financial writer for the *Chicago Sun Times* and also was an investment banking analyst with Lazard Frères in New York. He has a B.A. in Economics from Yale University and an M.B.A in Analytic Finance from the University of Chicago.

Atanu Ghosh, CFA

**Assistant Portfolio Manager
Zacks Investment Management**

Atanu Ghosh has over ten years of finance experience serving as a quantitative and fundamental research analyst and an equity portfolio manager. Prior to joining Zacks Investment Management, Atanu was a Senior Research Analyst at Fiduciary Asset Management, on their Large Cap Core and quantitative strategy teams.

Atanu develops quantitative models that we utilize in the management of our investment strategies, and is constantly analyzing industry trends and research to ensure we remain on the cutting edge of portfolio management. Atanu received his M.B.A. from Washington University, St. Louis and his Bachelor's degree in Computer Science from Jadavpur University, Calcutta, India. Atanu is a Chartered Financial Analyst.

Prasanth Sankar
Portfolio Manager, PhD
Zacks Investment Management

Prasanth has worked as a portfolio manager and quantitative analyst at Zacks Investment Management for over 5 years. Prasanth co-manages several of Zacks' investment strategies and also develops and refines many of our proprietary models. Prasanth applies his mathematical background to the investment process through sophisticated and in-depth quantitative analysis, where he seeks to identify investment anomalies and develop investment models to profit from them.

Prasanth has a Ph.D. in Theoretical Physics from the University of Illinois at Urbana-Champaign, and a Bachelor's degree from the Indian Institute of Technology.

Ben Zacks
Principal & Managing Director
Zacks Investment Management

Ben is the core of the Zacks Investment Management Team, and the most experienced member of the Investment Policy Committee. Ben co-founded Zacks Investment Research in 1978, and he was a critical contributor in the development and fine tuning of the strategies and models that define the Zacks name. He has used his expertise to navigate through the market's ups and downs several times.

Ben is also a nationally recognized investment strategist and a known expert on corporate earnings—he's been featured extensively in the financial media including CNBC, CNN, CNNfn, and quoted in *The Wall Street Journal*, *The New York Times*, *The Chicago Tribune*, *Financial World Magazine*, *Smart Money Magazine*, and *Worth Magazine*.

Ben founded Zacks Investment Management in 1992, and has a B.A. in Economics from Boston University.

Scott Schneider
President
Zacks Advantage

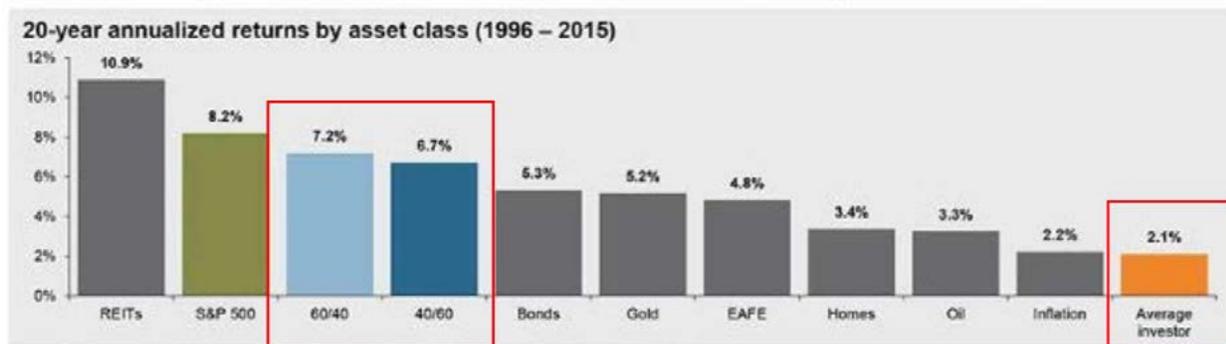
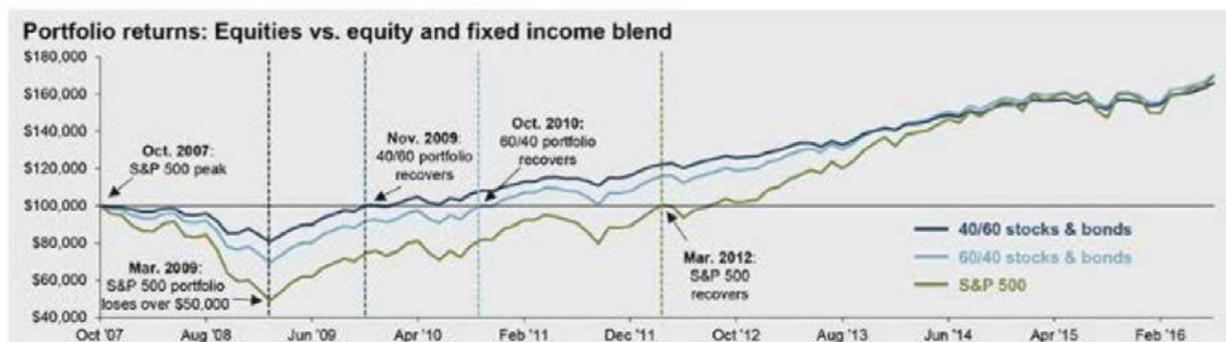
Prior to joining Zacks Advantage, Scott was the founder, managing partner and chief investment officer of Sawmill Lane Capital LLC, a hedge fund comprising the Sawmill Lane Capital Activist Fund and the Sawmill Lane Capital Managed Risk Fund.

The Sawmill Lane Capital Activist strategy was a long-only, event drive fund focused on merger & acquisition activity within the equity markets. The Sawmill Lane Managed Risk Fund was an absolute return strategy maximizing returns in the broadest range of market conditions with a focus on minimizing risk and preservation of capital.

Scott has Bachelor's degree in Economics from Tufts University.

Conclusion

Asset allocation has become a cornerstone of modern, balanced portfolio investment management. While research shows that long-term diversification across asset classes can generate attractive long-term returns, there remains a disconnect between investors actually realizing that performance. In many cases, investor error caused by emotional reaction to market swings can lead to adverse market timing decisions. But hiring an active mutual fund manager, research has shown, is not a much better solution in the pursuit of performing in-line with or outperforming an index



Source: J.P. Morgan Asset Management; (Top) Barclays, FactSet, Standard & Poor's; (Bottom) Dalbar Inc. Indexes used are as follows: REITs: NAREIT Equity REIT Index, EAFE: MSCI EAFE, Oil: WTI Index, Bonds: Barclays U.S. Aggregate Index, Homes: median sale price of existing single-family homes, Gold: USD/troy oz, Inflation: CPI, 60/40: A balanced portfolio with 60% invested in S&P 500 Index and 40% invested in high quality U.S. fixed income, represented by the Barclays U.S. Aggregate Index. The portfolio is rebalanced annually. Average asset allocation investor return is based on an analysis by Dalbar Inc., which utilizes the net of aggregate mutual fund sales, redemptions and exchanges each month as a measure of investor behavior. Returns are annualized (and total return where applicable) and represent the 20-year period ending 12/31/15 to match Dalbar's most recent analysis. Guide to the Markets – U.S. Data are as of July 31, 2016.

Research suggests that a solution to this issue is taking an index investing approach. However, challenges to this approach exist for most investors, as there are aspects of the approach that require research, analysis, and investment expertise. Among the challenges are deciding which ETFs to purchase; how to properly allocate a portfolio across style, sector, region, and size to effectively mix non-correlated asset classes; how to create an asset mix that has a risk profile (equity exposure and type of equity exposure) matching that of the investor; and how to manage the asset allocation over time to respond to changing market conditions and shifting investment objectives.

Zacks Advantage, utilizing our experienced management team, the Zacks Investment Management forecasting approach to adaptive asset allocation, and the Zacks proprietary ETF Ranking system, seeks to address and solve these challenges for investors via a new actively managed approach to balanced portfolio investing. In short, the Zacks Advantage goal is to enhance long-term portfolio performance through a tactical approach to asset allocation, built on Zacks Investments Management's 30 years of investment management experience.



Appendix

Appendix I: Zacks Advantage Portfolio Asset Classes

Key factors considered when choosing asset classes for the portfolio are liquidity, correlation matrix and diversification for comprehensive exposure to available investment opportunities.

Equity

U.S. Large Cap Stocks - This category represents equity stake in the largest 500 publicly listed corporations in U.S. based on market capitalization. U.S. economy is largest in the world and its markets one of the most liquid. Though current valuations indicate lower future return expectation as compared to historical realization, the resilient and innovative nature of U.S. businesses still makes a strong case for exposure.

U.S. Small Cap Stocks - This category represents equity stake in smaller listed corporations in U.S. based on market capitalization. These stocks tend to be more volatile as compared to large cap, but historically have had higher returns.

International Developed Large Cap Stocks - This category represents an equity stake in large corporations that have their headquarters in developed economies outside U.S. These economies such as Japan, Germany, U.K. etc. represent a substantial fraction of the world economy.

International Developed Small Cap Stocks - This category represents an equity stake in smaller corporations in the developed economies besides U.S. These stocks again tend to be more volatile, but present with a higher chance of growth.

International Emerging Market Stocks - These represent an equity stake in corporations headquartered in developing economies such as China, India, Indonesia, Mexico, Brazil etc. These economies have outpaced their counterparts in the developed world in terms of growth in the recent past, and their demographic make-up and rapid industrialization points towards continuation of this trend. We opine that these economies are going to deliver higher returns than developed economies in the long-term.

U.S. Exchange Traded REIT - REITs or Real Estate Investment Trusts are companies that own and operate income producing real estate. These publically traded entities provide access to U.S. real estate as an investment opportunity. Performance of REITs tends to be highly correlated with inflation, more so than other asset classes. This makes them a perfect hedge against inflation and an important constituent of any portfolio.

International Exchange Traded REIT- This asset class represents international real estate as an investment opportunity, providing further means of hedging against inflation and making the portfolio less sensitive to shocks in U.S. economy.

Fixed Income

U.S. Short Term Treasury Notes – This category represents the short term (1-3-year maturity) debt issued by the U.S. government. These provide steady income and historically have had low correlation with U.S. equity. Currently these yields are at historical low levels because of the low interest environment.

U.S. Long Term Treasury Bonds - This category represents long term (3year + maturity) debt issued by the U.S. government to fund its various activities. Bonds with longer maturity command higher yield, this is referred to as term premium.

U.S. Investment Grade Corporate Bond – These represent debt issued by U.S. corporations to fund their business activities. These have higher yields than U.S. Government Bonds, accounting for higher credit risk and liquidity constraints.

International Developed Country Bond - These represent debt issued by governments of developed economies like Europe, Japan and Australia. Currently, most of these yields levels are at record lows because of unprecedented scale of quantitative easing being employed by most central banks in an effort to spur growth, reign in unemployment and get inflation to a desirable level.

U.S. Corporate High Yield Bond – These represent segment of the debt issued by U.S. corporations that has its yield on the higher end. Higher yield is demanded off these corporations by investors because of their higher probability to default on their debt. Yield differential thus is the compensation for additional risk that investors are subjected to.

International Emerging Market Bond – These represent debt issued by governments of developing economies such as India, China, Mexico, Indonesia, and Brazil etc. These governments issue debt to finance capital intensive projects involving infrastructure development and other public programs, and sometimes to finance budget deficits. Yields on these bonds are higher than those offered by their Developed Market counterparts to account for the additional default risk that the investor bears.

Appendix II: The Case for an Index Investing (ETF) Approach

Combining the strategic asset allocation approach described above with an index investing (ETF) strategy enables us to build low cost, diversified portfolios that go beyond the passive indexing strategies commonly found in the “Robo-Advisor” field.

The last 10 years has seen the propagation of index funds for any specific market, industry, sector, country, commodity, and so on. The case for index investing has grown in recent years as enough data has become available for comprehensive research, and recent studies we cite below all make compelling cases for index investing over mutual fund investing.

Vanguard has been at the forefront of the growth and development of ETF and indexing strategies, and has also produced a great deal of research in the field. Their studies generally focus on the negative impact of fees to total return over time, particularly in the mutual fund space.

If a market is defined by the aggregate holdings of all investors, the cumulative investments’ excess returns over the benchmark would theoretically be ‘zero’ – much like a ‘zero-sum game.’ However, mutual fund investors generally have to bear additional costs, including management fees, bid-ask spreads, administrative costs, commissions, and so on—meaning that the asset-weighted average excess return net of costs could fall below the ‘zero sum.’ By that logic, a high-cost fund would be more likely to underperform its benchmark compared to a low-cost one.

Vanguard showed that using a time horizon of 15 years and after accounting for costs, most of the U.S. equity index funds yielded excess returns around -1% to 0% from their respective prospectus benchmarks. On the other hand, there’s a substantial number of (high-cost) actively managed U.S. equity funds with net excess returns of various ranges on either side of the scale – an indication of greater risk dispersion and significantly lower performance consistency. Also to note is that the vast majority of liquidations/mergers happen in the active mutual fund manager space, versus with index funds.

Figure 3. Distribution of equity and fixed income funds' excess return

a. Distribution of equity funds' excess return



b. Distribution of fixed income funds' excess return



Recent research by Vanguard found that 46% of mutual funds available in January 1997 were no longer in existence by December 2011. The study also noted that these funds tended to have poor performance over an 18-month period prior to closing or merging. The shortfall was -4.63% for large-cap blend equity funds, -10.52% for small-cap blend equity funds, and -1.75% for US corporate bond funds.

Vanguard would contend that fees are a main driver of underperformance, and several other studies support that claim. Research by James J. Rowley Jr. and David T. Kwon (2015), using 198 U.S. ETFs, showed that expense ratios were the dominant variable affecting excess returns, compared to other variables including active share and fair-value pricing. There may be certain cycles or specific years when an actively managed fund beats the performance of its benchmark and that of an index fund. But research suggests that over time, the cost-advantage of index investments relative to active funds is compounded—a feature that can potentially allow passive investment returns to edge past the transitory gains of high-cost funds, especially since persistent performance is found to be a rarity in actively management.

Whatever the cause, the evidence is mounting that actively managed mutual funds have a very difficult time outperforming their benchmarks over long stretches of time. The Carhart (1997) study found no evidence of fund outperformance persistence, after adjusting for Fama-French 3-factor model and momentum. In 2010, Fama and French concluded a 22-year study showing it to be extremely difficult for an active fund to beat its benchmark on a regular basis. A more recent Vanguard study looked at active U.S. equity funds between two separate, subsequent and non-overlapping five-year periods ending December 31, 2010 and December 31, 2015, respectively. Among funds belonging to the first quintile in the first five-year period (in terms of excess returns relative to respective benchmarks), most (24.1%) got relegated to the bottom quintile in the second five-year period.

The latest research we've reviewed on the matter was conducted by Betterment (Ferre, Benke 2013). It focused less on the impact of fees and more on raw performance (much like Fama and French). Ferre and Benke looked at passively managed index funds that attempt to track the performance of a market or market sector less a small expense, and actively managed mutual funds that attempt to outperform a market or market sector net of expenses. No rebalancing was done, and 5,000 simulated trials were done for each actively managed mutual fund.

There were three main findings to emerge from their study:

- » Index funds have a higher probability of outperforming actively managed funds when combined together in a portfolio;
- » The probability of index fund portfolio outperformance increased when the time period was extended from 5 years to 15 years;
- » The probability of index fund portfolio outperformance increased when two or more actively managed funds were held in each asset class (in other words, the more active mutual fund managers involved, the lower the probability they could collectively outperform an index strategy).

The first “scenario” of the study was to look at a 3-index fund portfolio composition:

Portfolio 1

Category	Allocation	Fund Name	Ticker
US Equity	40%	Vanguard Total Stock Market Index Fund Investor Shares	VTSMX
International Equity	20%	Vanguard Total International Stock Index Fund Investor Shares	VGTSX
US Investment-Grade Bonds	40%	Vanguard Total Bond Market Index Fund Investor Shares	VBMFX

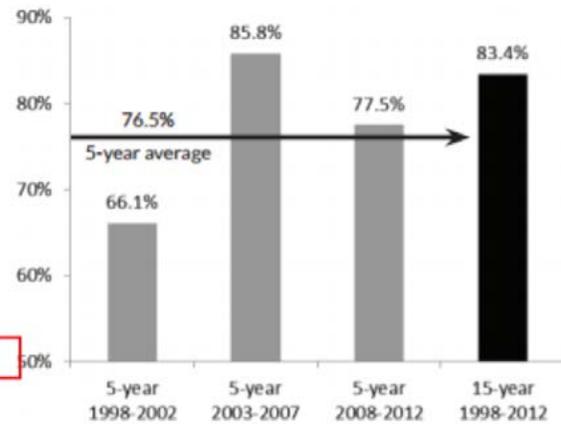
This allocation represents a generally balanced allocation between stocks and bonds. Ferre and Benke analyzed performance from 1997 – 2012 (which included two recessions/bear markets), and they also ran 5,000 simulated trials of actively managed mutual fund portfolios covering the same categories, over the same time period.

Ferre and Benke’s results were straightforward and compelling: The index fund portfolio outperformed the randomly selected actively managed fund portfolios 82.9% of the time during this 16-year period. There were 4,144 underperforming actively managed fund portfolios and 856 outperforming portfolios. The median annual performance shortfall of the losing portfolios was -1.25% annually and the median outperforming portfolios beat the index fund portfolio by 0.52% annually (meaning the upside potential of actively managed mutual fund portfolios did not make up for the risk of downside probability and magnitude of underperformance).

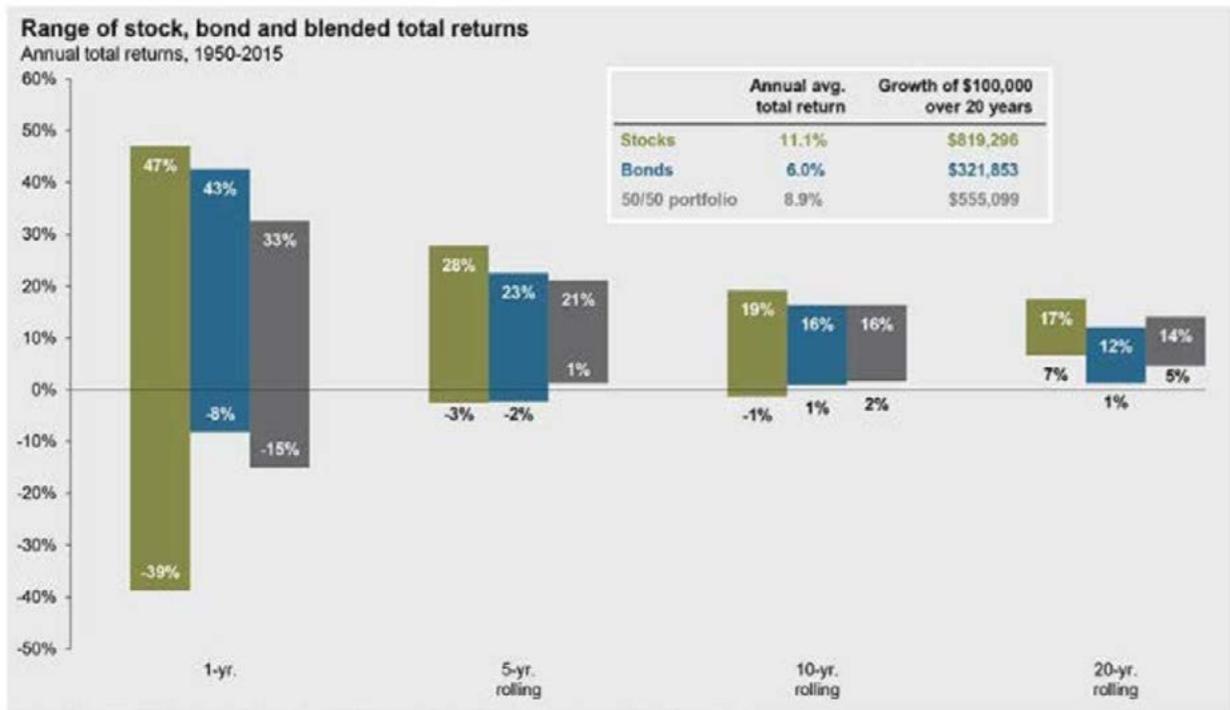
In the second “scenario” of the study, Ferre and Benke measured the performance impact over time. They found that the longer the time period of index funds versus actively managed mutual funds, the greater the likelihood that performance would increase versus the portfolio of average comparable actively managed funds.

An Index Fund's “Winning Percentage” Increases Over Time

TIME PERIOD	NUMBER OF YEARS	INDEX PORTFOLIO WIN %
1998-2002	5	66.1%
2003-2007	5	85.8%
2008-2012	5	77.5%
1998-2012	15	83.4%



The longer you hold the index portfolio, the higher the probability of outperforming—yet another reminder of the benefits to being a long-term investor.



Source: Barclays, FactSet, Federal Reserve, Robert Shiller, Strategas/Ibbotson, J.P. Morgan Asset Management.
 Returns shown are based on calendar year returns from 1950 to 2015. Stocks represent the S&P 500 Shiller Composite and Bonds represent Strategas/Ibbotson for periods from 1950 to 2010 and Barclays Aggregate thereafter. Growth of \$100,000 is based on annual average total returns from 1950 to 2015.
 Guide to the Markets – U.S. Data are as of July 31, 2016.

The final scenario tested for the effects of additional diversification, and found that the “winning percentage” for index funds increased as more funds were added. On one hand, this could be related to the positive effects of additional diversification as discussed earlier in this paper, but it also may attest to the notion that the more active mutual fund managers involved, the lower the probability of outperforming an index.

The study looked at a three index fund portfolio (scenario 1), then a five fund index portfolio and finally a ten fund index portfolio. These were all analyzed just as in scenario 1 (except for the time period in this final scenario was from 2003 – 2012), against 5,000 simulated trials using various actively managed mutual fund portfolios. The findings are once again straightforward and compelling, and point to the increasing benefits of additional diversification:

3 fund = Index Portfolio Wins 82.9% of the time.

5 fund = Index portfolio wins 87.8% of the time.

10 fund = Index portfolio wins 89.9% of the time.

The research presented above overwhelmingly suggests that while it is possible to outperform a portfolio of index funds using actively managed mutual funds, it is just not probable.

Appendix III: Industry Accepted Forecast Models

Capital Asset Pricing Model (CAPM) – Sharp (1964), Linter (1965) and Mossin (1966). CAPM is the first model that formalized the relationship between risk and return. It is one of the central elements of Modern Portfolio Theory. This model posits that investors must be compensated for taking systematic risk or risk that can’t be diversified away. It can formally be stated as:

$$E(R_i) = R_f + \beta_i * (E(R_m) - R_f)$$

E(R_i) = Expected Return on the Capital Asset

R_f = Risk Free Rate of Interest, generally garnered from government bonds **β_i** = Sensitivity of expected excess asset return to expected excess market return

Formally, **β_i = Cov(R_i, R_m)/Var(R_m)**

Arbitrage Pricing Theory – Conceptualized by Ross (1976), addresses the shortcomings of CAPM Model. It is based on the notion of ‘Law of One Price.’ It states that the expected return of financial assets can be modeled as a linear combination of macroeconomic factors.

$$E[R_j] = \alpha_j + \beta_{j1}F_1 + \beta_{j2}F_2 + \dots + \beta_{jn}F_n + \epsilon_j$$

where:

E[R_j] is the expected return of asset **j**

α_j is a constant for asset **j**

F_i are systematic factors

β_{ji} are respective factor loadings for asset **j**

ε_j is white noise, **N(0, σ_j²)**

Roll, Ross and Chen (1980) – Identified the important macroeconomic factors that explain security return.

Gordon Growth Model (1956, 1959): This is another form of the Dividend Discount model that Myron J. Gordon used to derive the long-run expected return of the equity market. This model assumes that there is a long-term trend in dividend and earnings growth. For the developed market, this is not an unreasonable assumption.

Grinold-Kroner Model: Grinold and Kroner (2002) modified the Gordon Growth model to account for share repurchases. According to this model, expected return can be explained in terms of the following factors:

$$E(r) = D/P - \Delta(S) + I + G + \Delta(PE)$$

Where **D/P** = Dividend Yield

$\Delta(S)$ = percentage change in shares outstanding

I = rate of Inflation

G = real total earnings growth

$\Delta(PE)$ = change in PE ratio, which is expected to be mean reverting.

Fed Model: This model was developed by the US Federal Reserve. This model postulates that the equity market is overvalued if the current earnings yield on equities is less than the 10-year US Treasury yield.

Risk Premium Approach: The general framework with this approach is that expected return on a risky asset should equal the risk-free rate plus one or more risk premiums, for which the investor seeks compensation (systematic risk or risk that can't be diversified away must be compensated for). For example, the expected return of an investment grade corporate bond = Risk Free Interest Rate + Default Risk Premium + Maturity Premium.

Maturity Premium: Premium for holding a longer-dated security. An investor who holds bond with 10-year maturity will seek a Maturity Premium, as longer dated bonds are more sensitive to interest rate changes. An investor needs compensation for forgoing current consumption.

Default Premium: Premium that investor expects for the possibility that an issuer might default. A high quality issuer with a strong balance sheet will have a lower default premium than an issuer with a weak or overly leveraged balance sheet.

Notes

ⁱ A Case for Index Fund Portfolios by Richard A Ferri,CFA & Alex C. Benke

ⁱⁱ Schwab Intelligent Portfolios Asset Allocation White Paper by Charles Schwab & Co.



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