

Online Portfolio Evaluation and Analysis in a Basic Investments Course

Eddie Ary

Introduction:

Many professors who teach investments require their students to participate in an online stock portfolio simulation as a means of gaining investment experience. Often near the end of this experience students are asked to analyze and evaluate their portfolios. There are many tools online that can be used to assist students in this process. This paper reviews several Web sites which provide either portfolio evaluation reports or tools, and briefly explains some ways in which the reports/tools can aid in the process of portfolio analysis and evaluation. It is hoped the information presented will prove valuable to professors who require students to become involved in some form of portfolio evaluation, as well as professors who may simply want to teach students the process of portfolio evaluation and analysis.

Even though the paper is oriented toward portfolio evaluation and analysis for a stock portfolio simulation, much of the information presented could be utilized by small investors managing their own investment portfolios.

Before introducing the Web sites, a review of some of the important elements of stock portfolio evaluation and analysis is in order.

Important Elements in Evaluating and Analyzing a Stock Portfolio

Diversification:

By building diversified portfolios, students can reduce or eliminate the risk associated with individual securities, called unsystematic or diversifiable risk. Statman (1987) found that 30 to 40 stocks are needed to create a well diversified portfolio. Research by Surz and Price (2000) indicated that a randomly selected portfolio of 30 stocks eliminated about 85 percent of unsystematic risk, and that a 60 stock portfolio reduced unsystematic risk by 88 percent. Because of such findings, investment professors may find it desirable to ask students to include at least 30 stocks in their simulation portfolios. As a result of effective diversification, student portfolios will mainly face systematic or non-diversifiable risk—the risk associated with securities in general, such as interest rate risk, market risk, purchasing power risk, and liquidity risk.

In evaluating portfolio diversification, it is obvious that diversification among industries, as well as the weight of each stock in the portfolio is important. Having a portfolio consisting of the stocks of ten different companies each operating in a different industry is not going to effectively reduce unsystematic risk if one of the stocks accounts for 40 percent of the portfolio.

Eddie Ary is Associate Professor of Finance at Ouachita Baptist University in Arkadelphia, Arkansas.

Another factor to consider in analyzing portfolio diversification is the correlation among the stocks in the portfolio. The prices of stocks with correlation coefficients of +1 on average tend to move together, those with 0 correlation show no relationship, and the prices of stocks with -1 correlation tend to on average move in opposite directions. Of course, in reality there are probably few (if any) stocks that have these extreme degrees of correlation.

In recent years, there has been much emphasis on investing internationally as a means of diversifying. In spite of the fact that the correlation between United States stocks and foreign stocks has risen over the years, there are still markets which show fairly low correlation. Ibbotson Associates reports the following correlations between United States stocks (S&P 500 Index) and selected foreign stock markets for the fifteen year period ended December 31, 2004:

Japan (Morgan Stanley Capital International Japan Index), .36

Asia Pacific—excluding Japan—(MSCI All Country Asia Pacific Ex-Japan Index), .60

Emerging Markets (MSCI Emerging Markets Index), .63

Developed Markets--excluding United States—(MSCI Europe, Australia, and Far East Index), .65

Europe (MSCI Europe Index), .74

If the analysis of a portfolio reveals risk exceeding the tolerance of an investor, stocks with negative or low positive correlation should be added to the portfolio to lower its risk. If the investor desired to accomplish this by investing internationally, investing in Japanese companies or mutual funds appears to be the best approach based on the Ibbotson Associates data.

A statistic that can be used to evaluate the extent to which diversification has reduced the unsystematic risk in a portfolio is the coefficient of determination, often referred to as R-squared since it is the correlation coefficient squared. R-squared values can range from 0 to 1. An R-squared of .90 means that 90 percent of the return of a portfolio can be explained by movements in the market, indicating that the portfolio manager has done a good job of reducing the unsystematic risk of the portfolio.

A high R-squared can also be interpreted as showing a close relationship between the fluctuations in the return of a portfolio and the market. Therefore, much attention should be paid to beta, a statistic which indicates how the price of a stock has moved in relation to the market. For example, a stock with a beta of 1 has tended to exactly follow the market; if the market has moved up 10 percent, so has it. The beta of a portfolio can be computed by multiplying the beta of each stock by the weight of the stock in the portfolio, and then adding the results. Beta is often used as an overall measure of systematic risk in a portfolio; therefore, part of the evaluation process should be determining whether the beta of the portfolio matches the manager's risk tolerance (or in the case of a mutual fund is compatible with the investment objective of the fund). For instance, a manager with a low risk tolerance would likely be uncomfortable with a portfolio that had a high beta. Of course, a manager speculating on the direction of the market could intentionally build a portfolio of high beta stocks if there was a strong belief that the market would rise.

Risk-Adjusted Performance:

Another important aspect of portfolio evaluation is determining risk-adjusted performance. Performance monitoring would be easy if return was the only part of the equation, but the risk borne to earn the return is another very relevant factor that an investor must consider. Three measures which have been developed to help an investor evaluate the performance of a portfolio on a risk-return basis are often introduced in a basic investments course. A brief explanation of these measures follows.

1. Sharpe's measure: William Sharpe (1966) developed this measure which computes excess return per unit of risk. Hirt and Block (2003) state the formula for Sharpe's measure as "Total Portfolio Return minus the Risk-free Rate/portfolio standard deviation," often expressed as $r_p - R_f/s_p$. For example, if during a given year, a portfolio earned a return of 12 percent, the risk-free rate was 4 percent (normally the rate on United States Treasury bills), and the standard deviation of the portfolio was 20 percent, Sharpe's measure would be .40, indicating that the portfolio earned an excess return (a return above the risk-free rate) of .40 percent per unit of total risk (both unsystematic and systematic). Whether this is good or bad depends upon the excess return per unit of risk earned by the market or similar portfolios. Sharpe's measure is suitable as a measure of risk-adjusted performance when the portfolio is not well diversified and therefore there is a need to measure the total risk of the portfolio.
2. Treynor's measure: Treynor's measure was developed by Jack Treynor (1965). Gitman and Joehnk (2003) indicate that Treynor's measure is computed as follows: "Total Portfolio Return minus the Risk-free Rate/portfolio beta," or $r_p - R_f/b_p$. In the example given earlier for Sharpe's measure, if we assume a portfolio beta of 1.20, the portfolio has generated an excess return of 6.67 percent ($12\% - 4\%/1.20$) per unit of risk. The only difference between Sharpe's and Treynor's measure is that Sharpe's measure uses standard deviation as a measure of risk while Treynor's measure uses beta. Treynor's measure assumes unsystematic risk has been diversified away. In other words, total risk is used in Sharpe's measure while systematic risk (beta) is the risk measurement in Treynor's measure. Like Sharpe's measure, Treynor's measure must be compared to the identical measure for the market or for similar portfolios.
3. Jensen's measure (often called Jensen's alpha): Michael Jensen (1968) introduced this measure, probably the best known and most widely used risk-return measure. Jensen's measure can be stated as "the excess return earned by a portfolio minus the return the portfolio should have earned based on the return of the market and the risk of the portfolio as measured by beta," or $(r_p - R_f) - [b_p \times (r_m - R_f)]$. For example, if a portfolio had an excess return of 8 percent and a required return of 6 percent, Jensen's measure would be 2 percent, indicating the portfolio outperformed the market on a risk-adjusted, market-adjusted basis. In other words, positive Jensen's measures indicate out-performance, negative measures indicate underperformance. Like Treynor's measure, Jensen's measure assumes the portfolio has been diversified to eliminate unsystematic risk. Jensen's measure, unlike Sharpe's measure and Treynor's measure, incorporates the market return, thus a separate comparison to the market is not necessary.

Not only must the performance of the entire portfolio be examined from time to time, but the performance of the individual investments making up the portfolio as well. Investments which lagged the market should be studied closely to see if there is potential for improved future performance. The outlook for investments experiencing considerable price appreciation should be examined to determine whether some profit taking is in order.

Now that we have a brief overview of the main elements involved in portfolio evaluation and analysis, our focus will shift to some Web sites which provide helpful reports and/or tools to facilitate the process.

Portfolio Evaluation and Analysis Reports and Tools

Marketocracy:

An excellent Web site for an investments class portfolio simulation is Marketocracy (<http://www.marketocracy.com/>). This site provides students the opportunity to create a \$1,000,000 stock portfolio and enables them to buy long or sell short. Students are viewed as mutual fund managers. The net asset value (NAV) of each mutual fund starts at \$10 and then fluctuates with the performance of the portfolio.

Marketocracy provides many different types of portfolio reports, the most valuable of which is the Overview Report. This report provides the following information:

- The current total value of the portfolio broken down by total stock value and cash.
- The NAV of the portfolio.
- The return of the portfolio today, month to date, quarter to date, and year to date compared to the S&P 500, Dow, and Nasdaq.
- The percent of the portfolio in each major sector along with the performance of each sector today and since inception.
- The percent of the portfolio in each style class (small cap--value, small cap--growth, small cap--blend, medium cap--value, medium cap--growth, etc.), and the performance of each class today and since inception.
- The percentage return since inception of large, medium, small, and micro stocks in the portfolio.
- The returns of the portfolio last week; last month; the last three, six, and twelve months; the last two and three years; and since inception. The returns of the S&P 500 over these same time periods are provided, as well as a column showing the percentage the portfolio earned under or over the S&P 500 return.
- The alpha (Jensen's measure) of the portfolio based on the S&P 500. Beta and R-squared are also provided.
- The turnover of the portfolio for the last month, three months, six months, and twelve months. Turnover measures the amount of trading occurring in the portfolio; of course, the more trading the higher the brokerage commissions incurred.

Ary - Online Stock Portfolio Evaluation and Analysis in an Investments Class

- The five stocks providing the best percentage returns and the five stocks providing the worst percentage returns since inception of the portfolio.
- The five stocks providing the biggest dollar gains and the five stocks providing the least dollar gains (or biggest losses) since inception.

Other reports provided by Marketocracy give more specific details of the breakdown of the portfolio by the following: sector, style, top ten holdings, and top ten winners and losers in dollars and percentage terms. A report called a Timing Analysis helps the portfolio manager measure ability to time the market. The report shows the 30, 60, and 90 day returns on stocks purchased, and provides the same information on stocks sold. A Volatility Analysis report provides the best, worst, and average returns the portfolio has experienced over three, six, nine, twelve, and 24 month periods. It also shows the overall volatility the fund has experienced over the same time spans; of course, as time increases the volatility of the portfolio should decrease as good investments outweigh the bad. To remove the volatility of the overall stock market, the Volatility Analysis report shows the largest gains and largest losses of the portfolio compared to the S&P 500 over one day, one week, one month, three month, six month, and twelve month periods. The average daily, weekly, monthly, three month, six month, and twelve month percentage returns of the portfolio are also compared to the S&P 500.

The reports provided by Marketocracy are so comprehensive that students should be able to conduct a very thorough and comprehensive evaluation of portfolio diversification, risk-adjusted return portfolio analysis, as well as evaluation of individual stock holdings. In fact, Marketocracy promotes portfolio diversification by requiring that the following rules be met in order for a portfolio to be ranked on the site: one stock cannot exceed 25 percent of the portfolio, 65 percent of portfolio assets must be invested, half of the portfolio must consist of stocks that make up 10 percent or less of portfolio assets. Excessive margin trading is discouraged by the rule that negative cash balances must not exceed 5 percent of total portfolio value. About the only measure not provided by Marketocracy for the portfolio evaluation and analysis likely to be required in a basic investments course is correlation.

An added benefit of requiring students to conduct a portfolio evaluation using the data provided by Marketocracy is that terms studied such as Sharpe's measure, alpha, R-squared, etc. are internalized as students begin to see the implications for their own personal portfolios. As a result, students are more likely to gain insights into how they can make their portfolios more efficient.

RiskGrades:

A site which can be very helpful in evaluating the risk of a portfolio to make sure it is compatible with the risk tolerance of an investor is RiskGrades (<http://www.riskgrades.com>). The definition given for a risk grade at the site is "a measure of price volatility (or return volatility) to help investors better understand their market risk. Risk grades can range from 0 to 1,000 or more, where 100 corresponds to the market-cap weighted average volatility of international equity markets during normal market conditions." Emphasis is placed on the fact that risk grades are updated daily to reflect any factors that may have led to increases or decreases in the risk of an asset.

Upon entering the symbols and number of shares of stock that comprise a portfolio, the RiskGrade of not only each individual stock is displayed but the portfolio RiskGrade as well. The RiskGrade of the entire portfolio is not a weighted-average of the stocks that comprise the portfolio; such factors as correlation among the stocks in the portfolio and the size of each asset position are also considered. "What if" analysis can be performed to see what happens if one of the stocks is deleted from the portfolio or a new one is added.

Based on the RiskGrade of a portfolio, the portfolio is classified into one of the following investment strategies (listed from highest to lowest risk): speculative, aggressive, growth, balanced, conservative, or short-term risk. The percentage by which portfolio diversification has lowered the risk of the portfolio is noted, as well as the volatility of the portfolio compared to the S&P 500. For example, upon entry of the portfolio of a faculty-staff investment club of which the author is a member, RiskGrades provided the following insights: Risk Grade is 94 resulting in an aggressive investment strategy, diversification has reduced the risk faced by the portfolio by 52 percent, and the portfolio is 1.22 times as volatile as the S&P 500. The faculty-staff investment club portfolio consisted of 100 shares of American Oriental Bioengineering (AOB), 100 shares of Callaway Golf (ELY), 60 shares of China BAK Battery (CBAK), 100 shares of Cisco Systems (CSCO), 200 shares of Coldwater Creek (CWTR), 100 shares of E*Trade Financial (ETFC), 40 shares of Expedia (EXPE), 100 shares of Home Depot (HD), 100 shares of J. B. Hunt Transportation (JBHT), 50 shares of Murphy Oil (MUR), 100 shares of Providence Service Group (PRSC), 90 shares of TD Ameritrade Holdings (AMTD), 100 shares of Tempur-Pedic International (TPX), 100 shares of Trex Company (TWP), 100 shares of Walgreen Company (WAG), and 100 shares of Wells Fargo Company (WFC).

Another statistic, referred to as XLoss, provides an estimate of the average loss the portfolio is likely to experience in extreme market downturns. To arrive at this estimate, back testing is done to determine the dollar amount the portfolio would have gained or lost each business day of the past year assuming that its composition did not change. The worst 5 percent of the losses the portfolio would have experienced are then averaged to arrive at XLoss.

Some other helpful reports provided by RiskGrades are highlighted below:

- Report showing which portfolio holdings are generating sufficient returns for the level of risk being assumed.
- Chart plotting the RiskGrade of the portfolio over time. The user can select time periods of 3, 6, or 12 months or a longer period if desired. For each period selected, the minimum, maximum, and average RiskGrade is shown for the portfolio.
- Chart showing the range of RiskGrades for each stock in the portfolio over a time period selected by the user. The same information is provided for the portfolio.
- Historical table indicating for each stock the time period (3, 6, or 12 months) when the stock had its best return and its worst return.
- Table indicating how much of the Total RiskGrade of the portfolio is contributed by each individual stock in the portfolio.

Ary - Online Stock Portfolio Evaluation and Analysis in an Investments Class

As was mentioned earlier, the information provided by RiskGrades can be very helpful to students in keeping the risk of their portfolio in line with their risk tolerances. Using the reports supplied by RiskGrades, students can isolate which stocks are contributing the most to the risk of the portfolio and sell them if reduction of risk is desired. Stocks that have not generated sufficient returns for the level of risk being assumed can be studied further to determine whether they should be sold or held. The report which indicates the time period when stocks had their best and worst returns might even be used to detect trading patterns (a form of technical analysis) that could be used to the advantage of students.

Morningstar:

The portfolio feature at Morningstar (<http://www.morningstar.com>) can be very helpful in portfolio management since it provides several different views of a portfolio. Two that could be especially helpful in evaluating a portfolio are the “Fundamental” and “X-Ray Overview.” The Fundamental View provides the following information for each stock in the portfolio: industry classification, size of firm, type of stock (value, growth, or blend), earnings per share in dollars for the trailing twelve months, forward P/E ratio, price/book ratio, and trailing twelve months dividend yield.

The X-Ray Overview is perhaps the most valuable Morningstar view for portfolio analysis. Following is some of the information shown in the X-Ray Overview.

- Percentage of the portfolio in cash, United States stocks, foreign stocks, bonds, and other.
- Percentage of the portfolio in value, core, and growth stocks.
- Percentage of the portfolio in large, medium, and small firms.
- Percentage of the portfolio in high yield, distressed, hard asset, cyclical, slow growth, classic growth, aggressive growth, and speculative growth stocks.
- Percentage of the portfolio invested in major sectors, as well as the percentage invested in the industries making up each sector.
- Percentage of the portfolio in United States and Canadian, European, Japanese, Latin American, Pacific Rim, and other stocks.
- Forward P/E ratio, projected five year EPS growth rate, price/book ratio, return on assets, return on equity, dividend yield, and average market cap of the portfolio, as well as a comparison of each of these to the S&P 500.
- Weight of each of the top ten holdings in the portfolio, and the industry classification, current price, market value, and year to date total return of each.

The X-Ray Overview is of great value to students in assessing the diversification of their portfolios as well as determining whether portfolios appear to be over or undervalued in relation to stocks in general. A comparison of the forward P/E and the projected five year EPS growth rate (the PEG approach) should also be helpful in this regard. Information provided by the Fundamental View will be useful in analyzing each stock in the portfolio.

In addition to the Fundamental and X-Ray Overview, other reports prepared by Morningstar are available, as well as a custom view (called “My View) which can be created by

the user. Custom view reports can be up to 35 columns and can include various data selected from the following categories: EPS estimates, financial statements, grades, industry/sector, profitability, stock growth, stock intraday, stock ownership, and valuation/price measures.

Select Sector SPDRs:

At this Web site (<http://www.sectorspdr.com/correlation/>), when the student types in the symbol of a company in a Correlation Tracker and selects either a six month, one year, or three year time period, the ten stocks having the highest correlation and the ten having the lowest correlation are listed. The correlations are based on daily closing data. When a one year time period was selected, the following correlation results were obtained for Yahoo; industry classifications were provided by Morningstar.

Ten stocks having the highest correlation: Newell Rubbermaid, personal products, .87; Kite Realty Group Trust, REIT; Arbinet-thexchange, business/online services, .85; General Growth Properties, REIT, .85; Cracker Barrel, restaurants, .83; Safeguard Scientifics, business/online services, .83; Dollar Thrifty Automotive, rental and repair services, .82; Ionatron, aerospace and defense, .82; Lazard, securities, .82; Simon Property Group, REIT, .82 .

Ten stocks having the lowest correlation: Heartland Payment Systems, business applications, -.77; iRobot, household and personal products, -.77; Sport Supply Group, advertising, -.76; Daxor, medical equipment, -.72; PRA International, biotechnology, -.72; SanDisk, semiconductors, -.72; Hawk, metal products, -.69; PetMed Express, speciality retail, -.69; SAP AG, business applications, -.69; First Mutual Bancshares, savings and loan, -.68.

When the one year correlations were compared to the six month and three year top ten highest and lowest correlated stocks lists for Yahoo, PetMed Express was the only firm appearing on two of the three lists, the six month and one year lists.

The information provided on correlation can be used by students to lower portfolio risk by adding negatively correlated firms to their portfolios, or to increase portfolio risk by adding positively correlated firms in hopes of raising portfolio return.

Another feature of the Select Sector SPDRs Correlation Tracker is the ability to enter two stock symbols and obtain the correlation coefficient for the two stocks. Using this feature, the one year correlation between Yahoo and Expedia (an online travel service) was found to be -.26 while the correlation between Yahoo and Pfizer (a major pharmaceutical company) was .43. The Correlation Tracker enables students to see the correlation between the various stocks in their portfolio and thus could be helpful in revising the portfolio if most of the stocks are positively correlated or on the other extreme, negatively correlated.

Conclusions:

Ary - Online Stock Portfolio Evaluation and Analysis in an Investments Class

Most investments students enjoy and learn much from an online portfolio simulation. One of the learning activities that can enhance the experience is requiring students to evaluate and analyze their portfolios. This paper has presented four sites that could prove useful in this process. Even though some of the information provided at the sites overlaps, each site makes available unique information. The main disadvantage of using all four sites is the necessity of entering the portfolio at each (the SelectSector SPDRs Web site would only require the entry of symbols). If only one site is chosen by the investments professor for the purpose of portfolio evaluation, the author would recommend the Marketocracy site; however, since Marketocracy does not provide information on correlation, the Correlation Tracker at the Select Sector SPDRs Web site should likely be used as a supplement.

Professors desiring that students learn how to calculate such measures as portfolio beta, standard deviation, Sharpe's measure, Treynor's measure, and Jensen's measure, etc. could ask their students to do so even though many of these measures are given at the Web sites reviewed in this paper. In fact, such calculations could be useful in helping students discover that their results may be different from those reported at the sites due to the use of different assumptions and different information sources (for example, betas reported at Web sites vary due to the use of different time periods, different market indexes, etc.).

Finally, an investor managing a stock portfolio rather than investing in a mutual fund may find the information presented in the paper helpful.

Table I
Selected Comparisons of the Portfolio Features Offered by the Four Web Sites

Feature	Marketocracy	RiskGrades	Morning-star	Select Sector SPDRs
Jensen's Alpha	x			
Beta	x			
R-squared	x			
XLoss for Individual Stocks and Portfolio		x		
Percentage Reduction in Risk Due to Diversification		x		
Risk-Return Report for Individual Stocks and Portfolio		x		
E-mail Risk Alerts		x		
Correlation		x (indirectly)		x
Turnover	x			
Timing Analysis	x			
Volatility Analysis	x	x		
Classification of Portfolio Investment Strategy	x	x		
Ability to Perform What If Analysis		x		
Historical Returns for Selected Time Periods	x	x	x	
Comparison of Portfolio Return to Stock Indexes	x	x	x	
Five Best and Worst Gainers	x			
Ten Best and Worst Gainers	x			
Sector Allocation of Portfolio	x	x	x	
Sector Performance Report	x	x		
Style Allocation of Portfolio	x		x	
Style Performance Report	x			
Stock Type Report	x		x	
Fundamental Report			x	
News and Opinions by Stock			x	

References

- Gitman, Lawrence J. and Michael D. Joehnk. *Fundamentals of Investing*, 10th edition, Pearson/Addison Wesley, Boston, 2008, pp. 554-555.
- Hirt, Geoffrey A. and Stanley B. Block. *Fundamentals of Investment Management*, 7th edition, McGraw Hill/Irwin, New York, 2003, p. 623.
- Jensen, Michael. C. "The Performance of Mutual Funds in the Period 1945-1964," *Journal of Finance*, May 1968, pp. 389-416.
- Marketocracy, www.marketocracy.com
- Morningstar, www.morningstar.com
- RiskGrades, www.riskgrades.com
- Select Sector SPDRs, www.sectorspdr.com/correlation/
- Sharpe, William F. "Mutual Fund Performance," *Journal of Business*, January 1966, pp. 119-138.
- Statman, Meir, "How Many Stocks Make a Diversified Portfolio?," *The Journal of Financial and Quantitative Analysis*, September 1987, Vol 22, No 3, pp.353-363.
- Surz, Ronald J and Mitchell Price, "The Truth About Diversification by the Numbers," *Journal of Investing*, Winter 2000, pp. 1-3.
- Treynor, Jack L. "How to Rate Management of Investment Funds," *Harvard Business Review*, January-February 1965, pp. 63-74.