CHAPTER EIGHT

Risk and Return

"He gave me a lot of very useful advice when I set up Virgin Atlantic 21 years ago. Perhaps his best advice was to make sure that I took BA to court before they bankrupted us - not after, as he did."

--Sir Richard Branson, Virgin Atlantic

referring to the late Sir Freddie Laker

Every decision in life contains some degree of risk, not matter how trivial the risk factor is. For instance, there is a risk that a recently purchased car will incur mechanical defects which are not covered by warranty. However, the degree of risk that the car will incur a defect and that the defect is not covered by warranty can depend on a host of factors, such as the car's reliability, the warranty coverage provided, the manufacturer's reputation, and how the car is driven. Ultimately in finance, analyzing the risk of a company undergoes a similar process such as determining the company's market position, analyzing financial statements, and identifying the company's long-term threats and opportunities. However, in finance, determining the benefit received from a decision, called return, can be calculated as it is usually stated in currency terms. For instance, while an airline may be facing bankruptcy, an investor may be willing to provide equity. For this investor, the risk factor would be the airline going bankrupt and losing their investment, while the return factor would be the perceived gain of investing in the airline. This chapter will help the reader understand the concept of risk and return by understanding the different risk preferences and how risk applies to the airline industry. The capital asset pricing model (CAPM) will be explained and in order to fully understand the concept of risk and return, the question posed to investors, is the airline industry a risky investment?, will be discussed. This chapter explains the dichotomy between risk and return and how it impacts the financial environment.

- Expected Rate of Return
    - Portfolio Risks and Returns
- Risk Analysis
- Financial Risk Preferences
- Risk Diversification
- Beta
- The Capital Asset Pricing Model (CAPM)
- Is the Aviation Industry Risky?

Expected Rate of Return

While the term "return" in finance may appear to be a rather elementary term, in fact in contains many subtle connotations which could significantly alter one's results and outlook. Simply, return is the profit received on capital investments or securities. For instance, suppose a company invested in a new piece of machinery which resulted in a $5,000 annual increase in profits. In dollar terms, the return would simply be $5,000 as that was the profit received attributed to the incremental increase in investment. Referring back to chapter four, returns are also commonly stated in percentage terms, with such metrics as return of investment, return on assets, and return on equity. Assuming the piece of machinery cost $40,000, the return on investment would have been 12.5% per year.

Equation 8.1

$$\text{Return on Investment} = k_i = \frac{Net\ income}{Investment} = \frac{Net\ income}{Average\ total\ asets}$$

$$k_i = \frac{\$5,000}{\$40,000} = 12.5\%$$

The above example concerning an addition to property, plant, and equipment is the classic example of a company's returns. The return can be stated in dollar terms as the cash received from the investment or expressed in percentage terms. However, the return on a financial investment is a little less definitive, as the total dollar return is comprised of two components: dividend income and capital gains.

Total Dollar Return = Dividend Income + Capital Gain (or loss)

Dividend income is commonly received from purchases in stock as profitable companies typically re-direct a portion of their earnings back to their shareholders. Dividends are usually paid by corporations with stable historical profits and a sound financial outlook. Dividends can be distributed annually, bi-annually, or quarterly and are up to the sole discretion of the company. Companies are free to increase or slash dividend payments; however, such changes will trigger a shift in the company's stock price, as the dividend amount is ultimately imbedded within the price of the stock.

Capital gains represent the change in the stock price ($P_{s,t}$) from one period to the next ($P_{s,t+1}$). For instance, assume the share price for Continental Airlines increased from $10 to $15 during a month. For one share of stock, the capital gain recorded would be merely $5, the difference in share price between the two periods.

Capital Gain / (Loss) $P_{s,t+1} - P_{s,t}$ = $15 - $10 = $5

However, one important distinction needs to be made with respect to capital gains, in that the profit is never actually received until the equity investment has been sold. Therefore, any increase in stock price is merely an unrealized gain, or loss, and it becomes realized upon the sale of the stock. In the Continental Airlines example above, if the shareholder retained the stock at the end of the month, the $5 gain would have been unrealized. However, if the stock was sold at the end of the month, the $5 gain would have been realized. This distinction becomes particularly important when evaluating financial statements and determining the financial impact of valuation in investment and derivative instruments.

Gain on stock can also be stated as a percentage return by calculating both the dividend yield and capital gain percentage of the stock. Consider a stock that issued a $3 annual dividend per share and increased in value from $15 per share to $30 per share during the year. By using the formula contained below, the total unrealized return on an investment in the stock would yield the shareholder a 120% annual return, a great return on investment by anyone's standards.

Equation 8.2

Total Return = k_i = Dividend Yield + Capital Gain %

$$k_i = \left(\frac{\text{Dividend}_{t+1}}{\text{Share Price}_t}\right) + \left[\frac{\left(\text{Share Price}_{t+1} - \text{Share Price}_t\right)}{\text{Share Price}_t}\right]$$

$$k_i = \frac{\$3}{\$15} + \left[\frac{\$30 - \$15}{\$15}\right] = 0.20 + 1.0 = 1.20 \, or \, 120\%$$

Another key when measuring the return on investment is the holding period, or the length of time in which the security is held. In other terms, holding period represents the time in which any gains or losses are unrealized. Since smart investing usually requires holding onto an investment for extended periods of time, the holding return on a stock is merely the return on investment for the extended period of time. For instance, consider a stock that provides zero dividends and which experienced -8% return in the first year, +6% in the second year, and +14%

in the third year. While the annual return varies considerably by year, the three-year holding return is merely the sum of the annual returns:

Equation 8.3

$$K_T = \sum_{i=1}^{3} k_i = (-8\% + 6\% + 14\%) = 12\%$$

Holding period return is fundamentally different than average return which merely states the holding period return on an annualized basis. For instance, the average annual return for the stock above would be 4%.

Equation 8.4

$$\hat{k} = \frac{\sum_{i=1}^{3} k_i}{N} = \frac{12\%}{3} = 4\%$$

Portfolio Risks and Returns

The expected return on a portfolio is the weighted average of the expected returns on the securities included in that portfolio, with the weight of a security in a portfolio simply being the percentage of asset invested in that security. A key investment strategy used to reduce risk is to hold a portfolio of stocks, as it reduces an investors risk that one stock performs horribly. While this risk minimization technique reduces the potential gain, it also greatly diminishes downside losses. Portfolio theory is a key reason why mutual funds have grown to be a very popular, and effective, investment tool. The expected return on a portfolio ($\hat{k}_p$) is the weighted average of the expected returns on the securities included in the portfolio, weighted by the percentage of the portfolio invested in that security.

Equation 8.5

Expected Return on Portfolio = $\hat{k}_p = \sum_{i=1}^{n} w_i \times \hat{k}_i$

where:

$w_i =$ $\frac{\text{value of investment i}}{\text{value of portfolio}}$

$\hat{k}_i =$ expected return of investment i

In order to calculate the return on an investment portfolio, the weighted average annual return needs to be calculated. Consider the following portfolio highlighted in table 8.1, which contains three stocks with varying annual returns.

Table 8.1 – Sample portfolio

	Shares Held	Closing Price	Stock Value	Annual Return
Stock A	100	$60	$6,000	8%
Stock B	20	$120	$2,400	-12%
Stock C	40	$40	$1,600	15%
	160		**$10,000**	

Portfolio return is calculated by weighting the annual return of an individual security based on the security's dollar value of the portfolio. For the portfolio contained in table 8.1, stock A represents 60% of the portfolio based upon its stock value compared with the total portfolio value, while stock B and stock C represent 24% and 16% of the portfolio respectively. From the portfolio values of the individual securities, the portfolio return is found to be 4.3%, based on equation 8.6.

Equation 8.6

$$k_p = \sum_{i=1}^{n} w_i \times k_i$$

$$k_i = (8\% \times .60) + (-12\% \times .24) + (15\% \times .16)$$

$$k_i = 4.8\% - 2.9\% + 2.4\% = \mathbf{4.3}\%$$

Table 8.2 Portfolio Return

Stock	Ki		Value	Wi	Wi*Ki
A	6%	$	200,000	0.2	1.20%
B	2%	$	100,000	0.1	0.20%
C	10%	$	300,000	0.3	3.00%
D	-3%	$	100,000	0.1	-0.30%
E	-9%	$	100,000	0.1	-0.90%
F	4%	$	100,000	0.1	0.40%
G	5%	$	100,000	0.1	0.50%
		$	**1,000,000**		
Kp					**4.10%**

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As another example, consider the portfolio contained in table 8.2. Assume the portfolio consists of seven stocks with a total value of $1,000,000. The value of each stock ranges from $100,000 to $300,000 or 10% to 30% of the portfolio; returns on each of the stocks range from -9% to 10%. By multiplying each of the returns by the stocks weight, the individual weighted return for each stock is found (W_i*K_i); all weighted returns added together provides the portfolio return, which equals 4.1% for the portfolio contained in table 8.2.

A similar methodology can be used to determine the expected return of an individual stock or portfolio. Expected return is the return that an individual expects in a future period. Since expected return is a projection of the future, the actual return of a stock can vary considerably. Additionally, the expected return of the same security can vary based upon one's beliefs, projections, knowledge, and/or skill. One methodology for calculating expected return is to assign varying probabilities of an expected annual return. For instance, consider a stock (table 8.3) with different expected returns based upon the state of the economy. Additionally, one has varying probabilities of the state of the economy. Based on these factors, the expected return of the stock can be calculated.

Table 8.3 Expected annual return of an individual security

	Probability	Expected Annual Return	Weighted Return
Depression	5%	-20%	-1.00%
Recession	10%	-5%	-0.50%
Normal	65%	10%	6.50%
Boom	20%	35%	7.00%
$\hat{k}_i$			**12.00%**

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Equation 8.7

Expected Return on Investment = $\hat{k}_i$

$$\hat{k}_i = p_{depression} \text{ x } k_{depression} + p_{recession} \text{ x } k_{recession} + p_{normal} \text{ x } k_{normal} + p_{boom} \text{ x } k_{boom}$$

$$\hat{k}_i = \sum_{i}^{n} p_i \text{ x } k_i$$

$$\hat{k}_i = (5\% \times -.20) + (10\% \times -5\%) + (65\% \times .10) + (20\% \times .35)$$

$$\hat{k}_i = -1\% - 0.5\% + 6.5\% + 7.0\% = \mathbf{12.0}\%$$

Based upon one's assumptions of the economy and the associated return, the expected return of the stock is 12%. For this stock, there was a 55% range (-20% to 35%) in which the stock's expected return could vary. Other stocks could potentially have smaller ranges in which return will vary. This ultimately represents risk, or the variance of expected returns. We will further discuss variance in the next section on risk.

Risk Analysis

While there is no universal financial definition of risk, the variance of return is usually the most agreed upon definition. A stock or portfolio whose returns are fairly stable over time would be considered less risky than a company whose returns swing wildly from one period to the next. Ultimately, the expected return of investment is based upon this risk. The expected return of an investment can be constructed from two categories: risk-free return and risk premium.

Expected return = Risk-free return + Risk premium

Risk-free return is a security with zero to little risk as the return is guaranteed. As a result of the return needing to be guaranteed, risk free securities are usually debt instruments. However, all financial institutions have some probability of bankruptcy whereby the return would not be received; therefore there is no corporate financial instrument that has absolutely zero risk. The only true risk-free securities available are instruments that are backed by the government, since from a finance perspective, it is assumed the government will never default. Therefore, US

treasury bills are considered a risk-free investment as their return is guaranteed, with the risk-free return being the return on a standard US treasury bill.

The risk premium represents the excess return over the risk-free rate. Since the underlying principle of the risk and return dichotomy is that the more risk an individual bears, the greater the return that is expected. The risk premium is ultimately the difference between the expected return and the risk-free return. When both risk-free return and the risk premium are combined together, the total risk component is borne.

The basic definition of risk is the variance of expected return. Using the same stock contained in table 8.3 and the expected return of 12%, the variance and standard deviation of the stocks' return can be calculated using the following formula:

Equation 8.8

$$Variance = \sigma^2 = \sum_{i=1}^{n} P_i \times (\hat{k}_i - k_i)^2$$

Finally, the square root of the variance is called the standard deviation:

Equation 8.9

$$\text{Standard Deviation} = \sigma = \sqrt{\sum_{i=1}^{n} P_i \times (\hat{k}_i - k_i)^2}$$

If we return to the example in table 8.3 of a stock with various returns depending on the state of the economy, we can calculate the standard deviation:

Table 8.4 Standard deviation of a weighted individual security				
	Probability	**Expected Annual Return**	**Weighted Return**	$P_i \times (\hat{k}_i - k_i)^2$
Depression	5%	-20%	-1.00%	0.00512
Recession	10%	-5%	-0.50%	0.00289
Normal	65%	10%	6.50%	0.00026
Boom	20%	35%	7.00%	0.01058
$\hat{k}_i$			12.00%	1.89%
			σ	13.73%

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√0.01885 = 0.13730 or 13.73%

The standard deviation of the security is 13.73%, which means that on average the expected return can vary by a degree of 13.73%. In terms of judging if this stock is too risky enough, the stock needs to be compared to another stock or portfolio. On a standalone basis, it is difficult to determine risk as risk needs to be compared with the next best alternative. Additionally, the riskiness of this stock relates to one's viewpoint of risk and how much risk one is willing to bear.

Standard deviation is an important measure when determining the risk of a security or portfolio. Standard deviation is often associated with the normal distribution curve; in a normal distribution 68% of all measurements will fall within one standard deviation of the mean, 95% within two standard deviations, and 99% within three standard deviations (McKee, 2004 January). Figure 8.1 shows a normal distribution curve with a mean of 50 and various standard deviations:

Figure 8.1 Normal Distribution Curve- Mean= 50

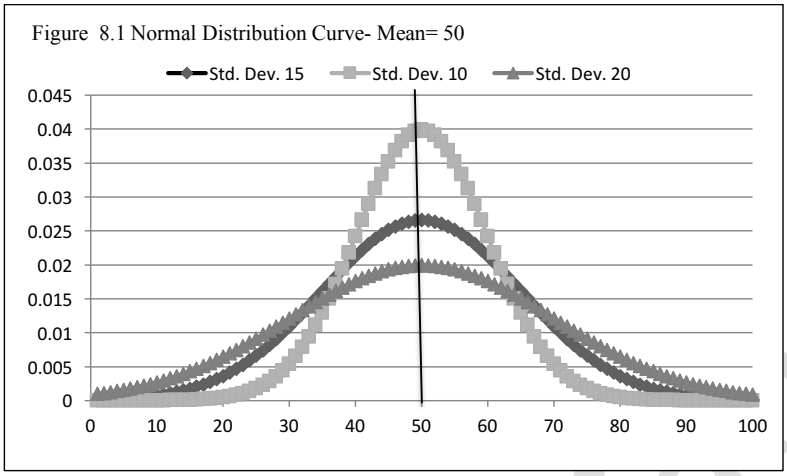

Figure 8.1 shows that as the standard deviation (risk) increases for a normal distribution with the same mean, the shape of the standard normal curve becomes more flat.

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Risk can be classified into two separate categories, systematic and unsystematic, based upon the driver of the risk.

Systematic risk is risk that is inherent to the entire market or industry, usually affecting all industries and companies across the board. Also commonly called market risk, systematic risk contains factors such as recessions and wars. For instance, during a recession/depression period, economic factors impact the entire market, providing negative returns for the majority of the companies in the market. While systematic risk can impact some companies/industries more than others, it is really difficult to avoid; therefore, it is rather out of an investor's control and goes with the territory of investments.

Unsystematic risk is of far greater concern to an investor as it represents risk inherent to a specific industry or company. As a result, unsystematic risk is avoidable and therefore represents the risk of choosing one investment strategy over another. The airline industry is filled with unsystematic risk, with the largest risk factor being the price of oil. With jet fuel being the greatest cost to the airline industry, soaring fuel prices will cause an adverse effect on the profitability of the airline industry. As a result, the price of oil represents a major unsystematic

risk factor towards the aviation industry. Other industry specific unsystematic risk factors include the threat of labor action that could potentially halt an airline's operations and aviation safety that could potentially cause people to choose other airlines or modes of transport in response to an accident. The degree to which these unsystematic factors exist ultimately helps decide how much risk an investor is willing to bear. Unsystematic risk can be reduced or eliminated through diversification (Ross, Westerfield & Jordan, 2008). Investing in a portfolio with stocks from many different industries spreads out unsystematic risk among many different investments with the intent that unsystematic risk throughout the different industries will balance each other out.

Financial Risk Preferences

> *Why would Northwest let PNCL (Regional carrier, Pinnacle Airlines) profit during their demise? If PNCL was reaping profits from the avoidance of fuel price risk and customer risk, why couldn't Northwest change the agreement in a way that would be detrimental to Pinnacle and beneficial to Northwest?*
>
> *- Jeff Annello Author, Seekingalpha.com*

An important understanding of risk is that just like people, no investors are alike. Different investors will assume varying degrees of perceived risk, and as a consequence, will have varying degrees of optimal return. Risk tolerance is the degree of risk or uncertainty that an investor is willing to absorb. An investor's level of risk tolerance is based on a host of factors, both economically and socially. For instance, a retiree on a fixed income will assume a low level of risk as a result of their desire not to lose life savings. There are generally three primary categories of risk tolerance based upon one's level of assumed risk and the expected return: risk averse, risk neutral, and risk seeking.

> ***Risk-adverse investor***: the typical investor who will take on additional amounts of risk only in lieu of a greater expected return.

While risk adverse investors will take on some level of risk, the declining returns of risk will typically stop risk adverse investors from absorbing high levels of risk. The prime example of a risk adverse investor is one whom when faced with two investment options with similar expected return, will choose the option with the lowest amount of risk. While this investment

strategy may appear to be the only correct strategy, in actuality, risk adverse investors will stick to safe investments, such as government bonds and mutual funds. As a result of their lower levels of risk, risk adverse investors typically yield lower returns; however, during recessionary periods, risk adverse investors will also not lose as much, relative to other investors. As a result, risk adverse investors usually have fairly stable returns over time, perfect for investors looking to retain their money. Retirees are a perfect example of risk adverse investors as they do not want their retirement income to swing violently at the whim of the economy.

> ***Risk-neutral investor***: an investor whom does not consider the underlying risk when making an investment decision.

To a risk neutral investor, risk is implicit in every investment and therefore should not be the discerning factor when making a decision. Risk neutral investors will typically focus much of their attention on expected returns as opposed to analyzing potential factors that could result in losses. Many individuals likely fall into the category of risk neutral, believing that the underlying factors of a company stock will spur positive gains, as opposed to the issues that could cripple the company.

> ***Risk-seeking investor***: An investor who will take on additional risk, without the necessary increase in return.

Finally, a risk seeker is an investor who will take on additional risk, without the necessary increase in return. While a risk lover may be taking on high levels of expected returns, the increased amount of risk does not justify the higher returns. A risk lover is one who commonly diverges from conventional investing wisdom, as they seek increased amounts of risk for the allure of high returns. While very few investors are pure risk lovers, hedge firms routinely absorb a significant amount of risk in an effort to obtain high returns of their investments.

Risk Diversification

To reduce risk, the most common and successful investment strategy applied is diversification. *Diversification* is the technique of mixing a wide variety of investments in a single portfolio in order to reduce risk (Marshall, 1989). The goal of diversification is to minimize risk by smoothing out unsystematic risk while helping to maximize investment return (Ross, Westerfield & Jordan, 2008). A truly diversified portfolio is one that crosses multiple industries covering a variety of unsystematic risk while ensuring that no one risk factor is heavily weighted in the investment portfolio. By trying to minimize the importance of any single risk factor, an investor helps eliminate unsystematic risk altogether, providing themselves with a portfolio where only systematic risk is prevalent. In essence, a fully diversified portfolio acts like the market, whereby any one individual investment will not significantly help or harm the investment portfolio. Mutual funds are a prime example of a diversified investment, with the strategy largely proving successful.

As was mentioned, constructing a diversified investment portfolio involves taking a host of individual investments with differing properties in order to help cancel out unsystematic risk. The key in creating a fully diversified portfolio is having individual investments that are extremely poorly correlated or highly negatively correlated. In the later case, a highly negatively correlated stock In order to highlight the process of determining a diversified portfolio, consider an investor who solely holds an interest in American Airlines (AMR) common stock, but wishes to diversify their portfolio to minimize their risk and swings in price volatility. As an example, the investor is looking at four other sectors in which to diversify with: gold with Barrick Gold Corporation (ABX)[1], oil with Exxon Mobil (XOM), technology with Google (GOOG), and aerospace/defense with Boeing (BA). Table 8.5 provides historical monthly closing prices for all five investment options as well as the monthly return, on an annualized basis.

[1] Barrick Gold Corporation (ABX) is the largest gold exploration and development company, in terms of market capitalization, located on the New York Stock Exchange (NYSE).

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Table 8.5 Monthly closing prices and annualized returns for AMR, ABX, XOM, GOOG, and BA

	AMR	ABX	XOM	GOOG	BA	AMR Return	ABX Return	XOM Return	GOOG Return	BA Return
Nov-08	$7.05	$20.81	$68.93	$291.00	$42.52	-2.58%	-0.71%	-0.54%	-1.59%	-1.52%
Oct-08	$10.21	$22.74	$73.70	$359.36	$52.03	0.33%	-3.18%	-0.38%	-0.86%	-0.72%
Sep-08	$9.82	$36.74	$77.22	$400.52	$56.92	-0.41%	0.48%	-0.24%	-1.13%	-1.04%
Aug-08	$10.33	$34.73	$79.55	$463.29	$65.07	1.20%	-1.50%	0.00%	-0.18%	0.66%
Jul-08	$9.03	$42.35	$79.56	$473.75	$60.28	6.36%	-0.58%	-0.73%	-0.83%	-0.58%
Jun-08	$5.12	$45.50	$87.18	$526.42	$64.83	-2.40%	1.08%	-0.06%	-0.84%	-1.72%
May-08	$7.19	$40.29	$87.80	$585.80	$81.65	-1.50%	0.40%	-0.35%	0.17%	-0.17%
Apr-08	$8.77	$38.43	$91.66	$574.29	$83.32	-0.23%	-0.93%	0.84%	2.53%	1.18%
Mar-08	$9.02	$43.24	$83.30	$440.47	$73.02	-2.47%	-1.36%	-0.23%	-0.54%	-0.85%
Feb-08	$12.81	$51.70	$85.69	$471.18	$81.29	-0.68%	0.08%	0.16%	-1.38%	0.00%
Jan-08	$13.94	$51.19	$84.04	$564.30	$81.27	-0.05%	1.86%	-0.71%	-1.53%	-0.41%
Dec-07	$14.03	$41.84	$91.87	$691.48	$85.45	-2.81%	0.32%	0.42%	-0.02%	-0.46%
Nov-07	$21.18	$40.31	$87.43	$693.00	$90.42	-0.98%	-0.66%	-0.23%	-0.17%	-0.48%
Oct-07	$24.00	$43.75	$89.86	$707.00	$95.98	0.64%	0.79%	-0.05%	2.05%	-0.51%
Sep-07	$22.29	$39.94	$90.41	$567.27	$102.21	-0.75%	1.99%	0.66%	0.84%	0.71%
Aug-07	$24.51	$32.24	$83.74	$515.25	$94.14	-0.06%	-0.10%	0.09%	0.09%	-0.52%
Jul-07	$24.68	$32.62	$82.82	$510.00	$100.35	-0.53%	1.10%	0.12%	-0.20%	0.63%
Jun-07	$26.35	$28.82	$81.61	$522.70	$93.30	-0.59%	-0.02%	0.07%	0.41%	-0.37%
May-07	$28.35	$28.88	$80.92	$497.91	$97.60	0.72%	0.35%	0.44%	0.47%	0.71%
Apr-07	$26.09	$27.73	$76.90	$471.38	$89.90	-1.19%	-0.13%	0.43%	0.24%	0.38%
Mar-07	$30.45	$28.16	$73.09	$458.16	$85.95	-0.89%	-0.37%	0.44%	0.16%	0.16%
Feb-07	$34.08	$29.46	$69.44	$449.45	$84.35	-0.67%	0.07%	-0.24%	-0.86%	-0.18%
Jan-07	$37.05	$29.22	$71.48	$501.50	$86.24	1.88%	-0.29%	-0.28%	0.74%	0.07%
Dec-06	$30.23	$30.28	$73.92	$460.48	$85.55	-0.45%	-0.20%	-0.02%	-0.42%	0.03%
Nov-06	$31.96	$31.01	$74.09	$484.81	$85.25	1.06%	0.15%	0.67%	0.15%	0.94%
Oct-06	$28.34	$30.46	$68.60	$476.39	$76.63	1.87%	0.07%	0.54%	1.54%	0.11%
Sep-06	$23.14	$30.19	$64.45	$401.90	$75.66	1.00%	-0.69%	-0.07%	0.51%	0.44%
Aug-06	$20.65	$32.90	$64.99	$378.53	$71.87	-0.51%	0.72%	0.03%	-0.17%	-0.24%
Jul-06	$22.00	$30.27	$64.76	$386.60	$74.00	-1.12%	0.34%	0.87%	-0.65%	-0.46%
Jun-06	$25.42	$29.09	$58.65	$419.33	$78.29	0.26%	-0.27%	0.06%	1.06%	-0.13%
May-06	$24.66	$30.08	$58.23	$371.82	$79.57	0.01%	0.06%	-0.25%	-0.92%	0.01%
Apr-06	$24.64	$29.85	$60.00	$417.94	$79.49	-0.74%	0.99%	0.30%	0.60%	0.59%
Mar-06	$27.05	$26.67	$57.89	$390.00	$74.24	0.65%	-0.04%	0.21%	0.63%	0.60%
Feb-06	$25.10	$26.80	$56.47	$362.62	$69.24	0.88%	-1.08%	-0.41%	-1.35%	0.57%
Jan-06	$22.70	$30.81	$59.37	$432.66	$64.80	0.18%	1.07%	0.98%	0.36%	-0.23%
Dec-05	$22.23	$27.29	$53.15	$414.86	$66.63					

Source: Compiled by the author with data obtained from Yahoo! Finance

From the historical monthly closing stock price data, a simple correlation matrix can be constructed to compare the relationships between the five stock prices. Table 8.6 displays the correlation matrix of the five stocks.

Table 8.6 Correlation matrix of the stock prices of AMR, ABX, XOM, GOOG, and BA

	AMR	ABX	XOM	GOOG	BA
AMR	1.0000				
ABX	-0.4843	1.0000			
XOM	-0.4102	0.6802	1.0000		
GOOG	-0.0408	0.6250	0.7681	1.0000	
BA	0.5507	0.2029	0.4050	0.6303	1.0000

From table 8.6, three of the stocks have a negative correlation to American Airlines stock price (ABX, XOM, GOOG). A negative correlation indicates that when AMR's stock price increases, the other stocks will decrease in price, and vice versa. Such negative correlation helps guard against significant losses; however, all three stocks are not strongly negatively correlated to AMR. In fact Google, with a correlation coefficient of -0.0408, has practically no relationship with AMR, indicating that each company has different unsystematic risk factors. This makes practical sense as Google operates in a completely different environment than American Airlines, something that helps diversify one's investment portfolio. Both commodity companies (ABX and XOM) have a moderately negative correlation with AMR which also makes implicit sense for as commodity prices rise (especially oil), an airline's input costs also increase, which hurts profitability and ultimately the company's long-term earnings potential. Therefore, Exxon Mobil would be a good stock to add to an AMR investment portfolio as it prices tend to move in the complete opposite direction, thereby minimizing any potential losses (and potential gains). Boeing would not be a good choice to diversify one's portfolio as it is moderately correlated to American Airlines, indicating that both companies have similar unsystematic risk factors. This is fairly easy to understand, for Boeing's success ultimately depends on the success of the airline industry; therefore, when an airline's financial performance falls and the stock price does poorly, so too does Boeing's. Based on the correlation coefficients alone, a portfolio of solely American Airlines stock could be better diversified with the addition of Barrick Gold Corporation (ABX) stock (the greatest negatively correlated stock to AMR) and Google (GOOG). Such a portfolio should help smooth out the unsystematic risk, while also increasing expected returns.

As was mentioned previously, the degree of risk can also be measured through the standard deviation of the portfolio. Using the annualized return data contained in table 8.5, the average annual return of American Airlines (AMR) stock for the three year period was -0.13%.

Using the assumption that the historical three year average return can be used as a proxy for the future expected return of an investment in AMR, the standard deviation of the return is 9.45%.[2]

$$\sigma^2 = \sum_{i=1}^{n} (\hat{k}_i - k_i)^2$$

[2] Note that both variance and standard deviation of a dataset can be calculated in Microsoft Excel using the Variance and standard Deviation functions.

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Table 8.7 Standard Deviation of AMR Returns		
	AMR Return	Variance
Nov-08	-2.58%	0.00060
Oct-08	0.33%	0.00002
Sep-08	-0.41%	0.00001
Aug-08	1.20%	0.00018
Jul-08	6.36%	0.00421
Jun-08	-2.40%	0.00052
May-08	-1.50%	0.00019
Apr-08	-0.23%	0.00000
Mar-08	-2.47%	0.00055
Feb-08	-0.68%	0.00003
Jan-08	-0.05%	0.00000
Dec-07	-2.81%	0.00072
Nov-07	-0.98%	0.00007
Oct-07	0.64%	0.00006
Sep-07	-0.75%	0.00004
Aug-07	-0.06%	0.00000
Jul-07	-0.53%	0.00002
Jun-07	-0.59%	0.00002
May-07	0.72%	0.00007
Apr-07	-1.19%	0.00011
Mar-07	-0.89%	0.00006
Feb-07	-0.67%	0.00003
Jan-07	1.88%	0.00040
Dec-06	-0.45%	0.00001
Nov-06	1.06%	0.00014
Oct-06	1.87%	0.00040
Sep-06	1.00%	0.00013
Aug-06	-0.51%	0.00001
Jul-06	-1.12%	0.00010
Jun-06	0.26%	0.00002
May-06	0.01%	0.00000
Apr-06	-0.74%	0.00004
Mar-06	0.65%	0.00006
Feb-06	0.88%	0.00010
Jan-06	0.18%	0.00001
Avg. Return	-0.13%	
Variance		0.00892
Standard Dev.		0.0944501

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$\sigma^2_{AMR} = 0.00892$

$\sigma_{AMR} = 0.0944501 = 9.45\%$

While the standard deviation of American Airlines equity return may appear minimal, diversifying the portfolio can further reduce risk. Based on the correlation coefficients contained

in figure 8.4, an investor wishes to diversify their portfolio by adding an equal share of Exxon Mobile (XOM) to their portfolio. From the data in table 8.5, the average annualized return of an XOM investment yielded a 0.07% return. With an equal 50/50 share of the investor's portfolio, the expected return on the portfolio is

$$\hat{k}_p = \sum_{i=1}^{n} w_i \times \hat{k}_i$$

$$\hat{k}_p = w_{AMR} \times \hat{k}_{AMR} + w_{XOM} \times \hat{k}_{XOM}$$

$$\hat{k}_p = 0.50 \times (-0.13) + 0.50 \times (0.07) = -0.03\%$$

Where w_{AMR} is the percentage of the portfolio held in AMR, $\hat{k}_{AMR}$ is the expected return on AMR, w_{XOM} is the percentage held in XOM, and $\hat{k}_{XOM}$ is the expected return on XOM.

By diversifying one's portfolio to include Exxon Mobile (XOM), the expected return of the mixed portfolio improved over a portfolio of solely AMR, as a result of the expected return on XOM being greater than AMR. However, if the expected return on XOM was worse than AMR, then the portfolio would have experienced a decline in expected return, yet in this situation, the holding of AMR would have helped diversify and improve the gain of a portfolio of merely XOM. Additionally, it is important to note that adjustments in the percentage held of the portfolio can result in significant changes to the expected return.

In order to illustrate the risk minimization properties of diversification, both the variance and standard deviation of the new portfolio can be calculated using the following formula.

$$\sigma^2_p = \mathrm{w_{AMR}}\, x\, \sigma^2_{AMR} + 2\mathrm{w_{AMR}}\ \mathrm{x}\ \mathrm{w_{XOM}}\, x\, \sigma_{AMRXOM} + \mathrm{w_{XOM}}\, x\, \sigma^2_{XOM}$$

Where $\sigma^2_{AMR}$the variance of AMR's return is, σ_{AMRXOM} is the covariance between AMR's and XOM's annualized returns, and σ^2_{XOM} is the variance of XOM's return.

Using the covar function in Microsoft Excel and the data contained in table 8.5, the covariance of the annualized returns between AMR and XOM was found to be -0.000012.[3] Additionally, the variance and standard deviation of XOM's annualized returns was found to be 0.00065 and 2.55%, respectively. Based on this information, the variance and standard deviation of the newly constructed portfolio is

$$\text{Variance of Portfolio} = 0.5(0.00892)^2 + 2(0.5)(0.5)(-0.000012) + 0.5(0.00065)^2$$

Table 8.8	Standard Deviation of AMR/XOM Portfolio
Variance	0.0000341
Std. Dev.	0.58%

Based on the standard deviation of the portfolio, the inclusion of XOM into the portfolio helped reduce the amount of risk from 9.45% to 0.58%. This indicates that the actual return for a portfolio holding equal proportions of AMR and XOM will not vary greatly from the expected return. However, adjustments to the composition of the portfolio can dramatically affect both the risk and the expected return on the portfolio. Furthermore, the inclusion of additional securities to the portfolio will help mitigate risk, as the portfolio variance of the unsystematic risk will be minimized. Figure 8.2 provides a visualization of the diminishing risk as the numbers of securities are added to the portfolio. It is important to note that unsystematic risk will never equal zero, as the portfolio variance becomes asymptotic to the covariance of the portfolio (all pairs of covariances held within the portfolio). Additionally, there will always be some component of systematic or market risk in the portfolio, as with any individual security.

[3] Note that the covariance of the annualized returns between AMR and XOM is different than the correlation coefficient of the stock prices between AMR and XOM.

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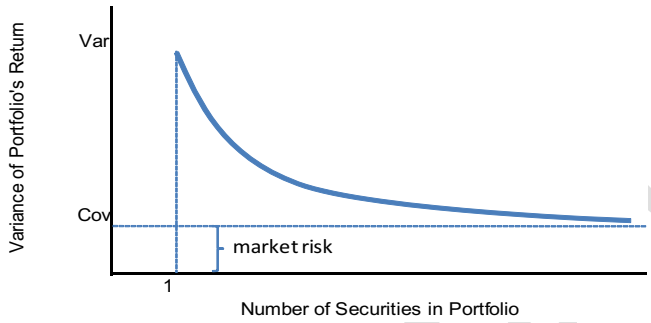
Figure 8.2 Relationship between the variance of a portfolio and the number of securities in the portfolio



Beta

Another measure of risk is beta, which describes the relationship between the individual security's expected return to that of the market's return. Also referred to as financial elasticity, beta helps measure a security's sensitivity to that of the market, ultimately displaying the degree of risk in the security, compared to the market. Beta is calculated by measuring the correlation between the historical returns of the company's stock versus the historical return of the market. By mathematical definition, the beta value of a company's stock is calculated by:

$$\beta_i = \frac{Cov(R_i, R_M)}{\sigma^2(R_M)}$$

Where $Cov(R_i, R_M)$ is the covariance of return on the asset and the return on the market and $\sigma^2(R_M)$ is the variance of the market's return.

Covariance can also be calculated between two securities as we did in the example with AMR and XOM; we display this covariance between AMR and XOM in table 8.9.

Table 8.9 Covariance between AMR and XOM Returns		
	AMR Return	XOM Return
Nov-08	-2.58%	-0.54%
Oct-08	0.33%	-0.38%
Sep-08	-0.41%	-0.24%
Aug-08	1.20%	0.00%
Jul-08	6.36%	-0.73%
Jun-08	-2.40%	-0.06%
May-08	-1.50%	-0.35%
Apr-08	-0.23%	0.84%
Mar-08	-2.47%	-0.23%
Feb-08	-0.68%	0.16%
Jan-08	-0.05%	-0.71%
Dec-07	-2.81%	0.42%
Nov-07	-0.98%	-0.23%
Oct-07	0.64%	-0.05%
Sep-07	-0.75%	0.66%
Aug-07	-0.06%	0.09%
Jul-07	-0.53%	0.12%
Jun-07	-0.59%	0.07%
May-07	0.72%	0.44%
Apr-07	-1.19%	0.43%
Mar-07	-0.89%	0.44%
Feb-07	-0.67%	-0.24%
Jan-07	1.88%	-0.28%
Dec-06	-0.45%	-0.02%
Nov-06	1.06%	0.67%
Oct-06	1.87%	0.54%
Sep-06	1.00%	-0.07%
Aug-06	-0.51%	0.03%
Jul-06	-1.12%	0.87%
Jun-06	0.26%	0.06%
May-06	0.01%	-0.25%
Apr-06	-0.74%	0.30%
Mar-06	0.65%	0.21%
Feb-06	0.88%	-0.41%
Jan-06	0.18%	0.98%
Avg. Return	-0.13%	0.07%
Covariance	-0.0012%	

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There was only about one-one thousandth of a percentage of covariance between AMR and XOM, which makes sense intuitively. Exxon and American Airlines are in industries which have an adversarial relationship; as oil companies do well, airlines typically do poorly. The covariance being near zero tells us that the returns in each stock do not typically move in the same direction with each other and are not highly correlated.

The beta calculation is essentially a regression of the historical returns of the company versus the total market, which is a fairly complex undertaking. Thankfully most financial sources, such as Yahoo! Finance, provide a computed beta value for all publicly listed companies. While methodologies may vary slightly from source to source, the majority compute the covariance against the S&P 500. For instance, Yahoo! Finance computes the beta value of a company against the monthly price changes of the S&P 500 over a 36 month period (Yahoo! Finance, 2008). Other suitable barometers of the markets can be used; however, the important note is that not all beta values are calculated to the same market.

For most companies, beta values typically range from zero to two; however, there is no absolute range of values for beta; therefore, outliers are possible. A beta value of one indicates that there is perfect correlation between the market and the individual security, in that historical returns of the company match perfectly with the market. In essence, it could be stated that the market has a beta value of one, and that any deviation on either side displays the amount of risk that the security has. Typical companies with beta values close to the market are conglomerates such as Siemens (SI) and General Electric (GE) whose diversified business ventures enable their returns to act similar to the market.

A security with a beta value greater than one indicates a security that varies greater than the market, thus containing a greater amount of risk. As an example, by definition, a company with a beta value of 1.5 will see a 1.5% movement in their stock price for every 1% movement in the market. In essence, the company's returns vary 50% more than the market. Speaking in elasticity terms, a beta value greater than one is more elastic, as the stock's returns will fluctuate more significantly. A fine example of high beta value stocks are technology companies, whose earnings and returns tends to fluctuate over product life cycles and the macro-economic environment.

Oppositely, a beta coefficient less than one indicate that the firm's returns vary less than the market and thus are deemed more stable and less risky. For instance, a company with a beta value of 0.50 will only provide a 0.50% return when the market achieves a 1% return; however, when the market losses 1%, the company will only lose 0.50%. Thus, the returns of low beta stocks are much more stable. Low beta stocks are typical for utility companies whose revenue and costs are relatively fixed and stable over time.

Negative beta values are also possible, in that it represents a company that is negatively correlated to the market. Companies with negative beta coefficients will provide negative returns when the market is experiencing positive gains, and vice versa when the market is falling. An investor should view negative beta stocks as a hedge or insurance policy and are a perfect addition to a well diversified portfolio in that they help reduce risk. However, while negative beta coefficients can be achieved in the short-term, in the long-run, empirical evidence has shown that virtually no stocks have negative beta values (Ross, Westerfield, & Jaffe, 2005).

The Capital Asset Pricing Model (CAPM)

Using the determinant of risk, beta, and various market forecasts, the expected rate of return of an individual security can be calculated by using the capital asset pricing model (CAPM). Developed in the early 1960s by William Sharpe, the basic underlying assumption of CAPM is that the expected return of a security is linearly related to its beta, which is the relationship between an individual security and the market (Burton, 1998 May/June). Since beta values are readily calculated and supplied, the capital asset pricing model is obviously a valuable tool as it helps project expected return, providing an investor with an important valuation tool. The capital asset pricing model states:

$$k_i = k_{RF} + \beta_i \times (k_M - k_{RF})$$

Where: k_{RF} is the risk-free rate of return, β is the beta of the security, and k_M is the expected return on the market.

Interestingly, $(k_M - k_{RF})$ is also called the risk premium, as it is the difference between the expected return on the market and the risk-free rate. While the risk-free rate of return is usually a known value, as it is commonly calculated based upon short-term US treasury bills, the expected market return is largely based on the investor's projection of the future. However, CAPM is not a model used to calculate the expected rate of return of the market, but how an investor can position oneself in the market based upon the risk of the security.

In order to understand the capital asset pricing model, and the impact of beta, consider a market with an expected return of 10% and a risk-free rate of return of 2%. For company A with a beta equal to 1, the expected return on the company will equal the market return, since the beta value indicates the company moves exactly as the industry.

$$\hat{k}_i = k_{RF} + \beta_i \times (\hat{k}_M - k_{RF})$$

$k_A = 2\% + 1.0(10\% - 2\%) = 2\% + 1.0(8\%) = 10\%$

However, consider company B who has a beta value of 0.50. For this company, the expected return on the security will fall significantly to 6%. This is the result of the return on the risk premium being cut into half.

$k_B = 2\% + 0.5(10\% - 2\%) = 2\% + 0.5(8\%) = 6\%$

Conversely, if a company has a beta value of 1.5, then the expected return on the security will exceed the market with an expected return of 14%. Obviously, such a situation where the return on a security exceeds the market is desirable; therefore, in a bull market, investors should focus their attention on stocks with high beta values.

$k_C = 2\% + 1.5(10\% - 2\%) = 2\% + 1.5(8\%) = 14\%$

However, as was mentioned, high beta stocks contain greater risk. For instance, consider the same scenario except that the market is projected to decrease by 6%. A company with a beta value of 0.50 will have an expected return of -2%, which outperforms the industry.

$k_B = 2\% + 0.5(-6\% - 2\%) = 2\% + 0.5(-8\%) = -2\%$

Under the same scenario, a company with a beta of 1.5 would have an expected return far worse than the industry at -10%. Clearly, companies with beta values greater than 1 exhibit the true risk/reward, for in bull markets they will outperform the industry, but during bear markets they will be far worse off. Such individual investment decisions will ultimately depend on one's outlook of the market.

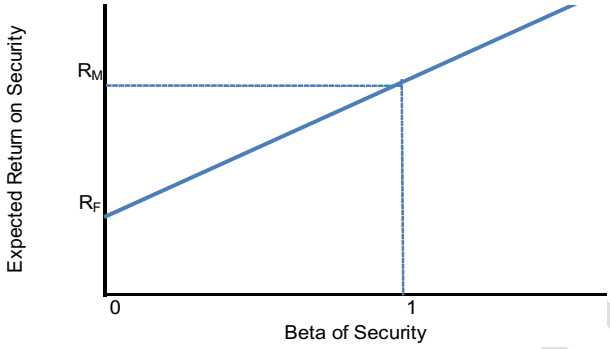
$k_C = 2\% + 1.5(-6\% - 2\%) = 2\% + 1.5(-8\%) = -10\%$

To further understand the impact of beta using the capital asset pricing model, consider company D whose beta value is -1.25. A negative beta value indicates the company's return moves in the opposite direction of the market; therefore, using an expected market return of negative 6%, company D's expected return will actually be positive at 12%. While such companies are rare, they represent great investment options during bear markets, and are perfect companies to diversify one's portfolio with and reduce one's risk exposure.

$k_D = 2\% - 1.25(-6\% - 2\%) = 2\% - 1.25(-8\%) = 12\%$

This representation of the relationship between the expected return of a security and the beta value of the security can be depicted graphically through the security market line (SML). The security market line, shown in figure 8.3, shows the linear relationship between expected return and beta with the intercept of the line being the risk-free rate and the slope of the line being the risk premium, or the difference between expected market return and the risk-free rate. Based on empirical evidence in the long-term, the SML is generally upward-sloping as a result of the expected return on the market being greater than the risk-free rate of return (Ross, Westerfield, & Jaffe, 2005). However, during recessionary periods, the SML could be downwards-sloping whereby the risk-free rate exceeds the market return. Based on the long-term SML shown in figure 8.3, when the beta value of the security is equal to zero, the expected return on the security is merely the risk-free rate of return. When the beta value is exactly one, the expected return of the security is equal to the expected return on the market as was demonstrated earlier.

Figure 8.3 – General long-term security market line (SML)

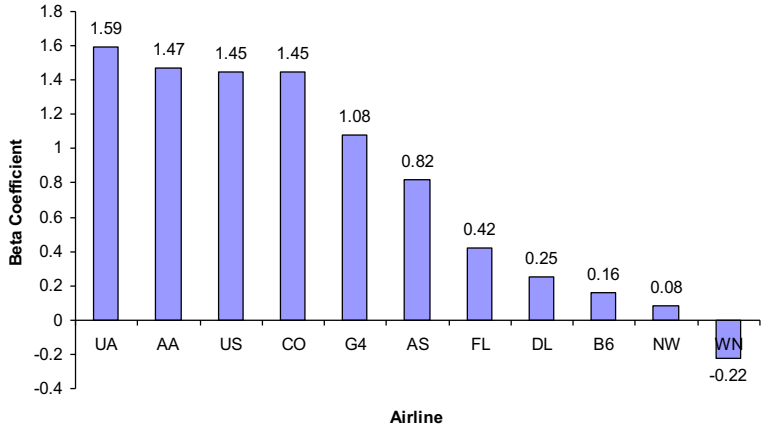


Is the Aviation Industry Risky?

While it is important to understand the fundamentals of the risk/return dichotomy, for students of the aviation industry, it is particularly important to understand how the aviation industry is viewed externally. The amount of risk that a company represents plays a significant role in a company's ability in obtaining capital, and if successful, the cost of the capital.

While there are many determinants of risk, for an investor, the beta coefficient helps determine an individual company's risk relative to the market. Figure 8.4 provides the beta coefficient for major US airlines as at the start of September 2008.

Figure 8.4 – US airlines' beta coefficients as of September 2, 2008



Source: Compiled by the author using data from Yahoo! Finance

Based on information contained in figure 8.4, US airlines contain a variety of risk characteristics with a few legacy carriers having beta coefficients greater than one, one airline having a similar degree of risk as the market, several airlines, mostly low-cost carriers, having fairly stable historical returns, and Southwest Airlines (WN) having a negative beta coefficient indicating the company acts in a direct contradiction to the market.[4] In essence, the airline industry contains companies with a wide variety of risk factors.

While it is clear that no generalization about risk can be applied to all airlines, two separate statements concerning risk can be made about the US airline industry. Based on the beta values contained in figure 8.4, legacy carriers appear to be more risky than the market (DL and NW excluded, see footnote), while low-cost carriers exhibit tendencies to be less risky and more stable. This generalization makes some practical sense as legacy carriers are not only highly

[4] It should be noted that since Yahoo! Finance calculates beta values on three years of historical data, both Northwest Airlines and Delta Air Lines are likely to have a smaller sample size as a result of being in bankruptcy protection during the time period.

leveraged financially, but also appear to be less flexible in their cost structure, thus they are unable to reduce costs quickly during periods of diminishing demand, but able to fully bear the profits of increased demand. Such stable cost structures with fluctuating demand will ultimately cause greater fluctuation in earnings and ultimately investment returns. In general, with many of the low-cost carriers still being relatively young and focused on a growth-orientated business model, by curtailing growth during down demand periods, low-cost carriers appear better at matching supply and demand, while removing the associated costs. As for Southwest Airlines, a possible explanation for their negative beta coefficient is that during recessionary periods, travelers, especially business travelers, move to the lower cost option, thus helping improve Southwest Airlines profitability. In essence, Southwest Airlines could be acting as an inferior good. This theory is supported by the fact that during distressed periods for legacy carriers, Southwest Airlines has a tendency of being aggressive and stealing market share away. In recent times Las Vegas has become Southwest's largest city (in terms of daily flights)[5]; while US Airways has reduced capacity in Las Vegas (Michaels, 2008, June 12). However, during the recent time period, much of Southwest's profitability also could be traced to gains relating to jet fuel hedging, thus providing the airline with profits during periods of high commodity prices which appear to be contradictory.

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The analysis of figure 8.4 seems to fly in the face of more recent shifts in airline betas. By March 2009, only six months later, US airline betas had completely changed, in many respects, with the global economic downturn.

[5] Source: http://www.swamedia.com/swamedia/cities/swamedia_las.html

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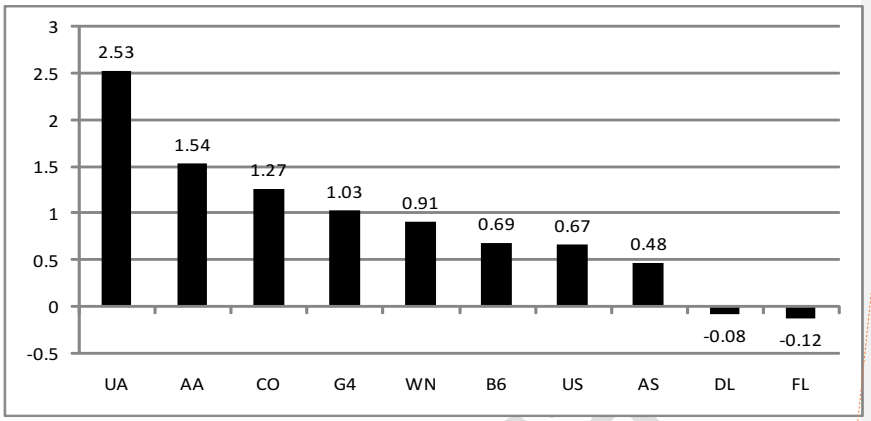
Figure 8.5 US airlines' beta coefficients as of March 24, 2009



Source: Data compiled by authors from MSN Money and Yahoo! Finance
Note: Northwest and Delta have combined since Sept. 2008; therefore the current beta is for the combined carrier

Comparing figure 8.5 with figure 8.4 demonstrates that betas are constantly fluctuating over time. In September 2008, Southwest was the only airline with a negative beta; in March 2009 Delta Air Lines (DL) and AirTran Airways (FL) had negative betas. Investors must continually monitor betas to determine whether or not they are receiving an appropriate return for the amount of risk that they are undertaking.

Another indication on the riskiness of the aviation industry is the fluctuation in the earnings of the airlines. Airlines have historically displayed significant variation in earnings not only over the long-term, but also in the short-term. The airline industry has shown extreme cyclicality, much in the way the market does; however, this problem has been exaggerated as a result of airline's significant fixed costs and the long development time in strategic planning. Historically, after aviation deregulation in the United States in 1978, the airline industry has displayed significant industry losses during the first half of every decade, closely followed by significant profitability in the latter half of every decade (Vasigh, Fleming, & Tacker, 2008). This earnings cycle creates heightened risk as earnings fluctuate severely while placing airlines in financial distress.

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In the short-term, the airline industry also exhibits seasonality where earnings vary from quarter to quarter. Historically, the third quarter (northern hemisphere summer) has proved to be the most profitable quarter while the first quarter (northern hemisphere winter) typically provides the year's worst earnings. Such seasonality is a result of air travel demand; however, the market as a whole does not exhibit the same degree of seasonality, causing a greater variance in earnings, and thus increased risk. With fuel hedging representing an increasing activity by all airlines, earnings have become even more volatile as airlines report realized/unrealized gains and losses. For airlines not practicing fuel hedge accounting, any fluctuation in the price of commodities will cause a significant change in the mark-to-market account, which ultimately needs to be recorded in the company's consolidated income statement.[6] To summarize, fuel hedging has created further variances in airline earnings, thus causing greater distortions in investor returns, while providing increased risk to investors. An example of the volatility between quarters for airline earnings in shown in table 8.10:

Table 8.10 Earnings by Quarter ($ Millions)

Southwest Airlines

Year	Q1	Q2	Q3	Q4
2007	93	278	162	111
2008	34	321	-120	-56

Continental Airlines

Year	Q1	Q2	Q3	Q4
2007	22	228	241	71
2008	-80	-3	-236	-266

Sources: Southwest and Continental Airlines 10Q Filings 2007-2008

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As can be seen from table 8.10, Southwest Airlines and Continental Airlines quarterly earnings followed the normal pattern in 2007. In the first quarter (winter), earnings were lower than in the second and third quarters (spring and summer). However, the trend did not hold true in 2008 as a result of rising fuel prices; those airlines which hedged fuel when prices began to rise experienced losses on those hedges in the third and fourth quarter of 2008 when oil prices retreated back down. We can see the impact of fuel prices and fuel hedges with the quarterly

[6] For further information on hedge accounting and mark-to-market changes, please refer to chapter thirteen.

earnings of Southwest and Continental; earnings in the third and fourth quarter of 2008 were worse for both airlines than in the first and second quarters of that year. Therefore, while the common earnings trend may exist, certain management actions or external macro-economic events may ultimately cause the earnings trend to be distorted. Investors need to interpret such information when evaluating the quarterly performance of an individual carrier.

Finally, another barometer of industry risk is the amount of times firms enter bankruptcy protection. The airline industry is filled with tales of airlines going bankrupt or ceasing operations, with Delta, Northwest, United, US Airways, and Frontier having all entered bankruptcy protection in the last several years. The following table shows airline bankruptcies in the U.S since the terrorist attacks of September 11, 2001.

Table 8.11 Airline Bankruptcies in the U.S. since 9/11

Date	Airline (dates of service)	Bankruptcy Chapter
1/2/02	Sun Country Airlines	7
7/30/02	Vanguard Airlines	11
8/11/02	US Airways	11
12/9/02	United Airlines	11
3/21/03	Hawaiian Airlines	11
10/30/03	Midway Airlines	7
1/23/04	Great Plains Airlines	11
1/30/04	Atlas Air/Polar Air Cargo	11
9/12/04	US Airways	11
10/26/04	ATA Airlines	11
12/1/04	Southeast Airline	7
12/30/04	Aloha Airlines	11
9/14/05	Delta Air Lines	11
9/14/05	Comair	11
9/14/05	Northwest Airlines	11
9/29/05	TransMeridian Airlines (founded 1995)	7
10/13/05	Mesaba Airlines (founded 1944; sched. service eff. 2/4/73)	11
11/7/05	Independence Air (originally Atlantic Coast Airlines eff. 12/15/89)	11

12/28/05	Era Aviation (sched. service eff. 5/83)	11
1/6/06*	Independence Air (6/16/04 through 1/5/06)	7
2/21/06	Florida Coastal Airlines	11
10/15/07	Kitty Hawk Aircargo	11
12/24/07	MAXjet Airways (11/1/2005 through 12/24/07)	11
1/7/08	Big Sky (9/15/78 through 1/7/08)	7
3/31/08	Champion Air (orig. MGM Grand Air; 9/87 through 5/31/08)	11
3/31/08	Aloha Airlines (7/26/46 through 3/31/08)	7
4/2/08	ATA Airlines (8/73 [sched. service in 1986] through 4/2/08)	11
4/7/08	Skybus Airlines (5/22/07 through 4/5/08)	11
4/11/08	Frontier Airlines (began 7/5/94)	11
4/26/08	Eos Airlines (10/18/05 through 4/27/08)	11
5/14/08	Air Midwest (5/15/65 through 6/30/08)	7
6/18/08	Gemini Air Cargo	11
7/18/08	Vintage Props & Jets (began 1991)	11
8/12/08	Gemini Air Cargo (10/24/96 through 8/12/08)	7
10/6/08	Sun Country (began 1982 [sched. service 6/1/99])	11
10/15/08	Primaris Airlines (est. 2002, ops. in 2004; charter)	11
Source: Air Transport Association		

Bankruptcy ultimately causes shareholder wealth to be lost, representing a significant risk to investors; however, it is important to note that all these aforementioned carriers have re-emerged. While airlines are deemed risky to equity investors, to debt holders, airlines are not as risky due to the significant fixed assets (i.e. aircraft, engines, slots, spare parts) that can be collateralized. As a result, the significant fixed assets of airlines make the industry not entirely risky to debt holders; however, in a twist of irony, the significant fixed assets of airlines ultimately make them experience significant swings in profitability, which represent increased risk to equity investors. Therefore, depending on one's viewpoint, the aviation industry can be viewed as either a risky investment or a more stable investment; however, as this chapter has shown, one's rate of return on the airline industry will also vary.

Summary

Investors weigh both the riskiness of an investment and its expected return when deciding which securities to invest in. Assuming all other items (including expected return) being equal, the rational investor will choose an investment with less risk over one with more risk. There are two types of risk involved in investments: systematic risk and unsystematic risk. Unsystematic risk is the risk involved in investing in a particular industry and company, which can be essentially eliminated through a well diversified portfolio. Systematic risk refers to the general risk of financial markets and cannot be removed through diversification.

The beta of a company's stock refers to how the stock moves in comparison to the overall stock market. Stocks which have a positive beta move up and down as the market does; stocks with a negative beta move opposite the market. If the absolute value of the beta is less than 1, the stock is not as volatile as the market; an absolute value greater than 1 indicates the stock is more volatile than the market. A company's beta can then be used to determine the expected or required rate of return on investment in that company by using the capital asset pricing model (CAPM).

The airline industry is perhaps one of the most risky industries to invest in due to the cyclicality and volatility of airline profits. Fluctuating fuel prices and demand often lead to losses in the airline industry and even bankruptcy. Due to the riskiness of the industry it is often difficult for airlines to raise capital; the riskiness of the industry means that potential investors will require a greater rate of return on their investment.

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