Incorporating Uncertainty into Discounted Cash Flow Equity Valuations

Jon Comeau

Economics Senior Project

Fall 2009

Advisor: Dr. Eduardo Zambrano

[Abstract]: The discounted cash flow valuation is widely used by corporations, financial advisers, and investors to help guide investment decisions. However, the valuation estimates contain a high level of uncertainty. Multiple academics and practitioners have developed ways to combat uncertainty in investment decisions. This paper is aimed at giving decision makers more information to help improve the decision making process via Monte Carlo simulations and utility theory.

Table of Contents

I. Introduction

Discounted cash flow (DCF) analysis is a method of valuing investments including equity, real estate, corporate projects and even entire companies. The method essentially estimates future cash flows and discounts them using an appropriate rate to determine an estimate of their present value. The concept of DCF is derived from the fact that the value of an investment today should be equal to the present value of the cash flow it will generate. Discounting the cash flows is necessary to account for money being received at a future date being worth less than money received today because it could be reinvested to earn additional income. The method was first developed by Arthur M. Wellington, a railroad engineer, in the late 19th century. The method was further developed by academics and engineers post World War Two. DCF valuations are now widely used by firms to make irrevocable capital budgeting decisions (Dulman).

Beyond capital budgeting decisions, DCF valuations can be used to determine enterprise value, the estimated value of an entire company, and the intrinsic value of a firm's equity. Value investors use valuations, including DCF, to find stocks that are trading at a significantly different price than their estimated intrinsic value ("Value Investing"). To calculate a firm's intrinsic equity value using the DCF method future free cash flow (FCF) must be estimated. To obtain the FCF estimate the firm's income statement and balance sheet is forecasted out for typically 5 years. Beyond the 5 year period the Gordon Growth Model is used to calculate a terminal value which is the value of the FCF a firm will generate into infinity calculated as perpetuity. The company's weighted average cost of capital (WACC) is then used as the discount rate to determine the present value (PV) of FCF. To determine equity value, the current level of the firm's debt is subtracted from PV of FCF, which gives the cash flow available to equity investors. That value is then divided by the current number of shares outstanding to obtain the intrinsic value of the company's stock price (Gorman).

Due to the calculated intrinsic values being based on forecasts, the resulting estimate is uncertain. The only input in the DCF calculation that is not a forecast is the WACC used to discount the cash flows. However, the values used for the exogenous variables in the equation can differ from practitioner to practitioner. The uncertainty inherent in DCF calculations has significant real world implications. Firms make large and often irrevocable investment decisions based on DCF valuations. According to a survey of 37 leading Fortune 500 firms, 96% of corporations and 100% of financial advisers surveyed use the DCF technique to evaluate investment opportunities (Bruner 190). Value investors who utilize the DCF method are essentially betting that their valuation is accurate, and the firm's intrinsic value will be realized in the market during a particular time horizon. Despite the high level of uncertainty and the dependence on assumptions, DCF estimates are ubiquitous in the world of finance. Cal Poly Finance Professor John Dobson summarized this point by relating to his students that when all you have is a hammer everything looks like a nail, and in finance the hammer is the DCF valuation.

The objective of this paper is to analyze ways for value investors to make more informed investment decisions under uncertainty. Specifically, the paper focuses on incorporating probability models into a DCF equity valuation and running thousands of Monte Carlo simulations to derive an expected equity value rather than a single point estimate. The descriptive statistics that can be calculated from the simulation outputs should help illustrate the level of uncertainty in the valuation and help with the decision making process. The paper then looks at how calculating the expected utility of the investment based on a fixed level of risk tolerance can be used as an added decision making criteria. The decision maker can compare the expected utility of the investment to the expected utility of alternative investments or of not investing at all and choose the investment that maximizes expected utility. Running Monte Carlo simulations and calculating expected utility will not necessarily equate to more profitable investment decisions. The real benefit of applying these methods is framing the investment decision in the context of the level of uncertainty surrounding the estimate and the decision maker's risk profile.

The paper begins by over viewing previous work regarding investment under uncertainty, and although there is an extensive amount of literature on the subject only a few studies closely related to this paper will be profiled. The paper then overviews a DCF equity valuation of Cracker Barrel (Nasdaq: CBRL) conducted in December 2008. The DCF valuation is then redone by incorporating uncertainty into the FCF forecasts and running 5,000 simulations. Finally, the paper looks at calculating the expected utility of the investment by using a constant level of risk tolerance.

II. Literature Review

Various Academics have analyzed ways to incorporate uncertainty into investment decisions. Beginning in the 1930's Benjamin Graham laid the foundation for the modern value investor in *Securities Analysis* and *The Intelligent Investor*. In both books, Graham made a clear distinction between investing and speculating and argued that intelligent investors can protect themselves from the risk of uncertainty by making investments with a particular margin of safety. Graham made the distinction between investment and speculation in *Securities Analysis* as follows: "An investment operation is one in which, upon thorough analysis, promises safety of principal and a satisfactory return. Operations not meeting these requirements are speculative" (3). Graham advocates against investors timing the market, selecting stocks thought to outperform the market in the short term, and selecting stocks thought to outperform the market in the long term (i.e. growth stocks). The problem with those strategies is the difficulty of accurately predicting the future and doing it better than a "host of competitors" (11).

Graham promotes investing in securities at bargain levels relative to their fundamental values and in other promising securities and leading investment funds when the market is not too high (16). He believes these opportunities generally occur when the market is at depressed levels and when individual issues are particularly unpopular (173). The margin of safety advised by Graham is essentially picking securities whose value to the investor does not depend on accurately predicting the future. The margin of safety for fixed income investments can be thought of as the difference between the value of the company and their level of debt. For example, if a company is worth $30 million and they have $10 million in debt the company could shrink by 2/3 before there is any risk to the debt holders. For ordinary common stock Graham describes the margin of safety as the difference between the expected earning power of the stock and the going rate for bonds. To mitigate the uncertainty risk that is inherent in investments, Graham promotes investing in securities that have strong fundamentals at bargain levels that have an adequate margin of safety (256). The difference between the intrinsic or fundamental value and the low level the security is trading at provides a cushion against miscalculations and adverse market conditions.

When making investment decisions the worth of not investing immediately is another factor that can be taken into consideration. In *Investment Under Uncertainty* Avinash Dixit and Robert Pindyck argue that the value of delaying the investment should be incorporated into the decision making process. One technique is to view the investment decision as a real option. Firm's make large often irrevocable investment decisions continuously throughout time. The irreversibility of investment decisions requires that the standard NPV analysis taught in business schools be adjusted. Traditional NPV analysis ignores the opportunity cost of investing now. If the investment can be made now or at a future date and if it is irrevocable then the decision to invest can be viewed and valued as a call option (26). The adjusted NPV method developed in *Investment Under Uncertainty* can be utilized by value investors via incorporating the value of the option into the DCF.

Kenton Yee's *Deep-Value Investing, Fundamental Risks, and the Margin of Safety*, in the *Journal of Investing*, applies the option framework to Benjamin Graham's margin of safety. Yee views the margin of safety as the discount (the intrinsic value minus the market value) that is equal to the value of the option to delay the investment. The paper develops a model to determine how large a margin of safety a value oriented investor should demand. Value investing relies on mispricing, a convergence date where the intrinsic value will be realized in the market, and the ability to establish the desired position before the convergence date. Yee identifies four risks to value investors:

1. Market risk: volatility of the market price
2. News risk: news that will disrupt the investors intrinsic value estimate
3. Valuation risk: The intrinsic value estimate may be systematically biased or imprecise
4. Convergence risk: uncertainty about when the market price will converge to the estimated value

Yee incorporates those risk factors into calculating appropriate margins of safety using the real options framework. Analyzing companies in the S&P 500, Yee calculates the typical margin of safety to be between 20-30% of share prices. Like Graham, Yee advocates making investments with a large margin of safety to increase the probability of a desirable outcome.

Nick French and Laura Gabrielli analyze ways to incorporate uncertainty into the DCF method of valuing real estate in their *Discounted cash flow: accounting for uncertainty* study. The authors' find that although DCF real estate valuations are uncertain they are generally reported as a single point estimate without any reference to the uncertainty behind it. A point estimate is a common approach that uses the valuer's best estimate of the unknown value to make the calculation without any consideration of uncertainty (Myerson 49). The cash flows from real estate investments are uncertain which results in the valuation being uncertain. The projected cash flows are based on the best estimate of a professional. The authors argue that probabilities should be incorporated into those estimates. Normal distributions are the most statistically robust, but the Triangular distribution better reflects the judgment and thought process of the valuer. The valuer can use market information to determine the most likely outcome and then asses what they believe to be the best and worst outcome. The study uses Crystal Ball, a software package, to run Monet Carlo simulations. Instead of producing a single point estimate the simulation carries out multiple iterative calculations using random values that are based on the provided triangular distribution values. The process is repeated thousands of times and the mean of the resulting valuations is used as an expected estimate rather than a single point estimate. The study found that the expected value is not significantly different than the point estimate, but incorporating uncertainty adds beneficial information about the uncertainty of the result. One benefit is the simulation results provide a standard deviation which describes the risk of the valuation estimate not being realized. A range can be provided to show the probability of the value falling between a certain dollar range. Incorporating uncertainty places the valuation estimate in the context of the uncertainty of inputs and the risk of the output estimate not being realized (French).

Another method of making investment decisions under uncertainty is by looking at the expected utility of the investment. In *Probability Models for Economic Decision Making* Dr. Roger Myerson overviews how utility can be incorporated into investment decisions. The investor's risk tolerance can be estimated using a hypothetical binary lottery with each pay off being equally likely. If the risk tolerance can be assumed to remain constant then the investor's utility from various gambles can be computed. Using Monte Carlo simulations similar to the study mentioned above, the expected utility of an investment can be found by taking the average of thousands of simulation results. This value can then be compared to the expected utility of other investments or the utility of not investing at all. This method allows decision makers to make choices based on utility maximization given a specific risk profile.

Graham and Yee's objective in dealing with investment under uncertainty is to increase the probability that the investor will experience favorable results. As opposed to wealth maximization, French and Myerson focus on increasing the information available to decision makers. The focus of this paper will not be on increasing the chances of wealth maximization but rather on increasing information to aid in the decision making process. The Monte Carlo simulations will not necessarily provide a more accurate estimate, but it will illustrate the uncertainty surrounding the estimated stock price. Unlike French and Gabrielli's study, this paper will use the Generalized Log-Normal distribution rather than the Triangular distribution to incorporate uncertainty into the forecasts. The Triangular distribution provides a smaller range of possible randomly generated forecasts, and the Generalized-Log normal is used in this paper to reflect my higher level of uncertainty regarding CBRL's FCF forecasts. Incorporating the expected utility will add another decision making criteria to the margin of safety concept that is widely used by value oriented investors.

III. DCF Model 1: Overview

DCF Method

The discounted cash flows or free cash flow for the firm (FCFF) is the method used in this study to calculate the intrinsic value of CBRL's equity. The FCFF is the after tax earnings adjusted for depreciation, changes in working capital, and increases in capital expenditures. The method of calculating the overall cash flow to a zero debt firm used in this paper is listed below:

FCFF = EBIT (1-t_c) + (Depreciation + Amortization) – Cash Flows from Capital Spending – Cash Flows from Changes in Working Capital

where

EBIT = Total Revenue – Cost of Goods Sold (COGS) – Sales, General & Administrative Expenses (SG&A) – Other Indirect Expenses – Depreciation & Amortization

Cash Flows from Capital Spending = Purchases of Property Plant & Equipment (PPE) - Sale of PPE before Taxes + Taxes on Sale of PPE

Cash Flows from Changes in Working Capital = Increase (Decrease) in Accounts Receivable + Increase (Decrease) in Inventory + Decrease (Increase) in Accounts Payable

The DCF discounts the year by year FCF and a terminal value, V_n, which is calculating using the Gordon Growth Model. The discount rate used is the firm's weighted average cost of capital (Bodie 613).

Enterprise Value = $\sum_{t=1}^{n} \frac{FCFFt}{(1+WACC)^{t}} + \frac{Vn}{(1+WACC)^{n}}$, where $V_n = \frac{FCFFn+1}{WACC-g}$

To obtain the intrinsic value of equity, the current value of CBRL's debt is subtracted from the enterprise value, and a share price is obtained by dividing the value available to equity investors by the current number of shares outstanding.

Weighted Average Cost of Capital

WACC is the dominant discount rate used in DCF analyses (Bruner 173). It is given as follows:

$$WACC = (W_{debt}(1 - t_c)K_{debt})+(W_{preferred}K_{preferred})+(W_{equity}K_{equity})$$

where

K = component cost of capital

W= weight of each component as % of total capital

t_c = marginal corporate tax rate

The cost of equity can be calculated via the capital asset pricing model (CAPM) or a multifactor model. This valuation ran market model regressions to determine the cost of equity using both the

CAPM and a multifactor model. The CAPM was developed in 1964 by William Sharpe, John Linter, and Jan Mossin as method of calculating the required return of an asset (Bodie 279). The equation is

$$K_e = R_{rf} + \beta(R_m - R_{rf})$$

where

R_{rf} = Interest rate available on a risk free bond

R_m = Return required to attract investors to hold the broad market portfolio of risky assets

$R_m - R_{rf}$ = The equity risk premium

β = The relative risk of the particular asset (Bruner 175)

Another approach to calculating the cost of equity is using a multifactor model which aims to identify macroeconomic sources of systematic risk (i.e. risk that should be rewarded and thus increase the required return on an asset) (Bodie 424). This valuation incorporates the Fama French three factor model. The equation is given below:

$$K_e - R_{rf} = \alpha_0 + \beta_1 E[R(\text{Market-rf})] + \beta_2 E[R(\text{SMB})] + \beta_3 E[R(\text{HML})]$$

where

rf = Interest rate available on a risk free bond

E[R(Market-rf)] = The expected return on the market minus the Interest rate available on a risk free bond

E[R(SMB)] = The expected returns of small market cap stocks over big market cap stocks

E[R(HML)] = The expected returns of high book/market value stocks over low book/market stocks

The firm specific factors are incorporated into calculating the expected return on a security due to long standing empirical observations that firm size and the book-to-market ratio predict stock returns that are inconsistent with the CAPM (Bodie 336). There is much debate over the validity of the CAPM and multi factor models, but for the purpose of this paper it will be assumed that both adequately predict returns. The model that results in the highest statistical significance is used in this valuation.

The DCF model contains multiple assumptions beyond the forecasted FCF. The WACC value used can vary dramatically and will have a significant impact on the calculated value. A study examining the WACC estimation practices of various corporations, financial advisors, and finance textbooks found significant deviations in the practices of calculating WACC (Bruner 171). To account for the various possible values of the WACC a sensitivity analysis is incorporated into the second valuation. The objective of this paper is not to analyze the best practices of DCF valuations. The paper assumes the methods of calculating the DCF valuation in this study is valid and will focus on adding information to the decision making process.

IV. DCF Model 1: Data and Analysis

FCF Forecasts:

To forecast CBRL's FCF, 10 years of financial data were obtained from MergentOnline. Specifically, balance sheet, income statement, and statement of cash flows data from 1999-2008 are used. To estimate FCF revenue must first be forecasted (Figure 1 of Appendix A). Multiple regressions were run to try and determine factors that explain changes in CBRL's sales. However, due to the lack of an adequate model, revenue forecasts for 2009-2011 from Capital IQ and 2012-2013 forecasts from Value Line are used (Figures 2 and 3 of Appendix A). COGS, SG&A, and other indirect expenses are estimated using a 10 year historical mean percentage of sales. Depreciation and amortization is estimated using Value Line's future estimate. 2009 and 2010 purchases of PP&E are determined by using estimates listed on Cracker Barrel's 10-K. The remaining PP&E values use a 15 year historical average. The 2009 estimate of gains from the sale of PP&E is taken from the company's 10-K and the remaining years are forecasted from a 15 year historical average. Changes in working capital are estimated by using a 10 year historical average of days A/R, days inventory, and days A/P. Cracker Barrel predicted a 35% corporate tax rate for 2009, and that value is used for the 2009-2013 forecasts. The forecasting is done in Excel, and all the values mentioned above are located in a driver box that is used to compute the forecasted values (Figure 4 of Appendix A). With those values forecasted, the FCF generated from 2009-2013 is calculated (Figure 5 Appendix A).

Terminal Growth Rate:

To calculate the value of Cracker Barrel beyond 2013 a terminal growth must be determined. The terminal growth rate is highly subjective and can essentially be a shot in the dark. Investment Bank's using the Gordon Growth Model to calculate enterprise values will typically use the country's GDP growth rate, the rate of inflation, or something similarly conservative ("Breaking into Wall Street"). The rate used in the calculation is 3%, and is determined by taking the 1989-2009 average annual growth rate of the U.S.'s GDP from the Bureau of Economic Analysis.

WACC:

To properly determine the present value of the company's future cash flows it is necessary to discount those cash flows at the company's cost of capital. To determine the weighted average cost of capital for CBRL, I first determined the expected return of their equity to be 10.43% via the Fama French three factor model.

Cost of Equity/Market Model Regressions:

To determine the company's cost of equity market model regressions are run using both the capital asset pricing model (CAPM) and the Fama French three factor model. For the CAPM regression, 60 months of stock price data from November 2003 to October 2008 from Yahoo! Finance is used. The S&P 500 is used to represent the market, and to compute accurate returns S&P 500 dividends estimated by Yale University professor Robert Schiller are factored in. To get the excess returns, the returns on 1 year U.S. Treasury-notes obtained from economagic.com are subtracted from the returns of both Cracker Barrel and the S&P 500. To make the data accurate the T-note returns are divided by 1200 to get them in monthly decimal format. The regression resulted in an adjusted R^2 of .1079033 and a β_1 of .79691. β_1 is not statistically different from 1, meaning CBRL approximately moves with the market. The following model was run using OLS:

$$R(CBRL) = \beta_0 + \beta_1 * R(Market\text{-}rf) + \varepsilon$$

Like the CAPM, 60 months of stock price data from November 2003 to October 2008 from Yahoo! Finance is used for the Fama French regression. In addition, 60 months of data from November

2003 to October 2008 was taken off of Ken French's website. The data includes excess market returns, returns of high book/market value stocks over low book/market stocks, and returns of small market cap stocks over big market cap stocks. The following regression model was run using OLS:

$$R(CBRL) = \beta_0 + \beta_1 * R(Market\text{-}rf) + \beta_2 * R(SMB) + \beta_3 * R(HML) + \varepsilon$$

The HML estimator is not statistically significant. The variable was removed and a restricted F test shows the restriction is valid. The restricted model results in statistically significant estimators with $\beta_1 = .73982$ and $\beta_2 = .93548$. The restricted model has an adjusted R^2 of .165766. The Fama French model is used to calculate the cost of equity due to it having a higher adjusted R^2 (Figure 6 Appendix A).

For this valuation the betas were manually calculated. However, a majority of corporations and financial advisors will use betas from published sources (Bruner 191).

Cost of Debt:

At the time of the valuation Cracker Barrel's S&P credit rating was BB- ("CBRL Group Inc NasdaqGS CBRL Fixed Income"). As of fiscal 2008, Cracker Barrel had $789.9 million in debt. 99.5% of the company's debt was in term loans and the rest in capital leases and short term revolving lines of credit ("CBRL Group Inc NasdaqGS CBRL Financials"). Since Cracker Barrel has no outstanding bonds, a yield to maturity is calculated by using an outstanding bond, found on Yahoo! Finance, within a similar industry and with a similar maturity date. The cost of debt is calculated to be 8.306%.

Weights:

Best practices in calculating the WACC dictates using the market values of debt and equity to calculate the weights (Bruner 175). The market value of equity of $405,074,770 at the date of the valuation is calculated by multiplying the current share price of $17.78 by the number of shares outstanding. The value of debt was taken from figures provided by Capital IQ.

CBRL's current tax rate of 30.2% is used. Cracker Barrel had no preferred shares, so that element of the equation dropped out to zero. CBRL's WACC is calculated to be 7.34% (Figure 7 Appendix A).

Estimated Value of CBRL's Equity

This valuation of CBRL determines the present value of CBRL's assets in 2008 to be approximately $2.2 billion. Subtracting off the approximately $1.2 billion in liabilities leaves $967,890 available to equity investors. Dividing the $9.7 million PV of equity results in an intrinsic share price value of **$42.44** (Figure 8 Appendix A). With CBRL trading at $17.78/share at the time of the valuation this represents a significant undervaluation of the company's equity and this analysis resulted in a theoretical buy decision.

V. DCF Model 2: Overview

The original model was redone by incorporating probability models and running thousands of Monte Carlo simulations. Like the previous model, this valuation is done for CBRL as of their fiscal year ending in 2008. The simulation output is used to calculate the expected stock price and descriptive statistics, as well as the expected utility of the investment.

Incorporating Probability Models:

The forecasted values used to compute the future FCF in model 1 are single point estimates which results in the estimated stock price being a single point estimate. To combat this, probabilities can be incorporated into the forecasts. This model uses the Generalized-Lognormal distribution. The distribution is meant to represent my uncertainty regarding the true value of the forecasts and is not assumed to accurately represent the true distribution of the variables. The Generalized-Lognormal distribution is defined by three quartile boundary points: Q_1, Q_2, and Q_3.The quartile points characterize the distribution by specifying the .25, .50, and .75 cumulative probabilities. Q_1, Q_2, and Q_3 are the quartile boundary points for a Generalized-Lognormal distribution when for an unknown value X

$$P(X < Q_1) = .25,\quad P(X < Q_2) = .50,\quad \text{and } P(X < Q_3) = .75$$

If X is a continuous random variable then the actual value of X is equally likely (i.e. probability of ¼) to be located in any of the 4 quartiles. Q_2 can also be defined as the median value of the distribution (Myerson 122).

To estimate the FCF forecasts subjective probability assessments are used. Rather than to think in sophisticated statistical concepts it can be easier to think in terms of a simple binary lottery. The person conducting the assessment can think of a simple lottery that pays either $1000 or $0 with each of the outcomes being equally likely. For example, the subjectively assessed Q_2 would be the point where the person would be indifferent between the following 2 lotteries: (1) pays $1000 if the true value, **N**, is **<** Q_2 and $0 otherwise and (2) pays $1000 if **N** ≥ Q_2 and $0 otherwise (Myerson 127). The subjective probabilities would be defined as

$$P(\mathbf{N} < Q_2) = P(\mathbf{N} \geq Q_2) = \tfrac{1}{2}$$

The process is continued until the 3 quartile boundary points are defined such that

$$P(\mathbf{N} < Q_1) = .25,\ P(\mathbf{N} < Q_2) = .50,\ \text{an}\ P(\mathbf{N} < Q_3) = .75$$

The simulation is run in Excel using the Simtools add-in developed by University of Chicago Professor Roger Myerson. Like the previous model, this valuation is done in Excel. However, the drivers in this model are random variables generated by the subjectively assed quartile boundary points. The add-in utilizes Excel's RAND() function which generates a number between 0 and 1 with each value being equally likely. The RAND() function is used as the probability input in the Generalzied-lognormal equation used to incorporate probabilities into the forecasts. The Excel function used is

= GENLINV(RAND(), Q_1, Q_2, Q_3)

Minimum and maximum values can be included in the function by including a low and high value after the quartile boundary points (Myerson 124).

= GENLINV(RAND(), Q_1,Q_2,Q_3,L,H)

The drivers from the original model are used as the median values for the probability distributions, since they are essentially my best estimate. The future FCF generated from 2009-2013 is calculated from the randomly generated drivers. Then 5,000 simulations are run on the estimated intrinsic stock price. From the simulation output an expected stock price is calculated, as well as other descriptive statistics.

The purpose of using the probability models based on the Generalized-Lognormal distribution is not to necessarily obtain a more accurate stock price. Using probability models does not remove the danger of the valuation being based on bad assumptions. In fact, this valuation uses my own subjective assumptions, as well as assumptions from Capital IQ and Value Line. All simulation models face the problem of garbage in garbage out; meaning the accuracy of the simulation is dependent on the specified parameters. The real benefit from running the simulation comes from the descriptive statistics that can clearly illustrate the level of uncertainty in the valuation.

Expected Utility and Certainty Equivalent:

To improve the decision making process this valuation also includes the expected utility of the investment. The expected utility (E(U)) can be compared to that of a similar investment or of not investing at all. The E(U) in this paper is calculated by computing my own risk tolerance. Most investor's have at least a general sense of the risk they are willing to take. A risk seeking investor may prefer young growth companies that have no demonstrated ability to generate predictable earnings, while a highly risk adverse investor may prefer to older companies with predictable earnings that pay a stable dividend.

To specifically define an individual's risk tolerance a simple binary lottery can be used to determine a certainty equivalent (CE). For a simple lottery, the CE would be the lowest possible amount of money an individual would be willing to accept instead of taking the gamble. If an individual was offered a gamble that paid $5000 or $0 with each having a probability of 0.5 then the expected monetary value (EMV) of the gamble is 0.5*($5000 + $0) = $2,500. A perfectly risk neutral individual would have a CE equal to the EMV. If the individual is risk adverse then they would have a CE that is below the EMV. The difference between the EMV and the CE is known as the risk premium (RP). Specifically,

$$RP = EMV - CE$$

When looking at multiple gambles the one with the highest CE should be chosen because it is worth the most (Myerson 83).

Utility theory provides a useful way to analyze CEs while incorporating the decision maker's willingness to take risks. Utility theory assumes that individuals have personal utility functions with specific utility levels for every possible monetary level, and that individuals will always want to maximize their expected utility. With the choice of 2 gambles that have a random payoff of X for gamble 1 and Y for gamble 2, a risk neutral individual will prefer 1 if $E(X) > E(Y)$. However, according to utility theory, the first gamble will be preferred when $E(U(X)) > E(U(Y))$, where U = Utility. The CE for gamble 1 should have the same utility as the expected utility of the gamble. The basic equation is

$$U(CE) = E(U(X))$$

Von Neumann and Morgenstern argued in 1947 that rational decision makers should make decisions involving risky gambles based on utility theory. Accurately assessing an individual's utility function is difficult, but in this case it is made easier by assuming a constant level of risk tolerance. Assuming that an individual's risk tolerance remains constant means that if the payoff of a gamble changes by a fixed amount in all possible outcomes of the gamble then the CE of the gamble will change by the same amount. Constant risk tolerance allows independent gambles to be analyzed separately (Myerson 84). With constant risk tolerance the utility function can be defined as

$$U(x) = -e^{(-x/r)}$$

where *r* is the risk-tolerance constant. The Simtools add-in used in this valuation has a UTIL function that is used in place of the above function (UTIL $(x,r) = -e^{(-x/r)}$). The benefit of assuming constant risk tolerance is that only the parameter, *r*, needs to be calculated to determine the utility from different payoffs.

The parameter, *r*, can be calculated by a subjective assessment. The decision maker can think of a gamble that is similar to the potential real life payoffs. The gamble should have a high and low payoff with each being equally likely. The decision maker can then assess their CE. With the high and low payoffs denoted by H and L, the expected utility function is

$$E(U) = 0.5*-e^{(-H/r)} + 0.5*-e^{(-L/r)}$$

The utility of the decision maker's CE must equal the expected utility of the gamble, thus *r* can be solved by setting the 2 equations equal to each other.

$0.5*-e^{(-H/r)} + 0.5*-e^{(-L/r)} = -e^{(-CE/r)}$

This study uses the Simtools add-in that solves for *r* given a high and low payoff and a CE. The general equation used in Excel is RISKTOL = (H, L, CE). With a defined constant risk tolerance parameter the expected utility and certainty equivalent can now be calculated for any simulated gamble or investment (Myerson 85-86).

This study assumes that on December 2, 2008, I purchased 100 shares of CBRL at the price of $17.78. Then from the simulation data my wealth a time T is calculated, with T being equal to the length of time it takes for the intrinsic stock price to be realized in the market. For the utility analysis, it is assumed that the intrinsic value and market value will converge at some date T. The initial investment of $1778 ($17.78/share *100 shares) is subtracted from the new value of the investment at date T to calculate the profit from each simulation result. For the ease of computation and the ambiguity of date T, the time value of money is ignored in computing profits as is bid ask spreads and other transaction costs. Then from each simulated payoff my utility is calculated based on my subjectively assed *r*. From these figures the E(U), EMV, and risk premium is calculated. The E(U) of the investment is compared to my utility of not investing. Assuming my risk tolerance profile remains constant, I can determine whether investing or not investing will maximize my utility.

VI. DCF Model 2: Data and Analyses

DCF:

This valuation used the same 10 year financial data from MergentOnline. To perform the subjective probability assessment for the quartile boundary points I used the point estimates from the original model as a guide. Specifically, the point estimates used to estimate the future financial performance were used as the median quartile values. To help guide my decision making process the 1 and 99 percentile values are calculated (Figure 1 Appendix B). I could assess whether I believed the value being analyzed had a 1% chance of being above or below a certain value.

The WACC for the new model is held constant at the same 7.37% value used in the original model. However, a sensitivity analysis was performed using the original model. Both models are highly sensitive to the discount rate used. Decreasing the WACC by 37 basis points (i.e. 0.37%) to 7% increases the stock price by 17%, while increasing the discount rate by 63 basis points to 8% decreases the stock price by 28% (Figure 5 Appendix B).

The expected stock price was calculated by taking an average of the 5,000 simulated prices. The newly estimated price is **$67.07** vs. the $42.44 originally calculated. This represents a 58% increase in the estimated intrinsic value. Nick French and Laura Gabrielli's study on incorporating probability models into real estate DCF valuations only found a 10% difference between the point estimate and the expected value they calculated. This discrepancy is likely due to me having a larger amount of uncertainty regarding the true values of the forecasts. Also, the Triangular distribution used in their study provides a smaller range of possible randomly generated forecasts. The difference in the level of uncertainty is reflected in the different standard deviations of both valuations. The standard deviation in their study is £9,068 with a mean of £203,662 and a median of £202,489. My study has a standard deviation of $2,478 with a mean of $67.07 and a median of $47.16 (Figure 2 Appendix B). Experienced practitioners will likely be able to build simulations with smaller levels of uncertainty resulting in the point estimate being closer to the average of the simulated values. However, it is important to keep in mind that even if the practitioner is confident in their estimates and incorporates highly efficient distributions it does not necessarily mean that future events will match their predicted distributions.

With an alpha of 10% the confidence interval for the expected stock price is ($9.25; $124.88). The calculation is as follows:

$\mu \pm 1.65*(\sigma/\sqrt{N})$

Lower bound = $67.07 – 1.65 *($2,478/5000$^{1/2}$) = $9.25

Upper bound = $67.07 + 1.65*($2,478/5000$^{1/2}$) = $124.88

Assuming I invested in 100 shares at December 2, 2008 at the price of $17.78, the valuation predicts with 90% certainty that my wealth at date T would be between -$852.51 and $10,710.22, ignoring transaction costs and the time value of money.

The range computed from this valuation is significantly different than the estimate provided by Value Line. Projections for CBRL's stock price provided by Value Line are between a high and low value of $65-$45 for 2011-2013. The expected value is only 3% higher than Value Line's high estimate, but there is a drastically higher level of uncertainty regarding the range of possible stock prices (Figure 6 Appendix B). Again, this could be caused by my own inexperience causing higher levels of uncertainty. Also, Value Line does not state the method of calculating their projections or the level of confidence for their predicted stock price values. With an alpha of 50% the interval of CBRL's expected stock price decreases to ($44.64; $89.49). Based solely on the expected stock price this valuation would also lead to a theoretical buy decision. However, taking into account the standard deviation and confidence interval of the estimate the decision to invest is no longer a clear yes. The following section of the paper focuses on calculating the expected utility to help make the investment decision.

Expected Utility and Certainty Equivalent:

To calculate my risk tolerance constant I looked at a hypothetical gamble that had a 50% chance of paying $5000 or a 50% chance of paying $1000. The EMV of this gamble is $3000. The high and low values are chosen to reflect possible pay offs of the CBRL investment. Although the simulation indicates a potential loss, I am assuming there is a reasonable chance of two equally likely profitable outcomes. The high and low payoffs represent a stock price of approximately $67 and $28, respectively. The hypothetical gamble is not meant to be a 100% accurate representation of equally likely outcomes from investing CBRL, but rather it is meant to be a proxy for a potential payoff. Given the depressed level of the market and the extremely pessimistic outlook for the casual dining industry during the midst of the financial crisis, I do not believe the values used are unreasonable approximation. After consideration, I decided that I would be indifferent between taking the gamble or receiving $2500 for sure. This represents a $500 risk premium (RP = EMV – CE). Using the RISKTOL function in Excel my risk tolerance constant is calculated to be $3,830.46 (Figure 3 Appendix B).

To determine the utility of each simulated stock price, the payoff of each result is computed. As stated earlier, the number of shares purchased is assumed to be 100. The profit (or payoff) of each scenario is calculated by subtracting the initial cost of the investment from the value at time T. Using Excel's UTIL function the utility of each simulated investment outcome was computed. The expected utility for this investment is -0.77. The CE or the amount of money I would take for sure is $1,003.16. My utility of not investing is -1. So, based on utility theory I should make this investment. My certainty equivalent for not investing is $0. From the perspective of certainty equivalents, I should make this investment because it is worth $1,003.16 more to me. However, different choices of a CE for the hypothetical lottery can have a significant impact on the expected utility. For the lottery used in this study, if I decreased my CE by 11% to $2,215 I would be indifferent between investing and not investing (Figure 4 Appendix B). Utilizing expected utility is highly attractive because it provides an unambiguous way to make a decision under uncertainty; choose the investment that maximizes your expected utility. The downside to this method is the subjectively assessed CE. It is difficult to assess a CE and a risk tolerance parameter that would universally hold at all times for an investor. Also, the simulated payoffs from the investment assume the simulated stock price will be realized in the market and it ignores the time value of money and transaction costs all of which would change the payoffs and thus change the expected utility. Like the Monte Carlo simulations, the utility analysis is not meant to be a definitive representation of reality. Both are meant to be used as guides and their limitations need to be kept in mind while making investment decisions.

VII. Conclusion

The accuracy DCF valuations are dependent on the practitioner's ability to predict the future. Naturally that capability cannot be expected which means that estimates from DCF valuations can never be 100% accurate. Decision makers need to clearly understand the level of uncertainty in the valuation to make more informed and hopefully better decisions. The uncertainty of DCF valuations is not a trivial matter. Large investment decisions are constantly made using DCF valuations as a guide.

The main objective of this study is to analyze ways to help value oriented investors make more informed investment decisions when utilizing the DCF method. By incorporating probability models that reflect the practitioners' uncertainty about the true future values used in the analysis, the level of uncertainty can be easily modeled. The use of Monte Carlo simulations will not necessarily result in a more accurate calculation. The added benefit comes from the amount of uncertainty surrounding the estimate being clear to the decision maker. Adding more information will help put the estimate in a proper context and should hopefully help investors make better decisions. Nevertheless, placing the estimates in the context of uncertainty will not guarantee more profitable investment outcomes. This paper adds to the work done by French and Gabrielli by incorporating utility theory

Utility theory can help investors make decisions under uncertainty. Equity investments are risky and can essentially be thought of as a gamble. Most investor's have at least a general sense of the level of risk they are willing to take on. By assessing the risk tolerance of a decision maker and assuming it remains constant, the expected utility of a simulated investment outcome can be easily computed. As opposed to descriptive statistics describing the uncertainty surrounding the estimate and sensitivity analyses, maximizing expected utility is a clear way to make an investment decision under uncertainty. However, the subjectively assessed certainty equivalent can dramatically change the expected utility of the investment. Also, the validity of calculated payoffs from DCF simulations is questionable due to the necessity of ignoring the time value of money. Utility theory can be a powerful tool to help decision making under uncertainty, but like all calculations involving assumptions it faces the risk of bad inputs leading to bad outputs.

A real world application of the recommendations laid out this paper would require the practitioner to go more in depth. This paper assumed the method used to compute the DCF was valid and ignored issues regarding best practices. For real investment decisions those considerations should be explored further. Adjusting inputs can dramatically change the valuation and effect the investment decision. If the practitioner is fairly certain of their forecasts, a Triangular distribution can be used instead of the Generalized-lognormal. Beyond applying Graham's margin of safety, value investors can identify their risk tolerance and use utility theory to help choose investments. If expected utility is to be used as a guide, adequate time and serious consideration should be put into assessing an appropriate certainty equivalent. Also, it would be beneficial to analyze the expected utility of similar investments rather than just the utility of not investing. Applying Monte Carlo simulations and utility theory to investment decisions can aid in the decision making process but a profitable equity investment is never guaranteed.

References

Bodie, Kane, and Alan J. Marcus. *Investments*, Eight Edition. New York: Mcgraw-Hill Irwin, 2009

Bruner, R. *Case Studies in Finance*, Fifth Edition. New York: Mcgraw-Hill Irwin, 2007.

Breaking into Wall Street, Capital Capable Media. 2009

“CBRL Group” Value Line, 2008.

CBRL, Inc., November 2, 2009 Form 10-K (Filed September 30, 2008) via MergentOline , accessed November 2009

“Cracker Barrel Old Country Store, Inc. (NMS: CBRL)”, MergentOnline. November 2009. < http://www.mergentonline.com/compdetail.asp?company=13727>

“Cracker Barrel Old Country Store, Inc. (CBRL) Historical Prices”, Yahoo! Finance. November 2009. < http://finance.yahoo.com/q/hp?s=CBRL>

CBRL Group Inc NasdaqGS CBRL Financials, Capital IQ , Inc., a division of Standard & Poor’s

CBRL Group Inc NasdaqGS CBRL Fixed Income S P Credit Ratings, Capital IQ , Inc., a division of Standard & Poor’s

Dixit, A., Pindyck, R. *Investment under Uncertainty*, New Jersey: Princeton University Press, 1994.

Dulman, S. (1989), “The Development of Discounted Cash Flow Techniques in US Industry”, *The Business History Review*, Vol. 63 No. 3, pp. 555-587

French, K. Data Library. September 2008. <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html>

French, N., Gabrielli, L. (2005). “Discounted cash flow: accounting for uncertainty”, *Journal of Property Investment & Finance*, Vol. 23 No. 1, pp. 76-89

Gorman, L. Business 431. California Polytechnic Institute, San Luis Obispo. Fall quarter 2009.

Graham, B. *The Intelligent Investor*, New York: Harper & Brothers Publishers, 1959

Myerson, R. *Probability Models for Economics Decision Making*, Belmont: Thomson Brooks/Cole, 2005.

Studenmund, A.H. *Using Econometrics*, Fifth Edition. Pearson Addison Wesley, 2006.

United States; Dept. of Commerce; Bureau of Economic Analysis; National Economic Accounts; *Current-dollar and "real" GDP*; U.S. Dept of Commerce, 24 Nov. 2009; Web; 2 Dec. 2009

"US Monthly Interest Rate Data" Economagic. September 2008. < http://www.economagic.com/fedbog.htm>

"Value Investing." Investopedia.com. 6 Nov. 2009. <http://www.investopedia.com/terms/v/valueinvesting.asp>

Yee, K. (2008), "Deep-Value Investing, Fundamental Risks, and the Margin of Safety", *Journal of Investing*, Vol. 17 Iss. 3, pg. 35, 13 pgs

Appendix A: Model 1

Figure 1: Historical CBRL Free Cash Flow Data

Year:	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total Revenue	1,531,625	1,772,712	1,963,692	2,066,892	2,198,182	2,380,947	2,567,548	2,642,997	2,351,576	2,384,521
COGS	538,051	614,472	664,332	677,738	703,915	785,703	847,045	845,644	744,275	773,757
Gross Profit	993,574	1,158,240	1,299,360	1,389,154	1,494,267	1,595,244	1,720,503	1,797,353	1,607,301	1,610,764
Selling, General and Admin. Exp.	82,006	95,289	102,541	115,152	121,886	126,489	130,986	155,847	136,186	127,273
Other Indirect Expenses	735,145	884,320	1,034,550	1,062,724	1,133,021	1,216,417	1,316,380	1,421,821	1,246,009	1,273,832
EBITDA	176,423	178,631	162,269	211,278	239,360	252,338	273,137	219,685	225,106	209,659
Depreciation and Amortization	53,839	58,998	64,902	62,759	64,376	63,868	67,321	56030	56,908	57,689
EBIT	122,584	119,633	97,367	148,519	174,984	188,470	205,816	163,655	168,198	151,970
Cap Ex										
Purchases of PP&E	-164,718	-138,032	-91,439	-96,692	-120,921	-144,611	-146,291	-89,715	-96,538	-88,027
Sale of PP&E	3,383	17,333	141,283	5,813	1,968	945	7,854	6,905	8,726	5,143
Taxes on sale of PP&E	1,184	6,067	49,449	2,035	689	331	2,749	2,417	3,054	1,800
Working Capital										
A/R	8,935	11,570	10,201	8,161	9,013	9,802	13,736	14,629	11,759	13,484
Inventory	100,455	107,377	116,590	124,693	136,020	141,820	142,804	138,176	144,416	155,954
A/P	67,286	62,377	64,939	85,461	82,172	53,295	97,710	83,846	93,060	93,112

Figure 2: Capital IQ Projections

Capital IQ

CBRL Group Inc. (NasdaqGS:CBRL) > Financials > Key Stats

In Millions of the trading currency, except per share items.

Currency:	Trading Currency	**Conversion:**	Today's Spot Rate
Order:	Latest on Right	**Units:**	Capital IQ (Default)
Decimals:	Capital IQ (Default)		

Key Financials¹			
	12 months †	**12 months**	**12 months**
For the Fiscal Period Ending	**Jul-31-2009E**	**Jul-31-2010E**	**Jul-31-2011E**
Currency	***USD***	***USD***	***USD***
Total Revenue	**$2,439.2**	**$2,524.5**	**$2,666.4**
Growth Over Prior Year	*2.29%*	*3.50%*	*5.62%*

FY 2008 Capital Structure As Reported Details

Description	Type	Principal Due (USD)	Coupon Rate	Maturity	Seniority	Secured	Convertible
Capital Lease Obligations	Capital Lease	0.1	5.000% - 10.000%	2013	Senior	Yes	No
Delayed-draw Term Loan Facility	Term Loans	151.1	4.290%, Various Benchmarks	Apr-27-2013	Senior	No	No
Revolving Credit Facility	Revolving Credit	3.2	5.500%, Various Benchmarks	Apr-27-2011	Senior	No	No
Term Loan B Facility	Term Loans	633.5	4.290%, Various Benchmarks	Apr-27-2013	Senior	No	No

Capital Structure Data		
For the Fiscal Period Ending	**12 months Aug-01-2008**	
Currency	***USD***	
Units	**Millions**	**% of Total**
Total Debt	787.9	*89.47%*
Total Common Equity	92.8	*10.53%*
Total Capital	**880.6**	***100.00%***

Figure 3: Value Line Data

CBRL GROUP NDQ-CBRL

RECENT PRICE 24.56 | P/E RATIO 8.4 (Trailing: 8.1, Median: 16.0) | RELATIVE P/E RATIO 0.55 | DIV'D YLD 2.9%

TIMELINESS 4 Lowered 7/11/08
SAFETY 3 New 2/12/93
TECHNICAL 3 Lowered 8/1/08
BETA 1.15 (1.00 = Market)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
High:	34.6	43.0	24.3	24.3	30.7	34.1	42.1	43.1	44.6	47.9	50.7	38.9	
Low:	23.8	20.1	9.1	6.1	15.7	19.5	24.9	30.0	33.1	32.0	31.8	18.9	

LEGENDS
— 6.5 x "Cash Flow" p sh
.... Relative Price Strength
Options: Yes
Shaded area indicates recession

2011-13 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	65	(+165%)	29%
Low	45	(+85%)	18%

Insider Decisions

	O	N	D	J	F	M	A	M	J
to Buy	0	4	1	3	0	0	0	0	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	1	0	0	0	0

Institutional Decisions

	3Q2007	4Q2007	1Q2008
to Buy	75	74	87
to Sell	108	95	89
Hld's(000)	22900	22046	21103

% TOT. RETURN 7/08

	THIS STOCK	VL ARITH. INDEX
1 yr.	-35.5	-12.2
3 yr.	-34.9	7.2
5 yr.	-26.1	38.6

1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	© VALUE LINE PUB., INC.	11-13
7.31	8.69	10.70	13.05	15.57	18.40	21.08	26.12	31.28	35.69	41.11	45.92	48.82	56.07	85.46	99.35	108.85	118.55	Sales per sh A	145.00
.85	1.03	1.29	1.54	1.71	2.06	2.36	2.12	2.29	2.52	3.07	3.57	3.70	4.16	5.10	5.61	5.50	6.10	"Cash Flow" per sh	8.25
.61	.78	.94	1.08	1.19	1.41	1.65	1.16	1.11	1.30	1.64	2.09	2.31	2.45	2.50	2.52	2.60	3.00	Earnings per sh A D F	4.50
.01	.02	.02	.02	.02	.02	.02	.02	.01	.02	.02	.02	.44	.48	.52	.56	.72	.72	Div'ds Decl'd per sh C ■	.88
1.31	1.40	1.70	2.02	2.27	2.45	2.92	2.81	2.44	1.96	1.92	2.53	2.97	3.68	4.73	4.05	3.65	3.40	Cap'l Spending per sh	4.00
4.05	6.15	7.18	8.27	9.34	10.82	12.86	13.49	14.63	15.38	15.58	16.60	18.05	18.66	9.77	4.40	4.10	5.25	Book Value per sh	15.00
54.78	59.57	59.90	59.99	60.59	61.07	62.48	58.63	56.67	55.93	50.27	47.87	48.77	46.82	30.93	23.67	22.00	21.00	Common Shs Outst'g B	20.00
31.6	35.3	28.0	19.9	17.8	18.2	20.2	18.3	11.1	13.5	16.6	14.0	15.8	15.9	15.3	17.2	Bold figures are Value Line estimates		Avg Ann'l P/E Ratio	12.0
1.92	2.09	1.84	1.33	1.10	1.05	1.05	1.04	.72	.69	.91	.80	.84	.85	.83	.90			Relative P/E Ratio	.80
.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	1.2%	1.2%	1.4%	1.3%			Avg Ann'l Div'd Yield	1.6%

CAPITAL STRUCTURE as of 5/2/08
Total Debt $796.2 mill. Due in 5 Yrs $65.0 mill.
LT Debt $787.5 mill. LT Interest $40.0 mill.
(92% of Cap'l)
Leases, Uncapitalized Annual rentals $29.0 mill.

No Defined Benefit Pension Plan

Pfd Stock None

Common Stock 22,149,266 shs.
as of 5/30/08

MARKET CAP: $550 million (Small Cap)

1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009		11-13
1317.1	1531.6	1772.7	1963.7	2066.9	2198.2	2380.9	2567.5	2643.0	2351.6	2395	2490	Sales ($mill) A	2900
15.8%	11.5%	10.9%	10.1%	10.3%	10.8%	10.7%	10.5%	9.8%	9.6%	9.0%	8.0%	Operating Margin	8.5%
43.4	53.8	65.2	64.9	62.8	64.4	63.9	67.3	72.3	56.9	60.0	65.0	Depreciation ($mill)	75.0
104.1	70.2	64.3	73.7	91.8	106.5	116.6	126.6	116.3	76.0	61.0	63.0	Net Profit ($mill) F	90.0
36.8%	37.8%	37.8%	37.3%	35.6%	35.5%	35.9%	34.6%	30.8%	34.0%	35.0%	35.0%	Income Tax Rate	35.0%
7.9%	4.6%	3.6%	3.8%	4.4%	4.8%	4.9%	4.9%	4.4%	3.2%	2.5%	2.5%	Net Profit Margin	3.1%
60.8	d5.8	d29.6	d42.1	d61.6	d70.6	d43.8	d104.9	d25.6	d74.4	d35.0	d25.0	Working Cap'l ($mill)	50.0
60.6	312.9	292.0	125.0	194.5	186.7	185.1	212.2	911.5	756.3	800	775	Long-Term Debt ($mill)	750
803.4	791.0	829.0	846.1	783.0	794.9	880.2	870.0	302.3	104.1	90.0	110	Shr. Equity ($mill)	300
12.3%	6.9%	6.9%	8.2%	9.7%	11.3%	11.3%	12.1%	10.5%	12.3%	9.0%	9.5%	Return on Total Cap'l	10.5%
13.0%	8.9%	7.8%	8.7%	11.7%	13.4%	13.2%	14.6%	38.5%	73.0%	68.0%	57.5%	Return on Shr. Equity	30.0%
12.8%	8.8%	7.7%	8.6%	11.6%	13.3%	11.4%	11.9%	30.5%	60.3%	50.0%	43.5%	Retained to Com Eq	24.5%
1%	1%	1%	2%	1%	1%	14%	18%	21%	17%	26%	24%	All Div'ds to Net Prof	20%

CURRENT POSITION ($MILL.)	2006	2007	5/2/08
Cash Assets	89.6	14.2	11.9
Receivables	14.6	11.8	12.1
Inventory (LIFO)	138.2	144.4	133.3
Other	27.7	29.9	44.0
Current Assets	270.1	200.3	201.3
Accts Payable	83.8	93.1	69.5
Debt Due	8.1	8.2	8.7
Other	203.8	173.4	159.1
Current Liab.	295.7	274.7	237.3

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '05-'07 to '11-'13
Sales	17.0%	15.5%	10.5%
"Cash Flow"	12.0%	15.0%	7.5%
Earnings	8.5%	15.5%	10.5%
Dividends	37.5%	96.0%	9.0%
Book Value	6.5%	1.5%	5.5%

Fiscal Year Ends	QUARTERLY SALES ($ mill.) A Oct.Per	Jan.Per	Apr.Per	Jul.Per	Full Fiscal Year
2005	612.6	667.2	628.0	659.7	2567.5
2006	633.4	694.4	644.2	671.0	2643.0
2007	558.3	612.1	549.1	632.1	2351.6
2008	581.2	634.5	567.1	612.2	2395
2009	605	660	590	635	2490

Fiscal Year Ends	EARNINGS PER SHARE A B F Oct.Per	Jan.Per	Apr.Per	Jul.Per	Full Fiscal Year
2005	.57	.63	.52	.74	E2.45
2006	.51	.61	.47	1.03	E2.50
2007	.45	.60	.44	1.15	E2.52
2008	.57	.65	.46	.92	2.60
2009	.60	.90	.50	1.00	3.00

Cal-endar	QUARTERLY DIVIDENDS PAID C ■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2004	.11	.11	.11	.12	.45
2005	.12	.12	.12	.13	.49
2006	.13	.13	.13	.14	.53
2007	.14	.14	.14	.18	.60
2008	.18	.18	.18		

BUSINESS: CBRL Group, Inc. operates 576 Cracker Barrel Old Country Store restaurants/gift shops in 41 states, mostly in the South and Midwest (5/28/08). Restaurants feature an old country store motif, along with adjoining/separate gift shops, which sell early American reproductions and food items. Nearly all units are company owned, and located along interstate highways. Restaurants accounted for 78.4% of '07 sales; gift shops, 21.6%. CBRL also had (now divested) 143 Logan's Roadhouse company-operated and 26 franchised units. Has about 64,000 empls. Off./dir. own 6.1% of stock (10/07 proxy). Pres. & CEO: Michael A. Woodhouse. Inc: TN. Addr.: P.O. Box 787, 305 Hartmann Drive, Lebanon, TN 37088-0787. Tel.: 615-444-5533. Internet: www.cbrlgroup.com.

CBRL Group looks to have closed fiscal 2008 (ended August 1st) on a down note. Despite benefits from an aggressive stock-buyback program, share earnings probably fell a hefty 20% in the fourth quarter, to $0.92. (Results for the July interim are set to be announced in the middle of this month.) The disappointing showing is not especially surprising, given the challenging macroeconomic environment and the weak fundamentals across the restaurant industry. But . . .

The company seems to be hurting a bit more than most of its peers these days, since its value-oriented menu and home-style country fare cater to consumers at the lower end of the income spectrum. Additionally, sales at its restaurants, 85% of which are located along interstate highways, are closely tied to driving trends. In fact, we believe that high gasoline prices are having a chilling effect on traffic, not just on America's roads but at CBRL's 576 units. Meanwhile, the company maintains a large base of fixed overhead expenses relative to many other sector players. This makes it difficult for the firm to sustain earnings growth when, as is the case now, same-store sales soften. (Comps likely declined by around 1% in the fourth quarter.)

We are cautiously optimistic about fiscal 2009. Same-store sales at Cracker Barrel restaurants should return to positive territory before too long, thanks to easy comparisons, strategic price hikes, stepped-up advertising on a national level, and speed-of-service improvements. The company has been working hard to increase customer turnover lately. And, a simplified menu and more efficient kitchen layout will go a long way, we think, toward enhancing the customer experience and boosting sales during peak hours. Below the top line, progress is also likely starting this year. Indeed, we look for margins to gradually recover, as cost-cutting measures, greater comp leverage, and labor-related efficiency gains help to offset headwinds from food cost inflation.

This issue is currently an untimely selection. All but the most venturesome investors are encouraged to defer commitments until the business climate warms up and same-store sales rebound.

Justin Hellman *September 5, 2008*

(A) Fiscal year ends Friday closest to Jul. 31st. (B) Primary earnings thru '97; diluted thereafter. Excl. nonrecur. gain/(losses): '94, $0.02; '96, ($0.15); '00, ($0.08); '01, ($0.43); '04, ($0.06). Excl. gain from disc. ops.: '07, $2.41. Next earnings report due mid-September. (C) Quarterly dividend adopted in 9/03. Payments typically made in Nov., Feb., May, Aug. ■ Div'd reinvest. plan avail. (D) In millions. (E) Quarterly earnings do not sum due to rounding/changes in share base. (F) Incl. stock option expense starting in '06.

Company's Financial Strength	B+
Stock's Price Stability	50
Price Growth Persistence	45
Earnings Predictability	90

Figure 4: FCF Drivers

Drivers:	2009	2010	2011	2012	2013
Sales Growth	2.29%	3.50%	5.62%	10.50%	10.50%
COGS/Sales	33.05%	33.05%	33.05%	33.05%	33.05%
SG&A/Sales	5.45%	5.45%	5.45%	5.45%	5.45%
Other Exp/Sales	51.61%	51.61%	51.61%	51.61%	51.61%
Dep & Amort	75000	75000	75000	75000	75000
Days A/R (using average A/R)	1.87	1.87	1.87	1.87	1.87
Days Inventory (using average inventory)	66.52	66.52	66.52	66.52	66.52
Days A/P (using ave. A/P, relative to COGS)	39.35	39.35	39.35	39.35	39.35

Figure 5: FCF 2009-2013 Forecasts

Estimated:	2009	2010	2011	2012	2013
Total Revenue	2,439,127	2,524,496	2,666,373	2,920,512	2,598,491
COGS	806,131	834,346	881,236	965,229	858,801
Gross Profit	1,632,995	1,690,150	1,785,136	1,955,283	1,739,690
Selling, General and Admin. Exp.	132,932	137,585	145,317	159,168	141,618
Other Indirect Expenses	1,258,833	1,302,892	1,376,115	1,507,276	1,341,081
EBITDA	241,230	249,673	263,704	288,839	256,991
Depreciation and Amortization	75,000	75,000	75,000	75,000	75,000
EBIT	166,230	174,673	188,704	213,839	181,991
Cap Ex					
Purchases of PP&E	68,700	72,500.00	127,560.00	127,560.00	127,560.00
Sale of PP&E	58,755	3,383.00	3,383.00	3,383.00	3,383.00
Taxes on sale of PP&E	20,564	1,184	1,184	1,184	1,184
Working Capital					
A/R	11,509	14,359	12,962	16,963	9,663
Inventory	137,875	166,238	154,967	196,853	116,174
A/P	80,703	99,196	90,813	117,306	67,866

Figure 6: Market Model Regression

Dependent Variable: R(CBRL)

Variable	CAPM	Fama French Restricted	Fama French Unrestricted
Constant	-0.005057	-0.006973	-0.009899
	(-0.503233)	(-.071546)	(-0.95163)
Rmk - rf	0.796908	0.739822	0.799259
	(-0.726943)	(2.229807)**	(2.34735)**
SMB	n/a	0.935480	0.899265
		(1.924009)*	(1.836788)*
HML	n/a	n/a	0.479153
			(0.822317)
Adjusted R^2	0.107903	0.165766	0.161000

Coefficient estimates with t-stats in parenthesis.
** and * denote significance at 5 and 10 percent, respectively

Restricted F Test

Hypothesis:
H_0: $\beta_{HML} = 0$
H_A: $\beta_{HML} \neq 0$

Test statistic:
F = [(SSRr - SSRur)/q] / [SSRur/(N-k-1)]

where

SSRr = Sum of squared residuals from the restricted model
SSRur = Sum of squared residuals from the unrestricted model
q = The number of restrictions
N = The sample size
K = The number of variables in the unrestricted model

F = [(0.317233 - 0.321063)/1] / [0.321063/(60-3-1)] = 0.676096

The critical region for this test with numerator degrees of freedom = 1 and denominator degrees of freedom = N-k-1 = 56 and an alpha of 5% is ~ 4.00. Since 0.68 < 4.00, the null fails to be rejected. β_{HML} is not statistically different from 0, thus the restriction is valid.

Figure 7: WACC

WACC:	Market Value	Weight	E[R]	Tax Rate
Debt	$ 787,900,000.00	0.660	0.08306	0.302
Equity	$ 405,074,770.24	0.340	0.1043	
Total	$ 1,192,974,770.24	1		
WACC=	**7.37%**			

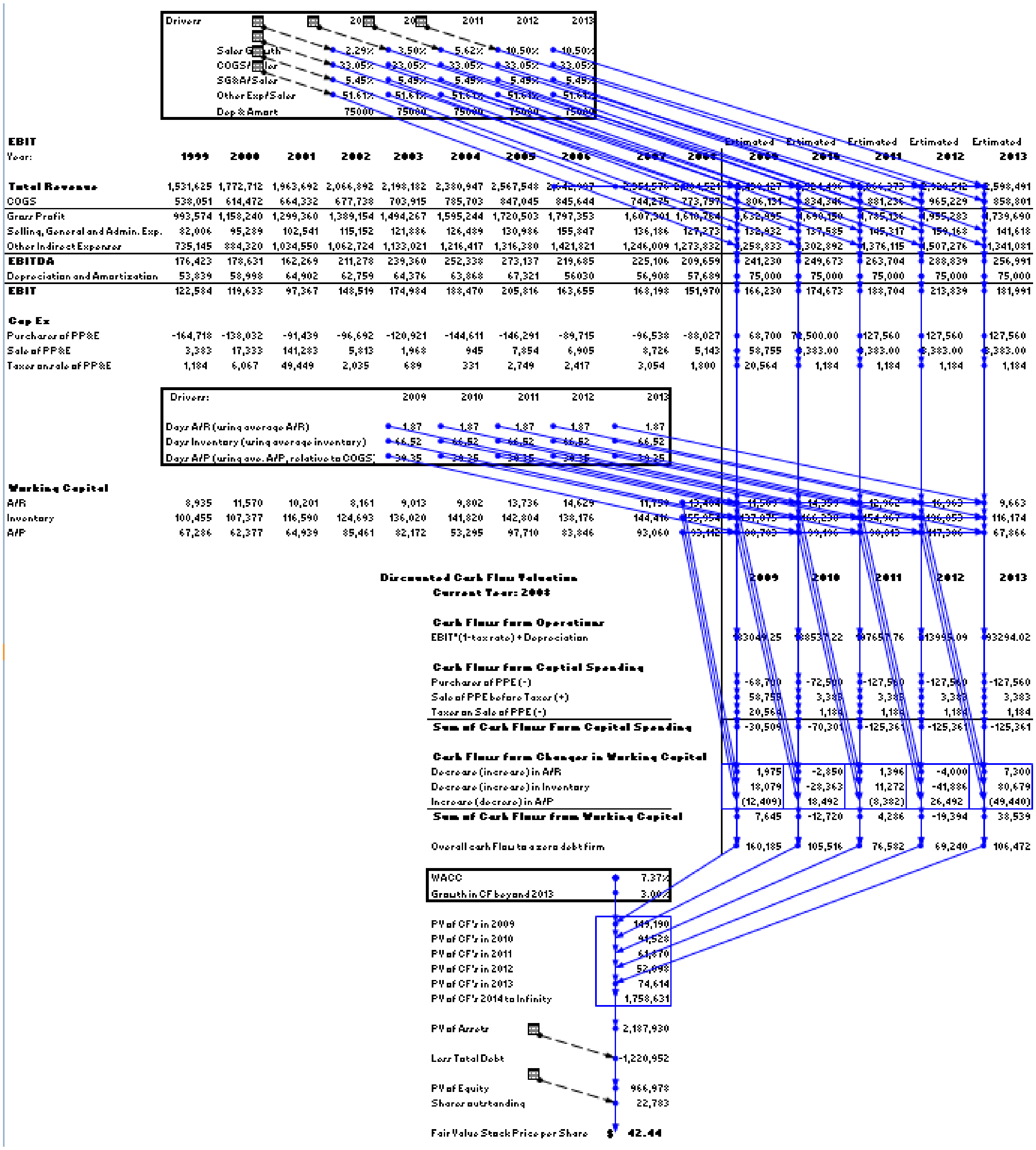
Fama French:			
		E[R_CBRL]=	**10.43%**
Beta 1	0.739822		
E[R_Mkt-rf]	0.07		
Beta 2	0.93548		
E[Rsmb]	0.0152		
Beta 3	0		
E[Rhml]	0.0694		
Risk-free rate	0.0383		

Figure 8: DCF Model 1 Results

Discounted Cash Flow Valuation	**2009**	**2010**	**2011**	**2012**	**2013**
Current Year: 2008					
Cash Flows form Operations					
EBIT*(1-tax rate) + Depreciation	183049.2	188537.2	197657.8	213995.1	193294
Cash Flows form Captial Spending					
Purchases of PPE (-)	-68,700	-72,500	-127,560	-127,560	-127,560
Sale of PPE before Taxes (+)	58,755	3,383	3,383	3,383	3,383
Taxes on Sale of PPE (-)	20,564	1,184	1,184	1,184	1,184
Sum of Cash Flows Form Capital Spending	-30,509	-70,301	-125,361	-125,361	-125,361
Cash Flows form Changes in Working Capital					
Decrease (increase) in A/R	1,975	-2,850	1,396	-4,000	7,300
Decrease (increase) in Inventory	18,079	-28,363	11,272	-41,886	80,679
Increase (decrese) in A/P	(12,409)	18,492	(8,382)	26,492	(49,440)
Sum of Cash Flows from Working Capital	7,645	-12,720	4,286	-19,394	38,539
Overall cash Flow to a zero debt firm	160,185	105,516	76,582	69,240	106,472

WACC		7.37%
Growth in CF beyond 2013		3.00%
PV of CF's in 2009	$	149,190
PV of CF's in 2010		91,528
PV of CF's in 2011		61,870
PV of CF's in 2012		52,098
PV of CF's in 2013		74,614
PV of CF's 2014 to Infinity		1,758,631
PV of Assets		2,187,930
Less Total Debt		-1,220,952
PV of Equity		966,978
Shares outstanding		22,783
Fair Value Stock Price per Share	**$**	**42.44**

Figure 9: DCF Illustration



Drivers			20[illegible]	20[illegible]	2011	2012	2013
Sales Growth			2.29%	3.50%	5.62%	10.50%	10.50%
COGS/Sales			33.05%	33.05%	33.05%	33.05%	33.05%
SG&A/Sales			5.45%	5.45%	5.45%	5.45%	5.45%
Other Exp/Sales			51.61%	51.61%	51.61%	51.61%	51.61%
Dep & Amort			75000	75000	75000	75000	75000

EBIT										Estimated	Estimated	Estimated	Estimated	Estimated
Year:	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total Revenue	1,531,625	1,772,712	1,963,692	2,066,892	2,198,182	2,380,947	2,567,548	2,642,997	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2,598,491
COGS	538,051	614,472	664,332	677,738	703,915	785,703	847,045	845,644	744,275	773,797	806,134	834,346	881,236	965,229	858,801
Gross Profit	993,574	1,158,240	1,299,360	1,389,154	1,494,267	1,595,244	1,720,503	1,797,353	1,607,301	1,610,764	1,632,995	1,690,150	1,785,136	1,955,283	1,739,690
Selling, General and Admin. Exp.	82,006	95,289	102,541	115,152	121,886	126,489	130,986	155,847	136,186	127,273	132,932	137,585	145,317	159,168	141,618
Other Indirect Expenses	735,145	884,320	1,034,550	1,062,724	1,133,021	1,216,417	1,316,380	1,421,821	1,246,009	1,273,832	1,258,833	1,302,892	1,376,115	1,507,276	1,341,081
EBITDA	176,423	178,631	162,269	211,278	239,360	252,338	273,137	219,685	225,106	209,659	241,230	249,673	263,704	288,839	256,991
Depreciation and Amortization	53,839	58,998	64,902	62,759	64,376	63,868	67,321	56030	56,908	57,689	75,000	75,000	75,000	75,000	75,000
EBIT	122,584	119,633	97,367	148,519	174,984	188,470	205,816	163,655	168,198	151,970	166,230	174,673	188,704	213,839	181,991
Cap Ex															
Purchases of PP&E	-164,718	-138,032	-91,439	-96,692	-120,921	-144,611	-146,291	-89,715	-96,538	-88,027	68,700	72,500.00	127,560	127,560	127,560
Sale of PP&E	3,383	17,333	141,283	5,813	1,968	945	7,854	6,905	8,726	5,143	58,755	3,383.00	3,383.00	3,383.00	3,383.00
Taxes on sale of PP&E	1,184	6,067	49,449	2,035	689	331	2,749	2,417	3,054	1,800	20,564	1,184	1,184	1,184	1,184

Drivers:	2009	2010	2011	2012	2013
Days A/R (using average A/R)	1.87	1.87	1.87	1.87	1.87
Days Inventory (using average inventory)	66.52	66.52	66.52	66.52	66.52
Days A/P (using ave. A/P, relative to COGS)	34.35	34.35	34.35	34.35	34.35

Working Capital	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
A/R	8,935	11,570	10,201	8,161	9,013	9,802	13,736	14,629	11,759	13,404	11,507	14,357	12,962	16,963	9,663
Inventory	100,455	107,377	116,590	124,693	136,020	141,820	142,804	138,176	144,416	155,954	137,875	166,238	154,967	196,053	116,174
A/P	67,286	62,377	64,939	85,461	82,172	53,295	97,710	83,846	93,060	93,112	[illegible]	[illegible]	[illegible]	117,306	67,866

Discounted Cash Flow Valuation
Current Year: 2008

	2009	2010	2011	2012	2013
Cash Flows form Operations					
EBIT*(1-tax rate) + Depreciation	183049.25	188537.22	197657.76	213995.09	193294.02
Cash Flows form Captial Spending					
Purchases of PPE (-)	-68,700	-72,500	-127,560	-127,560	-127,560
Sale of PPE before Taxes (+)	58,755	3,383	3,383	3,383	3,383
Taxes on Sale of PPE (-)	20,564	1,184	1,184	1,184	1,184
Sum of Cash Flows Form Capital Spending	-30,509	-70,301	-125,361	-125,361	-125,361
Cash Flows form Changes in Working Capital					
Decrease (increase) in A/R	1,975	-2,850	1,396	-4,000	7,300
Decrease (increase) in Inventory	18,079	-28,363	11,272	-41,886	80,679
Increase (decrease) in A/P	(12,409)	18,492	(8,382)	26,492	(49,440)
Sum of Cash Flows from Working Capital	7,645	-12,720	4,286	-19,394	38,539
Overall cash Flow to a zero debt firm	160,185	105,516	76,582	69,240	106,472

WACC	7.37%
Growth in CF beyond 2013	3.00%
PV of CF's in 2009	149,190
PV of CF's in 2010	91,528
PV of CF's in 2011	61,870
PV of CF's in 2012	52,098
PV of CF's in 2013	74,614
PV of CF's 2014 to Infinity	1,758,631
PV of Assets	2,187,930
Less Total Debt	-1,220,952
PV of Equity	966,978
Shares outstanding	22,783
Fair Value Stock Price per Share	$ 42.44

Appendix B: Model 2

Figure 1: Subjectively Assessed Quartiles

2009-2013	COGS/Sales	SG&A/Sales	Other Exp/Sales	Dep & Amort	Gain on Sale of PP&E	Days A/R	Inventory	Days/AP	FCF Growth Rate
Q 1	30.00%	5.00%	49.00%	26,488.00	2,000.00	1.60	60.00	31.00	2.50%
Q 2	33.05%	5.45%	51.61%	59,286.00	3,383.00	1.87	66.52	39.35	3.00%
Q 3	36.00%	6.25%	54.00%	72,278.00	8,319.99	2.00	73.00	46.00	3.75%
1%tile	22.09%	4.56%	41.55%	$ 10,000.00	$ 1,485.67	1.00	58.00	30.00	1.87%
99%tile	42.82%	11.90%	59.04%	$ 79,917.96	$ 156,218.73	2.10	88.70	57.12	7.57%

Sales Growth

Year:	2009	2010	2011	2012	2013
Q 1	1.00%	1.50%	3.00%	8.40%	8.40%
Q 2	2.29%	3.50%	5.62%	10.50%	10.50%
Q 3	4.00%	6.25%	9.00%	12.25%	12.25%
1%tile	-0.98%	-1.39%	-1.19%	1.31%	1.31%
99%tile	10.92%	18.16%	22.02%	15.40%	15.40%

Purchase of PP&E

Year:	2011	2012	2013
Q 1	$ 62,000.00	$ 60,000.00	$ 60,000.00
Q 2	$ 127,560.00	$ 127,560.00	$ 127,560.00
Q 3	$ 181,000.00	$ 181,000.00	$ 181,000.00
1%tile	$ 50,000.00	$ 10,000.00	$ 10,000.00
99%tile	$ 273,798.93	$ 269,353.30	$ 269,353.30

Figure 2: Simulated Stock Price Statistics

Number of simulations	5,000
E(Stock Price)	$ 67.07
Median	$ 47.16
Stdev	$ 2,477.60
Range Min	$ (107,619.13)
Range Max	93413.74597

	Lower bound	Upper bound
α = 10%	$ 9.25	$ 124.88
α = 50%	$ 44.29	$ 89.49

Figure 3: Certainty Equivalent and Risk Tolerance

	H	L	CE	EMV	Risktol
P(H) = P(L) = 0.5	$ 5,000	$ 1,000	$ 2,500	$ 3,000	$ 3,830.46

Figure 4: Expected Utility and CE Calculations from Simulation Results

Risktol	$ 3,830.46	Calculations from utilities:	
EMV	$ 17,662.29	E(U)	-0.77
CE	$ 1,003.16	CE	$ 1,003.16
Risk Premium	$ 16,659.13	Stdev(U)	0.74181651

Utility from not investing	
U	-1

Utility Confidence Interval		CE Confidence Interval	
Upper bound	-0.7490337	Upper bound	$ 1,106.89
Lower bound	-0.79015791	Lower bound	$ 902.16

Alpha of 5%

Figure 5: WACC Sensitivity Analysis Using DCF Model 1

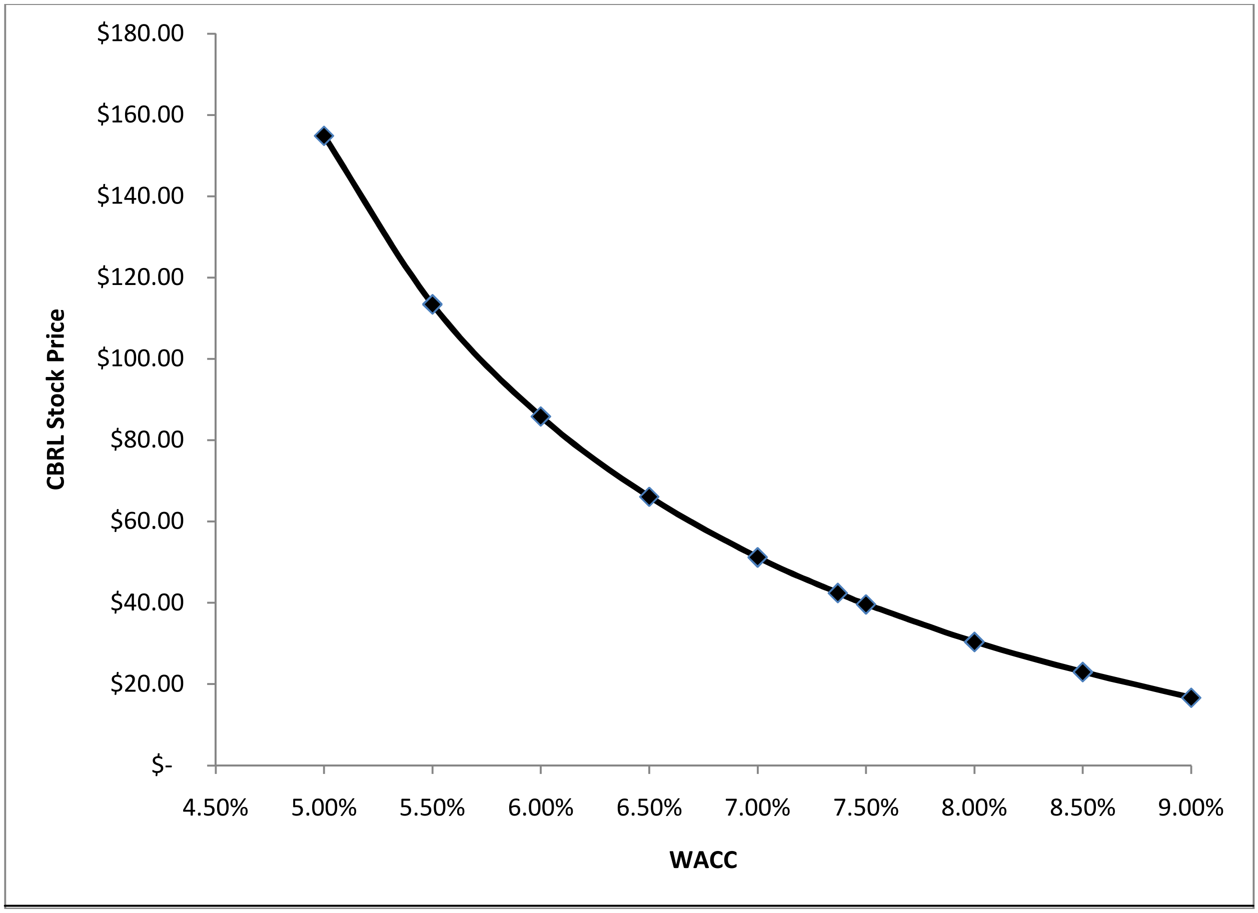


Figure 6: Post Valuation Movement in CBRL's Stock Price