



Equity Valuation in Cyclical and Acyclical Industries

Dissertation Submission

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Abstract

This dissertation provides an overview of various valuation approaches, mainly the multiples-based approach, the Dividend Discount Model, Discounted Cash Flow Model, Residual Income Valuation Model and the Abnormal Earnings Growth Model. In addition, it highlights the advantages and disadvantages of each, and follows with a discussion of the models and evidence of empirical research. It then takes the angle of assessing the performance of selected valuation models (Price to Earnings multiple using one and two-year forecast earnings and the Residual Income Valuation Model) on companies in cyclical and acyclical industries. The results of the empirical research highlight the over performance of the multiples-based approach in both industry types as identified in this dissertation. Finally, a structured content analysis is conducted on a selection of thirty-two equity research reports from cyclical and acyclical industries. I examine the similarities and differences in the valuation methods used, in addition to analyst recommendations while taking into account the state of the economy. I also test the differences in the forecasted revenue growth rates and discount rates used in the valuations between the cyclical and acyclical subsamples. Results of equity report content analysis show that analysts, to a certain extent, do take into consideration the cyclicity of companies.

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1. Chapter One: Introduction

Valuation can be broadly viewed as a process through which a firm or equity is valued. It can be defined as “the process of converting a forecast into an estimate of the value of the firm or some component of the firm” (Palepu et al. 2004). Lee (1999) describes the process as being inherently prospective as it requires estimating expected payoffs and making forward looking educated guesses. The objective of valuation is to determine the intrinsic value; “the value that would be attached to a firm by an all-knowing analyst, who not only knows the expected cash flows for the firm but also attaches the right discount rate(s) to these cash flows and values them with absolute precision” (Damodaran 2002).

This dissertation takes on a specific angle of investigating the issue of equity valuation for cyclical and acyclical companies. Cyclical companies are those that exhibit momentous repeating increasing and decreasing patterns of earnings due to macroeconomic as well as industry factors (Koller et al. 2005), while acyclical companies are less responsive to macroeconomic factors and exhibit less cyclical trends.

The dissertation begins with an overview of the equity valuation literature, explaining the most common equity valuation methods, their advantages and disadvantages, and also reviews related empirical research.

It then follows with a section studying the performance of three selected valuation methods on a data sample of US publicly listed companies covering the period 1995 – 2009. The valuation methods are the one-year forward price to earnings multiple¹, the two-year forward price to earnings multiple² and the Residual Income Valuation Method. As academics claim that

¹ PE1

² PE2

cyclicality introduces complexities in valuation (Koller et al. 2005), I test the three valuation methods in order to assess the performance of each in terms of bias, accuracy and explanatory power on both cyclical and acyclical companies. My results indicate the superior performance of the price-to-earnings multiple in valuation.

I then conduct a structured content analysis on a sample of thirty-two equity analyst reports on cyclical and acyclical companies listed on the London Stock Exchange. This section aims to investigate a variety of issues: Whether analysts apply certain valuation methods in cyclical and acyclical industries. How investment recommendations vary according to the state of economy. The relationship between analyst revenue forecasts for cyclical and acyclical companies and the state of the economy. Finally, I also research whether the discount rate used in multi-period valuations differs based on industry cyclicality. Findings indicate that the nature of the industry (cyclical and acyclical) is taken into account in the selection of valuation methods, making investment recommendations, and in selecting discount rates.

2. Chapter Two: Literature Review

2.1 Introduction to Valuation

There are numerous purposes for valuations; measuring value creation from implementation of new projects, supporting security buy and sell recommendations, setting a price for mergers and acquisitions, initial and secondary public offerings, credit analysis, and leverage buyouts, amongst many others (Palepu et al. 2004).

Several empirical studies have been conducted, results of which suggest that stock prices are impacted by accounting numbers. A study by Beaver (1968) shows that prices react to earnings, thereby indicating the information content of earnings. His findings also suggest that investors mainly consider reported earnings, and do not use other measures as a substitute. Similarly, results from Ball and Brown (1968) suggest that the information contained in the annual income number is useful as it is related to stock prices. However they point out that annual accounting reports are only one of the sources of information available to investors. Lev (1989) on the other hand argues that the value of earnings is limited, as indicated by a rather weak correlation between stock returns and earnings, which could be a result of poor quality financial reporting. Landsman and Maydew (2002) investigated the information content of quarterly earnings announcement over a more recent period, 1972-1998, and found an increase in the information content over time.

Financial statements are relied upon for fundamental analysis, a technique based on analyzing historical information to predict future financial performance (Lee 1999). Lee (1999) considers valuation to be an interdisciplinary task such that it requires combining accounting, economics,

marketing, strategy and finance knowledge, which collectively help in arriving at a value estimate.

Valuation can be conducted either on the firm or equity level to estimate the value of the firm³ or the value of equity. Enterprise value is the value of all the claimants of the firm, both equity and debt holders, while equity value is the value of the equity claimants of the firm only (Penman 2010). The equity value is calculated by taking the value of the firm less the value of net debt denoted by the expression below (Palepu et al. 2004):

$$\text{Enterprise Value} = \text{Equity Value} + \text{Net Debt} \quad (1)$$

↔

$$\text{Equity Value} = \text{Enterprise Value} - \text{Net Debt} \quad (2)$$

It is important to consider that one cannot expect any valuation approach to produce a precise value. An element of subjectivity will always be present in any valuation, thus it may be argued that valuation is as much an art as it is a science (Lee 1999).

³ Alternatively known as the enterprise value.

Damodaran (2002) classifies the valuation methods as follows:

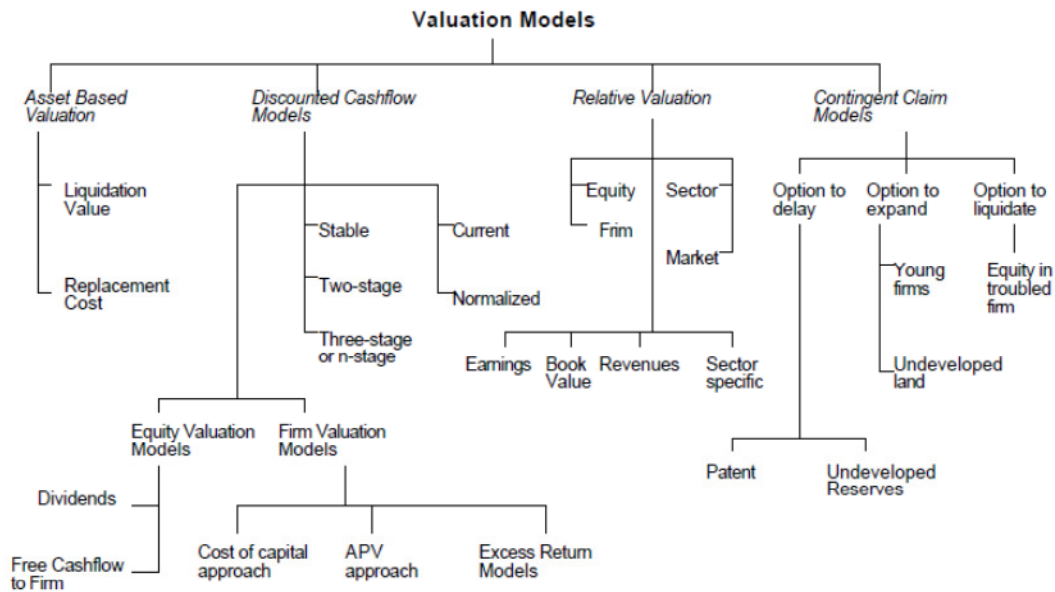


Figure 1 - Valuation Models

In this chapter, the methods are categorized into multiples-based models and multi-period methods which include the Dividend Discount Model (DDM), Discounted Free Cash Flow model (DCF), the Residual Income Valuation model (RIVM) and the Abnormal Earnings Growth model (AEGM)⁴.

⁴ A brief section on option-style and asset-based valuation models is available in Appendix (a).

2.2 Multiples-Based Valuation

2.2.1 Introduction to the Multiples-Based Method

The multiples-based method is widely used due to its simplicity such that it does not require detailed inputs (Palepu et al. 2004; Penman 2010). It is used in cases such as initial public offerings, stock recommendations, mergers and acquisitions (Tasker 1998) and where companies are privately held or have no reliable traded price (Penman 2010).

According to Liu et al (2002), multiples communicate the core of the more complex valuation methods, and are thus often used as a substitute to them. They are also used as second stage methods to complement comprehensive methods and to derive continuing value terms (Fernandez 2002; Liu et al. 2002; Imam et al. 2008).

2.2.2 Underlying Ideas and Assumptions

Multiples-based valuation is founded on the premise that value has a positive relation with expected future payoffs and a negative relation with risk, similar to principles of the more complex valuation approaches (Liu et al. 2002) and are thus determined by the following variables, (i) risk, (ii) growth and (iii) ability to generate cash flows⁵ (Damodaran 2002).

The method assumes that the market is efficient in setting prices (Penman 2010). Moreover, it assumes that the short and long term growth of the company is reflected through the market (Palepu et al. 2004). Thus, the method measures the relative as opposed to intrinsic value, and provides a reflection of the state of the market (Damodaran 2002).

⁵ This is expressed in the form of equations in Appendix (b).

There are generally two types of multiples; enterprise and equity multiples. The multiples can then be classified into stock multiples (e.g. price to book value), or flow multiples (e.g. price to EBITDA) (Citigroup 2008). Some multiples can also be industry-related, for example page views can be used as a driver for the valuation of internet firms (Trueman et al. 2000). The choice of equity versus enterprise multiples depends on various factors. For example, enterprise multiples value firms independently of the financing and capital structure decisions, while equity multiples contain the impact of financing decisions of the firm, which may decrease their comparability (Citigroup 2008).

2.2.3 Implementation

The following steps are performed in the implementation of multiples-based valuation:

- a) A set of comparable companies with similar operations and characteristics to those of the company being valued is formed;
- b) A driver⁶ is identified as a basis for the valuation, and multiples of the driver are calculated using the prices at which the firms trade;
- c) A benchmark multiple is computed by taking the mean, median or harmonic mean of the comparable companies' multiples;

$$\text{Mean (Arithmetic Average)} = \frac{1}{n} \sum_{j=1}^n \frac{P_j}{VD_j} \quad (3)$$

⁶ E.g. Earnings, cash flow, book value.

$$\text{Weighted Average} = \sum_{j=1}^n \left(\frac{VD_j}{\sum_{i=1}^n VD_i} \right) \times \frac{P_j}{VD_j} = \sum_{j=1}^n P_j / \sum_{j=1}^n VD_j \quad (4)$$

$$\text{Harmonic Mean} = \frac{1}{\frac{1}{n} \sum_{j=1}^n \frac{VD_j}{P_j}} \quad (5)$$

where P_j is the observed price for the j th comparator firm.

- d) After computing the benchmark multiple, the following formula is applied in order to calculate the value:

$$V_i = VD_i * \text{Benchmark Multiple} \quad (6)$$

where V_i is the estimated value of firm i , VD_i is the value driver ($VD > 0$),

The value can also be derived from more than one value driver according to the following formula:

$$V_i = w_1[VD_1 * \text{Benchmark Multiple}_1] + w_2[VD_2 * \text{Benchmark Multiple}_2] \quad (7)$$

Where w_1 and w_2 are the weights assigned to the value drivers.

According to Palepu et al. (2004), consistency should be maintained between the numerator and denominator. If the denominator represents the performance of the firm prior to servicing the debt such as sales, then the numerator should include the value of equity as well as debt.

2.2.4 Advantages and Disadvantages of the Multiples-Based Valuation Method

Although it is a simple method (Penman 2010), finding comparable firms of similar risks and features is not always possible⁷. Firms in the same industry may also not be good comparables due to differences in strategies (Palepu et al. 2004).

Since the minimum value of a firm is regarded to be the asset value⁸ (Burgstahler and Dichev 1997), firms cannot have negative values. Therefore, one of the downfalls of the method is that negative multiples produce meaningless results, which results in excluding them from the comparables set and creating sample bias (Palepu et al. 2004).

Another problem with the implementation is that each driver may produce a different value (Penman 2010). Moreover, different estimates can be produced from the same driver depending on how the benchmark is computed. Finally, relative valuation can result in too high values when the market as a whole is overvalued, or values that are too low when the market is undervalued (Damodaran 2002).

2.2.5 Empirical Evidence on Multiples-Based Valuation

Research conducted by Lie and Lie (2002), suggests that all multiples tested yield negatively biased estimates. They claim that asset-based multiples (market value to book value), compared to sales and earnings multiples, lead to more accurate and less bias estimates. According to Liu et al. (2002), based on historical drivers, sales was found to be the worst performer, but in contrast to Lie and Lie (2002), earnings performed better than book value. They also found that equity

⁷ E.g. in the case of firms operating in various industries simultaneously.

⁸ Also referred to as adaptation value.

value multiples to sales and EBITDA performed better than enterprise multiples using the same drivers (Liu et al. 2002).

Liu et al. (2002) claim that there are no best multiples for any given industry, however Tasker (1998) finds that companies in the software industry are valued based on revenue multiples, and companies in the oil and real estate industries are valued based on operating cash flow multiples.

Prior literature suggests that accuracy of the valuation improves significantly when forecast earnings are used in PE⁹ ratios compared to trailing earnings (Kim and Ritter (1999); Lie and Lie (2002)). This view is confirmed in a study conducted by Liu et al. (2002), as they also find that the performance improves with the length of the forecast horizon.

Selecting a comparable peer group in multiples-based valuations is an important consideration. Alford (1992) finds that in selecting comparables based on standard industrial classification (SIC) code, the valuation accuracy increases when comparables are matched up to the third digit. His findings also show that there is no increased accuracy when industries are classified according to risk or growth. It is argued that the selection of the comparables is somewhat an art form, which can be viewed as a criticism to the method. In response to this issue, Bhojraj and Lee (2002) came up with the warranted multiple in an effort to provide a more scientific approach to the selection of comparables, as it involves selecting the comparables based on variables in valuation theory.

⁹ Price to earnings.

2.3 Dividend Discount Model

The dividend discount model (DDM) originally attributed to Williams (1938) is a flow-based model that values the equity of a company based on the present value of projected future dividends, which are the expected proceeds from a firm to its equity shareholders (Penman 2010; Francis et al. 2000).

The model has two main inputs; the expected dividends and the cost of equity capital. The expected dividends are normally projected based on assumed expected earnings growth rates and dividend payout ratios (Damodaran 2002). The equity value based on DDM can be computed as follows:

$$V_t^e = \sum_{\tau=1}^{\infty} \frac{E_t[DIV_{t+\tau}]}{(1 + k_e)^\tau} \quad (8)$$

where V_t^e is the value of equity at time (t), $DIV_{t+\tau}$ is dividends at the end of year (t), k_e is constant cost of equity capital, and $E_t[.]$ is the expectation operator at time (t).

As dividends cannot be forecasted into perpetuity, a terminal value term (P_T) is included in the model to reflect the value beyond the finite forecast horizon. Thus, the value of equity can be viewed as the present value of expected dividends to time T plus the present value of expected terminal value at time T.

$$V_t^e = \sum_{\tau=1}^T \frac{E_t[DIV_{t+\tau}]}{(1 + k_e)^\tau} + \frac{P_T}{(1 + k_e)^T} \quad (9)$$

where P_T is the terminal value at time=T.

The P_T can be estimated in a variety of ways, a common method for the estimation is as follows:

$$P_T = \frac{E_t[DIV_{t+1}]}{(k_e - g)} \quad (10)$$

where g is the growth rate of the dividend into perpetuity and $k_e > g$.

A variation of the DDM, known as the Gordon Growth Model (GGM), assumes that the company is in its steady state and that the dividends will grow at the same rate into perpetuity (Damodaran 2002). The expression for the value of the equity in a steady state is as follows:

$$V_t^e = \frac{E_t[DIV_{t+\tau}]}{(k_e - g)} \quad (11)$$

where $k_e > g$.

The GGM works well for companies with set dividend payout policies that are expected to persist into the future, and a growth rate close to the nominal growth in the economy. The model however has its limitations; it is very sensitive to the assumed growth rate, demonstrated by the fact that as the growth rate approaches the assumed cost of equity capital, the value of equity approaches infinity. Moreover, in the event the growth rate exceeds the cost of equity, the value becomes negative, which leads to a meaningless result (Damodaran 2002).

Another variation of the DDM is the two-stage DDM¹⁰. This variation of the model is used for companies with a phase of high or unstable growth followed by a phase of constant growth that is expected to be maintained into the future (Damodaran 2002).

Advantages and Disadvantages of the DDM

The DDM performs well when the dividend payout of a company is linked to value creation in a firm, especially when firms have a fixed dividend payout ratio. Dividends are usually

¹⁰ The two-stage dividend growth model is explained in Appendix(c).

considered to be relatively stable in the short-term, and can therefore be forecasted into the near future (Penman 2010).

Disadvantages of the method include that it requires forecasts of long horizons which add a challenge to the implementation. Additionally, Penman (2010) argues that although the model depends on the payment of dividends to shareholders (distribution of value), it does not reflect value creation as it does not take into account the capital gain component of stocks. He demonstrates this by considering the dividend irrelevancy theory; as dividends are paid out, the price is decreased by the amount of the dividend payment, and the lower is the terminal value, thereby indicating that dividends do not create value. He also shows this by firms that borrow funds in order to pay dividends, thereby reemphasizing the inability of dividends to reflect value creation.

2.4 Discounted Cash Flow Model

The Discounted Cash Flow (DCF) valuation model can be regarded as the entity version of the DDM as it involves discounting the free cash flows to the firm (FCF), which are the cash flows available to all stakeholders of a firm; debt holders and shareholders. Francis et al. (2000) claim that FCF reflect the value added over the short term better than dividends.

FCF is measured by considering the cash flows from operating activities (C) and investing activities (I) as follows (Penman 2010):

$$\text{Free Cash Flow}(FCF) = C_t - I_t \quad (12)$$

Alternatively, FCF can be calculated as follows (Copeland et al. 2000):

$$\begin{aligned} FCF = EBIT (1 - \text{tax rate}) + \text{Depreciation} - \text{Capital Expenditure} \\ - \text{Changes in Working Capital} \end{aligned} \quad (13)$$

where *EBIT* is earnings before interest and tax.

The value of the firm, being the present value of the forecasted FCF can be expressed by the following equation:

$$V_t^{e+d} = \sum_{\tau=1}^{\infty} \frac{E[FCF_{t+\tau}]}{(1 + WACC)^\tau} \quad (14)$$

where V_t^{e+d} is the value of the firm at time (t) and *WACC* is the weighted average cost of capital.

Similar to the DDM, the DCF also assumes the FCF to be forecasted into perpetuity, thus, a terminal value (P_T) is estimated to reflect the value of the firm beyond the forecast period.

The P_T can be calculated as follows in the case of constant FCF after $t=T$:

$$P_T = \frac{FCF_{T+1}}{WACC} \quad (15)$$

Alternatively, in the case of growing FCF after $t=T$, the P_T can be estimated as follows:

$$P_T = \frac{FCF_{T+1}}{WACC - g} \quad (16)$$

where g is the growth rate.

Thus, the value of the firm can be calculated as

$$V_t^{e+d} = \sum_{\tau=1}^T \frac{E[FCF_{t+\tau}]}{(1+WACC)^\tau} + \frac{P_T}{(1+WACC)^T} \quad (17)$$

By referring to equation (2), the equity value can be calculated by subtracting the value of net debt (V_t^d) from the firm value.

$$V_t^e = V_t^{e+d} - V_t^d \quad (18)$$

Thus, the value of equity can be expressed as:

$$V_t^e = \sum_{\tau=1}^T \frac{E[FCF_{t+\tau}]}{(1+WACC)^\tau} + \frac{P_T}{(1+WACC)^T} - V_t^d \quad (19)$$

Advantages and Disadvantages of the DCF model

Advantages of the method are that it is based on actual cash flows which are not influenced by accounting rules (Penman 2010).

Disadvantages of the model include the fact that low cash levels can signal either weak performance, which may in reality be due to capital investments being made into the business (Koller et al. 2005), thus, it does not account for value that is added in the short term (Penman 2010). The DCF can therefore be viewed as a liquidation concept, as value can be enhanced by

reducing investments. Further, it requires making forecasts into the long term future and accounting for a P_T , which is rather subjective and contributes to the value by a heavy weight (Penman 2010).

DCF valuation is best used for companies with positive cash flows and future performance which can be predicted reliably. Using the method is a challenge in the valuation of distressed firms, as meaningless values are derived from negative cash flows. It is also not suitable for firms with a large proportion of unutilized assets, as it only takes into account the assets that produce cash flows¹¹ (Damodaran 2002).

¹¹ For example, it does not consider the value of assets such as patents which do not produce cash flows and are not foreseen to produce cash flows in the near future (Damodaran 2002).

2.5 Residual Income Valuation Method

The Residual Income Valuation Model (RIVM) has become an important topic in equity valuation literature. Early work on RIVM was conducted by Preinreich (1938), Edwards and Bell (1962), Peasnell (1982). It was then developed and popularized by Ohlson (1995) (Frankel and Lee 1998).

The model is primarily based on and derived from the DDM¹². It can be conducted on either the equity or entity level. It sets the book value in the case of the equity perspective, and the net operating assets in the case of the entity perspective, as an anchor, and reflects the additional value by projecting future residual earnings (Penman 2010).

Residual Income (RI)¹³ can be defined as income less a charge for the capital employed. It represents the earnings that exceed the normal return on the book value of equity (O'Hanlon, N.D).

Equity perspective:

$$RI_t^e = NI_t - k_e * BVE_{t-1} \quad (20)$$

Entity perspective:

$$RI_t^{e+d} = NOPAT_t - WACC * NOA_{t-1} \quad (21)$$

One of the main assumptions of the model is the clean surplus relationship (CSR) whereby in the equity perspective, the equity book value (BVE) in year t equals the BVE in the previous year in addition to the earnings in year t less the dividends (DIV) paid at time t.

¹² The formal derivation of the model can be found in Appendix (d).

¹³ Also known as residual earnings or abnormal earnings.

Equity perspective:

$$\text{CSR: } BVE_t - BVE_{t-1} = NI_t - DIV_t \quad (22)$$

Entity perspective:

$$\text{CSR: } NOA_t - NOA_{t-1} = NOPAT_t - FCF_t \quad (23)$$

The value using RIVM is calculated as follows:

Equity perspective:

$$V_t^e = BVE_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}^e]}{(1 + k_e)^\tau} \quad (24)$$

Entity perspective:

$$V_t^{e+d} = NOA_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}^{e+d}]}{(1 + WACC)^\tau} \quad (25)$$

In order to reflect the value beyond the forecast horizon, a terminal value term is included as shown below:

In the case of a *flat growth rate*, the value is calculated as:

Equity perspective:

$$V_t^e = BVE_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}^e]}{(1 + k_e)^\tau} + \frac{E_t[RI_\tau^e]}{k_e(1 + k_e)^\tau} \quad (26)$$

Entity perspective:

$$V_t^{e+d} = NOA_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}^{e+d}]}{(1 + WACC)^\tau} + \frac{E_t[RI_\tau^{e+d}]}{WACC(1 + WACC)^\tau} \quad (27)$$

Whereas in the case of a *growing perpetuity* the value of equity is calculated as:

$$V_t^e = BVE_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}^e]}{(1+k_e)^\tau} + \frac{E_t[RI_\tau^e](1+g_r)}{(1+k_e)^\tau(k_e-g_r)} \quad (28)$$

$$V_t^{e+d} = NOA_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}^{e+d}]}{(1+WACC)^\tau} + \frac{E_t[RI_\tau^{e+d}](1+g_r)}{(1+WACC)^\tau(WACC-g_r)} \quad (29)$$

Advantages and Disadvantages of RIVM

Advantages of RIVM include the fact that the model focuses on value drivers; profitability and the growth in investments, both of which are important focuses of strategy. The model recognizes the accrual concept, such that value is added before cash flows, which results in smoother series of forecasts flow. Moreover, investments are treated as assets rather than expenses (Penman 2010). Compared to DCF, the forecast horizon can be shorter and more value can be realized in the near future (Penman 2010) as value is captured in the book value and therefore depends less on the terminal value. Ohlson (2005) argues that RIVM facilitates the use of more formal models as it does not require forecasting expected dividends as in the DDM.

One of the characteristics of the RIVM is that it is based on linear information dynamics, and therefore the model handles relevant but excluded variables from other information (Richardson and Tinaikar 2004).

An important consideration with RIVM is that projected earnings can be increased without increasing the value of the firm. This can be done by making zero-NPV investments or even by writing down assets in the balance sheet (Penman 2010).

Another drawback of RIVM is in its reliance on the CSR. Accounting literature shows that GAAP standards violate this relationship, especially in relation to capital transactions such as convertible bonds which have an effect on the number of shares, and hence may violate the CSR on a per share basis (Ohlson 2005). Further, Ohlson (2005) criticizes the model due to the importance it places on the current and expected book values.

2.6 Abnormal Earnings Growth Method

The Abnormal Earnings Growth Model (AEGM), also known as the OJ Model is a development of the RIVM by Ohlson and Juettner-Nauroth (2005). It expresses the relationship between value, forward earnings and abnormal earnings¹⁴ growth (AEG)¹⁵. The model relies on capitalized earnings as an anchor term, and reflects the premium through the present value of AEG (Ohlson 2005). AEG can be defined as “the earnings (with dividends reinvested) in excess of earnings growing at the required return” (Penman 2010).

$$V_0^e = \frac{E_0[NI_1]}{k_e} + \sum_{t=1}^{\infty} \frac{E_0[z_t]}{(1+k_e)^t} \quad (30)$$

Where V_0^e is the value of equity and NI is the net income

$$z_t = \frac{1}{k_e} [\Delta NI_{t+1} - k_e(NI_t - DIV_t)] \quad (31)$$

Where

$$AEG_t = [\Delta NI_{t+1} - k_e(NI_t - DIV_t)] \quad (32)$$

Advantages and Disadvantages of AEGM

Although it is based on DDM, the model does not depend on how dividends are expected to evolve, consistent with the dividend irrelevancy theory (Ohlson and Juettner-Nauroth 2005). Thus it does not require setting a dividend payout ratio over the period. Moreover, the model

¹⁴ Also known as residual earnings.

¹⁵ The formal derivation of AEGM can be found in Appendix (e).

drops the CSR requirement present in RIVM, which is one of the main advantages of AEGM over RIVM (Ohlson 2005).

The method is easy to understand as it focuses on earnings, a variable that investors understand and hence has a practical advantage. It also incorporates the accruals concept as it depends on earnings. The forecast horizon is also relatively shorter than other methods, such as the DCF, which may make it an easier model to implement (Penman 2010).

Disadvantages of the model include that it does not incorporate balance sheet items or focus on the growth drivers, but rather starts directly from earnings, and thus can limit the level of analysis. The estimates derived from the model can be inaccurate in the presence of earnings management. Moreover, it is sensitive to the required rate of return input, which affects the value (Penman 2010). Penman (2005) also criticizes the anchoring of AEGM on forward earnings compared to current book value in the case of RIVM, as even the anchor is based on an assumption.

2.7 Models Discussion and Empirical Evidence

Researchers and academics have studied the area of equity valuation extensively by comparing valuation methods in different settings in an attempt to identify the best performing methods.

Damodaran (2002) claims that relative valuations compared to DCF valuations produce results that are closer to market prices, and is thus an important consideration for investors or professionals being assessed on a relative basis.

Frankel and Lee (1998) find better predictive power in complete valuation approaches versus multiple-based methods especially over longer time horizons. They compare the performance of V/P (value to price) to B/P (book value to price) where V is calculated using the RIVM, and find that the superiority between the two methods lies with V/P which depends on RIVM over an extended time horizon. The results contradict those of Liu et al. (2002) as the performance of multiples based on the RIVM is worse than multiples based on earnings. The findings of Courteau et al. (2006) agree with those of Frankel and Lee (1998) as their results show that the direct valuation model outperforms the multiples-based model in terms of accuracy when comparing RIVM with forward PE multiples-based model. Their findings also show that by combining the two models into a hybrid model, more accurate results are produced compared to each method separately. Berkman et al. (2000) compare the performance of the DCF method with the PE multiples method based on market parameters¹⁶ and find that they produce close levels of explanatory power.

¹⁶ A market based WACC in the case of the DCF and a market based comparable in the case of PE.

The DDM, RIVM and DCF are considered to be theoretically equivalent models and are expected to perform equally well providing the same assumptions are used in all three models. The inconsistencies between the models in practice are primarily due to differences in the forecasted attributes, growth rates, or discount rates (Francis et al. 2000; Courteau et al. 2006). Francis et al. (2000) compare the performance of the DCF model, the DDM and the RIVM, and find that RIVM outperforms the rest in terms of reliability. Moreover, they find that the valuation accuracy of RIVM is not compromised by the degree of accounting discretion as they believe that the CSR of financial statements is not influenced by conservatism or accrual methods in accounting. They claim that the reason behind the superiority of RIVM over DCF could be due to the fact that it contains a stock in addition to a flow component, while the latter only containing a flow component (Francis et al. 2000). They note that in DCF and DDM more value is derived from the terminal value compared to RIVM, and in RIVM there is more reliance on the book value.

In agreement with the findings of Francis et al. (2000), when comparing the valuations based on forecasted residual earnings compared to forecasted dividends, Bernard (1995) finds that 68% of the value is explained by RIVM while only 29% is explained by the DDM. Jiang and Lee (2005) also find that RIVM outperforms the DDM, and consider earnings have more ability to explain volatile prices than regular cash dividends. Moreover, they believe that the book value and earnings complement each other as valuation inputs.

The issue regarding the superior performance of RIVM over DCF initiated a debate amongst researchers. Courteau et al. (2000), Francis et al. (2000), and Penman and Sougiannis (1998) claim the outperformance of the RIVM compared to the DCF model, while Lundholme and O'Keefe (2001) argue that the models however compared should yield identical results and that

no model is superior to the other. They believe that the difference in the results is attributed to the inconsistent use of assumptions across the models arising from the terminal value, discount rate, and the cash flow calculation. For example, Francis et al. (2000) point out that a bias in the measurement of the book value will affect the RIVM only without affecting DDM or DCF.

In relation to the two viewpoints, Richardson and Tinaikar (2004) believe that there is truth to the two claims; on one hand that the DCF model is incomplete and additional information is required, and on the other hand that if full proforma statements are available, then the information is complete, and the choice of valuation method is irrelevant. Plenborg (2002) argues that as forecasting depends on accrual accounting, and that as budget control is based on accounting numbers as opposed to cash flow measures, RIVM is a more appealing method than DCF as it is based on the accrual concept.

According to Ohlson (2005), compared to RIVM, the AEGM valuation method results in smaller truncation errors, and thus works better in valuation for a finite period due to the reliance of the model on the capitalized expected earnings rather than the book value.

Penman (2005), in a discussion on Ohlson (2005)'s paper explicitly expresses his reservations regarding AEGM in favour of RIVM. He compares the performance of RIVM to AEGM and finds that the median value to price ratio of RIVM is 1, compared to AEGM at 2.02, suggesting that the variation is due to the overly optimistic short term forecasts and earnings growth rates which particularly affect AEGM. Jorgensen et al. (2011) find that the RIVM overperforms the OJ model, and claim that it is due to the earnings growth assumptions after the projection period.

2.8 Conclusion

To conclude, this chapter provides a description of the main valuation methods, multiples-based valuation, DCF, DDM, RIVM and AEGM. It discusses the advantages and disadvantages of each model, and highlights some of the main related empirical evidence. This will follow to the next section in which some of the valuation models are implemented and assessed in terms of their performance in the samples of acyclical and cyclical industries.

3. Chapter Three: Large Sample Analysis

3.1 Introduction

This chapter of the dissertation aims to examine the performance of valuation methods according to industry cyclicality. Cyclical firms are those that exhibit momentous repeating increasing and decreasing patterns of earnings due to macroeconomic as well as industry factors (Koller et al. 2005). According to Damodaran (2002) cyclical companies can be identified in two ways; either on the basis of historical performance, or their performance in relation to the overall economy. Thus, a company that performs well during an economic boom and weakly in an economic downturn can be classified as a cyclical company (Damodaran 2009). Further, the chapter aims to identify the most suitable valuation method for each industry type. I select the PE multiple using one and two-year earnings¹⁷ forecasts, and the RIVM. The valuation methods are analyzed based on examining the valuation estimates and valuation errors resulting from each method as described in the sections to follow:

3.2 Prior Literature on Valuation of Cyclical Industries

Companies with a cyclical nature bring about additional complexities in valuation, mainly due to volatile earnings (Koller et al. 2005), they also tend to have high fixed costs which result in magnifying the volatility of their cash flows and earnings (Damodaran 2009).

Damodaran (2009) claims that the most important obstacle in the valuation of cyclical companies is that the earnings or cash flows are a function of where the company is in the cycle, thus, making projections could lead to misvaluations. Various inputs in valuation models are also

¹⁷ PE-1 year and PE-2 year.

affected by where in an economic cycle the companies lie¹⁸. Basing such inputs on previous years without taking into consideration the cyclical nature of the company could result in significant valuation errors (Damodaran 2009).

According to findings of Koller et al. (2005), consensus forecasts of earnings of cyclical companies show no indication of future cyclical nature, as the forecast trend is observed to be normally upwards except in the case of the year following the trough of a cycle. Potential reasons behind such consensus forecasts are that analysts may be reluctant to predict downward cycles, in the interest of maintaining good relationships with particular companies (Koller et al. 2005). Damodaran (2009) argues that the lack of attention to the economic cycles in the projections, or the excessive fixation on the cycles results in valuation errors. Although there is a high chance of making valuation errors by ignoring cycles, it must be noted that errors can be made by attempting to project cycles. Misvaluations due to cyclical nature will result in vagueness to an investor, as the extent of misvaluation attributed to the company itself and the expectation of an improvement in the economic cycle will be unknown (Damodaran, 2009).

3.3 Research Question and Hypothesis Development

Considering the difference in the characteristics and behaviour of cyclical and acyclical companies, I examine the performance of the three methods on firms in cyclical and acyclical industries. The motivation for investigating this area in equity valuation is due to the practical importance of it, as the results may assist in identifying the most suitable valuation method for each industry type.

¹⁸ Examples of such inputs are the profitability measures, reinvestment measures, debt ratios and cost of funding.

My expectation based on the findings of De Heer and Koller (2000) and Koller (2005) is that RIVM will outperform the multiples-based method in the case of cyclical industries as it reduces the forecasted earnings to a single number. In line with the same view, according to Copeland et al. (2000), the value of a cyclical company is not reflected in a single price-to-earnings ratio. Moreover, based on the results of Frankel and Lee (1998) and Courteau et al. (2006) regarding the superiority of direct and complete models over multiples-based models, I expect to find that RIVM outperforms multiple-based models for the acyclical subsample. Finally, according to the findings of Damodaran (2009), I expect to see greater valuation errors in the valuation of the cyclical subsample compared to the acyclical subsample.

3.4 Methodology

Basing the methodology on that of previous studies, Francis et al. (2000) and Frankel and Lee (1998), the analysis of the valuation methods depends on testing the valuation errors resulting from each method. The valuation errors are based on comparing the value estimates of each valuation model with the actual price. Thus, an important assumption is made, that all available information is reflected in the forecasts, and that the price reflects the intrinsic value, consistent with the efficient market hypothesis (Francis et al. 2000).

The bias and accuracy of the models are assessed by testing the valuation errors. The bias is measured through the signed valuation error, as it measures the degree of under or overvaluation of the share compared to the actual price, whereas the accuracy is measured through the absolute valuation error as follows:

$$\text{Signed Valuation Error} = \frac{\text{Estimated Value} - \text{Price}}{\text{Price}} \quad (33)$$

$$\text{Absolute Valuation Error} = \text{Absolute} \left[\frac{\text{Estimated Value} - \text{Price}}{\text{Price}} \right] \quad (34)$$

Multiples-based Valuation

As mentioned previously, I undertake the PE1 and PE2 multiples-based valuations. The selected value drivers are the median one-year and two-year forward earnings per share (EPS) adjusted for any stock splits. The forecast earnings are selected as opposed to the trailing as according to Kim et al. (1999) and Lie and Lie (2002), the use of earnings forecasts improves the valuation accuracy compared to historical earnings. Additionally, findings suggest that performance improves with the increase of the forecast horizon (Liu et al. 2002).

The benchmark multiple is based on the industry harmonic mean¹⁹ of the one-year and two-year median forecast based on the SIC 2 classification, while excluding the firm itself from the peer group.

$$\text{Harmonic Mean} = \frac{1}{\frac{1}{n} \sum_{j=1}^n \frac{VD_j}{P_j}} \quad (35)$$

where P_j is the observed price for the j th comparator firm.

¹⁹ The harmonic mean of the industry is used versus the median or mean based on the findings in Liu et al. (2002) as it was proven to produce more accurate estimates.

Multi-period Valuation

The multi-period model used is the RIVM, assuming a two-year forecast period and a terminal value calculated as follows:

$$\begin{aligned} V_t^e &= BVE_0 + \frac{E_1[RI_1^e]}{(1+k_e)} + \frac{E_2[RI_2^e]}{(1+k_e) * (k_e - g)} \\ &= BVE_0 + \frac{E_1(EPS_1 - k_e * BVE_0)}{(1+k_e)} + \frac{E_2(EPS_2 - k_e * BVE_1)}{(1+k_e) * (k_e - g)} \end{aligned} \quad (36)$$

There is no strong consensus on the methodology of setting the discount rate (Frankel and Lee 1998). Nevertheless, I use the Capital Asset Pricing Model (CAPM) to determine the cost of equity used in RIVM:

$$k_e = r_f + \beta * MRP \quad (37)$$

where k_e is the cost of equity capital, r_f is the risk free rate, β is the beta and MRP is the market risk premium.

The assumption for the r_f is the US long term treasury bonds²⁰. The beta is assumed to be the yearly median beta for each SIC 2 industry²¹. The MRP is assumed at 5% for the base case²².

A dividend payout ratio is assumed in order to calculate the dividends and project the book value of equity for the RIVM while assuming a CSR.

²⁰ Long term Treasury bonds are used as according to Damodaran, the risk free rate should be based on a rate that covers the investment period.

²¹ The use of the industry beta is in line with Francis et al. (2000), as it is argued to produce more precise results compared to firm specific betas.

²² Equal to the median MRP used by finance professors in the UK, Europe and Canada in the year 2008 (Fernandez, 2009). Approximates the average MRP for I/B/E/S data of 5.3% for the period 1991 to 1998 (Easton et al., 2002). MRP as at end of 2003 was just below 5% (Koller et al., 2005).

$$\text{Dividend payout ratio} = \frac{\text{Dividend}}{\text{Common Shares Outstanding}} \div \text{EPS} \quad (38)$$

A terminal growth rate of 3% is assumed in the RIVM to calculate the terminal value reflecting the value beyond the forecast period.

3.5 Data and Sample Description

The analysis is based on accounting data, share price data and analyst forecasts for a large sample of U.S. public firms for the period 1995 - 2009. The sample excludes all U.S. public financial companies, as they may introduce inconsistencies due to the differences in accounting for financial companies. The information on the firms and financial statements are obtained from Compustat®, whereas share prices and analyst forecasts are obtained from I/B/E/S, and betas are obtained from CRSP.

The industries are categorized into cyclical and acyclical industries based on the classification in Boudoukh et al. (1994), whereby the cyclicity is determined based on the beta produced from the regression of the production output of certain manufacturing industries against the overall production output. Based on this measure, the three most cyclical and acyclical industries are selected and mapped with the SIC2 of the industries available in the dataset²³.

²³ Although according to Alford (1992), SIC 3 produces more superior results compared to SIC 2 in selecting comparables, the industry classification provided in Boudoukh et al. (1994), only allows the identification of the industry up to the SIC 2 level.

Table 1 - Industry Classification

	Boudoukh et al. 1994 Industry Classification	Beta	SIC 2 Industry Classification	SIC 2
Acyclical	Food and Beverage	0.17	Food and Kindred Products	20
	Tobacco	0.17	Tobacco Products	21
	Utilities	0.31	Electric, Gas and Sanitary Services	49
Cyclical	Rubber and Plastics	1.27	Rubber and Miscellaneous Plastic Products	30
	Transportation Equipment	1.84	Transportation Equipment	37
	Primary Metals	2.98	Primary Metal Industries	33

The table maps the cyclical and acyclical industry classifications from Boudoukh et al. 1994 onto the appropriate SIC 2 codes.

The sampling process starts with the full sample dataset containing 30,530 observations. A restriction is made on the price as some outliers are included in the dataset. Any firm reporting a missing price or a price above USD 226²⁴ is excluded from the sample. Further, any firms reporting a missing EPS are also excluded from the sample as the variable is required for the calculation of the dividend payout ratio used in RIVM. In order to enable computation of all three models using the same sample, firms that do not have one and two year forward median earnings forecasts are also excluded. A restriction is also added on the number of observations in an industry in order to ensure including a reasonable number of peers in the computation of the benchmark multiple. The sample is then trimmed by removing extreme observations by excluding the upper and lower 1% of the valuation errors from the distribution.

The table below describes the stages of the sampling process in order to arrive at the cyclical and acyclical subsamples.

²⁴ Based on the price at the 99th percentile

Table 2 - Sampling Process

Sampling Process	Number of Companies
Universe of non financial public US companies	30,530
Exclusion of companies with:	
Missing eps, and prices above USD 226	305
	30,225
Missing or negative median1 and 2 year forward earnings, and negative prices	8,040
	22,185
Excluded industries with less than 5 observations	475
	21,710
Excluded observations after calculating values and trimming errors	2,056
Remaining observations after trimming (Pooled Sample)	19,654
Cyclical subsample sorted by SIC2	1,201
Acyclical subsample sorted by SIC 2	1,991
Remaining Companies	16,462

The table represents the sampling process and the exclusions made at each stage in order to arrive at the cyclical and acyclical subsamples.

The table below provides the descriptive statistics of the trimmed dataset containing the pooled sample, and the cyclical and acyclical subsamples:

The acyclical subsample appears to have a higher mean and median share price, however, the cyclical companies have a higher price standard deviation compared to the acyclical sample reflecting the fluctuation in the price. The actual and forecast EPS of the cyclical sample also has a higher standard deviation compared to the acyclical subsample reflecting the characteristic of the subsamples.

Table 3 - Valuation Inputs Descriptive Statistics

	Mean	Minimum	Percentiles			Maximum	Standard Deviation
			25th	50th	75th		
Panel A :Pooled Sample							
n = 19,654							
Share Price (USD)	24.14	1.02	11.04	19.42	31.68	223.50	19.25
EPS (USD)	1.15	-68.33	0.30	0.96	1.86	198.05	2.48
Median 1 Year EPS (USD)	1.38	0.01	0.53	1.05	1.83	27.25	1.32
Median 2 Year EPS (USD)	1.66	0.03	0.74	1.30	2.13	31.75	1.49
BPS (USD)	10.01	0.00	4.11	7.50	12.88	1151.60	14.45
Panel B : Cyclical Subsample							
n = 1,201							
Share Price (USD)	25.47	1.32	11.88	20.33	34.88	155.37	18.81
EPS (USD)	1.68	-11.78	0.52	1.40	2.72	18.17	2.32
Median 1 Year EPS (USD)	1.82	0.01	0.79	1.40	2.40	13.60	1.52
Median 2 Year EPS (USD)	2.17	0.08	1.09	1.73	2.80	18.25	1.65
BPS (USD)	11.70	0.31	5.79	9.56	14.90	89.98	8.95
Panel C : Acyclical Subsample							
n= 1,991							
Share Price (USD)	26.74	1.21	16.75	24.41	34.56	120.34	14.61
EPS (USD)	1.71	-22.04	0.94	1.70	2.48	22.29	1.55
Median 1 Year EPS (USD)	1.74	0.03	1.05	1.65	2.33	6.98	0.98
Median 2 Year EPS (USD)	1.91	0.07	1.19	1.80	2.50	7.88	1.03
BPS (USD)	13.89	0.00	7.32	13.12	18.69	59.22	8.16

3.6 Empirical Findings

This section presents the results of the tests conducted on the valuation methods for the subsamples.

3.6.1 Valuation Errors Descriptive Statistics

Tables 4 and 5 present the descriptive statistics of the signed and absolute valuation errors resulting from the three valuation models:

Table 4 - Signed Valuation Errors Descriptive Statistics

	Mean	Minimum	Percentiles			Maximum	Standard Deviation
			25th	50th	75th		
Panel A : Pooled Sample							
n= 19,654							
PE1	-0.005	-0.949	-0.305	-0.042	0.242	2.484	0.446
PE2	-0.014	-0.896	-0.271	-0.056	0.183	2.964	0.382
RIVM	-0.044	-0.951	-0.438	-0.183	0.194	5.911	0.603
Panel B : Cyclical Subsample							
n = 1,201							
PE1	-0.014	-0.926	-0.273	-0.057	0.191	2.095	0.415
PE2	-0.017	-0.862	-0.253	-0.073	0.165	2.284	0.351
RIVM	0.066	-0.902	-0.346	-0.084	0.315	4.558	0.616
Panel C : Acyclical Subsample							
n= 1,991							
PE1	-0.005	-0.892	-0.177	0.011	0.160	2.366	0.303
PE2	-0.010	-0.752	-0.170	-0.013	0.124	2.115	0.278
RIVM	0.357	-0.909	-0.109	0.182	0.625	5.911	0.741

The table presents the descriptive statistics for the signed valuation errors calculated as follows:
(value estimate - price) / price

Table 5 - Absolute Valuation Errors Descriptive Statistics

	Mean	Minimum	Percentiles			Maximum	Standard Deviation
			25th	50th	75th		
Panel A : Pooled Sample							
n= 19,654							
PE1	0.345	0.003	0.132	0.277	0.491	2.484	0.284
PE2	0.291	0.002	0.111	0.232	0.405	2.964	0.248
RIVM	0.445	0.004	0.187	0.365	0.579	5.911	0.409
Panel B : Cyclical Subsample							
n = 1,201							
PE1	0.315	0.005	0.119	0.240	0.443	2.095	0.271
PE2	0.267	0.004	0.109	0.212	0.350	2.284	0.228
RIVM	0.441	0.006	0.174	0.337	0.563	4.558	0.435
Panel C : Acyclical Subsample							
n= 1,991							
PE1	0.223	0.004	0.081	0.168	0.302	2.366	0.205
PE2	0.200	0.002	0.070	0.146	0.274	2.115	0.193
RIVM	0.531	0.005	0.144	0.319	0.666	5.911	0.627

The table presents the descriptive statistics for the absolute valuation errors calculated as follows:
|value estimate - price| / price

3.6.2 Testing the Significance of the Valuation Errors

The valuation errors test the deviation of the value estimates from the actual price. Statistical testing is conducted for each of the pooled, cyclical and acyclical subsamples in order to measure the significance of the valuation errors at a 5% level of significance, whereby the null hypothesis is that the valuation errors are equal to zero.

Table 6 - Valuation Errors and P-Values

	Mean	P-value	Median	P-value
Panel A: Pooled Sample n = 19,654				
Signed Prediction Errors (Bias)				
PE1	-0.005	0.085	-0.042	<.0001
PE2	-0.014	<.0001	-0.056	<.0001
RIVM	-0.044	<.0001	-0.183	<.0001
Absolute Prediction Errors (Accuracy)				
PE1	0.345	<.0001	0.277	<.0001
PE2	0.291	<.0001	0.232	<.0001
RIVM	0.445	<.0001	0.365	<.0001
Panel B: Cyclical Subsample n = 1,201				
Signed Prediction Errors (Bias)				
PE1	-0.014	0.230	-0.057	0.000
PE2	-0.017	0.100	-0.073	<.0001
RIVM	0.066	0.000	-0.084	0.382
Absolute Prediction Errors (Accuracy)				
PE1	0.315	<.0001	0.240	<.0001
PE2	0.267	<.0001	0.212	<.0001
RIVM	0.441	<.0001	0.337	<.0001
Panel C: Acyclical Subsample n = 1,991				
Signed Prediction Errors (Bias)				
PE1	-0.005	0.446	0.011	0.332
PE2	-0.010	0.095	-0.013	0.001
RIVM	0.357	<.0001	0.182	<.0001
Absolute Prediction Errors (Accuracy)				
PE1	0.223	<.0001	0.168	<.0001
PE2	0.200	<.0001	0.146	<.0001
RIVM	0.531	<.0001	0.319	<.0001

The sample covers the period 1995 - 2009.

The table presents the mean and median signed and absolute valuation errors calculated as follows:

Signed Valuation Error=(value estimate - price) / price, Absolute Valuation Error = |value estimate - price| / price

The p-values indicate whether the mean (median) valuation errors equal zero based on t-statistics (signed rank statistic)

I base my analysis mainly on the median errors rather than the mean errors as they are more likely to exclude the outliers.

Table 6 indicates that for the pooled sample all models provide statistically significant mean and median signed and absolute valuation errors with the exception of the mean signed error for the PE-1 year. The PE-1 year multiple appears to be the least bias, and most accurate based on median errors. The results contrast those of Frankel and Lee (1998) and Courteau et al. (2006) in the under performance of the direct model compared to multiples-based models. They are however in line with the results of Liu et al. (2002) that claim the ability of forward PE multiples to explain stock prices.

Turning to the cyclical subsample, the PE1 and PE2 show bias, however the 2-year forward PE shows higher accuracy. Although the RIVM shows no bias based on median errors, it is the least accurate model, failing to account for 34% of the value, contradicting De Heer and Koller (2000) and Koller et al. (2005) in the suitability of multi-period methods in valuing cyclical companies. The findings are also in contrast with Copeland et al.'s (2000) claim that the value of cyclical companies cannot be captured in a single price to earnings ratio.

The errors of the acyclical industry show that the PE1 does not provide biased results based on the median errors. However, both RIVM and PE2 indicate the presence of bias, with a tendency to overvalue in the case of RIVM. Similar to the cyclical industry, the acyclical industry shows a lack of accuracy in all valuation models, following the same order of accuracy amongst the models, with RIVM showing double the inaccuracy of the multiple based models.

The findings in general are in line with those of Damodaran (2009), such that relative valuations are closer to market prices compared to multi-period valuations.

3.6.3 Comparison of Valuation Errors between Cyclical and Acyclical Industries

In this section, I compare the valuation errors between the cyclical and acyclical subsamples in table 7 in order to examine whether the models perform better in one industry type compared to the other. A two sample t-test and Wilcoxon test are performed at the 5% level of significance. The null hypothesis is that there is no difference in the valuation errors of the methods when applied to the cyclical and acyclical subsamples.

All three models indicate a difference in the bias based on median errors. RIVM however produces the largest difference between the two subsamples as it has a tendency to overvalue the acyclical subsample.

The accuracy, as measured by the median errors produced show different levels of accuracy for the multiples. However RIVM is expected to produce results with the same level of accuracy in the two subsamples. The multiples produced higher median errors in the cyclical subsample, in line with Damodaran's (2009) claim that more valuation errors are observed in the valuation of cyclical companies, which are due to the difficulty in making accurate projections.

Table 7 - Performance of the Models (Cyclical vs Acyclical Subsample)

	Mean		Mean Diff	P-value	Median		Median Diff	P-value
	Cyclical Subsample (b1)	Acyclical Subsample (b2)			Cyclical Subsample (b1)	Acyclical Subsample (b2)		
Panel:A Signed Prediction Errors (Bias)								
PE1	-0.014	-0.005	-0.009	0.471	-0.057	0.011	-0.067	0.002
PE2	-0.017	-0.010	-0.006	0.577	-0.073	-0.013	-0.060	0.003
RIVM	0.066	0.357	-0.291	<.0001	-0.084	0.182	-0.266	<.0001
Panel:B Absolute Prediction Errors (Accuracy)								
PE1	0.315	0.223	0.092	<.0001	0.240	0.168	0.071	<.0001
PE2	0.267	0.200	0.067	<.0001	0.212	0.146	0.067	<.0001
RIVM	0.441	0.531	-0.090	<.0001	0.337	0.319	0.018	0.664

The table presents the results from two samplet-tests (wilcoxon tests) to test whether the mean (median) signed and absolute errors for each valuation method for the cyclical and acyclical subsamples is equal to zero.

3.6.4 Testing Explanatory Power of the Valuation Models

This section focuses on testing the explanatory power of the valuation models with reference to the actual stock price using univariate regression. The value estimate of each model (the dependent variable) is regressed against the share price as on 15 April of each year (the independent variable) according to the following formula:

$$P = \alpha + \beta * \text{value estimate} + \varepsilon \quad (39)$$

where P is the stock price, α is the intercept, β is the slope coefficient, and ε is the residual errors.

The proportion of the share price explained by the value estimate is represented by the R^2 .

Table 8 - Regression Results

	PE1	PE2	RIVM
Panel A : Pooled Sample			
OLS Coefficient	0.719	0.828	0.646
P-value OLS Coefficient = 0	<.0001	<.0001	<.0001
OLS R ²	0.670	0.722	0.506
Model OLS R ²	0.726		
Incremental OLS R ²	0.000	0.041	0.003
Panel B : Cyclical Subsample			
OLS Coefficient	0.761	0.829	0.713
P-value OLS Coefficient = 0	<.0001	<.0001	<.0001
OLS R ²	0.731	0.763	0.563
Model OLS R ²	0.780		
Incremental OLS R ²	0.009	0.026	0.007
Panel C : Acyclical Subsample			
OLS Coefficient	0.817	0.879	0.369
P-value OLS Coefficient = 0	<.0001	<.0001	<.0001
OLS R ²	0.757	0.782	0.399
Model OLS R ²	0.785		
Incremental OLS R ²	0.000	0.025	0.002

The table presents the results of the regression of the value estimate against price according to the following equation

$$\text{Price} = \alpha + \beta * \text{Value Estimate} + \epsilon.$$

The proportion of the share price explained by the value estimate is represented by the R².

PE1 represents the value based on 1 year forward multiple, PE2 represents the value based on 2 year forward multiple.

Model OLS R² represents the adjusted R² obtained from the regression of the following :

$$\text{Price} = \alpha + \beta_1 * \text{Value Estimate}_{(PE-1)} + \beta_2 * \text{Value Estimate}_{(PE-2)} + \beta_3 * \text{Value Estimate}_{(RIVM)} + \epsilon.$$

Incremental OLS R² is the difference between the adjusted R² for the OLS regression containing all three value estimates and the adjusted R² for the OLS regression which excludes the value estimate in the noted column

In the pooled sample, PE2 provides the highest explanatory power while RIVM provides the lowest explanatory power.

The same trend is observed for the cyclical and acyclical subsamples, however the explanatory power of the multiples-based models is slightly higher for the acyclical subsample compared to the cyclical sample. Moreover, the explanatory power of RIVM is significantly less in the acyclical subsample compared to the cyclical sample.

The higher explanatory power of the PE2 over the PE1 in all three cases is in line with my expectation. However the low explanatory power of RIVM is contrary to my expectation which

could be due to a variety of reasons which I will investigate in the sections to follow. A potential explanation as argued by Sougiannis et al. (2001) could be due to missing information, and the forecast horizon not being long enough.

3.6.5 Testing the Performance of the Models across the Cyclical and Acyclical Subsamples

In this section I compare the bias and accuracy amongst the models in both subsamples by using paired t-testing. My null hypothesis is that there is no difference in valuation errors between the two methods employed for the same sample.

Table 9 - Comparing Valuation Methods for the Same Subsample

	Signed Errors				Absolute Errors			
	Mean		Median		Mean		Median	
	PE2	RIVM	PE2	RIVM	PE2	RIVM	PE2	RIVM
Panel A: Pooled Sample								
PE1	<.0001		<.0001		<.0001		<.0001	
PE1		<.0001		<.0001		<.0001		<.0001
PE2		<.0001		<.0001		<.0001		<.0001
Panel B: Cyclical Subsample								
PE1	0.755		0.0001		<.0001		<.0001	
PE1		<.0001		<.0001		<.0001		<.0001
PE2		<.0001		<.0001		<.0001		<.0001
Panel C: Acyclical Subsample								
PE1	0.100		<.0001		<.0001		<.0001	
PE1		<.0001		<.0001		<.0001		<.0001
PE2		<.0001		<.0001		<.0001		<.0001

The table presents the p-values from the paired t- tests and (signed rank tests) for the mean (median) valuation errors testing whether the valuation errors in each subsample is equal to zero.

The results suggest that there is a difference in the level of accuracy and bias in all the models in the pooled sample.

Similar results are produced for the cyclical and acyclical subsamples based on median errors, at the 5% level of significance. In terms of accuracy, none of the models in the paired test provide the

same levels of accuracy and thus the null hypothesis is rejected in all the cases. PE2 provides the most accurate results for the pooled sample and the cyclical and acyclical subsamples.

3.7 Supplementary Analysis

Having observed the weak performance of the RIVM model compared to the multiple-based models contradicting prior literature, I argue that the weakness could be partially due to the input assumptions of the cost of equity and terminal value calculations, and therefore conduct a sensitivity test on these assumptions.

Further, since the cyclical nature of an industry depends on its behaviour in response to changes in the macroeconomic environment, I test the performance of the valuation models on the two subsamples during a period of economic expansion and a period of economic.

3.7.1 Assumptions Sensitivity Analysis

To conduct the sensitivity analysis, I vary the MRP, the terminal growth rate (g) and the beta. Although cyclical companies are characterized by betas higher than the market beta, and acyclical companies are characterized by low betas, by taking into consideration the determinants of the beta and how it is affected by the financial and operating leverage of individual companies (Hillier et al. 2010), I test RIVM on the two subsamples using a non firm-specific beta of 1.

The results indicate the sensitivity of the value estimates to the variation of the assumed MRP and g . In the base case, the tests show no bias in the cyclical industry based on median errors, while under all other scenarios the result is contrary. It is noticed that the median signed valuation error in the cyclical sample form a wide range under the scenarios, from a low of -

25.3% to a high of -8.4%, showing notable responsiveness to both the MRP and the g. The same is true for the acyclical subsample when comparing the signed valuation errors, with a range from -8.8% to 18.2%.

It is worth noting that the range of the median absolute errors for the cyclical subsample remains to be higher than the PE1 and PE2 absolute errors of 24.0% and 21.2% respectively. The same is true in the case of the acyclical subsample as the absolute errors for PE1 and PE2 are 0.168 and 0.146 respectively as shown in table 6. This indicates that even with the variation of the MRP and g assumptions, the multiples-based methods still produce more accurate results while using the share price as a benchmark.

Table 10 -Valuation Errors Sensitivity Analysis: Market Risk Premium and Growth Rate

	Signed				Absolute			
	Mean	p-value	Median	p-value	Mean	p-value	Median	p-value
Panel A: Cyclical Subsample								
MRP 5% & g 3%	0.066	0.000	-0.084	0.382	0.441	<.0001	0.337	<.0001
MRP 5% & g 1%	-0.056	<.0001	-0.170	<.0001	0.369	<.0001	0.315	<.0001
MRP 6% & g 3%	-0.068	<.0001	-0.201	<.0001	0.422	<.0001	0.365	<.0001
MRP 6% & g 1%	-0.151	<.0001	-0.253	<.0001	0.381	<.0001	0.354	<.0001
Panel B: Acyclical Subsample								
MRP 5% & g 3%	0.357	<.0001	0.182	<.0001	0.531	<.0001	0.319	<.0001
MRP 5% & g 1%	0.088	<.0001	-0.009	0.000	0.340	<.0001	0.252	<.0001
MRP 6% & g 3%	0.201	<.0001	0.059	<.0001	0.447	<.0001	0.295	<.0001
MRP 6% & g 1%	0.002	0.852	-0.088	<.0001	0.325	<.0001	0.264	<.0001

The table presents the mean and median signed and absolute valuation errors of the RIVM for the cyclical and acyclical subsamples under varying market risk premia (MRP) and terminal growth rates (g).

The p-values test whether the valuation errors are equal to zero.

By assuming a beta of 1, a decrease in the absolute median valuation errors is noticed for both the cyclical and acyclical subsamples. The median valuation errors for the cyclical subsample approach those of the PE multiples as shown in table 6, while in the case of the acyclical subsample they remain to be significantly higher. It is worth noting that a significant

decrease is observed in signed errors of the acyclical subsample from being positively biased in the case of the industry median beta, to negatively biased in the case of the beta of 1.

Table 11 - Cyclical and Acyclical Subsample Valuation Errors Sensitivity Analysis: Beta

Beta	Signed				Absolute			
	Mean	p-value	Median	p-value	Mean	p-value	Median	p-value
Panel A: Cyclical Subsample								
Industry Median	0.066	0.000	-0.084	0.382	0.441	<.0001	0.337	<.0001
1	0.032	0.036	-0.088	0.009	0.355	<.0001	0.263	<.0001
Panel B: Acyclical Subsample								
Industry Median	0.357	<.0001	0.182	<.0001	0.531	<.0001	0.319	<.0001
1	-0.160	<.0001	-0.223	<.0001	0.316	<.0001	0.272	<.0001

The table presents the mean and median signed and absolute valuation errors of the RIVM for the cyclical and acyclical subsamples under varying betas; the industry median beta and a beta of 1.

In terms of explanatory power, the R^2 is increased significantly for both the cyclical and acyclical subsamples when a beta of 1 is applied. In the case of the cyclical subsample the R^2 approximates that of the PE valuations in table 8. However, although the explanatory power increases in the acyclical subsample, it still falls behind the explanatory power of the PE multiples. This can potentially be explained by the subsample being dominated by companies from the utilities industry and the unsuitability of the use of multi-period models for such industries.

Table 12 - Regression Results: Sensitivity Analysis Beta

Cyclical Subsample	Industry Median	OLS Coefficient	0.713
		P-value OLS Coefficient = 0	<.0001
		OLS R ²	0.563
	1	OLS Coefficient	0.729
		P-value OLS Coefficient = 0	<.0001
		OLS R ²	0.705
Acyclical Subsample	Industry Median	OLS Coefficient	0.369
		P-value OLS Coefficient = 0	<.0001
		OLS R ²	0.399
	1	OLS Coefficient	0.785
		P-value OLS Coefficient = 0	<.0001
		OLS R ²	0.585

The table presents the results of the regression of the RIVM value estimate against price according to the following equation $Price = \alpha + \beta * Value\ Estimate + \epsilon$ for both subsamples when $\beta = industry\ median$ and $\beta = 1$.

Although the variation of the assumptions indeed demonstrate the sensitivity of the value to the inputs, and may improve the accuracy and explanatory power results, I believe that one should also consider the fact that the markets may not be efficient. This would mean that the share prices may not necessarily reflect the intrinsic value, and may be either over or under valued due to irrational players in the market.

3.7.2 Testing the Performance of the models across different time periods

The time periods are selected based on the gross domestic product (GDP) growth rates over the period 1995 – 2009 ²⁵.

²⁵ The period of economic expansion period represents the years 1995, 1996, 1998, 2002, and 2003, while the period of economic contraction represent the years 2000, 2007, 2008 and 2009.

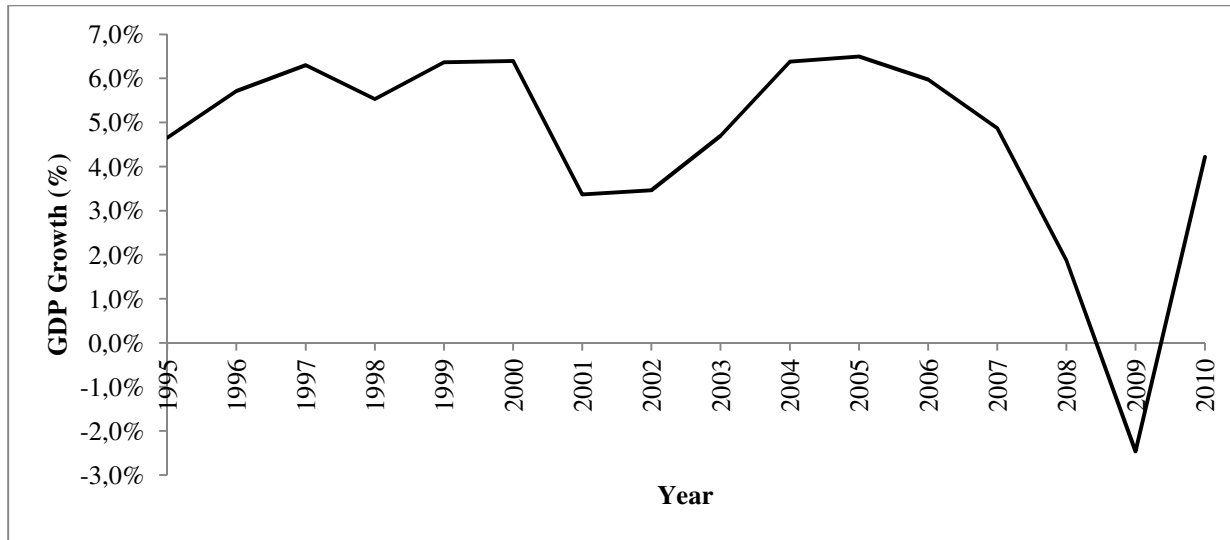


Figure 2 - US GDP Growth Rate (1995 – 2010)
 (Source: US Bureau of Economic Analysts)

Although all models produce inaccurate results, it is noticed that they all produce lower absolute median errors during the economic expansion period in both subsamples. The absolute errors in the case of the cyclical subsample decreases dramatically in the expansion phase and approaches the multiples-based errors. However, in the acyclical subsample RIVM remains to produce valuation errors that are notably higher than those of the multiples-based models in both economic states. This contradicts the findings of Courteau et al. (2006) and Frankel and Lee (1998) regarding the over performance of direct valuation methods compared to multiples-based methods.

Table 13 - Cyclical and Acyclical Subsample Valuation Errors Sensitivity Analysis: Time Variation

Cyclical Sample	Signed Errors				Absolute Errors			
	Mean	P-value	Median	P-value	Mean	P-value	Median	P-value
Panel:A Cyclical Subsample Economic Contraction								
PE1	-0.013	0.615	-0.094	0.033	0.381	<.0001	0.293	<.0001
PE2	-0.010	0.648	-0.070	0.018	0.312	<.0001	0.246	<.0001
RIVM	0.165	<.0001	-0.062	0.147	0.572	<.0001	0.433	<.0001
Panel:B Cyclical Subsample Economic Expansion								
PE1	-0.018	0.336	-0.057	0.034	0.298	<.0001	0.228	<.0001
PE2	-0.026	0.111	-0.087	0.002	0.267	<.0001	0.228	<.0001
RIVM	0.223	<.0001	0.127	<.0001	0.407	<.0001	0.271	<.0001
Panel:C Acyclical Subsample Economic Contraction								
PE1	-0.012	0.363	-0.011	0.134	0.254	<.0001	0.191	<.0001
PE2	-0.018	0.148	-0.027	0.007	0.240	<.0001	0.188	<.0001
RIVM	0.649	<.0001	0.432	<.0001	0.771	<.0001	0.509	<.0001
Panel:D Acyclical Subsample Economic Expansion								
PE1	-0.002	0.829	-0.014	0.280	0.222	<.0001	0.160	<.0001
PE2	-0.006	0.553	-0.025	0.008	0.194	<.0001	0.133	<.0001
RIVM	0.403	<.0001	0.273	<.0001	0.514	<.0001	0.332	<.0001

Panel A and B present the mean and median signed valuation errors and corresponding p-values testing whether they are equal to zero for the cyclical subsample in periods of economic contraction and economic expansion.

Panel C and D present the mean and median signed valuation errors and corresponding p-values testing whether they are equal to zero for the acyclical subsample in periods of economic contraction and economic expansion.

The table below shows the explanatory power of each of the valuation models during the two periods.

Table 14 - Time Variation Sensitivity Analysis Regression Results

		PE1	PE2	RIVM	
Cyclical Subsample	Economic Contraction	OLS Coefficient	0.767	0.878	0.660
		P-value OLS Coefficient	<.0001	<.0001	<.0001
		OLS R ²	0.679	0.722	0.519
	Economic Expansion	OLS Coefficient	0.772	0.877	0.643
		P-value OLS Coefficient	<.0001	<.0001	<.0001
		OLS R ²	0.717	0.746	0.717
Acyclical Subsample	Economic Contraction	OLS Coefficient	0.833	0.896	0.300
		P-value OLS Coefficient	<.0001	<.0001	<.0001
		OLS R ²	0.719	0.747	0.361
	Economic Expansion	OLS Coefficient	0.811	0.903	0.388
		P-value OLS Coefficient	<.0001	<.0001	<.0001
		OLS R ²	0.692	0.724	0.515

The table presents the results of the regression of the value estimate against price according to the following equation

Price = $\alpha + \beta * \text{Value Estimate} + \epsilon$ for both subsamples in both states of the economy.

It is observed that the explanatory power of the models for the cyclical subsample increases in the expansion compared to the contraction period. It is especially noticeable in the case of RIVM, as the R^2 approaches that of the multiples-based R^2 during the expansion period.

In the case of the acyclical subsample the explanatory power of RIVM increases significantly during the expansion phase, while it decreases slightly for the multiples-based methods.

Despite the improvement of the explanatory power of RIVM in the cyclical and acyclical subsamples in during economic expansion, the PE2 remains to provide the highest explanatory power.

3.8 Conclusion

The results show that the PE multiples performed considerably well in valuing the two types of industries over the full period in addition to the periods of economic expansion and contraction, with the PE2 consistently showing higher explanatory power. These findings can be linked to those of Liu et al (2002), claiming that multiples communicate the core of the more complex methods, and are as a result often used as a substitute method. The findings of this study however contradict Frankel and Lee (1998) and Courteau et al. (2006) who claim that the superiority of complete valuation approaches.

A surprising finding is the outperformance of the PE multiples compared to RIVM for the cyclical subsample which contradicts Koller et al (2005), De Heer and Koller (2000) and Copeland et al. (2000). I believe that the weak performance of the RIVM model can be attributed to the computation of the discount rate and its assumptions, terminal growth assumptions, quality of earnings forecasts in addition to the position of the company within the cycle. This is

demonstrated through the improved performance of RIVM in the period of economic expansion compared to economic contraction, and the use of a non firm-specific beta.

Regarding the performance of the RIVM in the acyclical industry, the results show that the errors vary with the variation in the market risk premium and the beta. Moreover the large valuation errors in the acyclical subsample could potentially be due to subsample being dominated by companies from the utilities industry, which may be better valued using other methods.

4. Chapter Four: Small Sample Analysis

4.1 Introduction

In this chapter of the dissertation I investigate a sample of equity research reports to study the valuation methods financial analysts use in practice for both the cyclical and acyclical industries. I also assess the relationship between analyst recommendations and the state of the economy for both industry types, in addition to the behavior of revenue over the projection period. Finally, I look into the discount rates used in DCF valuations in the cyclical and acyclical subsamples.

4.2 Research Question and Hypothesis Development

The choice of valuation methods in practice often differs from what is suggested to be the superior method in academic research. For example, Morgan Stanley Dean Witter's analysts use price to earnings ratio as their preferred multiple, followed by EV/EBITDA²⁶, RIVM, with the DCF method standing in fifth place (Fernandez 2002). Penman (2010) and Koller et al. (2005) on the other hand claim that DCF is the most widely used valuation method. Such variations in valuation methods bring about the question of what valuation methods analysts use to value firms in cyclical and acyclical industries. Moreover, since the cyclicity of a company relies on its behavior in response to the overall economy, and as the performance of valuation methods differs depending on the state of the economy as observed in the large sample analysis, the question of whether the choice of valuation method differs according to the state of the economy is raised. As mentioned previously, De Heer and Koller (2000) and Koller et al. (2005) suggest that a multi-period methods such as DCF is more appropriate for cyclical companies as it deals with cycles more appropriately, and reduces the projected earnings to a single number. On the

²⁶ Enterprise Value-to-Earnings Before Interest Tax Depreciation and Amortization

other hand, multiples-based methods are regarded to be appropriate for industries that have relatively consistent and steady growth (Demirakos et al. 2004), and thus are regarded to be suitable for valuation of acyclical industries.

Further, as cyclical companies are expected to perform well during an economic boom and weakly during an economic recession, I test whether this behaviour is reflected in the analysts' recommendations. My prediction is to find a higher number of positive recommendations during an economic expansion compared to an economic contraction. Similarly, I perform the same test on the acyclical subsample, expecting to find no strong association as firms in such industries are characterized by being less responsive to the state of the economy.

I then move to my next test which aims to examine the relation between the economic state and the projected revenue growth rate of the two types of industries. I expect that the analysts' projections will result in finding a larger difference between the growth rates in the period of economic expansion compared to the period of economic contraction for the cyclical subsample. I also conduct the test for the acyclical subsample and expect there to be no significant relationship between the growth rates in the two states of the economy.

Finally, according to Brealey and Myers (2003), higher rates of return should be expected from firms with performance linked to the state of the economy. Thus, I expect analysts to use higher discount rates in the DCF valuations of cyclical companies compared to acyclical companies.

4.3 Methodology

The methodology used in this chapter is partially adopted from Demirakos et al. (2004). The dominant valuation method(s) is (are) considered to be the method(s) mentioned in the valuation narrative justifying or leading to the calculation of analyst target price. In the event only one dominant valuation method is used, this method is allocated a full score of 1, whereas when more than one method is used, the score is divided equally amongst the methods.

In testing the hypothesis regarding the analyst recommendations in the different states of the economy, the recommendations are simply counted from each report and classified accordingly.

With regard to testing the projected revenue growth rate, I calculate the revenue growth of all of the companies in both types of industries for each year of the projection period, and set the median²⁷ growth rate as a benchmark against which I compare the forecasts of each company.

Finally, in examining the difference in the discount rate used in the cyclical versus the acyclical subsample, I obtain the discount rate²⁸ mentioned explicitly in the report. In cases where the rate is not mentioned explicitly, I selected the mid rate of the range provided in the report.

4.4 Data and Sample Selection

The data used in this analysis is obtained from a selection of equity research reports prepared by investment banking and brokerage house analysts. The reports were obtained from Thomson Research, a provider of a comprehensive collection of information and analyst research reports covering over 30,000 companies worldwide.

²⁷The median is selected as opposed to the mean in order to reduce the effect of outliers.

²⁸ Also referred to as WACC (weighted average cost of capital).

The reports used in the analysis were also selected based on the cyclical and acyclical industry classification in Boudoukh et al. (1994). Part of the selection criteria is for the reports to include an equity valuation, stock recommendation, and a summary projected income statement. Similar to the practice in Demirakos et al. (2004), in order to avoid the results from being influenced by the way one particular brokerage firm analyses and values companies, the reports were selected from a range of brokerage houses.

Moreover, as the cyclicity of an industry is determined based on the behavior of its firms in relation to macroeconomic factors, two brokerage reports were selected for each firm in order to assess a report on each firm during a period of economic expansion and economic contraction. This criteria is added in the selection process in order to examine the report not only on the basis of cyclicity, but also in light of the analysts' expectations based on the economic state. The reports for each company are obtained from the same brokerage house for both periods in order to control for the difference in the practice of analysts from influencing the results when comparing across periods.

Similar to the large sample, the gross domestic product (GDP) growth is selected as a measure of economic performance. I selected the last quarter in 2008 and first quarter in 2009 as the period of economic contraction, and the year 2010 as the period of economic expansion as demonstrated in the graph below.

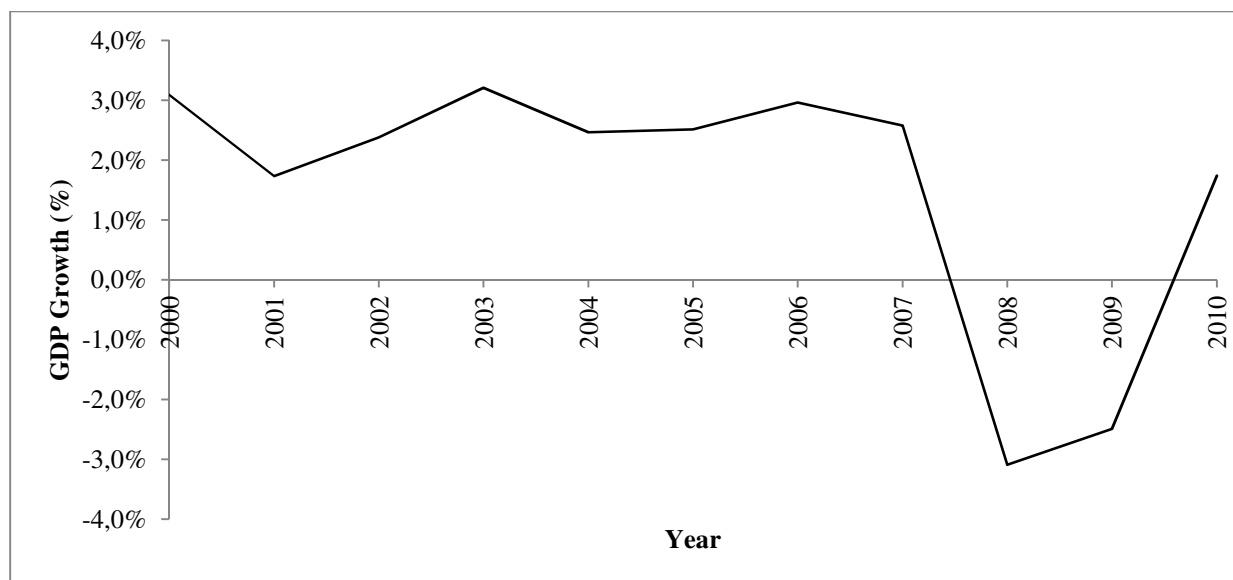


Figure 3 - UK GDP Growth
(Source: National Statistics Online)

The reports selected for the analysis are presented in the table below:

Table 15 - Sample Reports

Cyclical Subsample				Acyclical Subsample			
Industry	Company	Author	Date	Industry	Company	Author	Date
Transportation Equipment	GKN	RBS	2008	Food and Beverage	Associated	RBS	2008
		RBS	2010		British Foods	RBS	2010
	BAE Systems	DB	2009		Premier Foods	RBS	2009
		DB	2010		Diageo	RBS	2010
	Rolls-Royce	CS	2009		CS	2009	
		CS	2010		CS	2010	
Primary Metals	International Ferro Metals	N	2008	Tobacco	British American Tobacco	MS	2009
		N	2010		MS	2010	
	Rio Tinto	DB	2008		Imperial Tobacco	DB	2009
		DB	2010		DB	2010	
Rubber and Plastics	RPC Group	I	2009	Utilities	United Utilities	DB	2008
		I	2010		DB	2010	
	Bunzl	HSBC	2009		Pennon Group	HSBC	2009
		HSBC	2010		HSBC	2010	
	Tomkins	DB	2008		Centrica	MS	2008
		DB	2010		MS	2010	

CS: Credit Suisse, DB: Deutsche Bank, I: Investec, MS: Morgan Stanley, N: Numis, RBS: Royal Bank of Scotland.

The table below provides summary statistics of the sample reports:

Table 16 - Summary Statistics for the Sampled Companies and Reports

	Firms			Equity Research Reports				
	Number of Firms in			TNPg	MVPg	MdVPg	Rp/SSAB	Rp/F
	Sample	FTSE All Share Index	FTSE 100					
Cyclical	16	8	4	214	13.4 (5-37)	11.0	2.7	2
Acyclical	16	8	6	196	12.3 (6-26)	11.5	3.2	2

TNPg = Total number of pages of the reports

MVPg = Mean value of pages of report (range of pages per report in parenthesis)

MDVPg = Median value of pages of report

Rp/SSAB = Number of reports per sell-side brokerage house

Rp/F = Number of reports per sample firm

Table 17 - Profile of Samples Industry Types

Industry	Annualized Sales Growth	Volatility of Earnings Changes	MTBV	Beta
Cyclical	10.74% (10.51%)	5.88% (10.60%)	1.75 (0.87%)	1.15 (0.86%)
Acyclical	11.67% (7.56%)	6.03% (3.95%)	2.82 (1.73%)	0.47 (0.12%)

The first number represents the median, while the number in parentheses represents the interquartile range

The interquartile range is the difference between the third quartile and first quartile

Annualized sales growth is the geometric average sales growth of each firm.

Volatility of earnings changes is the firm-specific standard deviation of the annual change in earnings deflated by average sales.

MTBV = market to book value

(Source: Thomson ONE Banker)

The descriptive statistics in table 17 provide a reflection of characteristics of each subsample. In terms of annualized sales growth, the acyclical subsample has a higher median, however the cyclical subsample has a higher interquartile range. Although the acyclical subsample has higher median volatility of earnings, the interquartile range of the cyclical subsample is more than twice of that of the acyclical subsample thereby reflecting the higher volatility of earnings of cyclical companies. Moreover, the acyclical subsample has a considerably lower median market beta compared to the cyclical subsample, also lower than the market beta. While the cyclical

subsample on the other hand has a median market beta greater than 1. The results are therefore in line with my expectations reflecting the characteristics of the cyclical and acyclical companies.

4.5 Hypotheses Testing

4.5.1 Testing the association between industry cyclicality and the valuation method

A variety of valuation methods are used in the reports. They vary from multiples-based methods using different drivers, to multi-period methods, industry specific methods, and in some cases, a combination of methods. For the purpose of analysis, the methods are categorized into the following three groups; multiples-based models, multi-period models, and other models.

The tables below present the scoring of the valuation methods in the reports:

Table 18 - Cyclical Subsample Dominant Valuation Models

	Company	Multiple-based			Multi-period			Other
		PE	EBIT	EBITDA	DDM	APV	DCF	
Panel a: Cyclical Industries - Economic Expansion								
Transportation Equipment	GKN						1.00	
	BAE Systems		1.00					
	Rolls-Royce						1.00	
Primary Metals	International Ferro Metals	0.50						0.50
	Rio Tinto						1.00	
	RPC Group	1.00						
Rubber & Plastics	Bunzl	1.00						
	Tomkins		1.00					
	<i>Cyclical Industries Economic Expansion Total</i>	2.50	2.00				3.00	0.50
		31%	25%				38%	6%
Panel b: Cyclical Industries - Economic Contraction								
Transportation Equipment	GKN						1.00	
	BAE Systems		1.00					
	Rolls-Royce						1.00	
Primary Metals	International Ferro Metals						1.00	
	Rio Tinto						1.00	
	RPC Group	1.00						
Rubber & Plastics	Bunzl	0.50					0.50	
	Tomkins		1.00					
	<i>Cyclical Industries Economic Contraction Total</i>	1.50	2.00				0.50	4.00
		19%	25%				6%	50%

The table above shows the valuation methods used for each company in arriving at the target price.

PE: Price to Earnings Multiple
EBIT: Earnings Before Interest and Tax
EBITDA: Earnings Before Interest Tax Depreciation and Amortization
DDM: Dividend Discount Model
APV: Adjusted Present Value Method
DCF: Discounted Cash Flow Method
Other: Industry Specific Methods

Table 19 - Acyclical Subsample Dominant Valuation Models

	Company	Multiple-based			Multi-period			Other
		PE	EBIT	EBITDA	DDM	APV	DCF	
Panel a: Acyclical Industries - Economic Expansion								
Food & Beverage	Associated British Foods						1.00	
	Premier Foods			1.00				
	Diageo	1.00						
Tobacco	British American Tobacco	1.00						
	Imperial Tobacco						1.00	
	United Utilities			0.50				0.50
Utilities	Pennon Group				0.33		0.33	0.33
	Centrica	0.25		0.25			0.25	0.25
<i>Acyclical Industries Economic Expansion Total</i>		2.25		1.75	0.33		2.58	1.08
		28%		22%	4%		32%	14%
Panel b: Acyclical Industries - Economic Contraction								
Food & Beverage	Associated British Foods						1.00	
	Premier Foods			1.00				
	Diageo						1.00	
Tobacco	British American Tobacco						1.00	
	Imperial Tobacco						1.00	
	United Utilities			0.50				0.50
Utilities	Pennon Group			0.33			0.33	0.33
	Centrica	0.25		0.25			0.25	0.25
<i>Acyclical Industries Economic Contraction Tot</i>		0.25		2.08			4.58	1.08
		3%		26%			57%	14%

The table above shows the valuation methods used for each company in arriving at the target price.

PE: Price to Earnings Multiple

EBIT: Earnings Before Interest and Tax

EBITDA: Earnings Before Interest Tax Depreciation and Amortization

DDM: Dividend Discount Model

APV: Adjusted Present Value Method

DCF: Discounted Cash Flow Method

Other: Industry Specific Methods

The hypotheses are as follows:

H1₀: There is no association between the cyclicity of the company and valuation method used

H1₁: The method used is dependent on the cyclicity of the company.

Table 20 - Cyclical and Acyclical Subsamples Dominant Valuation Methods

	Multiple-based	Multi-period	Other
Cyclical Companies	8.00	7.50	0.50
<i>%</i>	<i>50%</i>	<i>47%</i>	<i>3%</i>
Acyclical Companies	6.33	7.50	2.17
<i>%</i>	<i>40%</i>	<i>47%</i>	<i>14%</i>
All	14.33	15.00	2.67
Chi square = 1.24			
The table presents the frequency of valuation methods used in the cyclical and acyclical subsamples and the corresponding chi square value.			

Table 20 above shows that the use of multiples-based methods slightly exceeds the multi-period methods for the cyclical subsample. In the case of the acyclical subsample, the multi-period models are used more frequently. The use of “other models” is found to be more frequent in the acyclical subsample compared to the very limited use in the cyclical subsample.

The results of the testing do not allow the rejection the null hypothesis at the 5% level of significance, and thus no association can be concluded between the cyclicity of the industry and the valuation method. The results are therefore contrary to my expectation of the reliance of analysts on multi-period methods in the valuation of firms in cyclical industries based on De Heer and Koller (2000) and Koller (2005), and also the reliance of multiple-based methods for the firms in the acyclical industries.

4.5.2 Testing the association between industry cyclicality and the state of the economy

I also examine whether or not the valuation methods used in each of the subsamples differs according to the state of the economy. My expectation is that the same method is used in the two economic states on the basis of the valuation methods being appropriate for the type of companies based on their characteristics rather than the state of the economy.

H₂₀: There is no association between the valuation method used and the state of the economy

H₂₁: The method used is dependent on the state of the economy

Table 21 - Cyclical Subsample Valuation Methods Based on Economic State

	Multiple-based	Multi-period	Other
Economic Expansion	4.50	3.00	0.50
	56%	38%	6%
Economic Recession	3.50	4.50	0.00
	44%	56%	0%
All	8.00	7.50	0.50

Chi Square = 0.93

The table presents the frequency of valuation methods used in the two economic states for the cyclical subsample and the corresponding chi square value.

Table 22 - Acyclical Subsample Valuation Methods Based on Economic States

	Multiple-based	Multi-period	Other
Economic Expansion	4.00	2.92	1.08
	50%	36%	14%
Economic Recession	2.33	4.58	1.08
	29%	57%	14%
All	6.33	7.50	2.17
Chi Square = 0.81			
The table presents the frequency of valuation methods used in the two economic states for the acyclical subsample and the corresponding chi square value.			

The results in the tables above show chi-square values for the cyclical and acyclical subsamples of 0.93 and 0.81 respectively, implying that there is no association between the valuation method used and the state of the economy.

4.5.3 An insight into the valuation methods used in the reports

Although analysts select certain dominant methods, they often explicitly rely on other methods as “sanity checks”. Moreover, a lot of subjective judgment is observed in the implementation of the valuation methods, as premia and discounts are applied to valuations as deemed appropriate by the analysts.

GKN Plc²⁹, a company in the cyclical subsample, is valued based on the DCF method with a discount of 22%. The analyst mentions that the discount rate is arbitrary, but explains that the subjectivity is due the expectation of the next cyclical downturn, and difficulty of the prediction of the tax losses. Subjectivity in valuation is also evident in the case of BAE Systems Plc³⁰, as a

²⁹ Morris, S., Royal Bank of Scotland, 10 November 2010.

³⁰ Fidler, B., Deutsche Bank, 26 July 2010.

discount of 10% is applied to one of its business lines to reflect growth concerns, however without showing explicit justification as to how the 10% is arrived at.

The analysts covering GKN Plc³¹ use the DCF method in both economic states. They mention in the report during the economic contraction period that they had previously relied on a peer group in their valuation, but find that the DCF is more appropriate as consensus forecasts are lagging behind. Their choice of valuation method links with the opinion of De Heer and Koller (2000) and Koller et al. (2005), as they claim that models such as the DCF are able to address the challenge of cyclicity in valuations.

A company in the Rubber and Plastics industry³² is valued based on the two year forward PE trading multiples from the previous recession and recovery in 2001 – 2003. The choice of selecting two year forward trading multiples is in line with Kim and Ritter (1999) and Lie and Lie (2002), such that accuracy of the valuation increases with the increase in the forecast horizon based on Liu et al. (2002).

With regard to the acyclical subsample, Diageo Plc, a company operating in the food and beverage industry is valued using the PE multiple but with the application of a discount to the group average, justified by the company's underlying EBIT trends compared to their industry³³. In the valuation of Associated British Foods Plc³⁴, the DCF method is used, however, a discount of 10% is applied, which the analysts mention is in line with the approach they use for the valuation of that sector. The 10% discount is applied by this particular analyst for the valuation of the food and beverage industry in the reports of both states of the economy.

³¹ Morris, S., Royal Bank of Scotland, 10 November 2010.

³² Bunzl Plc – Lloyd, M., HSBC, 8 March 2010.

³³ Diageo Plc – Bucalo, A., Bleakley, M., and O'Connor, L., Credit Suisse, 7 April 2010.

³⁴ Associated British Foods Plc - Hardwick, J. & Simpson, I., Royal Bank of Scotland, 14 January 2010.

The valuation of the utilities industry stood out compared to the other industries in as they were all valued using the sum of the parts method. All three utility companies³⁵ in the sample were partly valued using the regulatory asset base valuation (RAB) and multiples method. The same valuation methods were used in the periods of economic expansion and contraction for two out of the three utility companies.

The use of the RAB valuation for utility companies could be of particular significance regarding the results of the large sample analysis. The acyclical subsample in the large sample analysis is dominated by the utility companies, due to their large number compared to the other companies in the subsample. As the RIVM performed weakly compared to the multiple-based models for the acyclical subsample, the use of RAB in the valuation of utility companies could indicate that industry specific methods are more appropriate for valuing utility companies.

4.5.4 Testing the association between the analyst recommendations and the state of the economy

H3₀: No association exists between the analyst recommendation and state of the economy.

H3₁: The analyst recommendation is not independent of the state of the economy.

Table 23 - Cyclical Subsample Investment Recommendations

	Buy	Hold
Economic Expansion	6	2
(%)	75%	25%
Economic Contraction	4	4
(%)	50%	50%

Chi Square = 1.07

The table presents the number of companies in the cyclical subsample receiving buy and hold recommendations in both states of the economy.

³⁵ Centrica Plc, Penon Group Plc & United Utilities Plc.

As expected for the cyclical subsample, the number of positive recommendations is higher during the period of economic expansion compared to the period of economic contraction. However, the number of positive recommendations during the period of economic contraction is equal to the number of neutral recommendations.

All the companies in the Transportation Equipment and Primary Metals industries received positive recommendations during the period of economic expansion. The analyst covering GKN Plc justifies the recommendation through the growth of its revenues as due to economic recovery³⁶. International Ferro Metals Plc, also received a strong buy recommendation, due to a favourable outlook on ferrochrome prices and opportunities once economic problems ease in Europe³⁷. Bunzl Plc, a player in the Plastics and Rubber industry also obtained a positive recommendation, upgraded from neutral to overweight, with the removal of the volatility indicator³⁸, supported by a valuation that is based on the recession and recovery in 2001 – 2003³⁹.

The hold recommendations were received by companies in the Plastics and Rubber industry. RPC Group Plc⁴⁰ obtained a hold recommendation as the analyst has uncertain views the economic condition as being uncertain. Their view is more conservative than other analysts, which could be due to the extent of the downturn in 2008 and 2009. The recommendation for Tomkins Plc was also kept as hold, however the report acknowledges the recovery in the sector and thus the forecasts and target price are raised⁴¹.

³⁶ Morris, S., Royal Bank of Scotland, 10 November 2010.

³⁷ Davidson, A., Numis Securities Ltd, 28 May 2010.

³⁸ An indicator used by HSBC to reflect stocks with historical volatility

³⁹ Bunzl Plc – Lloyd, M., HSBC, 8 March 2010.

⁴⁰ Lawson, J., et al..Investec Securities, 12 February 2010.

⁴¹ Reily, P., Deutsche Bank, 7 May 2010.

As for the period of the economic recession, a hold recommendation was given to Rio Tinto Plc due to potential challenges in obtaining financing and risks for breaching debt covenants⁴². The hold recommendation of Bunzl Plc in 2008 is explicitly linked to the cyclical nature of the business. The report mentions employment as being a factor affecting performance, as a decline in the number of employees in grocery stores and janitors has a direct impact on their business, and poses pressure on margins⁴³. Although in a recession, the analysts covering Tomkins Plc surprisingly upgrade the recommendation from sell to hold while decreasing forecasts and target price, they admit that most readers will find the upgrade strange considering the weak markets, but justify it through their expectation of 2010 to be a recovery year⁴⁴.

In the case of the cyclical subsample companies that obtained a buy recommendation during the recession, (GKN Plc, BAE Systems Plc, Rolls Royce Plc and International Ferro Metals Plc) this does not necessarily mean that such companies are expected to do well during the downturn. For example, although GKN Plc was given a positive recommendation, the target price was reduced from GBP 3 to GBP 2, and the forecasts were also decreased. However the analyst justifies his recommendation based on the expected recovery in the years to follow⁴⁵. The analyst covering International Ferro Metals Plc acknowledges the challenge and the effect the downturn will have on the company, but also shows an optimistic view in that the company will survive it⁴⁶.

⁴² Clifford, R., Deutsche Bank, 27 November 2008.

⁴³ Lloyd, M., Kumar, R., HSBC, 25 February 2009.

⁴⁴ Reilly, P., & Wilkie, M., Deutsche Bank, 10 November 2008.

⁴⁵ Morris, S., Royal Bank of Scotland, 4 November 2008.

⁴⁶ Toyne, S., et al., Numis, 13 November 2008.

The testing produced a chi square of 1.07, which does not allow the rejection of the null hypothesis at the 5% level of significance, and thus an association between the state of the economy and cyclical firms cannot be statistically concluded.

The same test is conducted on the acyclical subsample and provided the following results:

Table 24 - Acyclical Subsample Investment Recommendations

	Buy	Hold
Economic Expansion	5	3
(%)	63%	38%
Economic Contraction	6	2
(%)	75%	25%
Chi Square =0.029		

The table presents the number of companies in the acyclical subsample receiving buy and hold recommendations in both states of the economy.

As expected, no relation is observed between the cyclicity and the state of the economy, as more buy compared to hold recommendations were received in both periods. Further, the number of buy recommendations is higher during the period of economic contraction compared to economic expansion, which is not atypical for acyclical companies.

In the tobacco industry, British American Tobacco Plc received a hold recommendation, which was justified by the company having access to the world's fastest growth profit pools although it was also said to have the weakest volume performance in the peer group⁴⁷. Centrica plc, a player in the utilities industry received a buy weighting, as the analysts said the company was ahead of competitors due to its ability to increase margins by cutting costs without

⁴⁷ McCullagh, T. et al., Morgan Stanley, 28 July 2010.

increasing prices⁴⁸. United Utilities Plc, is also given a buy recommendation justified by higher profits before tax from the higher profits in the water and sewerage businesses⁴⁹.

Only two companies received hold recommendations in during the economic contraction. Associated British Foods Plc, received a hold rating as it is expected to have modest reduction in profits due to higher interest costs from recent investment in capital expenditure and decrease in sugar prices⁵⁰. Centrica, received a downgrade from buy to hold mainly due to the risks involved in a potential acquisition deal and a rights issue⁵¹.

The other remaining companies received buy recommendations despite the state of the economy.

These findings from both subsamples are surprising to a certain degree as one may argue that it is not normal to not have any sell recommendations in a sample of 36 analyst reports, half of which are selected from a period of economic contraction, especially in the case of firms in the cyclical industry. These results could be linked to existing literature on the behavior of analysts. Michaely and Womack (1999) argue that conflict of interests exists in the different functions of investment banks which may lead to less objectivity and making positively biased recommendations. Considering the challenges involved in forecasting earnings and making recommendations in the case of cyclical companies, it is reasonable to consider Hurberts and Fuller's (1995) argument that forecast bias exists for companies that were difficult to predict in previous periods. They also suggest that incentives may result in analysts being more optimistic in their forecasts as investors will not be able to allocate how much of the forecast error is due to

⁴⁸ Chada, B., et al., Morgan Stanley, 2 August 2010.

⁴⁹ Brand, J. & Brough, M., , Deutsche Bank, 17 May 2010.

⁵⁰ Hardwich, J. & Simpson, I., Royal Bank of Scotland, 24 November 2010.

⁵¹ Chada, B., et al., Morgan Stanley, 10 November 2008.

the analysts and how much is due to the difficulty of forecasting the company. The findings of Das et al. (1998) confirm those of Hurberts and Fuller (1995) in that over optimism of earnings is observed to be higher for companies of low predictability compared to those of high predictability.

4.5.5 Testing the association between the projected revenue growth and economic state

H₀: No association exists between the projected growth of revenue and the state of the economy.

H₁: The projected growth of revenue is not independent of the state of the economy.

As expected, the revenue growth rates in the cyclical subsample are more responsive to the state of the economy than the acyclical subsample. Thus higher revenue growth rates are expected in the period of economic expansion, and lower rates in the period of economic contraction.

Table 25 - Cyclical Subsample Projected Revenue Growth Rates

	<5 %	>=5 %
Economic Expansion	3	5
(%)	38%	63%
Economic Contraction	4	4
(%)	50%	50%

Chi Square = 0.29

The table presents the number of companies in the cyclical industry with revenue forecast growth above and below the median revenue forecast growth (5%) in both economic states.

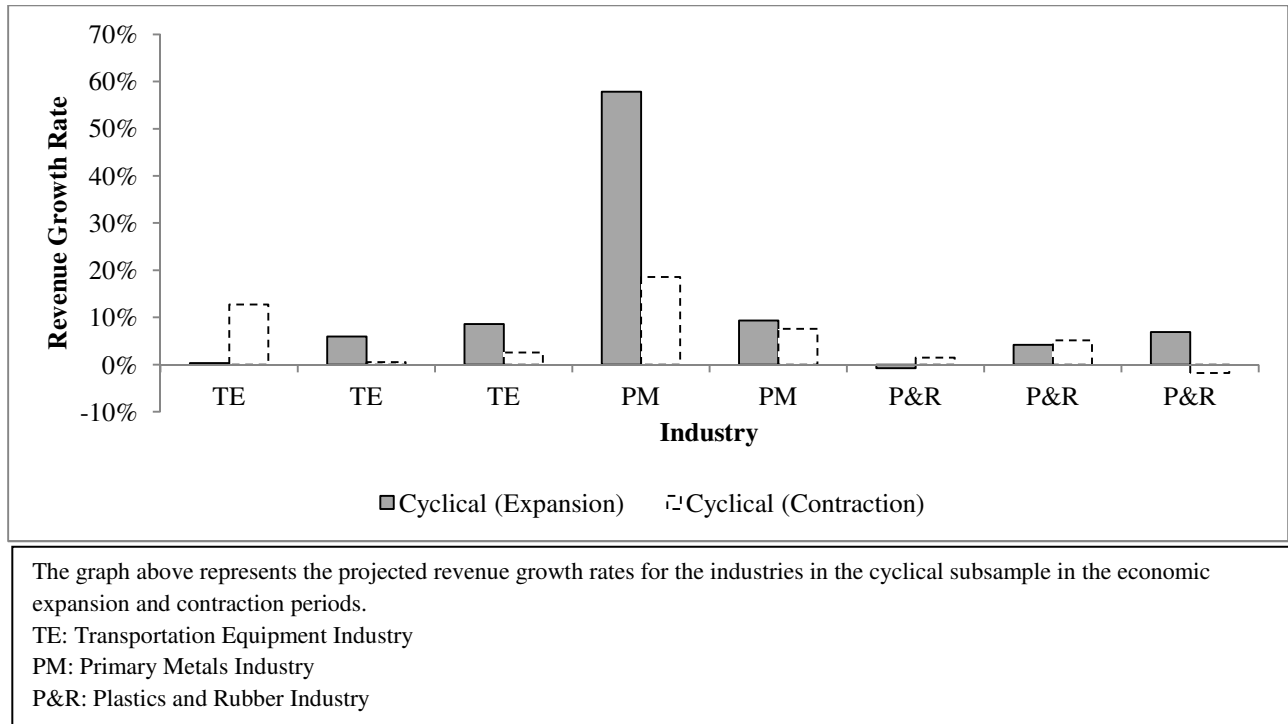


Figure 4 - Cyclical Subsample Projected Revenue Growth Rate

The number of high and low revenue growth rates is equal during the period of economic contraction, which is contrary to my expectation of there being more companies with lower predicted growth rates during a contraction. Such results can be due to guaranteed business and pre-signed contracts which reduces the effect of the economic contraction on the revenue. Moreover, it can also be linked to analyst positive bias, as argued by Hurbert and Fuller (1995) and Das et al. (1998).

The test results in a chi square value of 0.29 which does not allow rejecting the null hypothesis at the 5% level of significance.

As for the acyclical sample, the findings are interesting and contrary to my expectation. The number of companies showing high growth rates during the economic expansion period is lower than the number of companies with low growth rates. Similarly, the number of companies with

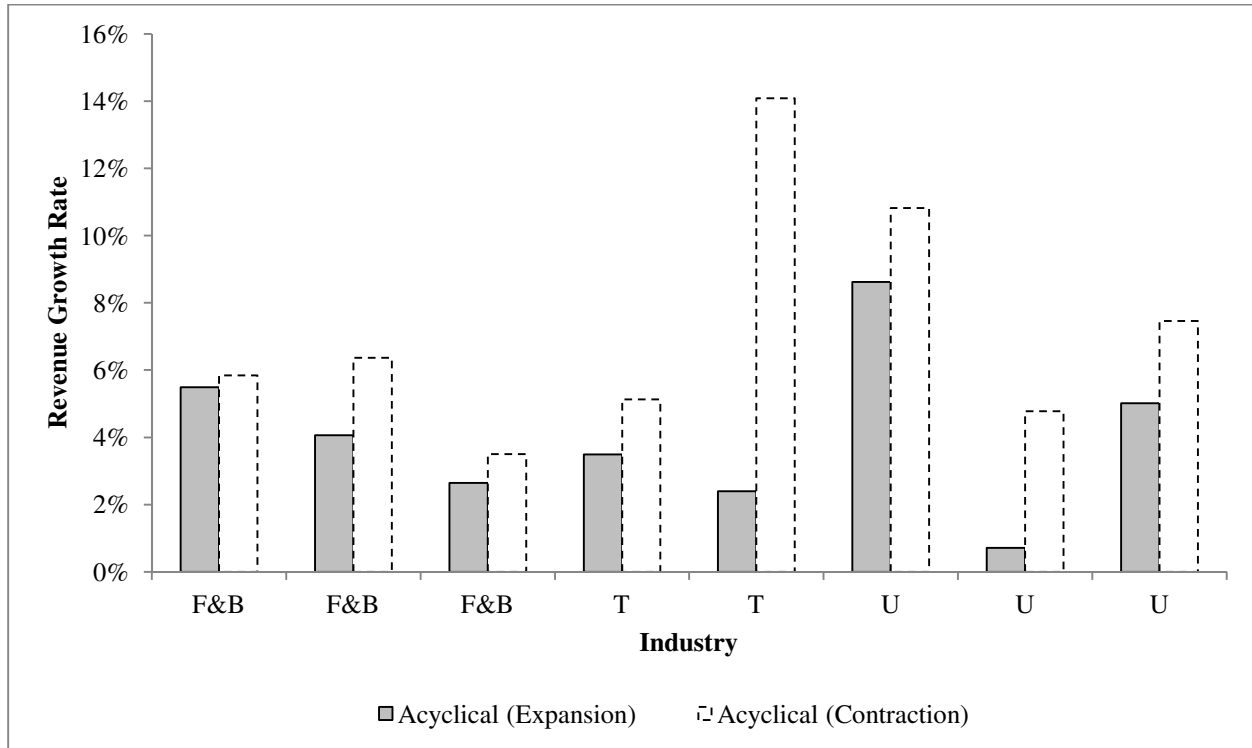
high growth rates during the period of economic contraction is higher than the number of companies with low growth rates.

Table 26 - Acyclical Sample Revenue Growth Rates

	<5%	>=5%
Economic Expansion	5	3
(%)	63%	38%
Economic Contraction	1	7
(%)	13%	88%

Chi Square = 4.27

The table presents the number of companies in the acyclical industry with revenue forecast growth above and below the median revenue forecast growth (5%) in both economic states.



The graph above represents the projected revenue growth rates for the industries in the acyclical subsample in the economic expansion and contraction periods.

F&B: Food and Beverage Industry

T: Tobacco Industry

U: Utilities Industry

Figure 5 - Acyclical Subsample Projected Revenue Growth Rate

A chi square result of 4.27 is obtained, which indicates the rejection of the null hypothesis at the 5% level of significance. The results however are most reasonably interpreted by the weak or

lack of association between the high growth rates in the expansionary state of the economy rather than a relation between higher growths due to the economic contraction. The results are more likely to reflect that the strong growth rates during economic contraction are a reflection of the companies' positive expected performance due firm specific reasons.

4.5.6 Testing the association between the discount rates and cyclicity of the industry

H5₀: No association exists between the discount rate and the cyclicity

H5₁: The discount rate is not independent of the cyclicity

Table 27 - Association between Discount Rates and Industry Cyclicity

	≤8 %	>8 %
Cyclical	2	7
(%)	22%	78%
Acyclical	5	2
(%)	71%	29%
Chi Square = 3.87		
The table shows the number of companies in the two subsamples valued using the DCF method with discount rates above and below the median discount rate of all the valuations in the sample of 8%		

As anticipated, the results indicate that the discount rates analysts use for the companies in the cyclical subsample are relatively higher than the rates used for the acyclical subsample. The chi square test allows the rejection of the null hypothesis at the 5% level of significance, and thus it can be statistically concluded that the rate of return is dependent on the cyclicity of the company, in line with Brealey and Myers (2003).

4.6 Conclusion

The small sample analysis provides a valuable insight into how equity analysts value companies of different industry classifications. It is evident from the analysis that analysts do take into account the nature of the industry in some cases when selecting the method of valuation⁵². Moreover, the reports demonstrate how analysts take macroeconomic factors into account to a larger extent when valuing companies and making investment recommendations for companies in the cyclical subsample compared to the acyclical subsample. The analysis also shows that forecasts of the cyclical subsample are more responsive to macroeconomic factors compared to the acyclical subsample, as evident in the testing of the projected revenue growth rate. Finally, the findings show that analysts use relatively higher discount rates in the valuation of cyclical companies compared to acyclical companies thereby reflecting the higher risk in cyclical companies.

* See Appendix (f) for extracts from annual reports reflecting the cyclical and acyclical natures of the companies.

⁵² For example in the case of GKN Plc.

5 Chapter Five: Limitations and Recommendations

Due to the scope of this dissertation, the selection of companies for cyclical and acyclical subsamples was based on industry classification in Boudoukh et al. (1994). Another way of selecting the samples could be based on evidence of historical cyclicity, or the relationship with macroeconomic measures⁵³. It would also be reasonable to use a larger number of observations from the tobacco and food and beverage industries, in order to reduce reliance on the utilities industry and investigate the consistency of the results.

Although the small sample analysis provides the opportunity to conduct in depth analysis, one cannot arrive at a generalized conclusion from such a small sample size. Thus, I recommend conducting the same tests on a larger sample while also covering companies listed on other exchanges.

⁵³ For example GDP. See Damodaran (2002).

6 Chapter Six: Conclusion

The results of the empirical analysis show that the PE multiple, particularly PE2, compared to RIVM is the preferred valuation method for both the cyclical and acyclical subsamples, contrary to De Heer et al. (2000) and Koller et al. (2005) who claim the suitability of multi-period models for the valuation of cyclical companies. Moreover, the results indicate that RIVM is a relatively weak valuation method for the acyclical subsample, as it yielded the lowest explanatory power, which could be due to the dominance of the Utilities Industry in the subsample which could potentially be better valued using industry specific valuation methods. The findings also show the sensitivity of the RIVM value to the cost of equity and terminal value, demonstrated by varying the market risk premium, beta and terminal growth rate. This highlights the importance of the careful selection of assumptions in the implementation.

Furthermore, a differential performance is observed in the valuation of the cyclical and acyclical subsample during the periods of economic expansion and contraction. A significant improvement in the explanatory power of RIVM is observed during the economic expansion period.

The findings of the small sample analysis indicate the popularity of the earnings-based multiples valuation and the DCF, with no clear association between the cyclicity of the industry and the valuation method used. Moreover, highlighting the relation between the performance of companies in the cyclical subsamples and the overall economy, the cyclical

subsample received more positive recommendations during economic expansion compared to economic contraction, with no clear relation observed in the case of the acyclical subsample. Finally, the higher risk and volatility inherent in cyclical companies is reflected in the revenue growth trends and the discount rates used in the DCF valuations.

This dissertation provides interesting findings to the field of equity valuation, particularly for cyclical and acyclical companies, and can therefore be further developed and enhanced by considering the limitations mentioned in the previous section.

7 Appendices

Appendix (a)

Option-Style Valuation

Another way of valuing a firm is by viewing it as an option. Burgstahler and Dichev (1997) suggest that the firm can be considered as a function of its earnings and its book value, in the sense that it has the option to either continue with its operations or utilize its assets in other forms. The function is regarded to have a convex relation between earnings and book value. Burgstahler and Dichev (1997) introduces two terms, the “recursion value” and “adaptation value” as determinants of equity value. Recursion value is described as being the discounted future earnings under the assumption of a going concern. The adaptation value on the other hand is the value of the resources if used for alternative purposes. The model contrasts other models in the literature as it assumes the convex relation between the two determinants, and does not view them as being two additive inputs.

Asset based Valuation

Damodaran (2002) suggests that asset based valuation is sometimes regarded as another valuation technique. The asset based valuation can be based on the liquidation value which is the value of the sold assets of the firm. Alternatively, it can be based on the replacement cost, which is the value of replacing all the assets of the firm. He argues that the asset based valuation method approaches do not replace the other more formal valuation approaches. Nonetheless, the DCF approach and the asset based method may result in the same values in the event the company has no growth assets (Damodaran, 2002).

Appendix (b)

Determinants of Multiples (Damodaran, 2002)

$$\text{Value of Equity} = P_0 = \frac{DIV}{k_e - g} \quad (40)$$

Where DIV is the dividends, k_e is the cost of equity, and g is the growth rate.

$$\frac{P_0}{EPS_0} = PE = \frac{\text{Payout ratio} * (1 + g)}{k_e - g} \quad (41)$$

Where EPS is earnings per share

$$\frac{P_0}{BV} = PBV = \frac{ROE * \text{Payout Ratio} * (1 + g)}{k_e - g} \quad (42)$$

Where BV is the book value and ROE is return on equity

$$\frac{P_0}{Sales} = PSales = \frac{\text{Profit Margin} * \text{Payout Ratio} * (1 + g)}{k_e - g} \quad (43)$$

A similar procedure is followed for firm value multiples:

$$\text{Value of the Firm} = V_0 = \frac{FCF_1}{k_e - g} \quad (44)$$

Where FCF is the free cash flow

$$\frac{V_0}{FCFF_1} = \frac{1}{k_e - g_n} \quad (45)$$

Appendix (c)

Two Stage Dividend Discount Model

Value = Present value of dividends during the high /unstable growth phase + present value of terminal value.

$$V_0 = \sum_{t=1}^T \frac{DPS_t}{(1 + k_{e,hg})^t} + \frac{P_T}{(1 + k_{e,hg})^T} \quad (46)$$

Where

$$P_T = \frac{DPS_{T+1}}{k_{e,st} - g} \quad (47)$$

And DPS is dividend per share, $k_{e,hg}$ is the cost of equity capital in a high growth period, $k_{e,st}$ is the cost of equity capital in a stable growth period and g is the growth rate.

In the two-stage DDM, as the company is expected to shift from a high growth to a low growth phase, the cost of equity is also expected to change to levels that reflect the growth rate of the company. Limitations to the two stage growth model include the fact that the model assumes the company shifts from one growth rate to another over one time period, whereas in reality it is more likely to make the change gradually over a period of time (Damodaran 2002).

Appendix (d)

RIVM Derivation

Equity Perspective

The model is derived from the DDM such that the value is equal to the present value of expected dividends

$$V_t^e = \frac{E_t[DIV_{t+1}]}{1 + k_e} + \frac{E_t[DIV_{t+2}]}{(1 + k_e)^2} + \frac{E_t[DIV_{t+3}]}{(1 + k_e)^3} + \dots \quad (48)$$

Where V_t^e is the intrinsic equity value at time (t), $DIV_{t+\tau}$ is the net dividend at time (t), k_e is the cost of equity capital.

Residual Income (RI) is the accounting earnings less a charge for capital employed

$$RI_t^e = NI_t - k_e * BVE_{t-1} \quad (49)$$

where RI_t^e is residual earnings in year (t), NI_t is net income at time (t), k_e is constant cost of equity capital, and BVE_{t-1} is book value of equity at the end of year t-1

Assuming the Clean Surplus Relationship (CSR):

$$BVE_t - BVE_{t-1} = NI_t - DIV_t \quad (50)$$

where BVE_t is the book value of equity at the end of year (t) and NI_t is net income at time (t) and DIV_t is net dividend at time (t).

By rearranging equation (49), NI_t can be expressed as follow:

$$NI_t = RI_t^e + k_e * BVE_{t-1} \quad (51)$$

and by rearranging equation (50) DIV_t can be expressed as follows :

$$DIV_t = NI_t - (BVE_t - BVE_{t-1}) \quad (52)$$

By combining equations (51) and (52) , DIV_t can be expressed accordingly:

$$DIV_t = [RI_t^e + k_e * BVE_{t-1}] - (BVE_t - BVE_{t-1}) = RI_t^e - BVE_t + (1 + k_e) * BVE_{t-1} \quad (53)$$

DIV_t from equation (53) replaces DIV_t in equation (48):

$$\begin{aligned} V_t^e = & \frac{E_t[RI_{t+1}^e - BVE_{t+1} + (1 + k_e) * BVE_t]}{1 + k_e} \\ & + \frac{E_t[RI_{t+2}^e - BVE_{t+2} + (1 + k_e) * BVE_{t+1}]}{(1 + k_e)^2} \\ & + \frac{E_t[RI_{t+3}^e - BVE_{t+3} + (1 + k_e) * BVE_{t+2}]}{(1 + k_e)^3} + \dots \end{aligned} \quad (54)$$

Cancelling terms

$$\begin{aligned}
 V_t^e &= \frac{E_t[RI_{t+1}^e - BVE_{t+1} + (1 + k_e) * BVE_t]}{1 + k_e} \\
 &+ \frac{E_t[RI_{t+2}^e - BVE_{t+2} + (1 + k_e) * BVE_{t+1}]}{(1 + k_e)^2} \\
 &+ \frac{E_t[RI_{t+3}^e - BVE_{t+3} + (1 + k_e) * BVE_{t+2}]}{(1 + k_e)^3} + \dots
 \end{aligned} \tag{55}$$

The DDM can be re-expressed as follows:

$$V_t^e = BVE_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}^e]}{(1 + k_e)^\tau} \tag{56}$$

where V_t^e is equity value at time (t), BVE_t is book value of equity at the end of year (t), $RI_{t+\tau}^e$ is residual earnings, and k_e is the constant cost of equity capital.

Entity Perspective

The entity model is derived from the DCF such that the value is equal to the present value of expected free cash flows:

$$V_t^{e+d} = \frac{E_t[FCF_{t+1}]}{1 + WACC_e} + \frac{E_t[FCF_{t+2}]}{(1 + WACC_e)^2} + \frac{E_t[FCF_{t+3}]}{(1 + WACC_e)^3} + \dots \tag{57}$$

where V_t^{e+d} is the value of the firm at time (t), FCF_t is the free cash flow at time (t),

$WACC_e$ is the weighted average cost of capital.

Residual Income (RI) is the accounting earnings less a charge for capital employed

$$RI_t^{e+d} = NOPAT_t - WACC * NOA_{t-1} \quad (58)$$

Where RI_t^{e+d} is residual earnings in year (t), $NOPAT_t$ is net operating profit after tax at time (t),

$WACC$ is the weighted average cost of capital, NOA_{t-1} is net operating assets at end of year (t-1)

Assuming the Clean Surplus Relationship (CSR):

$$NOA_t - NOA_{t-1} = NOPAT_t - FCF_t \quad (59)$$

where NOA_t is net operating assets at the end of year (t), $NOPAT_t$ is Net operating profit after tax at time (t) and FCF_t is free cash flow at time (t).

By rearranging equation (58), $NOPAT_t$ can be expressed as follow:

$$NOPAT_t = RI_t^{e+d} + WACC * NOA_{t-1} \quad (60)$$

and by rearranging equation (59) FCF_t can be expressed as follows :

$$FCF_t = NOPAT_t - (NOA_t - NOA_{t-1}) \quad (61)$$

By combining equations (60) and (61), FCF_t can be expressed accordingly:

$$\begin{aligned} FCF_t &= [RI_t^{e+d} + WACC * NOA_{t-1}] - (NOA_t - NOA_{t-1}) \\ &= RI_t^{e+d} - NOA_t + (1 + WACC) * NOA_{t-1} \end{aligned} \quad (62)$$

FCF_t from equation (62) replaces FCF_t in equation (57):

$$\begin{aligned} V_t^{e+d} &= \frac{E_t[RI_{t+1}^{e+d} - NOA_{t+1} + (1 + WACC) * NOA_t]}{1 + WACC} \\ &+ \frac{E_t[RI_{t+2}^{e+d} - NOA_{t+2} + (1 + WACC) * NOA_{t+1}]}{(1 + WACC)^2} \\ &+ \frac{E_t[RI_{t+3}^{e+d} - NOA_{t+3} + (1 + WACC) * NOA_{t+2}]}{(1 + WACC)^3} + \dots \end{aligned} \quad (63)$$

By cancelling terms,

$$\begin{aligned} V_t^{e+d} &= \frac{E_t[RI_{t+1}^{e+d} - \cancel{NOA_{t+1}} + (1 + WACC) * NOA_t]}{1 + WACC} \\ &+ \frac{E_t[RI_{t+2}^{e+d} - \cancel{NOA_{t+2}} + (1 + WACC) * \cancel{NOA_{t+1}}]}{(1 + WACC)^2} \\ &+ \frac{E_t[RI_{t+3}^{e+d} - \cancel{NOA_{t+3}} + (1 + WACC) * \cancel{NOA_{t+2}}]}{(1 + WACC)^3} + \dots \end{aligned} \quad (64)$$

The DCF can be re-expressed as follows:

$$V_t^{e+d} = NOA_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}^{e+d}]}{(1 + WACC)^\tau} \quad (65)$$

Where V_t^e is the firm value at time (t), NOA_t is the net operating assets at the end of year (t),

$RI_{t+\tau}^{e+d}$ is the residual earnings and $WACC$ is the weighted average cost of capital.

Appendix (e)

AEGM Derivation

AEGM is derived from the DDM such that the value is equal to the present value of expected dividends:

$$V_0^e = \frac{E_t[DIV_{t+1}]}{1 + k_e} + \frac{E_t[DIV_{t+2}]}{(1 + k_e)^2} + \frac{E_t[DIV_{t+3}]}{(1 + k_e)^3} + \dots \quad (66)$$

Where V_t^e is the equity value at time (t), DIV_t is net dividends at time (t), k_e is constant cost of equity capital.

Provided that

$$\frac{y_T}{(1 + k_e)^T} \rightarrow 0 \text{ as } T \rightarrow \infty \quad (67)$$

There is no specific restriction on y

$$0 = y_{\infty} + \frac{y_{\infty} - (1 + k_e) * y_{\infty}}{1 + k_e} + \frac{y_{\infty} - (1 + k_e) * y_{\infty}}{(1 + k_e)^2} + \frac{y_{\infty} - (1 + k_e) * y_{\infty}}{(1 + k_e)^3} + \dots \quad (68)$$

Rewrite DIV in terms of DIV and y

$$V_0^e = y_0 + \sum_{t=1}^{\infty} \frac{E_0[y_t + DIV_t - (1 + k_e) * y_{t-1}]}{(1 + k_e)^t} \quad (69)$$

Define y_t as the capitalized next period earnings:

$$y_t = E_0[NI_{t+1}]/k_e \quad t = 0,1,2, \dots \quad (70)$$

Where NI is net income.

Substitute y out

$$\begin{aligned} V_0^e &= \frac{E_0[NI_1]}{k_e} + \sum_{t=1}^{\infty} \frac{E_0[(NI_{t+1}/k_e) + DIV_t - (1 + k_e) * (NI_t/k_e)]}{(1 + k_e)^t} \\ &= \frac{E_0[NI_1]}{k_e} + \sum_{t=1}^{\infty} \frac{1}{k_e} \left\{ \frac{E_0[NI_t + k_e DIV_t - (1 + k_e) * NI_t]}{(1 + k_e)^t} \right\} \\ &= \frac{E_0[NI_1]}{k_e} + \sum_{t=1}^{\infty} \left\{ \frac{1}{(1 + k_e)^t} * \frac{E_0[\Delta NI_t + k_e(NI_t - DIV_t)]}{k_e} \right\} = V_0^e \\ &= \frac{E_0[NI_1]}{k_e} + \sum_{t=1}^{\infty} \frac{E_0[z_t]}{(1 + k_e)^t} \end{aligned} \quad (71)$$

$$\text{Where } z_t = \frac{1}{k_e} [\Delta NI_{t+1} - k_e(NI_t - DIV_t)] \quad (72)$$

$$\text{And } AEG_t = [\Delta NI_{t+1} - k_e(NI_t - DIV_t)] \quad (73)$$

Appendix (f)

One of the sources of information equity analysts rely upon in making investment recommendations is company annual reports as they provide a qualitative reflection and review the companies. Considering the research topic in this dissertation is focused on valuation of cyclical and acyclical industries, and the difference in the main characteristics of these two industries, I researched some annual reports from the sample during both the economic contraction period and economic expansion period. I highlight the views of chairman and management of the companies which act as a source of information for analysts and investors for making investment decisions.

I observe in my research of the annual reports the difference in the view of and the extent of the impact of the economic recession on the companies depending on their cyclicity. Companies in the cyclical subsample show a more severe reaction to the economic recession and reliance on the economic recovery to improve their performance. On the other hand, the companies in the acyclical subsample are not as affected by the economic downturn, and in some cases explicitly expressed their resilience to it.

Cyclical Subsample

A company in the Rubber and Plastics industry expresses the challenge they faced due to the effect of the economy on the spending habits of their end customers.

*“Difficult economic conditions continued to affect our customers’ own businesses during 2009 and also put **pressure on our margins**” (Bunzl Plc Annual Report, 2009).*

*“During 2009 the economy in Ireland contracted by 8% and this has had a significant impact on our business there. The hospitality sector which we serve has been disproportionately affected due to **declining demand**, a fall in tourism and an oversupply of hotel rooms.” (Bunzl Plc Annual Report, 2009)*

Companies in the Transportation Equipment industry expressed the dramatic impact of the economic turndown on the automotive industry, especially in terms of credit, which affected its performance.

*“GKN performed creditably in the first three quarters of 2008, ahead of the same period in the prior year, but the **dramatic and global reduction in demand** in the automotive sector had a very **detrimental impact** on the fourth quarter results. This reduction was strongly influenced by a **shortage of the credit** which traditionally drives automotive sales” (GKN Plc Annual Report, 2008)*

*“The adverse **economic outlook** inevitably creates huge **challenges** for all businesses and it is clear that Rolls-Royce will also be impacted. It is difficult to determine the precise scale of the impact on the Group until the severity of the current **downturn** is clearer” (Rolls Royce Plc Annual Report, 2008).*

The impact of the recession also forced some companies into cost cutting and making redundancies.

*“Unfortunately over the past two years we have had to announce some **redundancies**. The Board does not make such decisions lightly, as we take our responsibilities to our people very seriously. However, in order to **reduce our operating costs** in response to the **global economic upheavals**, the Board felt these were decisions it had to take” (Rolls Royce Annual Report, 2008).*

Similar to the significant effect of the economic down on cyclical companies, economic expansions play an important role in reviving such companies.

*“In Brazil we saw **strong growth** in both revenue and operating profit as the economy there **rebounded** from a relatively weak 2009” (Bunzl Plc Annual Report, 2010)*

*“In Germany, sales grew strongly in the horeca sector and revenues from guest amenities rose again as the **hotel sector recovered** (Bunzl Plc Annual Report, 2010)”*

The same reaction is also observed in the Transport Equipment and Primary Metals industries.

*“The **recovery** in global automotive production which started in the second half of 2009 accelerated in 2010 with **demand stronger** than we had anticipated.” (GKN Plc Annual Report, 2010).*

*“This economic stimulus has helped **trade to recover** from the low point of the global crisis, and thanks to our stronger balance sheet, we have been well positioned to benefit*

*from this recovery. We have sharpened our focus on our programme of organic growth and, for 2011, we envisage continuing this focus, with **capital expenditure set to increase to US\$13 billion.***” (Rio Tinto Plc Annual Report, 2010)

Acyclical Subsample

In contrast to the cyclical industry companies, it can be noticed that the economic recession did not have as much of a significant impact on companies of the acyclical industries.

Companies in the Food and Beverage industry demonstrated their resilience to the recession.

*“We have consistently developed the group through investment and this year it enabled the delivery of **good results in difficult economic time.**”*(Associated British Foods Plc Annual Report, 2009)

*“We expect to **maintain capital investment at planned levels in spite of the economic outlook.**”* (Associated British Foods Plc Annual Report, 2008).

*“Whilst general economic conditions are outside of the Company’s control we believe that our portfolio of staple food products and popular brands should continue to prove **resilient in the current difficult economic environment**”* (Premier Foods Annual Report, 2009).

In the Tobacco industry, British American Tobacco (BAT) proved to maintain positive performance despite the economic recession.

*“While many companies have struggled in the **harsh economic climate** and international markets have wavered, I find myself with the great privilege of being Chairman of a business that continues to **deliver excellent results** and has a well established strategy for achieving **sustainable growth**.” (British American Tobacco Plc Annual Report, 2009).*

As for the Utilities industry, resilience to the downturn is also observed.

*“Centrica’s underlying operating performance in 2009 demonstrated **resilience in a year of sustained economic downturn** and weak commodity prices.” (Centrica Annual Report 2009)*

In contrast to one of the companies in the Transport Equipment industry, employee retention was also high in a utility company despite the weak economic climate.

*“Despite the economic downturn, **retention remained high** for the core Central Heating Care product, as the increased breadth of our product range allowed us to offer customers effective alternative offerings.” (Centrica Plc Annual Report, 2009)*

Although the acyclical industries are regarded to be more resilient to economic downturns than cyclical companies, this does not mean to say that they are completely immune to negative economic impacts. Due to the extent of the 2008 and 2009 recession, even the utilities industry was affected to a certain extent.

*“Unlike previous recessions where utilities were less affected than other sectors, this time the industry has recorded a **significant reduction in demand** across all sectors. In the UK, North America and Europe we have experienced increased levels of **bad debts** amongst business and residential customers” (Centrica Annual Report 2009).*

*“Globally, utilities have been able to continue to access both debt and equity markets but given **global uncertainty and volatility** in financial markets this needs to be **carefully monitored**” (Centrica Plc Annual Report, 2009)*

The annual reports of the companies in the acyclical industry, generally showed less optimism, most cyclical companies referred to the year 2010 as a period of recovery, some acyclical firms refer to the economic situation as being uncertain.

*“The group has considerable financial resources, good access to debt markets, a diverse range of businesses and a wide geographic spread. It is therefore well placed to manage business risks successfully **despite the current economic uncertainty.**” (Associated British Foods Annual Report, 2010).*

The general characteristics of the cyclical and acyclical industries are reflected in the annual reports of the companies. While the cyclical industries show a weak performance as a direct result of the economic downturn, they also show optimism and dependency on the economic expansion period to lift them up. On the other hand, the acyclical companies show relatively strong performance despite the recession, and do not show the same level of optimism as the cyclical companies in the economic expansion period. They show a more conservative view as to the economic stability in the annual reports of 2010.

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