The Impact of the modern boom of the digital economy on the Price of Technology stocks, Are we in another tech bubble?

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ABSTRACT

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This paper examines the impact boom of the modern digital economy on the price of technology stocks in the Nasdaq Index, with reference to the past dot-com bubble of the 90s and early 2000s. This research applied fundamental valuation techniques and price multiples on selected technology stocks from the Nasdaq Index from the period of 2017 to 2020. This was performed by applying a regression analysis on the stock price of the selected companies, using the capital asset price model (CAPM) to derive the expected rate of return of the selected companies. Applying a single and Multiple stage Gordon growth valuation model on the selected companies to generate the fundamental value of the selected companies. The research results using fundamental valuation revealed that the selected companies using fundamental valuation are fairly valued. The research applied price multiples such as the Price to book ratio (P/B), Price to Earnings ratio (P/E) and Enterprise Value to Earnings before interest, taxes, depreciation, and amortization (EV/EBITDA), using these multiples revealed a varying result based on multiple applied with the constant being Tesla shares being Overvalued. From the results of the valuation model, the researcher concluded that there is currently no asset bubble in the technology sector.

Keywords- Digitization, Technology Stocks, Nasdaq Index, Dot-com Bubble, Capital asset pricing model (CAPM), Asset pricing, Free cash Flow for equity, Gordon Growth Model.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Digitization which is known as the Fourth Industrial Revolution is here to stay, with digitization becoming more prominent in our daily life make the digital economy ever more important, (Abduvakhidov 2020) describes the digital economy as the economy derived from the day-to-day activities of billions of online connections of people, companies, data and devices. According to (Yudina 2019), the digital economy is a supplement of the economy, as a harmonizing component of the normal economy and digitization, adjusting how economic and financial information is conceived, analysed, and monitored.

Due to the new digital revolution, we see countries at the forefront proving the required infrastructure to support this new revolution within their country through Information communications technology(ICT). (Khayala 2020) says due to the development of digital technology, the world countries promote digitalism and the integration of digitization on our social and economic life through various structures such as E-governance, E-services, E-taxes, E-education, E-health etc, which provides a means for transparency and observation.

The Digital Economy has impacted every aspect of our social and economic life which has caused a boom in the digital space over the years, and we see digital companies in various forms such as Microsoft, Apple, Google, Facebook, Amazon amongst others become financial market leaders due to their massive and constant growth, profit and market capitalization.

Digitization has helped raise the value of technology companies in the financial market, however, the value of some of these companies must be questioned since not all of them are as profitable as their market value would project.

1.2 THE SIGNIFICANCE OF THE STUDY

Asset valuation is a very important part of the financial market and a country's economy, the valuation of stocks will determine the performance in the financial market. Accordingly, the performance of the financial market plays a huge role in a country's economic performance. Close examination of asset valuation is necessary, specifically in the technology sector, the role of technology companies in the financial market has grown over time, with a lot of technology companies being market leaders with massive market capitalization, valuing these companies properly is crucial as they hold a sizable control on the financial market. Lack of proper valuation of these technology companies could lead to an asset bubble which depending on the size of the bubble could be catastrophic for the economy, an example of the impact an asset bubble could have on an economy is the "Dot Com" bubble of the late '90s and early 2000's, where according to Goodnight and Green (2010) by the end of the year after the bubble burst, the internet index lost 60% of its equity value with more than 140 internet companies trading at two dollars per share and more than half trading at five dollars per share. The technology companies that went through IPOs decreased in value from $1 trillion in March 2000 to $572 billion by the end of the year, this massive loss caused an overall downward spiral in the market.

The importance of proper valuation cannot be understated as it protects the financial market and the economy from a possible economic crash. It also helps prevent an investor from exhibiting irrational behaviour due to speculative beliefs about stock prices. The research will contribute to current knowledge as it provides an insight into the current pricing of technology companies to determined whether they are fairly valued or not.

This research aims to determine if the price of the selected stocks in the Nasdaq Index are valued fairly using normal market standards or the price of the selected stocks in the Index are inflated due to the world becoming more digital, digitization which influences market participants to speculate about technology stocks which inflates the value of the selected stocks creating an asset bubble. This research will examine the closing price data and annual reports of the selected companies in the Nasdaq Index from the 3rd January 2017 to 31st December 2020.

1.3 OBJECTIVE OF THE STUDY

The main objective of this research is to determine whether there is currently an asset bubble in the technological sector. While the researcher's precise objective is:

- To generate an appropriate valuation model to value the selected stocks from the Nasdaq Index.
- To generate an intrinsic value for the selected stocks from the Nasdaq index.

1.4 RESEARCH QUESTIONS

From the specified research objectives above, the research questions can be specified as follows:

- Is there currently an asset bubble in the technology sector?
- Are the selected stocks from the technology sector fairly valued?

CHAPTER TWO

LITERATURE REVIEW

2.1 ASSET PRICING.

The most prominent feature of the Dot com bubble was the rapid rate at which the price of tech stocks kept rising which does not follow the fundamental of asset pricing, according to (Kurt 2020) one of the principles of modern finance is that the price of an asset should equal the present value of its cash flows. Meaning when trying to determine the price of an asset, we must discount all future cash flows in which that asset provides us in the future, to get the value of those cash flows today, in order to determine the price of that asset today. This principle does not all hold because some external factors such as liquidity, capital market risk also affect the price of an asset. (Cochrane 2009) states asset pricing theory is used to explain asset prices, a low price indicating a high rate of return, a high price indicating a low rate of return, the theory explains why some assets have higher returns than others. According to (Miller 2010) excessive asset prices can be defended depending on the situation surrounding the asset in question, implying depending on the situation or new information surrounding that asset, an increase in the value of that asset may be justified. (Bossaerts and Plott) state in their study that Risk aversion is at the heart of asset price theory. When the risk is minor, people should be risk-neutral if they have smooth predicted utility preferences. Asset pricing theory forecasts not just the emergence of risk premia, but also how they will be spread among assets. As a result, the idea that risk aversion is at work gains credence when the cross-section of the discounts begins to resemble the theory. According to (Savor and Wilson 2014) asset prices behave quite differently on days when big macroeconomic news is slated for release. Return patterns are much easier to reconcile with classic asset pricing theories, both cross-sectionally and across time. (Hendershott *et al* 2019) states in their study that systematic market risk pricing is the core of modern asset pricing, the market risk which is measured by beta is loosely

associated with the weekly 24-hour market returns, which causes the capital asset pricing model to perform poorly. When markets open for trading, stock price behaviour is substantially different regarding beta sensitivity compared to when the market closes for trading. Overnight stock returns are positively associated with beta while stock returns during the trading day are negatively related to beta.

2.2 ASSET BUBBLE

According to (Penman 2002), an asset bubble works in the form of a pyramid, where speculation about the asset class fuels the price of the asset, momentum buying of the asset by investors fuels the price of the asset and normal accounting standards are neglected for speculative optimism. This means that bubbles are formed based on assumptions of investors about certain asset classes, not facts normally used to judge assets. (Jean 1985) states a bubble on money can exist when there is a difference between the market value and market pricing fundamentals. According to (Barlevy 2007) an asset bubble is a situation where the price of an asset has increased significantly over a short period of time which suggest the asset is also liable to an equal sudden collapse in price. (Hong *et al* 2006) argues that a bubble forms when the price outweighs optimists' expectations and investors expect to be able to resell to those with even greater valuations. The magnitude of the bubble is determined by float since investors expect a rise in float when lockups expire and speculate on the extent of insider selling.(Grossman and Yanagawa 1993) state that only non-accumulable useless assets can support bubbles and when bubbles arise, they stifle economic development both during the transition to a steady-state and in the long run. Bubbles also hurt all generations born after the asset first arises, to a degree that outweighs the advantage to the generation that benefits from the bubble. (Contessi and Kerdnunvong 2015) argues against the general view about asset bubbles, they argue that in the financial market the risk-free rate in the economy, the equity premium, and the growth rate of earnings all affect the price/earnings ratio in the financial

market, all of which can fluctuate over time and thus alter the price ratio which does not necessarily indicate a price bubble. (Mishkin 2008) states that not all asset price bubbles are similar, Asset price bubbles linked to credit booms provide unique problems since their collapse can result in bouts of financial instability with negative economic consequences, furthermore, regulation can assist avoid feedback loops between asset price bubbles and credit provision since asset price bubbles can originate from market failures that lead to credit booms. According to (Miao and Wang 2018) stock price bubbles can form because of a positive feedback loop mechanism and by increasing the debt ceiling, these bubbles attract a liquidity premium and encourage investment. A recession and a stock market catastrophe result from their failure. According to (Komarek and Kubicova 2011) continuous asset price monitoring is required for early detection of imbalanced booms that might later develop into asset price bubbles, they argue that asset price disequilibrium is a necessary but insufficient requirement for detecting a bubble in a particular asset, they also indicate that market and country details must be considered, since high growth in tracked assets in underdeveloped markets may not indicate the emergence of a bubble. (Hirano *et al* 2015) state that Bubbles enhance production level if the size of the bubble is relatively modest; nevertheless, when the size grows too huge, bubbles diminish it.

2.3 THE DOT COM BUBBLE

The Internet Bubble popularly known as the Dot-Com bubble is the period between 1995 and 2000, that saw an alarming rise in investment of internet-based start-up companies by investors due to speculative beliefs of future profit. These speculative beliefs lead to the creation of the Dot-Com bubble in the late ’90s and early 2000s. (Shiller 2000) states that asset prices were inflated by the media because the media were fuelling the speculation of investors to increase viewer ratings. (Morris and Alam 2012) states that during the dot com bubble, many investors questioned the value of standard financial information normally used for making an investment

decision such as Price to Earnings ratio because digital companies could not meet up to those standards. (Cassidy 2002) argues that during the dot come bubble, we did not just observe a stock market bubble but a buying frenzy that inflated the price of dot com stocks to levels that were impossible to maintain. The tread of Venture capital-funded companies trying to capitalize on the success of the internet, according to (Alexander and Wilhelm 2003) in 1996, the financial market saw a surge initial public offering (IPO) Opening day returns averaged around 17 per cent-in 1999 while opening day return averaged around 73 per cent, the year 2000, Digital company's Initial public offering opening day gains averaged an incredible 89 per cent during-the late '90s and the year 2000, The constant increase in average return from the initial public offering is one of the most noticeable features of the dot-com bubble with a lot of investment in dot-com companies, inflating the value of the NASDAQ Composite stock market index by 400 per cent. According to (Keating 2003) the downward turn of the financial market during the bubble does not coincide with the period of disclosure of web-traffic statistics, earnings or earning forecast. This indicates that the bubble did not burst because of new information. (Pastor and Veronesi 2006) argue that the bubble did not burst because of an increase in uncertainty but because the expected returns from the Nasdaq stock exchange was revised downward, meaning new information about the index caused the Index to crash. (Goodnight and Green 2010) state in their study that the dot com bubble was fuel by the self-feeding movement where information technology was marketed by promoting communication as the new information highway, even as expectations drew investment needed to materially build out predicted revolutionary improvements. According to (Crain 2014) Risk capital, a highly speculative kind of short-term investment in which assets are rapidly deployed in quest of above-average returns was the driving force of the bubble, which evolved out of a complex array of societal influences.

2.4 ASSET PRICING MODEL

CAPITAL ASSET PRICING MODEL

This Capital Asset Pricing Model (CAPM) is a model that aims to use the relationship between risk and returns to determine the required rate of return on an asset, which will be used to discount future cash flows of an asset, providing the present cashflows required to value an asset, the model has some limitations, which researchers have used various modification and extensions to make the model more accurate. (Fama and French 1993) state that there are three stock market factors and the CAPM should consider those factors when driving returns, a three-factor model extension should be applied to the CAPM. According to (Fama and French 2015) the Five-factor model extension of the CAPM which captures the size, value, profitability and investment patterns in average stock returns performs better than the three-factor model extension of the CAPM but is limited because it fails to capture low average returns on small stocks. According to (Hendershott 2019) the CAPM shows the price of an asset is closely related to beta at night (closing price) but during the day (trading day) the CAPM is less significantly related. (Pham and Phuoc 2020) argue that using the CAPM for daily and medium-horizon works better than a monthly and short-horizon date and believes the same applies to daily and quarterly or yearly data. (Michael and Yuzhao 2020) states an extended version of the CAPM using a stochastic horizon helps solve the one-period limitation of the standard capital asset model, by creating a relationship between the weighted sum of expected returns over different horizons and applying the same rule to beta over different horizons. According to (Bajpai and Sharma 2015) removing the intercept term which is a cross-sectional regression equation from the second phase of the CAPM, with this modification the CAPM perform better than the limited original model in the Indian equity market. (Ferreira et al 2019) state that the cost of capital measured by the implied capital surpasses the value derived from the CAPM, indicating that CAPM is lacking in determining the financial risk incurred by

infrastructure firms in Brazil, the study is also limited to the small sample size provided. According to (Kristoufek and Ferreira 2018) the CAPM is limited because there is no risk perception heterogeneity across investment horizons that would be perfect for all investors. (Perold 2004) states the CAPM is founded on the notion that not all risks should have an impact on asset values. A risk that can be diversified away by holding it alongside other assets in a portfolio is, in a very real sense, not a risk at all. The CAPM tells us what level of risk is associated with what amount of return. (Elbannan 2015) advise that the CAPM be utilized with caution when determining a stock's necessary rate of return. Furthermore, the CAPM and APT should be tested on various businesses in the MENA area, while academics and investors should guarantee that these models are relevant in their respective nations. According to (Jie 2020), based on regret theory, the CAPM can be used to create a regret-based model to recognize the combined effects of regrets when comparing returns on a selected portfolio with the alternative unselected portfolio, showing employing regret-related betas can help explain cross-sectional returns.

2.5 GORDON GROWTH MODEL

The Gordon Growth Model also known as the dividend discount model is a stock valuation approach that determines the intrinsic value of a stock assuming dividend will grow indefinitely at a constant rate. This model of valuation makes certain assumptions when evaluating a stock, which are:

- The company’s business model is constant
- The company’s growth rate is constant
- The company has stable financial leverage.
- The company’s free cash flow is paid as dividends

Over the years many variations and adjustment have been made to the original Gordon growth model. (Farrell 1985) states that the dividend discount model can be used to calculate the stock market's explicit expected return. Expansions on the standard dividend discount model are useful for analysing relative prices across a group of equities. To create a "market line" benchmark, returns from sophisticated models can be paired with risk data. According to (Payne 1999) While the continuous growth dividend discount model is a useful tool for predicting value, successful application necessitates a grasp of the model's core nature and parameters. Applicants of the model should be able to do more than just "plug and chug" the DDM formula; they should also be able to comprehend the model's inputs and sensitivity to the link between the needed rate of return and the growth rate, Due to estimates for Ks and g varying greatly dependent on the estimating methodologies utilized, calculating a value based on a single set of restricted assumptions is both insufficient and unworkable. (Mugosa and Popovic 2015) states that the Gordon growth model maintenance its reliability in stock price valuation based on the sample of 199 publicly traded companies in Europe, even at a moment of severe global financial crisis effect, the Gordon growth model proved to be a trustworthy gauge of stock price valuation. This indicates that when the economy is not doing well, the Gordon model still holds if the criteria are met. According to (Foerster and Sapp 2005) the dividend-based models perform better than commonly used earnings-based models at explaining real prices, this means that the dividend discount model is a better valuation method for real-world share prices compared to valuation methods that use earnings. (Vila and Weeken 2002) their study state that if the Gordon Growth model is an effective valuation model for stocks when applied by investors correctly, there should be no price disparity between the fundamental price generated by the Gordon Growth Model and the actual share price. Furthermore, the Gordon Growth model makes assumptions about the dividend growth rate and equity risk premium when generating a fundamental value for the share. According to

(Morris 2006) Due to the Gordon growth model assuming constant growth, only a small percentage of companies can apply this method of valuation because of the required constant growth rate.

2.6 H-MODEL

The H-model also known as the Two-stage Growth Model can be defined as a quantitative valuation method used to determine the fundamental value of a company's stock price. This method is similar to the two-stage dividend model, whereby the growth rate or dividend rate changes in a two-stage format, the first stage which is known as the high growth stage where the company's growth or dividend is high, the second stage is known as the stable growth period, where the company's growth or dividend becomes more stable. According to (Fuller and Hsia 1984) the H-model is more practical compared to the general dividend discount model and more realistic compared to the constant growth model. Changes in dividend growth rates can be accommodated by the H-model. As a result, the H-model produces findings that are quite comparable to the three-phase model while being more user-friendly and requiring only basic math. (Glabadanidis 2014) states in his study that only a limited number of companies can apply the one-stage dividend discount model due to most companies expected to have a high dividend growth rate higher than the normal growth rate for a certain period, it's only logical to expand the growth rate forecasting assumption to include two stages for this purpose. According to (Cruise 2012) the H-model moderately addresses the difficulty of the Gordon Growth Model by allowing an analyst to measure company cashflow growth from a higher rate to a more stable growth rate over a set period. The firm probably reaches a steady state after this set period, and Gordon finds the idea appealing, the goal of this model is to arrive at a more suitable steady free cash flow level where the Gordon Growth model can be applied, but the H-Model is limited because it only the Free cash flow growth is taken into consideration during the transition period between the high growth phase and normal growth phase. (Amico and

Blasis 2020) state in their study that H-model is more appropriate for valuing companies that are expected to have a higher initial growth phase than normal growth due to specific investments or patents rights that will result in higher profits, however, it does have its limitations such as; the growth rate is predicted to move dramatically from a high growth phase to a normal or steady growth phase, the length of the high growth era is difficult to specify in practical terms. According to (Gehr 1992) Dividend discount models with multiple growth rates is biased, using the expected value of the growth rate provides a skewed estimate for the price since the price is not a linear function of the growth rate. If the growth rates employed in a Dividend discount model is uncertain, employing predicted or estimated growth could result in a price estimate that is skewed, the more the uncertainty regarding the growth rate's value, the more bias there will be. The fundamental value should be generated by calculating the projected price using each value of the growth rate and its associated probability.

2.7 FREE CASH FLOW APPROACH

The cash a business earns after accounting for financial expenses to sustain its operations and maintain its capital assets is referred to as free cash flow. In other words, free cash flow is the money that remains after a firm has paid its operational and capital expenses. According to (Kousenidis 2006) a basic definition of a company's free cash flow, is the cash flows generated by operating and investment activities are exactly equal to the cash flows received by loan and stockholders (financing activities). (Shrieves and Wachowicz 2001) states that the FCF method focuses on the periodic total cash flows produced by subtracting total net investment from net operating cash flow. According to (Richardson 2006) Payments to shareholders and debt holders will influence the firm's capital structure, company management seek the optimal capital structure because it is difficult to determine what the optimal cash flow distribution should be. The appropriate level of free cash flow to be maintained will be determined by firm-specific variables such as cash flow unpredictability

and access to external capital markets. Firms with more variable cash flows will prefer to store cash for future periods when cash flow is low, while firms that find it harder to acquire external capital would want to hold more cash. (Adhikari and Duru 2006) FCF companies are less profitable and more indebted than their industry peers; they also have worse credit ratings and payout larger dividends. FCF disclosures are provided by FCF businesses to supplement reported income and cash flow statistics. FCF businesses see FCF disclosures as a valuable addition to their regular reporting processes. (Habib 2011) states that a valuation premium is paid to companies that have a positive free cash flow and strong growth prospects. Furthermore, when earnings are temporary, free cash flow is found to be favourably related to stock returns. Alternative definitions of free cash flow and growth possibilities did not affect the outcomes. According to (Mansourlakoraj and Sepasi 2015) Contrary to the agency hypothesis, free cash flow has a large and positive influence on company value, and its rise can boost firm performance. (Petty and Rose 2009) their study state that because free cash flow provides just the cash flow created by the firm's assets without any information on the quantities of cash allocated to the various investor groups, it cannot be fully reconciled with the accounting statement of cash flows.

2.8 EMPIRICAL REVIEW

A wide range of research has been conducted on asset bubbles and equity valuation around the world.

Rappaport (1986) in their research of equity valuation applied the Dividend Discount Model, this was applied using the company's affordable dividend, the affordable dividend which is generated from the company's annual report, they illustrated the Dividend Discount Model using affordable discount by using IBM as a case study, IBM affordable dividend was generated from the financial reports and projected for 6 years into the future, the present value

of the dividend generated by discounting it at IBM rate of return for 5 years, the affordable dividend for the 6 years was applied in the company's valuation using the Dividend Discount Model to generate the value of the company's equity. Their study revealed that due to the conventional Dividend model not taking into consideration the cash significance of expected operating, investment and financing decisions, the valuation generated may be biased.

Nasseh and Strauss (2004) in their research of stock prices and the Dividend Discount Model, applied the dividend discount model to stocks in the S&P 100 for the period of 1979.3-1999.2. Using a sample size of 84 firms for 20 years with data from COMPUSTAT, applying a 10-year government bond interest rate less inflation to generate the real interest rate. Their study revealed that for the period studied, for large established companies, there is a roughly one-to-one long-run relationship between stock prices and dividends. furthermore, in the short run, stock prices account for more than a third of dividend changes. However, according to our methodology, stocks were 43 per cent overvalued in the late 1990s.

Hurley and Johnson (1994) in their research of a realistic Dividend valuation Model, applied the dividend valuation modelling assuming the discount rate is fixed and models the pattern of dividend payment known as the Markov process. The research applied two dividend models for dividend growth, the geometric model, and the additive model. The research uses 3 selected companies for their analysis, using the Gordon Growth Model to generate the intrinsic value of all 3 companies. Their study revealed that the geometric model is likely to be preferred for more steady income equities, while the additive model is likely to be preferred for companies with irregular payout patterns.

CHAPTER THREE

RESEARCH METHODOLOGY

This empirical research which employs a quantitative approach, according to (Edwards 2019) quantitative research is a mode of examining observations in numerical quantities by employing different forms of statistical analysis, by analysing past price data of stocks in the NASDAQ index and comparing the difference between the price derived using market fundamentals and the actual prices of the stocks in the market.

3.1 RESEARCH SAMPLE SELECTION

This research aims to determine if there is an asset bubble in the shares of technology companies by using market fundamental valuation techniques and comparison. The companies selected in this research are all classified as technology companies and are selected based on Market capitalization size, they are all members of the NASDAQ index, we have a selected a total number of 6 stocks listed on the NASDAQ index for this research as our sample size, the selected stocks are :

- Microsoft Corporation
- Apple Inc.
- Amazon
- Alphabet Inc.
- Tesla
- Facebook

3.2 DATA COLLECTION

This is research is based on both primary and secondary data, primary data generated from the annual financial report of the selected companies, the research also applies secondary data

generated from Yahoo finance, Gurufocus.com, CSIMarket.com, Bloomberg and the United States Treasury.

3.3 METHOD OF APPROACH

3.4 FUNDAMENTAL VALUATION METHOD

The method of fundamental valuation applied in this research is done by comparing the Fundamental price of the stock generated using fundamental valuation techniques and the actual real-world price of the stock, the possible difference between the share price using fundamental valuation techniques and the actual real-world price will give us an indicator to whether the share price is fairly valued or not.

3.5 CAPITAL ASSET PRICING MODEL

The process of generating fundamental price value requires an Ordinary Least Square (OLS) estimator of simple linear regression analysis will be applied to derive the share beta, which is required for Capital Asset Pricing Model (CAPM). Beta (β) derived from our regression analysis equation on selected stocks on the Nasdaq Index, is used as our measure of risk in our CAPM, using Beta (β) as our measure of risk is consistent with past literature, (Omran 2007) applied a two-stage regression, where the first stage was used to estimate market and unique risk, the second stage regression is cross-sectional. The CAPM is applied to determine the required rate of return of the stocks in the Index, in line with past literature, (Kristoufek and Ferreira 2018) applied the CAPM to determine the risk profile of the Portuguese stock market index. The rate of return derived from the CAPM is used to discount future cash flows of the stocks in the Nasdaq index to determine the fundamental price of the stock.

$$R_a = R_{rf} + \beta_a * (R_m - R_{rf})$$

where:

R_a=Expected return on a security

R_{rf}=Risk-free rate

Rm=Expected return of the market

βa=The beta of the security

($Rm - Rrf$) = Equity market premium

3.6 INCOME-BASED VALUATION

The Income-based valuation method analysis an organization's financial history to forecast the organization future profits, there are two ways to apply the income-based valuation

- The capitalization of cash flow approach gets at a valuation by dividing a company's historical total cash flow stream by its capitalization rate, which represents the riskiness of the company and its projected future growth.
- The discounted cash flow technique computes a value by predicting future cash flows and then discounting them back to the valuation date.

The capitalization of cash flow approach is applied as it requires less forecasting and relies more on historical data. A Free cash flow to Equity model is applied to determine the value of the company after all debt, expenses and reinvestment have been paid, the Free cash flow to equity model is used to determine the amount of cash available to equity shareholders after all forms of debt and debt financing has been paid. (Rowland and Stanek 2021) applied the FCFE model to determine the overall value of Kofola ČeskoSlovensko using sourced data from the company's annual report and publicly available financial surveys, (Veronika *et al* 2020) also

applied the FCFE model to determine the intrinsic value of Seznam, a Czech marketing company. According to (Oleg 2011) after empirical reviews, the values generated using the FCFE approach is subjective since it is based on the appraiser's consideration about future returns and the associated risks. The FCFE model applied in this research is:

$$FCFE = FCFF\ -\ INT(1-T) + Net\ Borrowing$$

Where:

FCFF= Free cash flow to firm

INT= Interest Expense

T= Tax rate

Net Borrowing = Total amount Borrowed – amount paid on the principal.

The value generated from this model is then divided by the number of shares outstanding of the company to generate the free cash flow to equity per share, the number of shares outstanding can be found in the company annual report.

3.7 GORDON GROWTH MODEL

The Gordon Growth Model (GGM) is used to calculate a stock's intrinsic value based on a sequence of dividends or cashflows that rise at a consistent growth rate in the future. This model is used to value company stock based on the assumption of constant growth of the company dividends or cash flows. (Cho 1988) applied the Gordon infinite growth model to examine the possible impact of risk management decisions on a firm. This model requires the expected rate of return generated using the capital asset pricing model to always be greater than the consistent growth rate of the company. An FCFE variation of the Gordon growth model is applied in this research to generate the intrinsic value of the selected companies because not all selected companies pay dividends to their shareholders. This research applied two variations

of the Gordon growth FCFE model due to the selected companies' different growth rates and rates of returns. A single factor growth rate model, where the growth rate experienced by the company is constant and remain the same over time and an H-model, where the growth rate experienced by the company is divided into two periods, A high growth phase and a low growth phase. The Growth rate for the single factor growth rate model is generated using the arithmetic 10-years average return on income of the selected companies. The model for the single factor Gordon growth model is:

$$Value\ of\ equity = \frac{FCFE \cdot (1+g)}{k_e\text{-}g}$$

Where:

FCFE = Free cash flow to equity per share

G = Growth rate

Ke = Discount rate.

The Growth rate applied for the H-model is generated using the growth rate of the Nasdaq index for the low growth phase and the arithmetic 10-years average return on income for the high growth phase, with an arbitrary 5-year period for the half-life of the high growth phase. The model applied for the H-model Gordon growth model is:

$$Value\ of\ equity = \frac{FCFE \times (1+g_L)}{k_e - g_L} + \frac{FCFE \times H \times (g_H - g_L)}{k_e - g_L}$$

Where:

FCFE = Free Cash for Equity per share

G_L = Low Growth rate

G_H = High Growth rate

K_e = Discount rate

H = Half-life of the high growth phase.

The value generated from the Single-factor Gordon growth model and the H-model will be considered as the fundamental value of the selected companies and will be compared to the current real-world share price of the selected companies, to determine whether they are fairly valued or overvalued which indicated if there is an asset bubble.

3.8 METHOD OF COMPARISON USING MULTIPLES

The method of comparison applied in this research is done by applying price multiples, price multiples are ratios that use the stock market price of a company combined with some specific measure of fundamental value per share to evaluate the share price of a company to determine whether the share price is fairly valued, overvalued or undervalued. This method of valuation is essential to the research as it is a good indicator of asset bubbles that defer from market norms.

3.9 PRICE TO BOOK RATIO

This method of valuation compares the company's market capitalization to its book value. The P/B ratio measures how much market participants value a company's stock in comparison to its book value. This research applies the valuation method by the selected companies P/E ratio to the Nasdaq index. The P/B model is generally accepted as a valuation method but has its limitations such as it does not reflect the value of intangible economic assets, Different accounting conventions could obscure the investment value of shareholders in the firm which

could be a factor in comparison, inflation and technological change could affect the book and market values of assets which will affect the book value of the shareholders' investment. The P/B ratio applied in this research is :

P/B Ratio = $Market\ Price\ per\ share / Book\ Value\ per\ Share$

Where:

Market price per share = This is the current share price

Book Value per share = Shareholders Equity / No of shares outstanding.

3.10 PRICE TO EQUITY RATIO

This method of valuation compares the company's current share price to its per-share earnings. Investors and analysts use P/E ratios to evaluate the relative worth of a company's shares. It may also be used to compare a company's past performance to its own, as well as aggregate markets to one another or over time. We apply a P/E ratio comparing the selected companies to the Nasdaq index and comparing the selected company to pair companies. (Alford 1992) applied this method in a theoretical research where similar firms were selected based on industry, risk, earnings growth, individually and in pairs. (Sehgal and Pandey 2010) applied this valuation method in their valuation of the Indian market based on historical prices. The research recommends the historical P/E ratio as the best approach for equity valuation in the Indian context. The P/E ratio is generally accepted as a valuation method, but it has its limitations such as Companies could have negative earnings, accounting practices could impact reported earnings which reduces the credibility of the comparison with pair companies. The P/E ratio valuation method applied in this research is :

$$P/E \ = Market\ price\ per\ share\ /\ EPS\ over\ the\ previous\ 12\ months$$

Where:

Market price per share = The current market share price

EPS = Earnings per share over the previous 12 months.

3.11 EV EBITDA RATIO

This method of Valuation is a popular statistic for comparing a company's worth, including debt, to its cash profits less non-cash costs as a valuation tool. It is commonly used to comparing companies within the same industry. This research applies this method of valuation by comparing the selected company to its industry pair companies. (Fernandez 2001) applied this valuation method and concluded that price multiples are effective as secondary valuation method after performing another valuation method, as it allows to the research determine whether the selected company is fairly valued compared to its pair companies. The EV EBITDA ratio is generally used but has its limitation such as It does not consider capital investment; it does not include changes to working capital requirements. The EV EBITDA method of valuation applied in this research is:

$$EV/\ EBITDA = \ Enterprise\ Value\ \ /\ EBITDA$$

Where:

EV = Enterprise value

EBITDA = Earnings before interest, Tax, Depreciation and Amortization.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION OF RESULT

4.1 INTRODUCTION

In this chapter, we analyse the data accumulated during this research and interpret the results generated. Firstly, we apply a beta analysis on the stock price return of the selected companies for the time frame between 2016 to 2020. Next, apply the capital asset pricing model (CAPM) to generate the individual rate of return for each selected company within the time frame. Thereafter, we calculate the Free Cash Flow for equity of the individual companies for the time frame. Furthermore, we generate the Free Cash Flow for equity per share, then we generate the growth rate for each company for the time frame using a single-stage growth rate, a multiple-stage growth rate and a geometric growth rate of the NASDAQ index. Then we generate the intrinsic value of the selected stocks using the Gordon Growth Model and the H-Model. Secondly, we generate the Price to Book ratio of the selected companies for the time frame between 2017 to 2020 and compare that to the Price to book ratio of the NASDAQ index, we apply this same method to compare the Price to Earnings ratio of the selected companies and NASDAQ index, we also apply this method with Tesla Inc and compare Tesla with its pair companies. Furthermore, we apply the entire value of a firm equal to its equity value (EV EBITDA) ratio to value Tesla Inc by comparing Tesla to its pair companies. The selected companies for this research are selected based on market size, shown in the table below.

Table 1: Market Capitalization

Nasdaq Index	Microsoft	Apple	Amazon	Alphabet	Tesla	Facebook

Market Cap (US$)	1.89T	2.095T	1.633T	1.605T	604.403B	973.073B

4.2 FUNDAMENTAL VALUATION METHOD

This method of valuation aims to generate an intrinsic value of the selected sample companies using the Single-stage Gordon Growth Model and the H-Model Gordon Growth Model.

4.3 BETA ANALYSIS

The aim of calculating the beta of each of the selected companies for each year within the scope of the research is to generate the required rate of return of each of the selected companies for each year with the scope of the research. Beta is a measure of systematic risk of a single stock compared to the market, the level of beta indicates the stock move in correlation to the market, a beta of 1 indicates that a stock has the same volatility as the market, a beta greater than 1 indicates that a stock has greater volatility compared to the market, a beta less than 1 indicates that a stock has lower volatility compared to the market. The beta of the selected companies for the time frame between 2017-2020, using the closing stock price return of the selected companies from 2016-2020 sourced from Yahoo Finance is shown below.


Apple Closing Price
160
140
120
100
80
60
40
20
0
4.1.16
22.7.16
7.2.17
26.8.17
14.3.18
30.9.18
18.4.19
4.11.19
22.5.20
8.12.20
Apple


Alphabet Closing Price
2000
1800
1600
1400
1200
1000
800
600
400
200
0
4.1.16
22.7.16
7.2.17
26.8.17
14.3.18
30.9.18
18.4.19
4.11.19
22.5.20
8.12.20
Alphabet


Facebook Closing Price
350
300
250
200
150
100
50
0
4.1.16
22.7.16
7.2.17
26.8.17
14.3.18
30.9.18
18.4.19
4.11.19
22.5.20
8.12.20
Facebook


Tesla Closing Price
800
700
600
500
400
300
200
100
0
4.1.16
22.7.16
7.2.17
26.8.17
14.3.18
30.9.18
18.4.19
4.11.19
22.5.20
8.12.20
Tesla


Amazon Closing Price
4000
3500
3000
2500
2000
1500
1000
500
0
4.1.16
22.7.16
7.2.17
26.8.17
14.3.18
30.9.18
18.4.19
4.11.19
22.5.20
8.12.20
Amazon

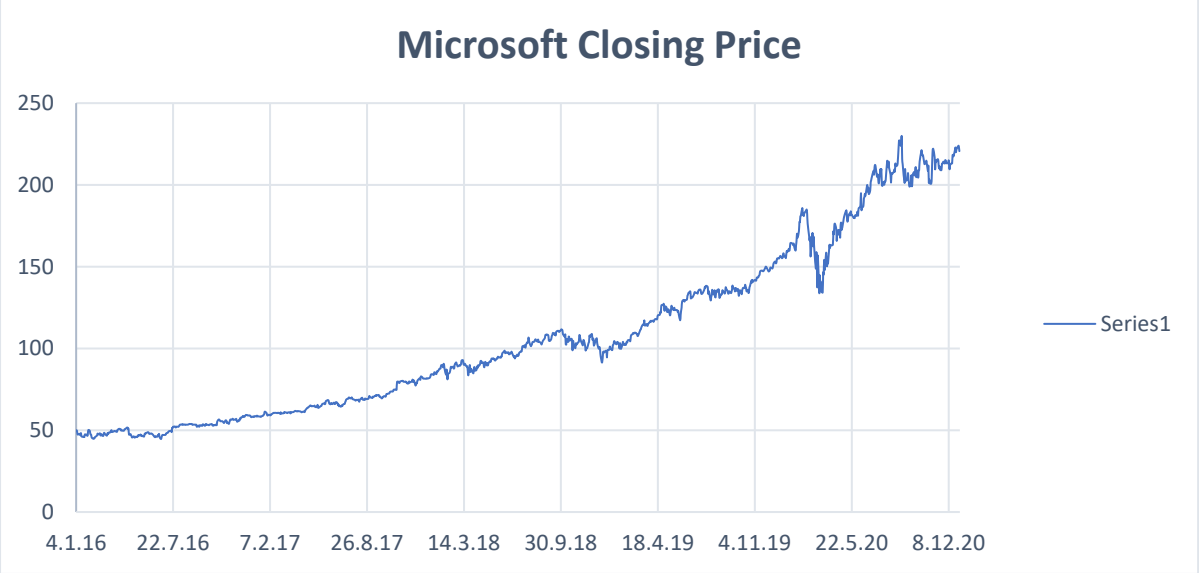

Microsoft Closing Price
250
200
150
100
50
0
4.1.16
22.7.16
7.2.17
26.8.17
14.3.18
30.9.18
18.4.19
4.11.19
22.5.20
8.12.20
Series1

Table 2: Beta Summary

Year	Microsoft	Apple	Amazon	Alphabet	Tesla	Facebook
03-Jan-17	1.10	0.98	1.07	0.90	1.11	1.04
03-Jan-18	1.08	1.24	1.36	1.18	1.31	1.29
03-Jan-19	1.22	1.14	1.46	1.18	1.15	1.19
03-Jan-20	1.07	1.33	1.17	1.13	1.25	1.15

From the table above, it is evident that most of the selected companies for the research are more volatile when compared to the market, only Apple and Alphabet in 2017 had a better lower than 1 but become greater than 1 overtime within the scope of this research, this indicates that most of research sample stock has greater volatility compared to the NASDAQ index.

4.4 INCOME-BASED VALUATION

The Free Cash Flow for equity for this research is generated using both primary and secondary data, primary data sourced from the annual financial report of the selected companies and Yahoo Finance, secondary data sourced from Gurufocus.com and CSImarket.com. The Free Cash Flow for equity model used in this research shows the amount of cash available to the shareholders of the selected companies after all the company's debt and debt financing has been paid. The table below shows the result of this analysis.

Table 3: Free Cash Flow for Equity (Values in thousands of US$)

Year	Microsoft	Apple	Amazon	Alphabet	Tesla	Facebook
2017	65764648	74213458	15662296	23942250	-4530862	17478358
2018	28133398	61944216	8343627	22670634	-124978	15851153

2019	31847435	54048014	10258840	31153330	-2318299	20422100
2020	37552774	74367712	25576005	52390938	-1794756	23052000

From the table above, it is evident that the selected companies have healthy cash flows except for Tesla Inc which make them suitable for the free cash flow valuation method within the time frame of this research (2017-2020). Tesla Inc is not suitable for the free cash flow valuation due to it having negative cash flows. Next, we generate the Free Cash Flow for equity per share using the Free Cash Flow for equity and the shares outstanding sourced from the annual financial report, the shares outstanding for each selected company except Tesla due to negative cash flows within the time frame of this research is shown in the table below

Table 4: Shares Outstanding (thousands of shares)

		Microsoft	Apple	Amazon	Alphabet	Facebook
No of Shares	FY 2017	7708000	20504804	484000	694783	2906000
	FY 2018	7677000	19019944	491000	695556	2854000
	FY 2019	7643000	17772944	498000	688335	2852000
	FY 2020	7571000	16976763	503000	675222	2849000

Using the number of shares outstanding and the free cash flow for equity generated, we can generate the free cash flow for equity per share, which is calculated as Free cash flow for equity divided by the number of shares outstanding, which is shown in the table below.

Table 5: Free Cash Flow for Equity per share

		Microsoft	Apple	Amazon	Alphabet	Facebook

FCFE (per share $)	2017	8.531999	3.619321	32.36012	34.46004	6.014576
	2018	3.664634	3.256803	16.99313	32.59354	5.554013
	2019	4.166876	3.041028	20.60008	45.25897	7.160624
	2020	4.960081	4.380559	50.84693	77.59068	8.09126

The FCFE per share indicates the selected company level of financial flexibility for the time frame of this research.

4.5 CAPITAL ASSET PRICING MODEL

After generating the beta for the selected companies for each year with the scope of the research, we generate the rate of return of the selected companies using the capital asset pricing model (CAPM). Using primary data from the United States treasury and Bloomberg, we could determine the market risk premium, which is an important component of the CAPM, the calculation is shown in the table below.

Table 6: Market Risk Premium

Market Risk Premium = Dividend Yield + Expected Growth Rate - Yield on a Long-Term Government Bond	
Dividend Yield	1.72%
Long Term Growth	10.19%
Government Bond	1.99%
Market Risk Premium	9.92%

After generating the market risk premium, which is the difference between the market risk-free (long-term Government Bond) and expected return on a market portfolio, we generate the rate of return of the selected stock for each year (2017-2020) with the scope of the research using the capital asset pricing model shown in the table below.

Table 7: Capital Asset Pricing Model

ROR	Microsoft	Apple	Amazon	Alphabet	Tesla	Facebook
2017	12.95%	11.75%	12.64%	10.89%	12.95%	12.29%
2018	12.74%	14.26%	15.47%	13.65%	14.94%	14.74%
2019	14.07%	13.32%	16.48%	13.70%	13.44%	13.79%
2020	12.61%	15.14%	13.64%	13.22%	14.36%	13.43%

The rate of return provided using the CAPM will be used to discount the free cash flow for equity using the Gordon Growth Model.

4.6 GORDON GROWTH MODEL

This research applies two different versions of the Gordon Growth Model, the single growth model, and the H-Model, to apply the Gordon Growth Model, we must generate the growth rate to be applied in both models. we generate the growth for the single growth stage using the income data from 2009 to 2020 of the selected companies sourced from Yahoo finance, Gurufocus.com and CSImarket.com. The table below shows the income data of the selected companies.

Table 8: Growth Rate using Net Income

Net income											
Year	Microsoft	Return	Apple	Return	Amazon	return	Alphabet	return	Tesla	Facebook	return
2009	14.57		8,235		932.55		6,520		-56	122	
2010	18.76	25.3%	14,013	53.2%	1,151	23.5%	8,505	26.58%	-154	372	111.5%
2011	23.15	21.0%	25,922	61.5%	628.4	-45.4%	9,737	13.53%	-254	32	-245.3%
2012	16.98	-31.0%	41,733	47.6%	173.25	-72.4%	10,737	9.78%	-396	668	303.9%
2013	21.86	25.3%	37,037	-11.9%	285.35	64.7%	12,733	17.05%	-74	1,491	80.3%
2014	22.07	1.0%	39,510	6.5%	-132.45		14,136	10.45%	-294	2,925	67.4%
2015	12.19	-59.4%	53,394	30.1%	599.25		15,826	11.29%	-889	3,669	22.7%
2016	20.54	52.2%	45,687	-15.6%	2,376	296.5%	19,478	20.76%	-675	10,188	102.1%
2017	25.49	21.6%	48,351	5.7%	2,248	-5.4%	12,662	-43.07%	-1962	15,920	44.6%
2018	16.57	-43.1%	59,531	20.8%	10,079	348.4%	30,736	88.68%	-976	22,111	32.8%
2019	39.24	86.2%	55,256	-7.5%	11,585	14.9%	34,343	11.10%	-870	18,485	-17.9%
2020	44.28	12.1%	57,411	3.8%	21,303	83.9%	40,269	15.92%	690	29,146	45.5%
Arithmetic Average		10.11%		17.65%		78.74%		16.55%			49.78%
Geometric Average		11.76%		21.43%		36.73%		19.97%			72.91%

From the table above, it is evident that we were able to generate a reasonable single growth rate for the selected companies except Tesla using their Arithmetic average and Geometric average. This method generating a single growth cannot be applied to Tesla due to the company having negative returns on income until 2020 which indicates that Tesla is not suitable for single stage Gordon Growth Model. For this research we will be applying the arithmetic average for the single-stage growth rate, from the table we can identify the growth rate of the selected companies as, Microsoft 10.11%, Apple 17.65%, Amazon 78.7%, Alphabet 16.55%, Facebook 49.78%. The arithmetic average of Amazon does not take into consideration 2014 due to the company experiencing abnormal losses during the year. After generating the single-stage growth rate for the selected companies, we generate the intrinsic value of the selected companies using the single-stage Gordon Growth Model, the result of this analysis is shown below.

Table 9: Single-Stage GGM value

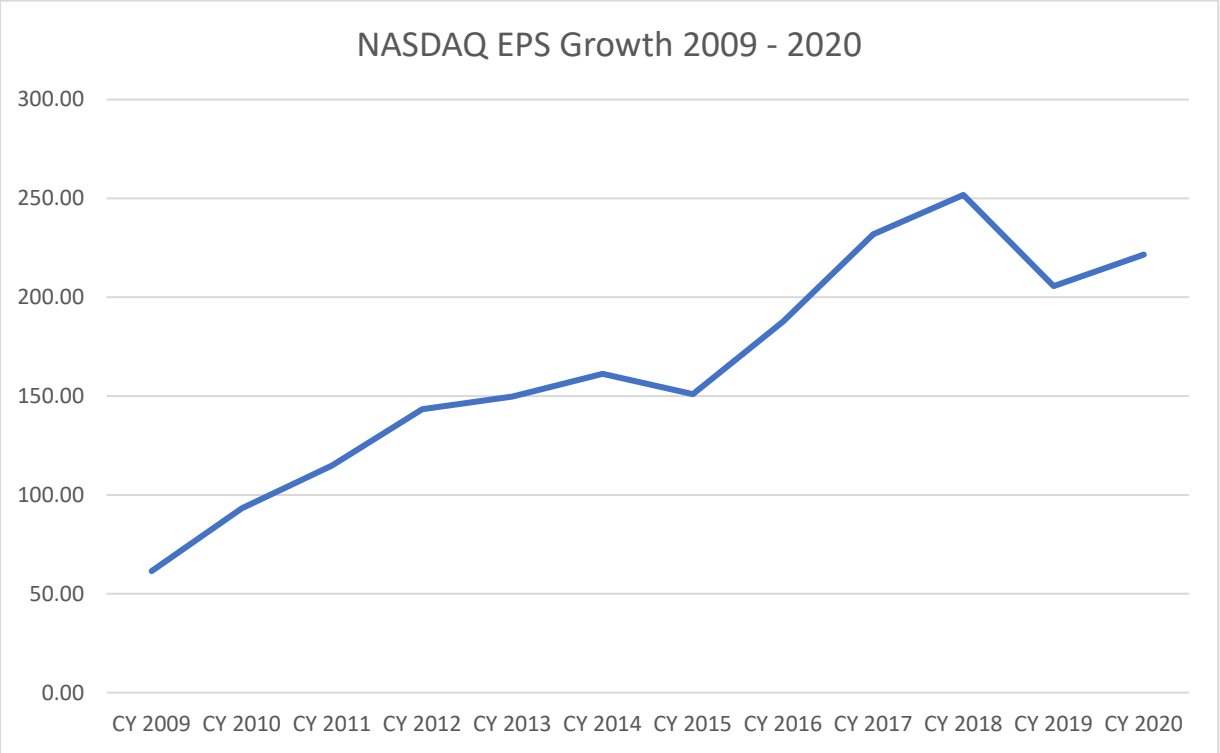
		Microsoft	Apple	Amazon	Alphabet	Facebook
Equity Value - GGM	2017	$330.8	-72.20	-88.13	-708.88	-24.03
	2018	$153.6	-112.94	-48.37	-1309.1	-23.74
	2019	$115.8	-82.55	-59.60	-1850.14	-29.8
	2020	$218.3	-205.45	-140.63	-2714.51	-33.34

Findings:

From the table above, it is evident that the single-stage Gordon growth model cannot be applied to all selected sample companies, Only Microsoft could apply the single-stage GGM model to

generate an intrinsic of $218.3 as of 2020 which is not far off from the real-world value of the company in the NASDAQ index at $286.95 as at 11th of August 2021 which indicate that Microsoft is fairly valued using market fundamentals valuation. The other sample companies all generated negative figures which indicate that the single-stage Gordon Growth Model cannot be applied to them.

Next, we apply the H-Model Gordon Growth Model to determine the intrinsic value of our selected sample stocks, the H-model requires two growth rather, we have the single-stage growth rate generated from the net income arithmetic average which will be used as the High stage growth rate of the sample stocks, the low or constant stage growth rate of selected stocks will be the growth rate of the NASDAQ index at 7.67% sourced from Bloomberg, this is the average growth rate of the stocks in the NASDAQ index.



This research will apply an arbitrary half-life of 5 years between the high growth phase of the stock and the low growth phase. The table below shows the result of the analysis.

Table 10: H-Model Valuation

		Microsoft	Apple	Amazon	Alphabet	Facebook
Equity Value - H model	2017	$193.70	$139.69	$2989.30	$1629.53	$414.04
	2018	$86.70	$77.90	$1001.13	$828.90	$249.88
	2019	$78.03	$84.87	$1074.22	$1141.31	$372.47
	2020	$120.31	$92.38	$3912.51	$2125.96	$446.76
H	Arbitrary	5	5	5	5	5
gl	NASDAQ	7.67%	7.67%	7.67%	7.67%	7.67%

Findings:

From the table above, it is apparent that the H-Model Gordon Growth Model perform better in generating a value for all the sampled companies except Tesla compared to the Single-stage Gordon Growth Model, the H-model provides suitable values for Apple at $92.3, Amazon at $3912.5, Alphabet at $2125.96 and Facebook at $446.76, which is similar to the real-world valuation of these selected companies in the NASDAQ index with Apple currently valued at $145.86, Amazon at $3292.1, Alphabet $2758.49, Facebook at $359.96 as at 11th of August 2021. This indicates that the share price for Apple, Amazon, Alphabet and Facebook are fairly valued using market fundamentals valuation. The H-Model GGM falls short in its valuation of

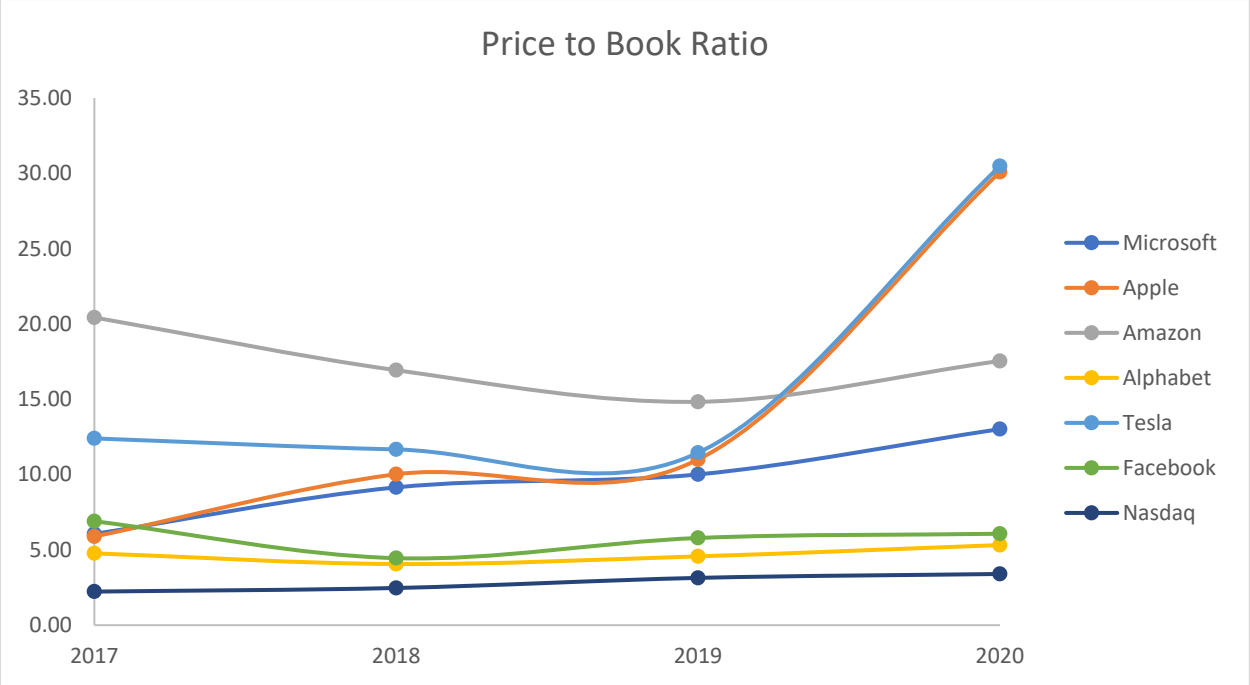
Microsoft with a value of $120.31 compared to the real world NASDAQ value at $286.95 and the single-stage GGM at $218.3.

4.7 METHOD OF COMPARISON

This method aims to value the selected sample companies by comparing them to the NASDAQ index, using price multiples such as the Price to Book ratio (P/B), Price to Equity (P/E) and Equity Value to Earnings before Interest, Tax, Depreciation and Amortization.

4.8 PRICE TO BOOK RATIO

The price to book ratio is a measure of a firm's market price compared to its book value, the book value of an asset is the value of the total assets of a firm minus the accumulated depreciation on those assets. The price to book ratio of the selected sample companies and NASDAQ index for the time frame of this research is shown in the graph below.

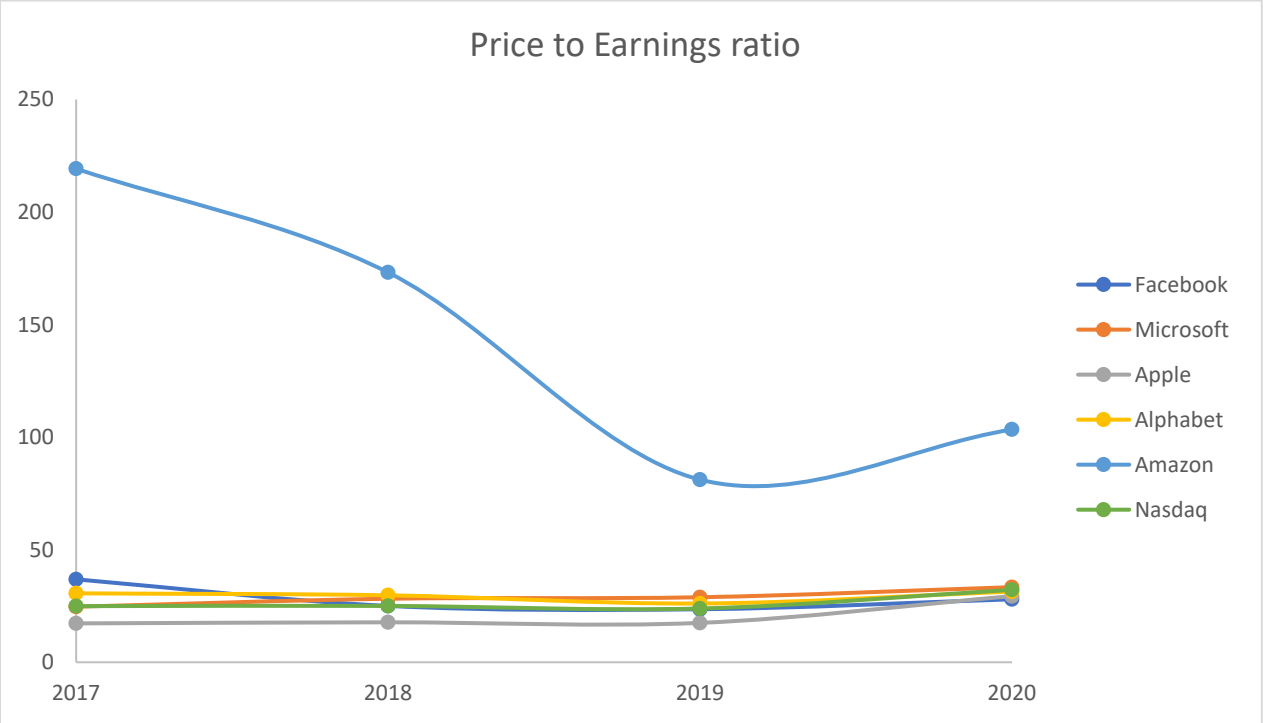


Findings:

From the graph above, it is evident that all the selected stocks have a higher P/B ratio than the NASDAQ index, this indicates that your average technological stock has a higher P/B ratio compared to the NASDAQ index. Due to all selected sample stock following the same trend of being greater than the NASDAQ index, this indicates that all the stocks are not undervalued according to the P/B ratio, the P/B ratio of Microsoft, Amazon, Alphabet and Facebook seem stable, this indicates that the stocks are fairly values, while the P/B ratio of both Apple and Tesla have increased sharply the other sample companies for the year 2020, which may raise questions about the appropriateness of their valuation using the P/B ratio, further research will be required to determine the reason for the massive increase. It is important to note that the P/B ratio values only tangible assets, which is a major factor in this analysis due to technological companies having several intangible assets such as software, patents, and goodwill. This flaw could affect the company valuation.

4.9 PRICE TO EARNINGS RATIO

The price to earnings ratio is a valuation method using the company's current share price in relation to its earnings per share (EPS). The price to earnings ratio of the selected sample companies and NASDAQ index for the time frame of this research is shown in the graph below.

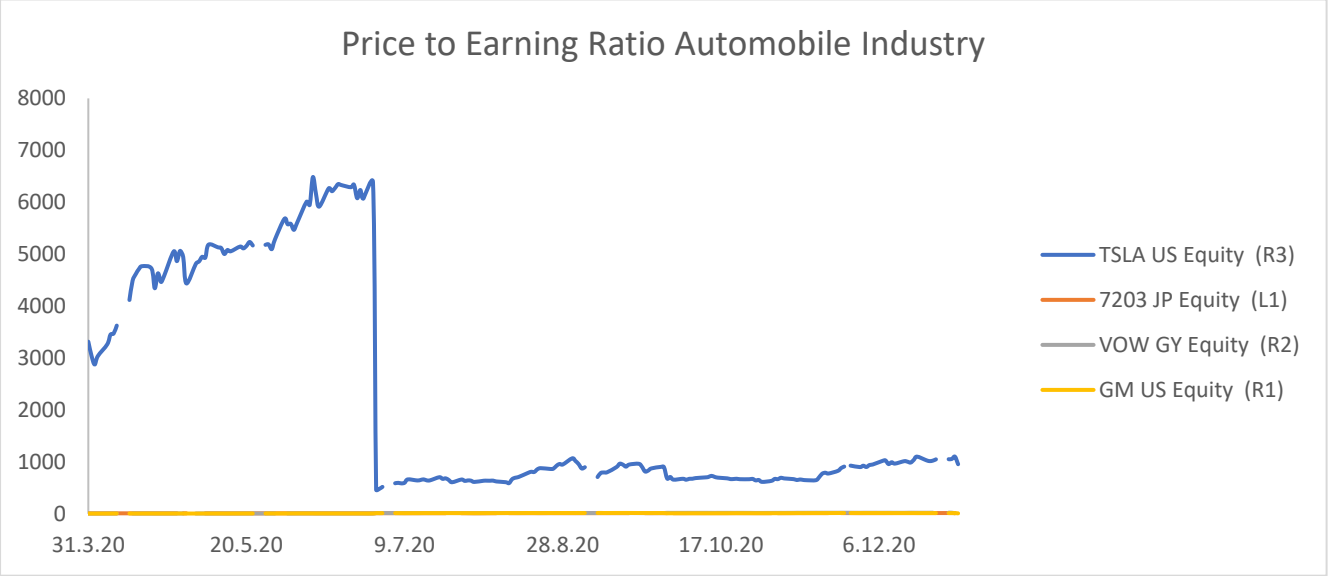


Findings:

From the graph above, it is evident that the price to earnings ratio of the selected companies except Tesla is all similar to the price to earnings ratio of the Nasdaq Index, the only outlier in this analysis is Amazon which has an excessively P/E ratio at the starting point of research (2017) but has dropped at the end of the research (2020), this high P/E ratio can be linked to growth in earnings of amazon in recent years and not a direct indication of Overvaluation using the P/E ratio as shown in the graph below.

Microsoft, Facebook, Apple, Alphabet all have consistent P/E ratios with the Nasdaq Index which indicates that they are fairly valued.

Due to Valuation Issues with Tesla when compared to the Nasdaq Index, this research applies an Industry only P/E ratio to value tesla, the graph below shows the P/E ratio for the automobile industry.

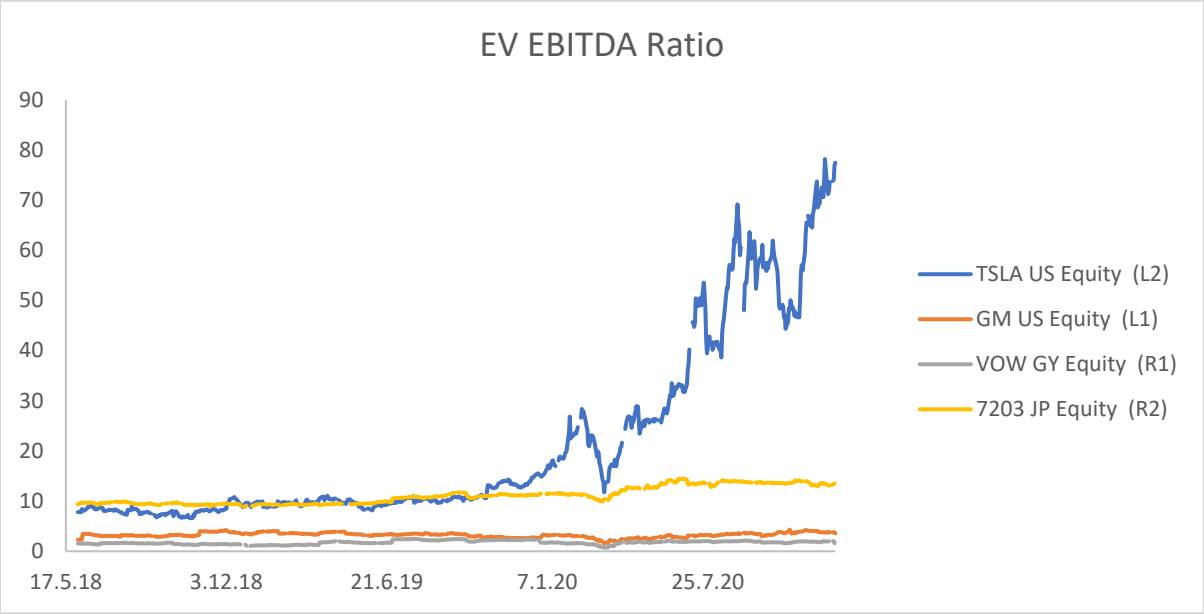


Findings:

From the table above, we generated the P/E ratio of companies in the Automobile industry namely General Motors, Toyota Motor, Volkswagen. From the period of 31st March 2020 to 31st December 2020, it is evident when compared to other companies in the automobile industry using the P/E ratio, Tesla is overvalued with an abnormally high P/E ratio compared to industry norms. Tesla also lacks high earnings that could be attributed to excessive-high P/E ratio.

4.10 EQUITY VALUE TO EARNINGS BEFORE INTEREST, TAX, DEPRECIATION AND AMORTIZATION.

The EV/EBITDA ratio is a valuation method used to value a company by comparing the value of the company including debt to the company's earnings less non-cash expenses. The chart below shows the EV/EBITDA ratio of companies in the automobile industry.



Findings:

From the graph above, we generated the EV/EBITDA ratio of companies in the Automobile industry. From the period of 17th May 2018 to 31st December 2020 it is evident that Tesla EV/EBITDA is far greater compared to its pair industry pairs. This is an indicator that Tesla is overvalued as most of its pair companies General Motors, Toyota Motors, Volkswagen have very smaller EV/EBITDA ratio

4.11 DISCUSSION OF FINDINGS IN ANALYSIS

The objective of this research is to determine whether there is an asset bubble in the technological sector by valuating selected technological stocks.

From the analysis above, we have generated the intrinsic value of the selected technological stocks, this research applied various valuation methods in the analysis. Some valuation techniques are more suitable for some companies than others, Using the single-stage Gordon Growth Model resulted in the generation of the intrinsic value of Microsoft which is similar to the real-world value of Microsoft which indicates that Microsoft is fairly valued using fundamental valuation but failed in the valuation of the other selected companies. The H-Model Gordon Growth Model generated a less suitable value for Microsoft despite generating suitable values for the other selected stocks namely Amazon, Apple, Alphabet, and Facebook, values which are similar to their real-world value, which indicate that they are fairly valued using fundamental valuation. A fundamental valuation cannot be applied to Tesla due to having negative cash flows, a negative cash flow cannot be used to generate Free Cash Flow for equity valuation required to generate an intrinsic value using Income-based valuation.

Furthermore, we applied another valuation method using price multiples, we applied the three different price multiples valuation methods, the Price to Book ratio(P/B), the Price to Earnings

ratio (P/E) and the Enterprise Value to Earnings before Interest, Tax, Depreciation and Amortization. Using the P/B ratio we were able to determine the value of selected companies except for tesla due to the lack of sufficient data, the P/B ratio indicated that Microsoft, Amazon, Alphabet and Facebook all seem to be fairly valued, but Apple and Tesla all seem to have excessive-high P/B ratio, but this may be because the P/B ratio values only tangible assets which is not suitable for valuing technological companies because they own several intangible assets.

The Price to earnings ratio (P/E) also provided suitable values for the selected companies, the P/B ratio of Microsoft, Facebook, Apple and Alphabet are all similar to the Nasdaq index, only Amazon among the selected companies has a P/E ratio significantly higher than the Nasdaq index, but this does not necessarily indicate overvaluation as Amazon earning has grown over time in recent year as shown in the graph above, which could be the reason for the difference in P/E ratio compared to the Nasdaq index. We applied an industry only P/E ratio to value Tesla due to the high P/E ratio exhibited by the company when compared to the P/E ratio of the other Automobile companies. Tesla's P/E ratio is excessively higher when compared to industry competitors in General Motors, Toyota Motor, Volkswagen, which indicates overvaluation using the P/E ratio.

Additionally, we applied the EV/EBITDA to value Tesla using its pair companies, the results indicated an overvaluation of Tesla's stocks in the market. . This result is consistent with research performed by JP Morgan (2021) on the auto Manufacturers, where a fundamental value for Tesla was generated using a blended combination of the EV/EBITDA which generated a value of $183, a P/E ratio which generated a value of $206, a P/S ratio which generated a value of $202 and a blended combination of all three multiples to generate a value of $197, which is was lesser than the price at that point at $641.

4.12 CONCLUSION

The selected valuation methods have been able to generate intrinsic values which have been compared to the real-world value of the selected companies, this is in line with previous research where fundamental was applied to generate the value of a company's equity, such as Rappaport (1986) where the Dividend discount model was applied to generate the intrinsic value of IBM. Nasseh and Strauss (2004) applied the dividend discount model to value 84 stocks in the S&P 100, however, it is argued by (Gehr 1992) that the dividend discount model is biased because the growth used to generate the growth rate is subject and it skews the valuation process.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

In the previous chapter, we determined the values of the selected technology stocks using various fundamental valuation methods, In this chapter, we will discuss the implications of the outcome in the context of our main objective in our conclusion. Afterwards the recommendation and contribution to knowledge will be drawn.

5.1 CONCLUSION

The rise in Digitization in our society has led to the increase and constant growth of technology companies in our society, with the growth of earnings and size of technology companies, the possibility of overvaluation and asset bubbles are not unexpected. This research aims to determine whether there is currently an asset bubble in the technological industry by valuing selected stocks using market fundamental valuation techniques.

From the research above, after generating the equity value of the selected sample companies from the Nasdaq index. From selected sample companies Microsoft, Apple, Alphabet, Facebook, and Amazon all generated intrinsic values similar to their real-world valuation using the Income-based valuation method, which indicates that the selected stocks are fairly valued. This method of valuation could not be applied to tesla due to having a negative cashflows. The result provided by the Income-based valuation method indicate that there is currently no asset bubble due to the stocks being fairly valued. Using price multiples such as the Price to Book ratio (P/B), Price to Earning ratio (P/E) and the Enterprise value to Earnings before Interest, Tax, Depreciation and Amortization (EV/EBITDA). Using the P/B ratio, we evaluated that Microsoft, Amazon, Alphabet and Facebook were all fairly valued using the P/B ratio, but Apple and Tesla have increased P/B ratios in 2020 which could indicate an overvaluation, but the limitation of the P/B ratio only valuing tangible assets which are not suitable for technology

companies by nature. Applying the P/E ratio, it is apparent that Facebook, Microsoft, Alphabet and Apple are all fairly valued, Amazon has a fairly high P/E ratio, but this does not necessarily indicate overvaluation as Amazon earnings have grown substantially in recent years. Using the Industry-specific P/E ratio to value Tesla, we evaluated Tesla to be overvalued when compared to industry pairs which indicate an asset bubble in Tesla shares. Furthermore, we applied the EV/EBITDA valuation method to value Tesla compared to its pair companies, we observed that Tesla is overvalued using this method which indicates an asset bubble in the company's shares.

From the research done, we can ascertain that there is currently no asset bubble in the technology industry as a whole using our selected companies, but selected stocks might have price bubbles in their valuation such as Tesla.

5.2 RECOMMENDATION

In line with the implication of the research, the researcher has noted some recommendations for the valuation of technology stocks. This could take form in how technology companies are valued, conventional valuation method proves difficult in valuing technology companies due to the massive growth in earnings exhibited by technological companies in recent years, conventional methods could lead to undervaluation or overvaluation due to applying subjective growth rates based on the analyst discretion. A common growth metric must be generated for technology companies as their growth rate tends to be greater than your average company. This adjustment could prove beneficial in preventing further price bubbles for technology stocks.

5.3 CONTRIBUTION TO KNOWLEDGE

The contribution made by this research to existing knowledge includes:

- The research helped determine if there is currently another asset bubble in the financial market due to technology stocks similar to the Dot Com bubble.

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