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Value Investing for Technology Companies

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Abstract: Electronic products are constantly flooding our lives. More and more technology companies invest more capital to research electronic products. This paper analyses the data for five representative US technology companies from year 2015 to 2021, from a value investing perspective. Specifically, this paper looks at factors like profitability, valuation, growth, pay out and returns. By analysing those factors with historical data, this paper looks at the value changes and explain the possible reason behind. This paper further compares each of those factors across the five companies and it is concluded that Apple Inc ranks the first and worth to invest in our five-company portfolio. Dell, being the second the best choice, rank ahead of other three companies by a large margin. This paper suggest that one can have APPL and Dell in the portfolio but not to invest the other three companies.

Keywords: value investing, technology, Apple, Dell

1. Introduction

Stock investment is one of the most discussed topics in the academic and financial circles. The ultimate goal of all investment companies or retail investors is to select the investment target. There are many different ways. For example, quantitative investment is made by looking at technical signals based on stock price and trading volume data, and fundamental investment is made by looking at the company's fundamentals (such as earnings and dividends). In addition, there is a macro approach to identify which sectors are more likely to surpass others by analyzing the economic cycle. For example, investors like to invest in defensive industries, such as public utility companies during economic recession, or non-essential consumer goods and other cyclical industries when the economy is performing well. Here, this paper only focuses on the technical department and only uses basic methods for analysis. Analyze the advantages and disadvantages of each listed company according to five important indicators. In particular, by observing five technology companies, namely Apple, Dell, Helmerich&Payne, Canon and HP. Most of the selected companies involve hardware, which is different from technology companies such as Google, Amazon and Facebook, so they are more comparable.

For both fundamental and technical approaches to invest stocks, factor modelling is the common way to perform analysis for stocks. The idea is simply look at different attribute of stocks and measure those attributes separately. This factor approach was invented many years ago [1-2], where they studied size, value, quality, profitability, and investment pattern. For other reference one can look at Ang & Chen, Banz [3-4].

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In our research, value investing approaches are used by looking at fundamental factors, in particular, this paper concentrated on earrings, valuation, growth and dividends factors.

2. Method and Results

This paper uses the finance Python software package to obtain stock price, trading volume and related basic data from Yahoo Finance. The companies we studied include APPLE, DELL, Helmerich&Payne, Canon and Hewlett Packard Enterprise. The important indicators of the five companies are calculated based on the formula, and the optimal investment portfolio is selected by comparing the changes of each indicator in five years.

2.1. Identifiers

Symbols used by stock exchanges and data processing libraries. For example, Microsoft's stock code is MSFT, and Apple's stock code is APPL. The corresponding English abbreviations of the five companies are [APPL, DELL, HPQ, CAJ, HPE].

This study uses the Finance Python API to download and process stock prices and data required over the years from Yahoo Finance. The API can display daily data. The downloaded data columns are as follows: Opening price and closing price on the open market trading day. High: the highest price on the day of normal trading. Low: the lowest price on the day of normal trading. Closing: The Exchange will announce the closing price of the listed company's shares after the closing of the normal trading day. Adjust the closing price: effectively adjust the closing price backwards, including stock dividends, splits and splits. In our case, we use the adjusted price so that we can calculate the actual return of each company.

2.2. Fundamentals

Fundamental data are draw from financial statements, which are income statement, balance sheet and cash flow statement. However, this paper does not need use all those data, we only need the ones that are enough to calculate the ratios that we need. For valuation, we need earning data and market cap, for profitability, we need book values, asset values and gross profit. For pay out we need to know the dividend data. Growth can be calculated by using sales and earnings data. The data are available for each quarter, but we only use the end of year data which is enough for our calculations.

2.3. Valuation

The simplest and best-known valuation method for a company, the P/E ratio, which divide the ratio of company’s price per share and earning per share. Which measures for how many years, one can get his investment back from investing into a company according to its current market cap and earnings. In the best-known factor investing paper [5], which use historical data to conclude that companies of higher book/market ratios are more likely to outperform. There the factor used Is the P/B ratio which look at the book value and market cap. In our case, this paper looks at the earnings which instead of book size, which better reflect the company’s ability to generate profit at given level of capitalization.

A straightforward justification for the value factor in equities research is that it makes sense to expect that buying an asset for less would result in higher future returns than buying it for more. There are many methods for calculating value. Morgan Stanley Capital International (MSCI) now uses P/E ratio, P/E ratio and dividend yield (the higher the yield, the better the value) to identify "value" enterprises (in both cases, the lower the ratio, the higher the value) [6].

By using these factors to evaluate individual stocks, the index includes the stocks with the highest value and the stocks with the lowest value. At the same time, according to other criteria,

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such as the value ratio based on cash flow and net profit, it can also be proved to provide beneficial excess return (excess alpha). The value factor may ultimately not fully reflect the real value, and the overall performance is lower than the corresponding market capitalization weighted index (S&P 500 index). According to Kenneth French's measurement of the "American value" factor, the overall valuation performance of listed companies was better from 1926 to 2016. Michael Fraikin, director of global research at Inversco Quantitative Strategies, said that this component could not be used as a measurement standard in the past 50 years. Therefore, the concept of "long-term excellent performance" may require a long timeline. For our universe, we will have the following result for value factor in the past 7 years (See Table 1).

Table 1: Valuation factors.

Valuation	2015	2016	2017	2018	2019	2020	2021
APPL	11.96	13.60	16.73	18.95	18.84	35.31	25.22
DELL	7.71	11.24	9.02	15.09	8.09	12.27	9.07
HPQ	10.87	9.47	14.56	7.40	8.39	8.98	5.69
CAJ	17.93	23.85	18.89	12.96	25.32	25.54	13.72
HPE	9.91	12.34	53.54	11.73	21.31	-34.56	5.68

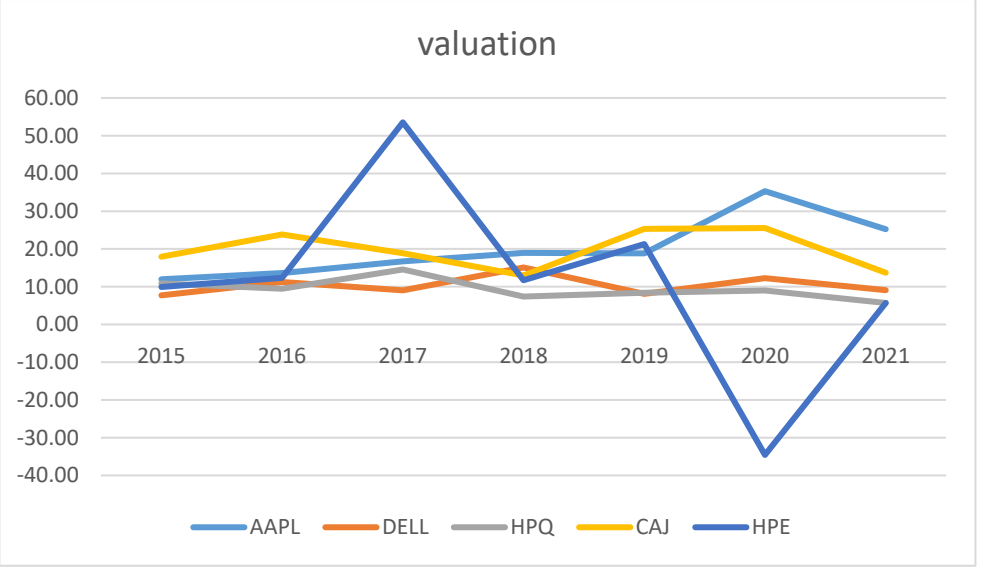

Figure 1: Valuation factors.

Here we can see that the PE ratio of APPLE is the highest in 2021 and trending up in the past few years. While HPE is very volatile which suggest the company's fundamental is not stable overtime (Five companies' Valuation factors can be seen in Figure 1).

2.4. Profitability

According to Robert Novy's most famous Marx's paper on profit factors [7], The Other Side of Value: The ratio of gross profit to assets is the change of P/E ratio. Since we use assets instead of market value as the denominator, this is a better estimate of the level of resources the company uses to generate the corresponding income. (Morgan Stanley Capital International, Introducing Profitability, 2022) has included the profitability factor into the model, and they have a more compact construction method. Among them, their factors have four equal weighted components, which are used to measure the efficiency of enterprise operation to generate profits. 1. Asset turnover rate (ATO): financial ratio

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to measure the asset management efficiency of listed companies (sales/total assets). 2. Gross profit margin (GP): (sales volume - cost of goods sold)/calculation of total assets. 3. Gross profit margin (GPM): (sales volume - cost of goods sold)/sales volume. It is usually used to adjust the proportion of actual profit to total revenue before operating costs (actual expenses and indirect expenses). 4. Return on Assets (ROA): an indicator used to indicate the actual profits generated by unit assets. The calculation method is income divided by total assets. Due to limited data resources, we only use the P/E ratio, which directly reflects the investment value and risk level of listed companies, which is representative enough for our research purposes. For our universe we have the following result for profitability factor in the past 7 years (See Table 2).

Table 2: Profitability factors.

Profitability	2015	2016	2017	2018	2019	2020	2021
APPL	35.83%	29.14%	26.02%	30.78%	32.82%	35.82%	41.78%
DELL	16.47%	21.96%	25.98%	26.61%	27.55%	26.67%	27.39%
HPQ	26.32%	32.11%	30.17%	32.11%	35.24%	32.03%	36.37%
CAJ	49.87%	37.44%	43.37%	42.60%	38.74%	34.67%	38.92%
HPE	17.82%	22.13%	17.75%	20.86%	22.72%	19.89%	20.14%

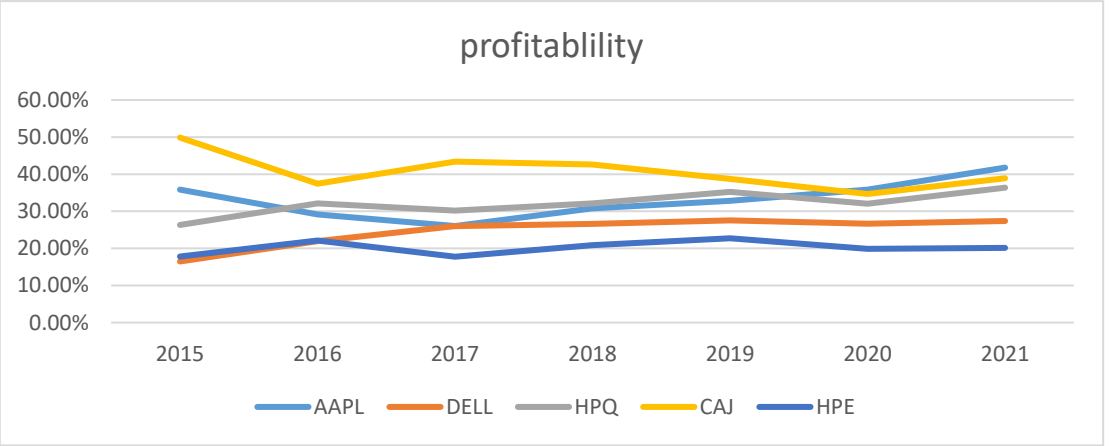

Figure 2: Profitability factors.

We see the best companies here are APPL and CAJ over time which might due to the monopoly of their products (Five companies' profitability factors can be seen in Figure 2).

2.5. Growth

The growth factor is easy to understand. It measures the year-on-year change in the company's earnings. Compared with the two more static indicators, P/E ratio and profitability, growth measures the change of the company and captures the momentum of the fundamental change of the company. Rabener shows that since 1992 [8], the performance of high growth stocks has been better than the average level of the U.S. stock market, in which the growth is measured by three-year sales and earnings growth. It is mentioned that active managers regard growth as a possible source of alpha [9], because it uses historical earnings, sales and forecast earnings to capture the growth prospects of enterprises. The excess return brought by Alpha is also far greater than the actual estimate. Since the 1950s, growth investment (also known as capital growth or capital appreciation) has been a common investment strategy. Active managers find that growth investment is one of the most logical and widely used investment strategies. The growth rate represents all the revenue capacity of the company

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(avoiding risks in revenue and expenditure). As the risk model proves, growth is an investment strategy with strong explanatory power. Independent of other fashion or industry influences, pure growth factors show attractive long-term returns. For our universe we have the following result for growth factor in the past 7 years (See Table 3).

Table 3: Growth factors.

Growth	2015	2016	2017	2018	2019	2020
APPL	-8.00%	6.60%	15.86%	-2.04%	5.51%	33.26%
DELL	22.10%	27.15%	14.65%	-6.41%	2.19%	16.76%
HPQ	-6.27%	7.91%	12.33%	0.49%	-3.60%	12.09%
CAJ	-10.49%	19.95%	-3.14%	-9.07%	-12.05%	11.17%
HPE	1.55%	-10.52%	9.51%	2.94%	-10.79%	10.71%

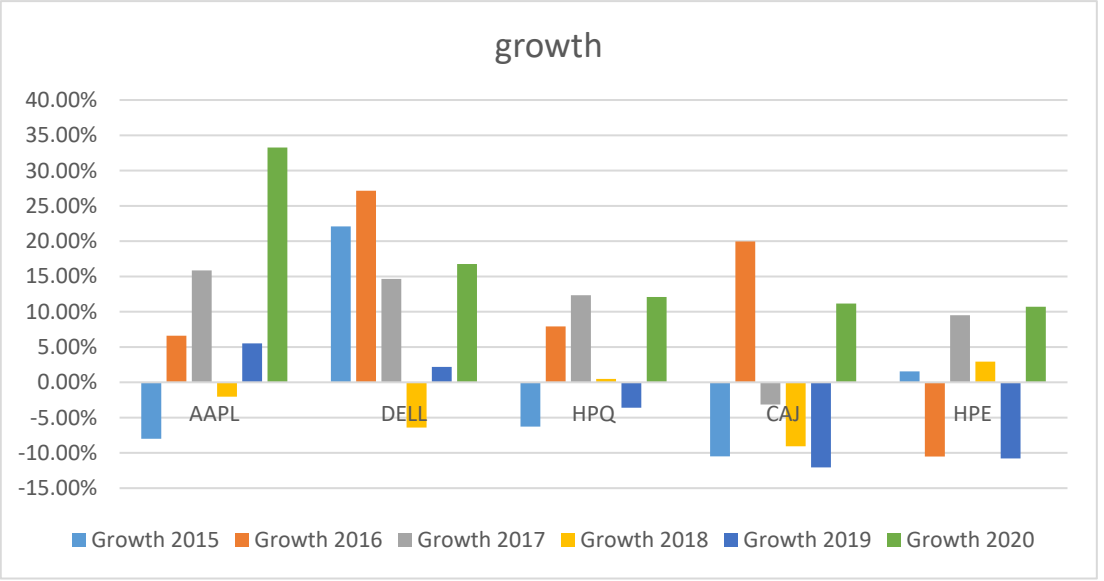

Figure 3: Growth factors.

Here we see that APPL and DELL have the highest the average growth where APPL is growth speed is faster and faster recently. APPL has the strongest trend up (Five companies' Growth factors can be seen in Figure 3).

2.6. Pay-out

Pay-out is a measure of cash that can be generated by holding the shares of a company. Currently, the dividend yield factor is included into the model [10], which is among the 8 factors in of their main model, which are value, size, momentum, quality, yield, volatility growth and liquidity. Value and growth factors we have mention above are also in MSCI's factor model. A yield (or high dividend yield) investment strategy exposes investors to businesses that seem inexpensive and have a history of consistent dividend growth. A naive high-yield equities strategy, however, may be vulnerable to a number of "yield traps," such as those brought on by momentarily strong earnings, excessive pay-outs, or declining stock prices. As a "defensive" factor, the yield factor has a tendency to profit from periods of economic downturn in the long run. At the same time, according to the signal theory, the increase or decrease of dividends paid over the years is a signal that the listed companies have released good or bad performance to the market. For our universe we have the following result for pay-out (yield) factor in the past 7 years (See Table 4).

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Table 4: Payout factors.

Payout	2015	2016	2017	2018	2019	2020	2021
APPL	1.89%	2.02%	1.62%	1.28%	1.42%	0.72%	0.62%
DELL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HPQ	2.51%	3.45%	2.50%	2.39%	3.82%	4.25%	2.83%
CAJ	4.41%	4.56%	3.58%	5.45%	5.42%	5.99%	3.02%
HPE	1.24%	1.01%	1.93%	3.38%	2.83%	4.17%	3.29%

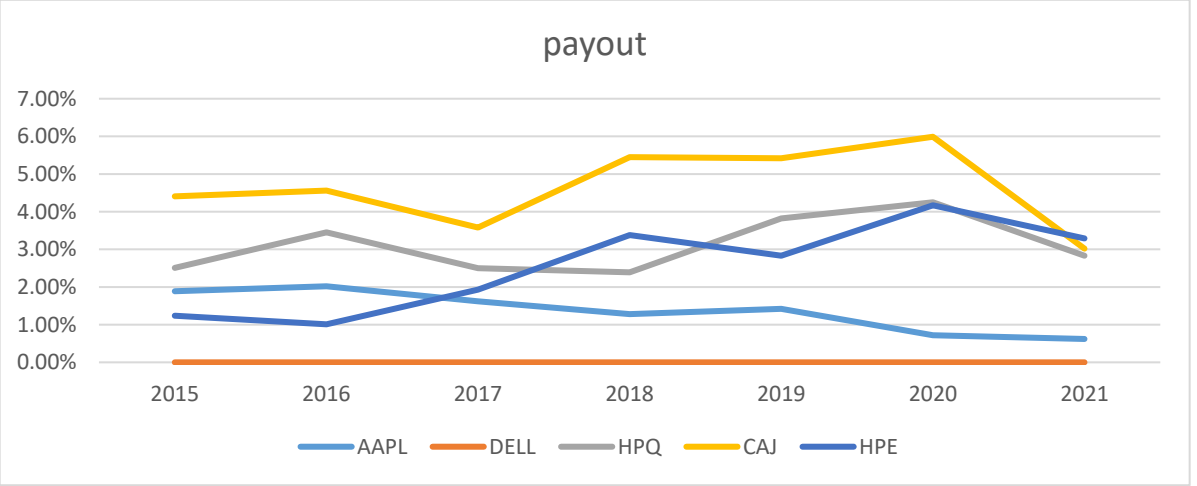

Figure 4: Payout factors.

From the above we can see that CAI and HPE have the highest pay-out factor there is no pay-out for DELL and below 1% pay-out for APPL (Five companies' Payout factors can be seen in Figure 4). Note that the stock price can be very volatile, and annual return can be higher than 10-20%, which means the pay-out factors we see above which are mostly in the range of a few percentages, end up has very limited impact to investors decision of stock selection.

2.7. Return

Another factor we will look at is simply the historical return of stocks, which is not part of the fundamental factor, but it is not ignorable in any modern equity factor models. It is called momentum factor. Based on the momentum factor theory, stocks that performed well in the past are likely to continue to perform well for a period of time. Jegadeesh and Titman found that long-term winners and short-term losers are strategies to generate excess returns [11]. As for why these momentum factors produce positive effects, the most widely accepted theory is based on behavioral finance effects and corporate finance theory. Investors may overreact to or underreact to the public information on the market, which may lead to changes in mentality that affect trading operations [12]. The variance of the historical rate of return also reflects the company's ability to operate stably, compared with some investors with large risk appetite. Risk stable investors prefer listed companies with stable growth rate of return. For our universe we have the following result for return (momentum) factor in the past 7 years (See Table 5).

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Table 5: Return factors.

Return	2015	2016	2017	2018	2019	2020	2021
APPL	46.25%	36.90%	36.87%	49.36%	55.92%	73.69%	147.44%
DELL	-49.92%	-15.87%	-22.93%	-64.42%	-150.28%	718.23%	1401.26%
HPQ	16.71%	20.91%	-69.23%	-263.26%	-344.10%	-166.27%	-335.38%
CAJ	7.88%	3.17%	4.53%	8.86%	8.56%	5.24%	7.41%
HPE	7.00%	9.73%	1.25%	8.54%	5.47%	-1.94%	19.03%

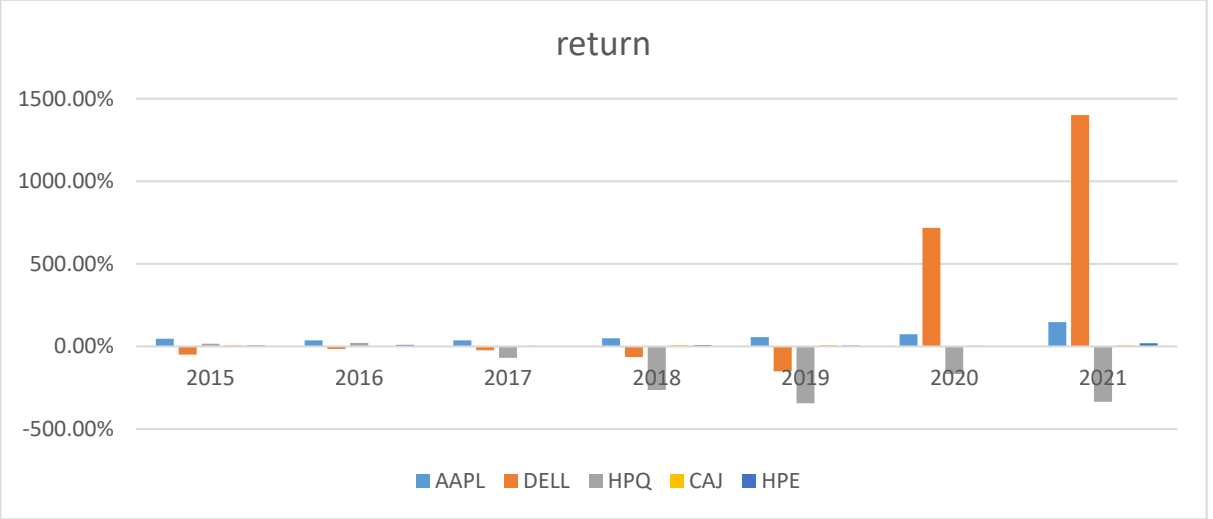

Figure 5. Return factors.

From the graphs we see that the returns data, where DELL has been negatived for five years but strong positive in the recent two years. APPL has been consistently positive over all past seven years (Five companies' Return factors can be seen in Figure 5). While others are pretty mixed or negative.

3. Conclusion

From the analysis of the above five factors, we can see that APPL and DELL are the most favorable factors. Based on the global positions of the two companies, it is not difficult to see that APPL is superior to DELL in scale and industry coverage. If we further compare the two, we can see that APPL is better than DELL in profitability from 2019 to 2021 and continues to be better than DELL in valuation; The growth of APPL from 2015 to 2018 was lower than that of Dell, but recently it was better than Dell. APPL continues to outperform DELL in terms of payment (although this indicator cannot be used as an important measurement basis), while APPL's return is lower than DELL (momentum). Therefore, in general, in our five-factor model framework, APPL performs better than DELL, and better than the other three companies. We conclude that APPL is the most favorable investment among our five stock options.

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