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Performance of Value and Growth Stocks in the Aftermath of the Global Financial Crisis

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Abstract

Background: Due to strong empirical evidence from different markets, existence of value premium became a financial theory standpoint. Although previous studies found that value stocks beat growth stocks in bearish and bullish markets, during the GFC, value stocks underperformed growth stocks. **Objectives:** This paper aims to examine the performance of value and growth stock portfolios after the GFC. Subjects of our analysis are constituent companies of the DJIA index, out of which portfolios of large-cap value and growth stocks have been constructed and evaluated. **Methods/Approach:** We measure the performance of stock portfolios, which are created based on the naïve diversification rule and random weighting approach. Statistical testing includes Levene's homogeneity test, the Mann-Whitney U test, T-test, and the One-Sample T-test. **Results:** Growth stock portfolios outperform value stock portfolios after the GFC. The dominance of growth stock portfolios compared to value stock portfolios is significant, and the value premium disappears. **Conclusions:** Financial theory and investment management implications show that growth stocks have overtaken the dominance over value stocks since 2009. Causes might be in (1) expansionary monetary policy characterized by very low long-term interest rates and (2) high performance of the tech industry to which most growth stocks belong.

Keywords: value premium; Dow Jones Industrial Average; investment strategies; naïve diversification
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Introduction

Value and growth investing are buying companies with low price-to-book ratios (value) versus high price-to-book ratios (growth), i.e., low versus high multiples. The value style was advocated by Benjamin Graham in the 1930s (Graham et al., 1938) and later by Warren Buffet. Value might indicate buying a stock at a low price, i.e., these stocks are seen as cheap compared with their potential compared to their intrinsic value estimated based on the balance sheet data. It has been found that value stocks outperforme not only growth stocks, but also the market itself (Folkinshteyn et al., 2017). Investing in growth stocks, i.e. stocks with relatively high price-earnings ratios, has been a popular portfolio strategy in the post-war periods, especially in times of strong economic growth (Bauman et al., 1997). Growth stocks come from innovative sectors, and the market positively values them, i.e., they have relatively high prices. For many decades, authors have pointed out that value stocks have excess return compared to the growth stocks. Many studies from the 1980s and the 1990s have found evidence about the outperformance of value stocks over growth stocks. The existence of value premium became a financial theory standpoint; it is a common belief that value stocks outperform growth stocks.

By buying stocks, future earnings are being bought. Price multiplies imbed expectations of earnings future growth. The widely used price-earnings ratio (P/E) demonstrate the expected future growth of earnings. Nevertheless, growth can be risky, so the stock market price does not discount future earnings only but also risks. On average, value stocks earn higher returns than growth stocks. Nevertheless sometimes there is a value trap and investors might be buying risky earnings growth (Penman et al., 2018).

Individual investment style is explained by several factors, such as the value or growth preference in stock markets. Investor's investment style can be explained by a biological basis, that are to some extend ingrained in an person from birth and by an individual's hedging demands (Cronqvist et al., 2015). In addition, they find that investors' style can be explained by life course theory in a way that former experiences are linked to investment styles. Living in unfavorable macroeconomic coditions, and a lower socioeconomic status amplify value preferences for many years later. Examples of such adverse experiences are growing up in times of crisis or looking for work in a recession.

Value stocks are generally seen as lower market prices than earnings per share or other multiples and could be less attractive due to low or negative earnings growth rates. Based on the previous records growth stocks are characterized by above-average performance, with same trend expectations. Compared to their earnings per share, dividends per share, cash flow per share and book value per share, growth stocks are being traded at relatively high prices. However, Bauman et al. (1997) find exact opposite characteristics of value stocks. In their work, they compared the performance of value stocks with the performance of growth stocks. They studied stocks behavior in the 14 years, 1980 to 1993. The hypothesis of adaptive expectations is analyzing differences in performance. The adaptive expectations hypothesis claims that forecasters rely too much on historical trends when predicting future and potential trends, leading to biased forecasts of future equity returns. They find evidence of favorable investment performance of value stocks. Namely, stocks with relatively low price multiples, like EPS, EPS growth rate and cash flow per share show favorable performance, supporting adaptive expectations hypothesis.

Crises seem to reset the rules. Large-cap value funds have outperformed their equivalent growth funds in 9 years during the last 22 years, from 1999 till 2020: 2000-

2002, 2004, 2006, 2008, 2011, 2014, and 2016, monitored by Morningstar. Interestingly, in the aftermath of the Global Financial Crisis (GFC), large-cap value stock funds have outperformed growth stock funds only in three years: 2011, 2014, and 2016, for 1.72%, 0.09%, and 11.4%, respectively. Since the outbreak of the Covid-19 crisis at the beginning of 2020, value stocks have experienced one of its worst years. From 2009 onwards, the value premium has disappeared. Large-cap growth stock funds with solid earnings growth profiles earning 34.8% have outperformed large-cap value funds. The margin is even wider that in 1999 dot-com bubble; 32% difference in 2020 versus 30.7% difference in 1999 (Lynch, 2021).

This study compares the performance of large-cap value stocks with large-cap growth stocks by implementing different diversification strategies. We address the research question about the existence of value premium on large-cap stocks after the GFC. The analysis is performed on the Dow Jones Industrial Average index (DJIA, Dow). DJIA constituents are observed over a ten-year period, from 2009 till the end of 2018/beginning of 2019. DJIA stocks are being analysed and marked as value or growth stock separately by the end of each year. Since multiples change over time, our analysis is based on portfolios of value and growth stock, which are created separately for each year, similar to Fama et al. (1998). We test the hypothesis if there is a statistically significant difference in returns on large-cap value and growth stock portfolios in a ten-year period after the GFC. Portfolios of value and growth stocks are created based on random weights and naïve diversification rules. Our methodological framework includes fundamental portfolio management techniques and statistical testing with Levene's test for equality of variances, T-test, Mann-Whitney U test, and One-Sample T-test.

Due to the relatively recent experience of the GFC that destroyed financial markets and economies worldwide and caused losses in trillions, it is interesting to analyze the behavior of US blue-chip large-cap value and growth stocks from DJIA in the ten-year period after the GFC. This research aims to further enrich the existing literature on stock performance because recent stock behavior deviates from financial theory and shows the disappearance of the positive value premium. The most interesting question is whether the negative value premium from the observed ten-year period will last in next years, especially after the Covid-19 crisis and after the expansionary monetary policies.

We find significant outperformance of growth stock portfolios compared to value stock portfolios in the aftermath of the GFC. The scientific contribution of our research is that in large-cap stocks portfolios, value premium disappeared. Growth stocks have overtaken dominance over value stocks, which calls for revision of the common standpoint of the financial theory. One reason for the outperformance of growth stocks might be expansionary monetary policy characterized by very low long-term interest rates. Another reason might be the incredible growth of tech stocks in the observed period, to which most growth stocks belong.

The paper starts with a literature review about growth and value stocks performance, followed by methodology. Analysis and main findings are presented in section data and results. Section discussion reveals the research's theoretical contribution and practical implications, followed by the conclusion.

Literature Review

Distinctive financial markets, from developed to emerging, and from domestic to global, are included in available studies about value and growth stocks performance. Most of those studies find that value stock portfolios tend to surpass growth stock portfolios over long periods, usually meaning throughout at least ten years (Fama et al., 1998; Bauman et al., 1998; Bird et al., 2007).

Different authors chose different financial measures to examine and compare the performance and behavior of value and growth stocks and portfolios created out of those stocks. Bauman et al. (1997) used earnings per share (EPS) forecasts of security analysis as representative for investors' expectations about the future, while Bauman et al. (1998) used four valuation ratios, i.e., price-earnings (P/E), price-to-cash flow (P/CF), price-to-book (P/B) and dividend yield to define value and growth stocks. Stock performance based on value premium was analysed by Fama et al. (1998) and Chan et al. (2004).

Bird et al. (2007) analyze the excess returns of the European market when a portfolio is rotated between value and growth stocks. Their study shows that value increasing potential of their rotation strategy is ruined when market sentiment and financial health indicators are used for the portfolio performance enhancement purposes.

Since outperformance of value stocks compared to growth stocks throughout these articles is connected with a more extended period, it is questionable whether this is true for a shorter period. Fama et al. (1998) and Chan et al. (2004) find that value stock outperform growth stocks in terms of total returns. Value stocks are offering total return which is higher than the return on growth stocks and suggests the existence of positive value premium, which is a residue of difference between returns of growth and value stocks.

Different studies have different views regarding value premium. According to Fama et al. (1998), the global value premium exists throughout time. By study conducted by Yen et al. (2004) the existence of value premium is stated only for a short periods. Fama et al. (1993) state that the level of risk generates the value premium; hence, value premiums are generated by investor biases.

Another way to study and compare value and growth stocks is price multiples. Some articles discuss that creation of value and growth portfolios based on one price multiple results in higher returns than by using other price multiples. When Athanassakos (2009) studied the Canadian market, he found that using the P/E ratio as a criterion for value and growth stock portfolio creation will earn higher returns than portfolios created using the P/B ratio. Fama et al. (1998) claimed differently, meaning that the P/B ratio allows an investor to gain higher return than sorting by other multiple and Bauman et al. (1998) agreed with their study.

A study done by Yen et al. (2004) finds that growth stocks give a lower return per unit of systematic risk compared to value stocks, which is a consequence of different features between these two stock types. According to Fama et al. (1998), growth stocks beta do not have negative value, just a pretty low value. They failed to explain the excess returns using the CAPM model since the intersection was not indifferent to zero. Gonenc et al. (2003) also got different results on intersections meaning that intercepts were negative and statistically significant. Fama et al. (1998) discussed their failure with the CAPM model and said that failure is due to its intercept and market slope, so they used the multi-factor model and explained returns. They find that considering a multi-factor model was more appropriate. The model supposes that excess return cannot be earned when the market excess return does not exist and there is no statistical difference between growth and value stock returns.

Fama et al. (1998) assume that the decrease in intercept is affected by the value premium added as an additional factor. They analyzed the returns obtained from growth portfolios (high price multiples) and value portfolios (low price multiples).

Analysis based on average global market returns led them to conclude that value stock portfolios outperform growth stock portfolios. From 1975 through 1995, value stock portfolios were yielded superior returns in twelve out of thirteen significant markets. On the international level the value premium cannot be explained by CAPM. Still, if a risk factor for relative distress is being included in the two-factor model, the value premium is being captured on international level.

Cheh et al. (2008) studied the performance of stocks with high and low P/E ratios. The holding period was shorter than one year, and they wanted to examine how the holding period length impacts performance of value investment strategy related to the P/E ratio. Their analysis spotted that average annual returns are higher for the portfolio with high P/E than for the portfolio with low P/E irrespective of the frequency of P/E stocks balancing. The authors conclude an improvement in a low P/E infrequent rebalancing portfolio performance, but a high P/E portfolio performance is reduced.

Chahine (2008) analyzed sensitivity of value and growth strategies to earnings growth, in the Eurozone region from 1988 to 2003. Author used tests that were based on asset pricing and returns strategy. Supervising for previous risk factors indicated by Fama et al. (1993), Chahine (2008) found evidence that a value strategy which is based on high earnings growth rate, outperforms both, value and growth strategies in the observed period. Empirical results show that growth of earnings affects performance determination of value in opposition to growth-stocks portfolios. There is a positive effect of EPS momentum, but only in undervalued value stocks; that was not the case with overvalued growth stocks (Chahine, 2008).

An analysis of annual value premiums on the Italian stock market showed evidence favoring value premium only from 2001 to 2006 (Gagliolo et al., 2020). In the GFC and after, the returns on value and growth stocks were quite aligned. Authors find that value stocks do not yield excess return any more, as they were in the past in. Their findings are aligned with the US market appears. They find a significantly high-value premium only of small-cap stocks over some periods from 2001 to 2018. Evidence about high-value premium was limited and was found only at the beginning of 2000s.

Methodology

In the empirical part of our research, we analyze the behavior of blue-chip, large-cap US companies included in the DJIA index. This stock market index measures the stock performance of 30 American leading blue-chip industrial and financial companies. Based on the previous studies and actual data related to the performance of value and growth stock portfolios and funds, we investigate whether growth stocks from DJIA performed statistically significant higher returns than value stocks from the same index in 10 year period after the Global Financial Crisis.

Our analysis is conducted as follows: firstly, all stocks which were part of the DJIA index in the ten years, from 2009 to 2018, are taken into account, meaning that more than 30 stocks are observed since there were minor changes in DJIA index constituents from period to period. Secondly, historical data for all stocks is collected; the historical data refers to financial data from the balance sheet, income statement, cash flow statement, and data related to daily historical prices of stocks. Sources used to collect data are Yahoo Finance, Morningstar, and Macrotrends. Data from financial statements and daily historical prices are used to calculate the price-earnings ratio (P/E), price-to-book ratio (P/B) and price-earnings-to-growth ratio (PEG). All sample stocks were analyzed based on their P/E, P/B, and PEG ratios every year, based on what stocks were marked as either value or growth. The P/E ratio of a stock is compared to the average sector P/E. The P/B ratio of a stock is also compared to the average sector P/B, and PEG is compared to 1. It is treated as a value if the stock's P/E is lower than the average sector P/E. The same rationale is used for the P/B ratio. Otherwise, it is treated as growth. According to Bodie et al. (2011) reference value of the PEG ratio is about 1. So stocks with a PEG ratio of 1 or lower are considered value stocks, whereas stocks with values greater than one are considered growth ones. After calculating all relevant ratios, the values are compared using the IF function in excel, and stocks are classified as either value or growth stocks. Hence value stock portfolios and growth stock portfolios are created. At least two multiples should indicate which stock we have, and in the ideal case, all three multiples show the same result.

When it comes to portfolio creation, we follow the same methodology as Fama et al. (1998) and create separate portfolios for each year, based on data available on fiscal year-end for a year under observation. The holding period for each portfolio is considered to be one year.

Although in the last 70 years, a large number of sophisticated theoretical models in portfolio management have been developed, many investors still use straightforward rules for their asset allocation. One of the simplest rules for risk diversification is naïve diversification, implying an equally weighted portfolio, i.e., the weight of individual asset *i* in a portfolio is $1/\mathrm{n}$, where *n* is a total number of assets ($w_i = \frac{1}{\mathrm{n}}$; $\mathrm{i} = \overline{1, \mathrm{n}}$). Optimal diversification will outperform naïve diversification only for high levels of unsystematic risk (DeMiguel et al., 2009).

Holding period return (HPR) for each composite stock of portfolio is calculated as the difference between the closing price of a stock on the last day of the year and its closing price on the first day of the year, relative to the closing price on the first day of the year. When weights and returns for each stock are known, realized return of a portfolio is calculated as the weighted average of holding period returns of each stock in a portfolio. Calculated return is compared with DJIA return for that year, and portfolios within the year are compared to see which one has greater return, i.e., 'beats the market'. Besides portfolios created by assigning each equal stock weight, an additional 50 portfolios are created, assigning each stock weight a random number. To get random numbers between 0 and 1 whose sum is equal to 1, code was created in MATLAB. Code is as follows (Figure 1)

Figure 1
Matlab Code

```
table=[];
for i=1:50
r = rand(1, 16);
r = r / sum(r);
Sum = sum(r) % check if sum equals
1
r=r';
table=[table r];
end
```
(1)

Lines of code (1) are created in MATLAB to get the desired number of numbers whose sum equals 1. To interpret the meaning of the code, the example of the portfolio with 16 stocks is taken and explained. We declared a variable called a table that we use to form the table of size *n*m*, where *n* is 16, representing rows, and *m* is 50, representing columns. The table is formed in a loop where we take *n* random numbers in the interval [0,1] and add them into array *r*. To get those numbers equal to 1, we need to divide that array with *n* numbers. After that, we check if we get *n* numbers whose sum equals 1. By exporting the MATLAB table in Excel, we get new random weights for 16 stocks in 50 new portfolios. The returns for the new 50 portfolios are calculated.

We have performed a similar analysis with groups of 30, 100, and 150 portfolios. Results have shown that groups of 50 portfolios achieve the normality of arithmetic means (central limit theorem). An additional increase in the number of randomly generated portfolios and the selection of other 50 random portfolios did not cause a significant change of expected return and standard deviation since differences were found after the fourth decimal place.

The methodological framework for hypothesis testing of value and growth stock portfolio returns in all years include the following statistics conducted in SPSS: Shapiro-Wilk normality test used to choose appropriate test (parametric or nonparametric) for checking if there is a statistically significant difference between returns of value and growth stock portfolios; Mann-Whitney U test and Two-sample T-test used to compare parameters for two unrelated samples based on the results of the Shapiro-Wilk normality test; Levene's test for equality of variances used for check equality of variance assumption in Two-sample T-test; One-Sample T-test used to examine whether the mean value and growth stock portfolio returns is statistically different from returns on DJIA index. Besides comparing all value and all growth stock portfolios with random weights, the portfolios whose stocks are assigned equal weight are compared with the DIJA index in each year to see whether such portfolios would outperform the market. The outperformance or underperformance is expressed in percentages.

Data and Results

In total, 35 stocks were constituents of the DJIA index from 2009 to 2018/2019. Since two companies do not have publicly available information, we excluded them from our research. Our analysis comprises 33 stocks from eight sectors: financial services, technology, oils/energy, communication services, consumer cyclical and consumer defensive, health care, and industrials.

Price-multiples for each company are calculated at the end of the year. If the stock is identified as value at the end of the year, it is a value stock until the following year. Its status changes or stays the same, depending on the new financial ratios. If we overview each stock from our sample in all ten years, there are in total 15 stocks that are in most years growth stocks, 15 stocks that are in most years value stocks, and three stocks that are in five years value and five years growth stocks. The identification made year by year is used for creating portfolios.

Table 1 is derived after stocks classification in value or growth portfolio and calculation of return on value and growth portfolios for each year. Realized returns on each year's DJIA index, value, and growth stock portfolios are presented and calculated as weighted averages. The value and growth portfolios results shown in Table 1 are based on the equally weighted portfolios.

Table 1
Performance of DJIA and Equally Weighted Value and Growth Stock Portfolios

Year	DJIA returns	No. of value stocks	No. of growth stocks	Value portfolio returns	Growth portfolio returns	Outperformance or underperformance (%)	
						Value	Growth
2009	21.52%	23	10	23.91%	39.18%	2.39%	17.65%
2010	10.90%	25	8	5.74%	24.62%	-5.16%	13.72%
2011	3.32%	25	8	13.14%	17.95%	9.82%	14.63%
2012	6.78%	25	8	14.79%	105.26%	8.01%	98.48%
2013	17.45%	18	15	23.16%	33.59%	5.71%	16.14%
2014	8.09%	16	17	13.76%	11.78%	5.67%	3.69%
2015	-8.31%	12	21	15.29%	13.22%	23.60%	21.53%
2016	19.12%	11	22	22.34%	11.72%	3.22%	-7.40%
2017	26.99%	10	23	4.05%	27.17%	-22.93%	0.18%
2018	-7.81%	14	19	-15.94%	1.18%	-8.13%	8.99%

Source: Authors' work

DJIA index was dominated by value stocks in the first 5-year period after the Global Financial Crisis, 2009-2013, while growth stocks dominated it in the next five-year period from 2014 onwards. Growth stock portfolio returns are higher than value stock portfolio returns in 7 years out of 10; hence value stock portfolio outperformed growth one only in 2014, 2015, and 2016. Returns on portfolios for each year are compared with the DJIA index realized returns. We can see that an equally weighted portfolio of value and growth stocks from DJIA mostly outperform the index's return. For value stock portfolios, the underperformance of portfolios compared to the DJIA index is seen in 2010, 2017, and 2018. Growth stock portfolio underperformance was found only in 2016. In all other years' value and growth portfolios outperform the index itself.

Previously presented results indicate a difference in returns between value and growth stock portfolios, and between DJIA and those two portfolios. To statistically test our assumption of a difference between returns, we create 50 new portfolios of value stocks and growth stocks for each year. The goal of creating 50 new portfolios was to determine whether there is a statistically significant difference between value and growth portfolio returns and a statistically significant difference between returns on these portfolios and the DJIA index. The difference between value and growth portfolios from Table 1 and these 50 new portfolios for each stock type and year is in weights assigned to each stock. MATLAB code (1) was used to assign different and random weights to stocks. MATLAB provided us random number generator, whose function was to give us 50 different weights for each year out of 10 years for both value and growth portfolios. The sum of newly generated random weights is always 1, i.e., no negative holdings.

The mean return is negative only in 2018 for the value stock portfolio. In all other periods and for other portfolios, the mean return is positive. In contrast, the highest mean return accompanied by the highest standard deviation was observed in 2012 for the growth stock portfolio.

Table 2
Descriptive statistics of random value and growth stock portfolios

Descriptive Statistics		N	Mean	Std. Deviation	Std. Error Mean	Shapiro-Wilk Test Statistic	df	Sig.
2009	**Value**	50	0.2276	0.04504	0.00637	0.983	50	**0.671**
	Growth	50	0.3920	0.07296	0.01032	0.983	50	**0.668**
2010	**Value**	50	0.0577	0.01755	0.00248	0.988	50	**0.883**
	Growth	50	0.2370	0.06017	0.00851	0.985	50	**0.792**
2011	**Value**	50	0.1353	0.09944	0.01406	0.945	50	**0.021****
	Growth	50	0.1762	0.02852	0.00403	0.981	50	**0.613**
2012	**Value**	50	0.1547	0.02597	0.00367	0.989	50	**0.912**
	Growth	50	1.1556	0.54794	0.07749	0.961	50	**0.093**
2013	**Value**	50	0.2318	0.02251	0.00318	0.970	50	**0.241**
	Growth	50	0.3262	0.03993	0.00565	0.989	50	**0.910**
2014	**Value**	50	0.1386	0.02536	0.00359	0.996	50	**1.000**
	Growth	50	0.1185	0.02036	0.00288	0.986	50	**0.825**
2015	**Value**	50	0.1460	0.04327	0.00612	0.991	50	**0.973**
	Growth	50	0.1390	0.03334	0.00472	0.983	50	**0.702**
2016	**Value**	50	0.2243	0.02150	0.00304	0.978	50	**0.484**
	Growth	50	0.1143	0.01621	0.00229	0.977	50	**0.419**
2017	**Value**	50	0.0446	0.04440	0.00628	0.989	50	**0.909**
	Growth	50	0.2730	0.03093	0.00437	0.982	50	**0.633**
2018	**Value**	50	-0.1567	0.02890	0.00409	0.986	50	**0.804**
	Growth	**50**	**0.0093**	**0.01765**	**0.00250**	**0.986**	**50**	**0.816**

Note: ** statistically significant at 5%
Source: Authors' work

It is necessary to check the assumption of the normality of returns distribution on a year-to-year basis and verify the assumption of variance equality (Table 2). Normality test helps us choose the correct test for checking if there is a statistically significant difference between returns of value and growth stock portfolios. Based on the Shapiro-Wilk test of normality, the null hypothesis of normally distributed portfolio returns cannot be rejected in all time-series and all years at 5%, except for the value stock portfolio in the year 2011. The results were the same by the Kolmogorov-Smirnov test of normality.

We test the significance of differences in returns of 50 growth and 50 value stock portfolios with randomly assigned weights each year using a T-test for independent samples and a Mann-Whitney U test for independent samples. Levene's test checked the homogeneity of variance, and the null hypothesis states that these groups have equal population variances. Test results are presented in Table 3.

The assumption of equal variances was satisfied only for 2014 and 2015, while it deteriorated for other years ($p<0.05$). These results are considered when interpreting the T-test.

Table 3
Results of Levene's Test for Equality of Variances

Dependent variable	F	df1	df2	Sig.	Dependent variable	F	df1	df2	Sig.
2009	8.075	1	98	0.005***	**2014**	2.124	1	98	0.148
2010	40.150	1	98	0.000***	**2015**	2.179	1	98	0.143
2011	79.854	1	98	0.000***	**2016**	5.275	1	98	0.024**
2012	156.164	1	98	0.000***	**2017**	7.098	1	98	0.009***
2013	15.554	1	98	0.000***	**2018**	7.574	1	98	0.007***
*** Design: Intercept + Value or Growth**									

*Note: *** statistically significant at 1%; ** 5%*
Source: Authors' work

The T-test is used to test differences in returns for growth and value stock portfolios per year except for 2011 since the normality assumption deteriorates for that year (Table 4).

Table 4
Results of T-test for Equality of Means

Year	t	df	p-value	Mean Diff.	Std. Error Diff.	95% Confidence Interval	
						Lower	Upper
2009	-13.557	81.613	0.000***	-0.16439	0.01213	-0.18851	-0.14026
2010	-20.231	57.281	0.000***	-0.17931	0.00886	-0.19706	-0.16156
2012	-12.903	49.220	0.000***	-1.00099	0.07758	- 1.15686	-0.84511
2013	-14.569	77.285	0.000***	-0.09444	0.00648	-0.10734	-0.08153
2014	4.375	98	0.000***	0.02012	0.00460	0.01099	0.02925
2015	.914	98	0.363	0.00706	0.00773	-0.00827	0.02240
2016	28.868	91.113	0.000***	0.10994	0.00381	0.10238	0.11751
2017	-29.841	87.494	0.000***	-0.22834	0.00765	-0.24355	-0.21313
2018	-34.661	81.095	0.000***	-0.16599	0.00479	-0.17551	-0.15646

*Note: *** statistically significant at 1%; Equal variances not assumed for all variables*
Source: Authors' work

Whether the assumption of variance equality is met, we see that p-values are less than the test value of 0.05 for all years except for 2015. Therefore, we consider a statically significant difference in the returns of value and growth portfolios except for 2015. For the year 2011, in which the normality of portfolio returns distribution is violated, the Mann-Whitney U test presented in Table 5 indicates no statistically significant difference between median returns of value and growth portfolios.

Table 5
Results of Mann-Whitney U Test

	Test Statistics*
Mann-Whitney U	1033.000
Wilcoxon W	2308.000
Z	-1.496
Asymp. Sig. (2-tailed)	0.135
*Grouping Variable: Value or Growth	

Source: Authors' work

For 50 randomly generated value and growth stock portfolios, we made a One-Sample T-test to check the statistical significance of the difference in returns between value and growth stock portfolios and DJIA. Table 6 compares realized index returns (DJIA) and value and growth portfolio returns.

Table 6
Results of One-Sample T-Test

Year	Index Value	Value or Growth	t	df	p-value	Mean Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
2009	Index Value = 0.2152	Value	1.941	49	0.058	0.01237	-0.0004	0.0252
		Growth	17.131	49	0.000***	0.17675	0.1560	0.1975
2010	Index Value = 0.1090	Value	-20.651	49	0.000***	-0.05126	-0.0562	-0.0463
		Growth	15.049	49	0.000***	0.12805	0.1110	0.1451
2011	Index Value = 0.0332	Value	7.263	49	0.000***	0.10214	0.0739	0.1304
		Growth	35.448	49	0.000***	0.14298	0.1349	0.1511
2012	Index Value = 0.0678	Value	23.650	49	0.000***	0.08685	0.0795	0.0942
		Growth	14.038	49	0.000***	1.08784	0.9321	1.2436
2013	Index Value = 0.1745	Value	18.002	49	0.000***	0.05730	0.0509	0.0637
		Growth	26.872	49	0.000***	0.15174	0.1404	0.1631
2014	Index Value = 0.0809	Value	16.082	49	0.000***	0.05768	0.0505	0.0649
		Growth	13.048	49	0.000***	0.03756	0.0318	0.0433
2015	Index Value = -0.0831	Value	37.440	49	0.000***	0.22913	0.2168	0.2414
		Growth	47.093	49	0.000***	0.22207	0.2126	0.2315
2016	Index Value = 0.1912	Value	10.874	49	0.000***	0.03307	0.0270	0.0392
		Growth	-33.526	49	0.000***	-0.07688	-0.0815	-0.0723
2017	Index Value = 0.2699	Value	-35.878	49	0.000***	-0.22527	-0.2379	-0.2126
		Growth	0.703	49	0.485	0.00307	-0.0057	0.0119
2018	Index Value = -0.0781	Value	-19.226	49	0.000***	-0.07857	-0.0868	-0.0704
		Growth	35.017	49	0.000***	0.08741	0.0824	0.0924

*Note: *** statistically significant at 1%*
Source: Authors' work

Our analysis shows a statistically significant difference at 1% between returns on value and growth stock portfolios versus DJIA returns in all periods, except for two cases. In 2009 returns on value stock portfolios were statistically significantly different than DJIA returns at 10%, while in 2017, returns on growth stock portfolios were not statistically significantly different than DJIA. In 15 out of 20 cases, DJIA value and growth stock portfolios formed based on the randomly generated weights have significantly outperformed DJIA itself.

Discussion

Theoretical contribution

Most of the studies conducted in the last two decades of the 20th century that were related to the performance of value and growth stock portfolios found that the value stocks have superior performance compared to the growth stocks in most developed and emerging markets, which became a standpoint of the financial theory. Actual data from the US stock market on investment fund performance indicates that growth stock portfolios outperform value stock portfolios in 9 out of 12 years, from 2009 until 2020 (Lynch, 2021). Our study performed on DJIA component stocks shows the dominance of large-cap growth stock portfolios over large-cap value stock portfolios in the ten years after the GFC, indicating our main scientific contribution's disappearance of the value premium.

Returns on equally weighted portfolios of value and growth stocks from DJIA mostly outperform the index's return. When analyzing returns of 50 randomly weighted value and growth stock portfolios, we find a statistically significant difference in returns for all years, except 2011 and 2015. Growth stock portfolios outperform value stock portfolios in seven out of ten years, while value stocks performed statistically higher returns only in 2016. The outperformance of value stocks in 2016 could be due to the energy and utility sector, which have been among the best-performing sectors in 2016 and created value premium. In addition, the healthcare sector was usually a component of growth portfolios and was among the worst-performing in that year. Further, we find a statistically significant difference between returns on value and growth stock portfolios versus DJIA returns in all periods, except 2017 for growth stock portfolios.

One possible issue is that large-cap value stocks are b classified as growth stocks (Chan et al., 2009). Fays et al. (2021) analysed mutual funds and found that there is a higher probability that value portfolios are being characterized as value portfolios if stocks are being firstly sorted on the basis of the size characteristic and then using book-to-equity ratio. The same holds for growth stocks and growth portfolios. Since our study is performed only on large-cap stocks, the risk of misclassifying stocks into value and growth stocks due to their size is minimized.

We contribute to the literature in many different ways. In contrast to previous research, which found that value stocks outperform growth stocks (Graham et al., 1938; Basu, 1977; Lakonishok et al., 1994; Bauman et al., 1998; Fama et al., 1998; Bird et al., 2007), growth stocks and market itself found by Folkinshteyn et al. (2017), we find that in ten-year period after the GFC large-cap growth stocks outperform value stocks. Growth stocks yielded higher returns than value stocks in brief periods, but value stocks reestablished their dominance very quickly. The continuity of excess returns of growth stocks in the aftermath of the GFC might be due to the historically low interest rates imposed by the expansionary monetary policies. These market conditions enable an increase in prices of growth stocks, since stock market pricing is strongly influenced by the expected cash flows (Gagliolo et al., 2020). An additional explanation might be that growth stocks are often from the technological sector (e.g., e-commerce, digital payments, digital advertising, hardware, and software), while value stocks are from the industrial and financial sectors. Tech companies persistently perform better than financial sector companies.

Finally, the important implications of our analysis for financial theory and investment strategies are that in (1) the post-crisis period and (2) expansionary monetary policy time value premium on large-cap stocks seems to disappear. Our results favor growth investing after a crisis and in expansionary monetary time, thereby impacting the portfolio management of private and institutional investors.

Implication for practice

Besides expanding the previous knowledge about the performance of value and growth investments, our results offer valuable insight into the effectiveness of these two investment styles in the post-crisis periods. Research results offer important implications for the investment management process. They could be insightful for private investors, institutional investors like mutual funds, pension funds, banks, insurance companies, other investment companies, portfolio managers, and investment advisors.

In this study, we found a general outperformance of value and growth stock portfolios created from the DJIA index compared to the index itself, which could be explained by the weighting issues of the DJIA index. Namely, it is often argued that Dow might be an inadequate representation of the overall US stock market compared to S&P 500, NASDAQ Composite, or Russel 3000 Index because it includes only 30 large-capitalization companies from the US, and it does not use weighted arithmetic mean nor is being weighted by market capitalization. Our results show that DJIA weighting issues question its benchmarking suitability with important implications in investment management, such as when choosing a proxy for the market, implementing index-tracking strategies, and benchmarking investment fund performance.

In 75% of cases (15 out of 20), blue-chip large-cap value and growth portfolios created based on the randomly generated weights have significantly outperformed DJIA in the aftermath of the GFC. DJIA will outperform the same stocks from the index regardless of the value or growth investment strategy being implemented. Due to higher returns, our results favor creating and implementing value and/or growth strategy rather than investing based on the DJIA index replication. In that way, higher returns will be generated. Again, it is shown that DJIA is inadequate for benchmarking and index-tracking strategies.

Most stocks from the DJIA index had price multiplies higher than sector averages at the end of 2013 and onwards. In the first five years after the GFC, 2009-2013, DJIA was predominantly constituted from value stocks, while in the next five years, 2014-2018, it was dominated by growth stocks. In the aftermath of the GFC, the expansionary monetary policy helped large-cap stocks increase their price-multiplies so that most DJIA constituents could be characterized as growth stocks from 2014 onwards. US stock market fully recovered to the level before the GFC in 2013 (measured by DJIA and S&P 500 index values) and continued its growth in the following years. We find that capital market recovery to the pre-crisis level coincides with the shift in stocks characteristics and dominance of growth stocks over value stocks among large-cap stocks from DJIA, with practical implications for investment managers.

Finally, according to the life course theory, after the experience of the massive crisis (like the GFC was), there should be a more robust value orientation for decades later (Cronqvist et al., 2015). Our research shows the dominance of growth stocks in the first decade after the GFC. An important implication to all investors is that after the GFC value premium has faded out.

Conclusion

Our analysis of DJIA component stocks shows that growth stock portfolios outperform value stock portfolios in the aftermath of the GFC. Returns on the growth stock portfolios are statistically significantly higher than on the value stock portfolios in seven out of ten years, namely in 2009, 2010, 2012, 2013, 2014, 2017, and 2018. Value stock portfolios performed significantly better only in 2016, while in 2011 and 2015, there is no statistically significant difference in the performance of value and growth portfolios. Although this research is conducted on DJIA component stocks, our results align with the actual data on the performance of Morningstar's large-cap value and growth funds. Morningstar reports a value-growth large-cap investment fund performance difference of 1.72% and 0.09% in 2011 and 2015, respectively (Lynch, 2021). Our study explains that the performance difference in those two years was not significantly different. After the GFC value premium in large-cap stocks disappears.

Previous studies focused on time before the GFC have shown that value stocks outperform growth stocks (Graham et al., 1938; Basu, 1977; Lakonishok et al., 1994;

Bauman et al., 1998; Fama et al., 1998; Bird et al., 2007). Analysis of the behavior of value and growth stocks during short-term market declines shows that value stocks outperform not only growth stocks, but the market itself (Folkinshteyn et al., 2017). Our study is focused on the stocks after the GFC, and our conclusions are opposite to those of previous studies. However, our findings align with Gagliolo et al.'s (2020) research, finding that the value premium on the large-cap stock has disappeared after the GFC.

Our results have crucial financial theory and investment management implications: in the post-crisis period and expansionary monetary policy time, the value premium on large-cap stocks seems to disappear. We find that DJIA weighting issues question its benchmarking suitability. Implementing either value or growth strategy in 10 year period after the GFC would yield higher returns than the DJIA index-tracking strategy. Large-cap stocks increased their price multiplies by the end of 2013, so most DJIA constituents have been characterized as growth stocks from 2014 onwards, resulting from expansionary monetary policy. US capital market recovered to the pre-crisis levels in 2013, coinciding with the dominance of growth stocks over value stocks among large-cap stocks from DJIA.

Our research results of DIJA growth portfolios outperformance over DJIA value portfolios should be seen in the light of the overall stock market recovery after the GFC, which erased trillions of dollars worldwide. Our study has some limitations. We did not investigate the performance of mid or small-cap stocks after the GFC or other large-cap stocks that differ from DJIA constituents or stocks from other capital markets. Other methodological approaches, including investment strategies and regression analysis, could also be used to research this topic. We analyzed stock performance measured by mean return.

Further research could include various stock performance measures, e.g., the Sharpe ratio. Although the adverse macroeconomic and financial experience during the GFC, when confidence in value stocks could have increased (Cronqvist et al., 2015), growth stocks have soared in height. Further research is warranted to examine whether the negative value premium from the observed ten-year period will continue in the next years, especially once the Covid-19 crisis ends and the expansionary monetary policies fade away, and whether the standpoint of the financial theory should change to the existence of positive growth instead of the value premium.

References

1. Athanassakos, G. (2009), “Value versus growth stock returns and the value premium: The Canadian experience 1985-2005”, Canadian Journal of Administrative Sciences / Revue Canadienne des Sciences de l'Administration, Vol. 26 No. 2, pp. 109-121.
2. Basu, S. (1977), “Investment performance of common stocks in relation to their price-earnings ratios: A test of the efficient market hypothesis“, The Journal of Finance, Vol. 32 No. 3, pp. 663-682.
3. Bauman, W. S., Conover, C. M., Miller, R. E. (1998), “Growth versus value and large-cap versus small-cap stocks in international markets”, Financial Analysts Journal, Vol. 54 No. 2, pp. 75-89.
4. Bauman, W., Miller, R. (1997), “Investor Expectations and the Performance of Value Stocks versus Growth Stocks“, The Journal of Portfolio Management, Vol. 23 No. 3, pp. 57-68.
5. Bird, R., Casavecchia, L. (2007), “Sentiment and financial health indicators for value and growth stocks: The European experience“, The European Journal of Finance, Vol. 13 No. 8, pp. 769-793.
6. Bodie, Z., Kane, A., Marcus, A. (2013), Essentials of Investments, McGraw-Hill/Irwin, New York.

7. Chahine, S. (2008), "Value versus growth stocks and earnings growth in style investing strategies in Euro-markets", Journal of Asset Management, Vol. 9 No. 5, pp. 347-358.
8. Chan, L. K. C., Dimmock, S. G., Lakonishok, J. (2009), "Benchmarking money manager performance: Issues and evidence", Review of Financial Study, Vol. 22 No. 11, pp. 4554-4599.
9. Chan, L. K. C., Lakonishok, J. (2004), "Value & growth investing: review and update", Financial Analysts Journal, Vol. 60 No. 1, pp. 71-86.
10. Cheh, J., Kim, D., Zheng, G. (2008), "Investing in growth stocks vs. value stocks", The Journal of Investing, Vol. 17 No. 2, pp. 75-92.
11. Cronqvist, H., Siegel, S., Yu, F. (2015), "Value versus growth Investing: Why do different investors have different styles", Journal of Financial Economics, Vol. 117 No. 2, pp. 333-349.
12. DeMiguel, V., Garlappi, L., Uppal, R. (2009), "Optimal versus naive diversification: How inefficient is the 1/N portfolio strategy?", The Review of Financial Studies, Vol. 22 No. 5, pp. 1915-1953.
13. Fama, E. F., French, K. R. (1993), "Common risk factors in the returns on stocks and bonds", Journal of Financial Economics, Vol. 33 No. 1, pp. 3-56.
14. Fama, E. F., French, K. R. (1998), value versus growth: The international evidence", The Journal of Finance, Vol. 53 No. 6, pp. 1975-1999.
15. Fays, B., Papageorgiou, N., Lambert, M. (2021), "Risk optimizations on basis portfolios: The role of sorting", Journal of Empirical Finance, Vol. 63, pp. 136-163.
16. Folkinshteyn, D., Meric, G., Meric, I. (2017), "Value and Growth Stock Price Behavior during Stock Market Declines", The Journal of Investing, Vol. 26 No. 4, pp. 41-52.
17. Gagliolo, F., Cardullo, G. (2020), "Value stocks and growth stocks: A study of the Italian market", International Journal of Economics and Financial Issues, Vol. 10 No. 3, pp. 7-15.
18. Gonenc, H., Karan, M. B. (2003), "Do value stocks earn higher returns than growth stocks in an emerging market? Evidence from the Istanbul stock exchange", Journal of International Financial Management and Accounting, Vol. 14 No. 1, pp. 1-25.
19. Graham, B., Dodd, D. L. (1938), Security Analysis, McGraw Hill, New York.
20. Lakonishok, J., Shleifer, A., Vishny, R. W. (1994), "Contrarian investment, extrapolation and risk", The Journal of Finance, Vol. 49 No. 5, pp. 1541-1578.
21. Lynch, K. (2021), "Value vs. Growth: Widest Performance Gap on Record", Morningstar, Inc., available at https://www.morningstar.com/articles/1017342/value-vs-growth-widest-performance-gap-on-record (12 March 2021)
22. Macrotrends (2019), "The Long Term Perspective on Markets", available at https://www.macrotrends.net (10 June 2019)
23. Morningstar (2019), "Independent Investment Research", available at https://www.morningstar.com (21 May 2019)
24. Penman, S., Reggiani, F. (2018), "Fundamentals of value versus growth investing and an explanation for the value trap", Financial Analysts Journal, Vol. 74 No. 4, pp. 103-119.
25. Yen, J. Y., Sun, Q., Yan, Y. (2004), "Value versus growth stocks in Singapore", Journal of Multinational Financial Management, Vol. 14 No. 1, pp. 19-34.

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