

Factor Performance and the Market Cycle

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Summary

In this study we have analyzed the performance of factor portfolios and their components throughout various market cycle sub-periods. Following are the main recommendations for investors suggested by our research:

Early Expansion

- The long side of the Investment factor (i.e., firms with high dividend payout ratios) makes for an excellent investment during recessionary period and early recovery.
- The short side of the Momentum factor (i.e., stocks with bad past performance) experiences solid performance during early expansion sub-period, as the market takes off after the recession.

Mid-Expansion

- Investing in long side of the Value (i.e., low priced stocks) and Momentum (i.e., stocks that have performed well in the past) portfolios during the market expansion generates significant positive excess returns.
- The short side of the Quality factor (i.e., stocks with sub-par accounting quality measures) produces significant negative excess returns, indicating a group of stocks to avoid.

Late-Expansion

- The long side of Momentum and short side of the Value factor (i.e., Growth stocks) perform very well during this last hurrah before the recession hits.
- Avoid low Quality stocks (i.e., stocks with sub-par accounting quality measures) during late expansion and recession sub-periods of the market cycle.

Recession

- Avoid low Quality (i.e., stocks with sub-par accounting quality measures) and high Investment (i.e., firms with low dividend payout ratios) during recessions.
- Seek out low Investment (i.e., firms with high dividend payout ratios) and high Value stocks (i.e., low priced/high dividend firms) during recessions.

1 Introduction

The purpose of this study is to analyze the performance of a group of well known factor portfolios across various stages of market cycle. These performance results enable us to provide actionable advice on the expected behavior of the factors during various market environments.

National Bureau of Economic Research (NBER) issues recession dates that are widely used as markers for analyzing market behavior. However, we show that there are significant differences in the timing of economic cycles

and market cycles. For this reason we use nonparametric smoothing techniques to detect the market cycles. This results in a classification of market cycles into subperiods, which are more relevant for investors.

In addition, we provide the analysis not only of the overall factor portfolio behavior, but also of the short and long sides of the factor portfolio (please see the Appendix for the details of factor portfolio construction) to, again, make the results more actionable for the investors.

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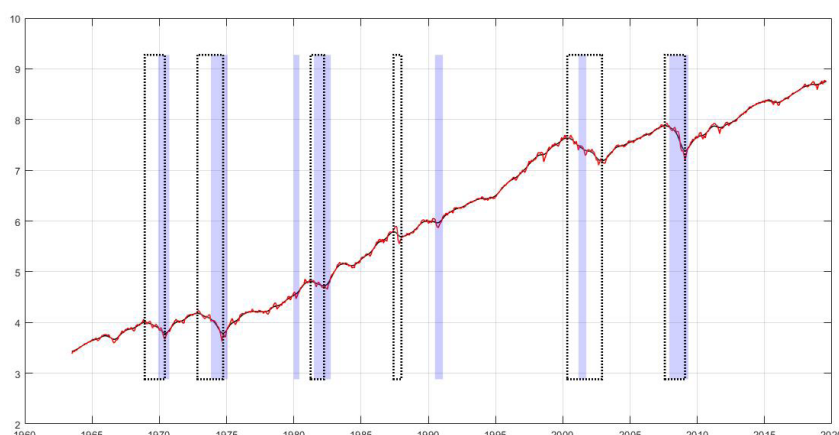


Figure 1. Plot of cumulative market return, NBER recessions (blue shaded periods), and recession sub-period of the market cycle (dotted periods) determined using nonparametric regression. Time period: 1963/07-2019/10. Source: NBER & QRG.

2 Market Cycles

NBER defines an economic recession as follows: “a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales.” Figure 1 gives a plot of the recession periods, as defined by NBER. However, as can be seen from the figure, these periods usually have only moderate overlap with periods of market decline. For example, the market crash of October 1987 was not during a recessionary period, and neither the recession of 1982/1982 nor that during 1990/1991 resulted in a significant market downturn. In addition, market downturns seem to be a leading indicator of recessions, usually occurring multiple months prior to the start of the economic recession, as designated by NBER.

Table 1. Stats on lengths of market cycle sub-periods, in months, defined using non-parametric regression analysis of the cumulative market return. Market cycle sub-periods: early expansion (EE), mid-expansion (ME), late expansion (LE), recession (recession), as well as the overall expansion (E), which covers EE, ME, and LE. Time period: 1963/07-2019/10. Source: QRG.

months	EE	ME	LE	E	R
min	7	14	7	29	7
max	37	75	37	150	31
mean	20	41	20	82	18
median	16	33	16	67	18

To capture cycles that are more relevant for investors, we analyze the historical cumulative market return series using nonparametric regression techniques to smooth out short-term volatility. The smoothed out cumulative market return is then used to define market recessions (peak to trough) and expansions (trough to peak). Finally, every expansionary period is divided into the following sub-periods: early expansion (EE), mid-expansion (ME), and late expansion (LE). We set the early and late expansion sub-period to be 1/4 of the overall expansion period, while the rest is assigned to mid-expansion sub-period. We also tried various other classification approaches, and results and conclusions were qualitatively very similar.

Table 1 gives details on the market cycles and their subperiods detected using nonparametric regression approach. There are a total of six full market cycles (i.e., expansion followed by a recession) covered in our data sample (July 1963 to October 2019).¹ In addition, the tail end of the observed sample consists of an expansion (the seventh expansion in our sample), which, at 128 months and counting, happens to also be the second longest market expansion ever observed.² As table 1 illustrates, recessions tend to be much shorter than expansions, with the median expansion length of 67 months exceeding the median recession length of 18 months by almost four times.

¹ The reason for the choice of this start date is the availability of factor data.

² The longest market expansion in our data sample is one that started in February of 1988 and ended in May of 2000, when the Internet Bubble burst. Note that to detect a beginning of recession, we require that the nonparametric estimate of the cumulative market return drop by at least five percent.

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3 Factor Performance

In the sections that follow we analyze the performance of factors as well as their long and short portfolios for various sub-periods of the market cycle over the time period of July of 1963 to October of 2019.³ While factor portfolio performance, which involves shorting,⁴ is accessible through factor portfolio products, most investors will construct their portfolios using long positions only. For this reason, we dissect the factor portfolios into long and short sides (please see the Appendix for more details), as this allows us to give advice on which stocks to invest in (long sides of the factor portfolio) and which to avoid (short sides of the factor portfolio) during various market cycle sub-periods.

The results for the long and short sides of the factor portfolio are given as excess returns over the market portfolio. The reason for doing this is to zero in on the relative performance of the various factors, since, as expected, the performance of the long/short side of the factor will fluctuate closely with that of the market. Note also that, since factor portfolio performance is calculated as a difference between the long/short portfolios (see the Appendix for details), the factor portfolio performance remains unchanged, whether we use excess returns or full returns for the long/short portfolio.

Table 2. Annualized performance of monthly factors (1963/07-2019/10) for the overall market cycle, in percent and in excess of the market return. “Long”/“short” refer to the long/short sides of the factor portfolio, while “Factor” refers to the overall factor performance. See Appendix for factor definitions. Source: Kenneth French Data Library, AQR, & QRG.

	Long	Short	Factor
SMB	2.96	0.24	32.72
HML	3.6	-0.07	3.68
MOM	5.14	-2.71	7.85
RMW	2.65	-0.5	3.14
CMA	3.11	-0.18	3.29
QMJ	-2.04	-6.72	4.69

3.1 Overall Performance

When analyzing the performance of the factors over the full cycle, we observed the following main results (please see table 2). First, Momentum factor has had the best performance over the full period, both for the overall factor portfolio as well as for the long side of the factor portfolio. As we note later, most of the positive performance for the long side portfolio comes from Momentum’s performance during mid- and late-expansion periods.

Second, the worst performance was experienced by the short side of the Quality portfolio. Interestingly, the long side of the Quality portfolio also experienced the worst performance, when compared to other factors’ long side performances, but the short side’s performance has been extremely weak (we will revisit this point, when we discuss the performance of factors during recession sub-period of the market cycle) that it makes Quality factor the second best performing factor overall, after Momentum. These results lend support to the EMH motivation for the Quality factor that we give in Appendix, where we noted that Quality stocks in the long portfolio tend to be defensive stocks likely to underperform during booming markets, but provide protection during market downturns.

3.2 Early Expansion (EE)

Table 3 gives results for the early expansion sub-period of the market cycle. When analyzing the performance of the overall factor portfolio, as well as the long and short side portfolio, we observed the following results. First, Investment factor’s long portfolio produced a very strong return, which is remarkable, given that Investment factor’s long portfolio did extremely also during the recession sub-period. The reason for this most likely is that companies that are included in the Investment factor’s long portfolio are companies that are not extended due to “empire building” going into a recession, have done relatively very well during the recession (more on this later), and therefore can hit the ground running once the recession is over. This effect was especially pronounced over the last two and a half market cycles. Thus,

Table 3. Annualized performance of monthly factors (1963/07-2019/10) during Early Expansion sub-period of the market cycle, in percent and in excess of the market return. “Long”/“short” refer to the long/short sides of the factor portfolio, while “Factor” refers to the overall factor performance. See Appendix for factor definitions. Source: Kenneth French Data Library, AQR, & QRG.

	Long	Short	Factor
SMB	6.45	0.09	6.35
HML	5.02	1.78	3.24
MOM	3.59	6.07	-2.48
RMW	3.3	3	0.3
CMA	6.37	1.61	4.76
QMJ	-1.66	-0.37	-1.29

Result 1: The long side of the Investment factor (i.e., firms with high dividend payout ratios) makes for an excellent investment during recessionary period and early recovery.

³ We also have carried out this analysis over the last full two cycles (February of 1988 to October of 2019) and note these results, where appropriate.

⁴ Note that shorting of a stock relative to an index can be implemented by underweighting this stock relative to its weight in the index.

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Second, the *short* side of the Momentum factor performs very well during this period. This is due to the so-called “Momentum crash” effect [Daniel and Moskowitz, 2016], where the short side of the Momentum gets so battered during the recession, that it experiences a sharp reversal, when the market bounces off of the bottom. As a result of this, the overall Momentum factor has poor performance during the early expansion sub-period, and this effect also probably carries over to the Quality factor.

Result 2: The short side of the Momentum factor (i.e., stocks with bad past performance) experiences solid performance during early expansion sub-period, as the market takes off after the recession.

3.3 Mid-Expansion (ME)

As indicated in table 4, traditional factor performance kicks in, as Value and Momentum factors overall experience the best performance across all the factors during the mid-expansion subperiod of the market cycle, mostly due to their long-side portfolio performance. Therefore,

Result 3: Investing in long side of the Value (i.e., low priced stocks) and Momentum (i.e., stocks that have performed well in the past) portfolios during the market expansion generates significant positive excess returns.

Table 4. Annualized performance of monthly factors (1963/07-2019/10) during Mid-Expansions sub-period of the market cycle, in percent and in excess of the market return. “Long”/“short” refer to the long/short sides of the factor portfolio, while “Factor” refers to the overall factor performance. See Appendix for factor definitions.
Source: Kenneth French Data Library, AQR, & QRG.

	Long	Short	Factor
SMB	4.64	0.05	4.58
HML	5.48	0.17	5.32
MOM	6.07	-2.46	8.52
RMW	3.72	0.2	3.51
CMA	2.45	1.98	0.47
QMJ	-1.44	-4.62	3.19

Table 5. Annualized performance of monthly factors (1963/07-2019/10) during Late Expansions sub-period of the market cycle, in percent and in excess of the market return. “Long”/“short” refer to the long/short sides of the factor portfolio, while “Factor” refers to the overall factor performance. See Appendix for factor definitions.
Source: Kenneth French Data Library, AQR, & QRG.

	Long	Short	Factor
SMB	-0.93	-0.32	-0.61
HML	-3.06	1.77	-4.83
MOM	5.6	-4.24	9.84
RMW	-0.07	-0.41	0.34
CMA	0.07	-0.14	0.21
QMJ	-4.06	-8.43	4.37

On the other side of the isle, perhaps as a harbinger for things to come during late expansion and recession sub-periods of the market cycle,

Result 4: The short side of the Quality factor (i.e., stocks with sub-par accounting quality measures) produces significant negative excess returns, indicating a group of stocks to avoid.

3.4 Late Expansion (LE)

Referring to table 5 we notice that overall (long minus short sides) Value factor performance is crashing during the late expansion sub-period, as Growth stocks, sometimes with unjustified exuberance, continue market’s upward momentum into the late stages of the market cycle. The same can be said for the overall Size factor, as Growth stocks tend to be larger cap stocks. This effect has been especially pronounced over the last two and a half market cycles, which gives us the following result:

Result 5: The long side of Momentum and short side of the Value factor (i.e., Growth stocks) perform very well during this last hurray before the recession hits.

A cautionary point should be made here. Pursuing the investment in Growth stocks at this late stage in the expansion should be pursued with care, as the performance of Value stocks sharply reverses during recessions.

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Also, the Value underperformance effect during the heady days of late expansion tends to bleed over to Investment factor as well (this has been especially true over the last couple of market cycles), as Growth stocks tend to also be the stocks that are more aggressive in terms of the “empire building”, making the long/short side of the Investment to under/outperform, which results in the overall Investment factor having weak performance.

Finally, low Quality stocks experience extremely poor returns, and this result is presaging the things to come during the recession period, giving us the following result:

Result 6: Avoid low Quality stocks during late expansion and recession sub-periods of the market cycle.

3.5 Recession (R)

Table 6 gives the performance results for recession sub-period of the market cycle.

Table 6. Annualized performance of monthly factors (1963/07-2019/10) during Recession sub-period of the market cycle, in percent and in excess of the market return. “Long”/“short” refer to the long/short sides of the factor portfolio, while “Factor” refers to the overall factor performance. See Appendix for factor definitions.

	Long	Short	Factor
SMB	-0.54	1.67	-2.2
HML	5.94	-5.55	11.48
MOM	4.09	-12.52	16.62
RMW	2.72	-6.88	9.6
CMA	4.75	-8.11	12.86
QMJ	-1.34	-17.94	16.6

With the exception of Size factor, we see very robust performance across all factors. Importantly, though, lion’s share of this overall factor portfolio performance comes from the *underperformance* of the short side of the portfolio, although on the long side of the factor portfolios we see strong performance for the Value and Investment long-side factor portfolio, which share high dividend payment as the common feature across these two factors. Therefore, these results can be distilled into the following recommendations:

Result 7: Avoid low Quality (i.e., stocks with sub-par accounting quality measures) and high Investment (i.e., firms with low dividend payout ratios) during recessions.

Result 8: Seek out low Investment (i.e., firms with high dividend payout ratios) and high Value stocks (i.e., low priced/high dividend firms) during recessions.

Appendix

Appendix: Efficient Market Hypothesis and Risk Factors

Under the Efficient Market Hypothesis (EMH), where prices adjust immediately to new information, and all (or at least a critical mass of) investors make rational decisions, assets are rewarded with additional return, the so-called “risk-premium”, only if the asset is exposed to additional systematic risk, i.e., risk that cannot be diversified away. In particular, existence of persistent and systematic arbitrage opportunities, defined broadly as being able to obtain positive return with zero investment and risk, would be a direct violation of the EMH. It turns out that the systematic risk can be multidimensional, and, in addition to the usual “Market” risk, which captures the systematic risk of a business cycle, investors could also come across other types of systematic risk, such as “Size”, “Value”, and others (see Table 7). Each of these risk dimensions or “factors” carry with it a risk premium (i.e., an additional positive return), which “exist in the long run because they compensate the investor for bearing losses during bad times...[and] each factor defines a different set of bad times.” [Ang, 2014]

Unfortunately, the EMH and the associated financial theories do not specify the precise set of risk factors, although it does allow for multiple risk dimensions or factors. As we noted above, if EMH holds, a zero cost and zero risk portfolio cannot generate persistent and systematic positive return, as that would constitute an arbitrage opportunity. If such a portfolio was found to exist, it can mean only two things: either the EMH does not hold (we will have more to say about this later on) or the portfolio is exposed to certain systematic risk. With this in mind, researchers have devised the following approach to try to uncover the list of potential risk factors from financial data. They construct “factor portfolios”, which consist of long and short sides, where the overall weight of the long and short portfolios is equal, but with opposite sign, resulting in the factor portfolio having an overall weight of zero,⁵ i.e., the portfolio is costless, if we abstract from transaction costs. If the factor portfolio constructed in this way produces a persistent positive return that cannot be explained away by other factors, one would be in a position to argue that a new systematic risk dimension/factor has been identified. Using this approach legions of researchers have scoured the observed data and identified a

⁵ Importantly, a factor portfolio constructed in this way nets out the exposure to the market risk factor, since the market beta of these factor portfolios should be close to zero.

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myriad of potential systematic factors – what Professor John Cochrane called “a zoo of new factors” [Cochrane, 2011].

An astute reader will note that such an approach could be highly susceptible to the risks of data mining, where the discovered risk factors are spurious in the sense that they hold in the observed sample (“in-sample”), but fail to produce the expected results going forward (“out-of-sample”). To guard against the danger of data mining, genuine risk factors should meet the following criteria [see, for example, Ang, 2014, Hsu et al., 2015].

Factors should be justified by academic research. There should be deep and long-standing literature debating and vetting the factors, which then produces a compelling rational or behavioral story for why the risk premium should exist and allows for ample out-of-sample performance.

They should exhibit significant risk premiums (otherwise – why care?) that are persistent through time and across markets.

They should not be susceptible to perturbations in definition (e.g., using P/E ratio over, say, B/M ratio to define “Value” factor).

The factor “risk premium” should be implementable in liquid traded instruments, because otherwise the positive risk premium might be present to reward for the additional risk of investing in illiquid investments and not for being exposed to a particular “risk factor”.

Applying these criteria to the multitude of available risk factors results in a list of the most widely known and used risk factors given in Table 7.

Note that in the above explanation of factor construction we assumed that the EMH holds. A competing view of the market (“behavioral finance”) assumes that this might not necessarily be true, and that investors, instead of being all-knowing and rational, are, in fact, subject to persistent biases and irrational behaviors, which lead to certain sets of stock portfolios having positive excess returns (“risk premium”), even though their systematic risk exposures do not warrant such long-term returns. There is an active ongoing debate between the EMH adherents and behavioralists as to the origins of the risk premium for factor portfolios.

Appendix: Factor Definitions

In this section we will give details for the construction of factor portfolios listed in Table 7.

SMB The Size factor (also known as “Small-Minus-Big” or SMB factor) is constructed by having the long side of the factor portfolio invested in relatively smaller cap stocks, while investing the short side of the factor portfolio in relatively large cap stocks. In other words, small cap stocks are expected to outperform long stocks. Recent research [see, for example, Asness et al., 2018], has demonstrated interesting and intuitive interaction between Size and Quality (discussed below) factors. The EMH-based explanation might be most intuitive for why Size factor constitutes a risk factor. This explanation is based on observing that small cap stocks are less diversified by their nature than large cap stocks, which would therefore result in more inherent risk from holding a small cap stock than a large cap stock.

HML The Value factor (also known as “High-Minus-Low” or HML factor) is one of the most well-known factors, which goes back to the investing principles of Benjamin Graham. Value factor is constructed by investing the long side of the factor portfolio in low-priced (according to price-to-book, price-to-earnings, price-to-sales, etc) stocks, while investing the short side of the factor portfolio in expensively priced stocks. The existence of the Value factor can be justified either from EMH or behavioralist standpoint, with the former group arguing that since the stocks with higher exposure to the Value factor get impacted a lot more during various market environments (e.g., 1990’s internet bull market, financial crisis of 2008), the investors get a risk premium for holding these stocks. The behavioralists counter that the reason for existence of the Value premium is that these are stocks that are neglected by the investing public, who due to their behavioral biases are chasing the latest fads, represented by the Growth stocks.

MOM The Momentum factor (also denoted by MOM factor) was identified by Jegadeesh and Titman [1993]. It is constructed by investing the long side off the factor portfolio in stocks that have performed well over the past 12 months (excluding the last one month), while investing the short side of the factor in stocks that have performed poorly over the past 12 months (excluding the last one month). The reason for excluding the last month is to avoid clouding the momentum signal with the signal coming from the Reversal

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factor, which says that stocks that have done well/poorly over the last month tend to do poorly/well over the following month [Jegadeesh, 1990]. There does not seem to be a readily available explanation based in EMH framework for why Momentum factor should exist. Thus, the existence of the Momentum factor is usually justified by appealing to behavioral explanations.

RMW The Profitability factor (also known as “Robust-Minus-Weak”, RMW) is constructed by investing the long side of the factor portfolio in stocks that have high gross profits-to-assets ratio, while investing the short side of the factor in stocks that have low gross profits-to-assets ratio. It was first described only recently by Novy-Marx [2013]. At first blush it might be unclear why investing in profitable, healthy companies might result in more systematic risk, which might point to behavioralist origins for this factor. However, Roncalli [2014] might give a potential efficient market based explanation for the Quality factor: “The quality factor highlights higher-quality, less cyclical, lower leverage companies

with above-average yields: these are defensive stocks that are likely to underperform in a rising market but which offer better protection in a downturn.”

CMA The Investment factor (also known as “Conservative-Minus-Aggressive”, CMA) is constructed by going long in stocks with low change in total assets/book equity and going short in stocks with high change in total assets/book equity. Investment factor was first used by Fama and French [2015]. There are several explanations offered by academic researchers for why these types of stocks should carry a risk premium. For example, the Investment factor essentially tracks how much of the earnings are paid out to shareholders.⁶ It turns out that empirically, the larger the proportion of the earnings that is paid out in dividends, the less opportunity the management of the company has in engaging in empire building, which often leads to shareholder value destruction and leaves these companies vulnerable to equity price decreases, especially during market downturns.

Table 7. Factor descriptions.

Factor	Symbol	Characteristics
Size	SMB	Smaller stocks tend to outperform larger stocks.
Value	HML	Stocks with lower prices relative to measures of fundamental value (e.g., book value, earnings, cash flow, sales, etc.) tend to outperform those with higher valuations.
Momentum	MOM	The tendency for stocks that have risen recently to continue to rise, and for stocks that have declined recently to continue to decline.
Profitability	RMW	Stocks of firms that are more profitable (as measured, e.g., by gross profit-to-assets) tend to outperform those of less profitable firms.
Investment	CMA	Stocks of firms with low asset (or equity) growth tend to outperform stocks of firms with high asset growth. Alternatively, firms with high dividend payout ratios, and/or low level of additional equity issue tend to outperform those, where these ratios are reversed.
Quality	QMJ	Consists of four components (Profitability, Growth in Profitability, Investment, and Safety), which are similar in nature to RMW and CMA factors, as well as Volatility factor [Blitz et al., 2019].

QMJ To construct the Quality risk factor (popularly known as the “Quality-Minus-Junk” or QMJ factor and first described in Asness et al. [2013]), we need to calculate more than 20 risk characteristics, grouped into following dimensions: Profitability, Growth of Profitability, Investment, and Safety. The Profitability dimension of the Quality factor is closely aligned with the RMW factor above. Similarly, the Investment

dimension is largely aligned with the CMA factor. The Safety dimension captures the so called “low-risk effect” [Blitz et al., 2019], which says that low market beta/low idiosyncratic risk companies tend to do better than those with high market beta or high idiosyncratic risk.

⁶ Thus, the long side of the CMA factor is a good proxy for dividend paying stocks.

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