Momentum Profits and Macroeconomic States: Is Winner Riskier than Loser?

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Abstract

We examine whether momentum profits and macroeconomic risk are related. We find that momentum strategy generates economically large negative profits in bad economic states, while positive profits in good economic states, when we define states of nature based on the expected market risk premium, instead of on the realized market excess return. Our findings suggest that time variation in momentum strategy is linked to variations in macroeconomic risk. Thus, our results are consistent with risk-based explanations of momentum.

JEL classification: G12

Keywords: Momentum, Macroeconomic risk, Expected market risk premium, Market efficiency.

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1 Introduction

The pioneering work of Jegadeesh and Titman (1993) shows that the simple investing strategy of buying prior winners and selling prior losers generate significant profits both statistically and economically. Their initial finding has been confirmed by subsequent studies, suggesting that data mining is an unlikely explanation.[1] Further, a growing body of literature has refined and extended momentum phenomenon in different context.[2]

One potential explanation behind momentum anomaly is that momentum profits might be a reward for priced business cycle risk. However, most empirical studies has so far failed to document evidence that macroeconomic risk can be a source of returns to a momentum strategy. Fama and French (1996) show that momentum profits is the only anomaly unexplained by their three-factor model. Grundy and Martin (2001) report that controlling for time-varying exposures to three-factors fail to explain the profitability of momentum strategy. Liew and Vassalou (2000) find little evidence that momentum is related to future GDP growth. Griffin, Ji, and Martin (2003) provide international evidence that macroeconomic risk cannot explain momentum profits internationally. As a result, the momentum literature has mostly followed interpretation of Jegadeesh and Titman (1993) that momentum payoffs are driven by irrational agents.[3]

[1] Rouwenhorst (1998) documents momentum strategy works in international market. Jegadeesh and Titman (2001) show that momentum profits have continued even subsequent to the period covered by the 1993 study.

[2] Moskowitz and Grinblatt (1999) document stronger and more persistent momentum effect is found with industry portfolio than with individual stocks. Lee and Swaminathan (2000) show that stocks with high turnover display more momentum. Avramov et al. (2007) find that firms with low-grade credit ratings have large momentum, but firms with high-grade credit ratings exhibit no momentum.

[3] Barberis, Shleifer, and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998), and Hong and Stein (1999) each employ different behavioral or cognitive biases to explain momentum anomaly. Jegadeesh and

We re-examine whether momentum profits are related to macroeconomic risk. We adopt the novel approach taken by Lakonishok, Shleifer, and Vishny (1994; hereafter LSV) to determine whether momentum strategies expose investors to a greater downside risk. LSV argue that a strategy would be fundamentally risky if (1) there are at least some states of the world in which the strategy underperforms and (2) these times of underperformance are, on average, bad states, in which the marginal utility of consumption is high, making the strategy unattractive to risk-averse investors.

Our central findings are easy to summarize. The momentum strategy is related to economic distress risk. From 1954 to 2005, the mean monthly momentum profit is an economically and statistically significant negative -1.90% in bad times when the expected premium for risk is highest, while the momentum strategy generates a significant mean monthly profit of 2.09% in good times when the expected premium for risk is lowest, as shown by Figure 1. Furthermore, the momentum strategy displays a countercyclical pattern of risk. That is, the payoffs to a momentum strategy tend to positively covary with macroeconomic conditions. When we regress momentum profits on the expected market risk premium as a *continuous* measure of the economic state, the coefficient estimate is always significantly negative. The negative relation between momentum and expected risk premium remains virtually unchanged while controlling for other state variables suggested by the literature.[4] Finally, our findings remain reliably evident: (1) in subperiod analysis, (2) for alternative formation and holding periods in constructing momentum strategy, (3) after controlling January effect in

Titman (2001) and Cooper, Gutierrez, and Hameed (2004) provide empirical evidences supporting for the behavioral models.

[4] Other state variables include the lagged three-year market returns shown to contain information about returns on momentum strategy (Cooper, Gutierrez, and Hammed (2004)), the contemporaneous market return and future GDP growth used to classify market states (Liew and Vassalou (2000); Griffin, Ji, and Martin (2003)).

momentum payoffs, (4) irrespective of whether skipping of the month between the formation and holding period, and (5) independent of whether including NASDAQ stocks.[5]

The empirical literature has failed to provide similar evidence because they define economic states in terms of the *realized* market return or GDP growth. Most relevant to our work, Griffin, Ji, and Martin (2003; hereafter GJM) show that average momentum profits are positive during negative GDP growth and even larger positive during negative market returns than during positive market returns in the United States,[6] and conclude that "there is no evidence that the profitability of momentum strategies is related to risk arising from macroeconomic states (p. 2539)."

However, the *ex-post* realized market return is a noisy measure for marginal utility or business cycle (see, e.g., Fama, 1981; Stock and Watson, 1999). Petkova and Zhang (2005) argue that more precise measures for aggregate economic conditions are the default spread, the term spread, and the short-term interest rate, macroeconomic variables that are common instruments used to model the expected market risk premium. Following Petkova and Zhang (2005), we classify macroeconomic states based on the expected market risk premium and show that GJM's basic inferences can be overturned with this reasonable change in measuring macroeconomic conditions.

Our finding lends support to Chordia and Shivakumar (2002), who show that

[5] Negative momentum profits in January are well documented in the literature (e.g., Jegadeesh and Titman (1993, 2001); Chordia and Shivakumar (2002, 2006)). Skipping one-month between ranking and holding period helps to minimize spurious negative autocorrelation due to bid-ask bounce (Cooper, Gutierrez, and Hammed (2004)).

[6] Liew and Vassalou (2000) also report larger positive mean momentum profits in negative GDP growth than in positive GDP growth.

macroeconomic variables can explain a large portion of momentum profits.[7] But we differ because we provide direct evidence on economic distress risk of momentum strategies and focus on the relation between momentum profits and macroeconomic states. We also go further in studying why our results differ from those of previous studies.

The remainder of the paper is organized as follows. Section 2 discusses empirical methodologies employed in this study. Section 3 describes the data, and presents the evidence on the relation between momentum profits and macroeconomic risk. Section 4 provides results from robustness analysis and additional discussions of the main findings. And Section 5 presents our conclusions.

2 Empirical Specification

To examine whether momentum strategies are related to economic distress risk, we adopt the novel approach taken by Lakonishok, Shleifer, and Vishny (1994). They argue that a strategy would be fundamentally risky if (1) there are at least some states of the world in which the strategy underperforms and (2) these times of underperformance are, on average, bad states,

[7] Several other studies provide risk-based explanations of momentum as well. Conrad and Kaul (1998) argue that cross-sectional dispersion in expected returns can potentially account for momentum. Berk, Green, and Naik (1999) presents a formal model in which economic risk factor that affect firm investment life cycles could explain momentum profits. Ahn, Conrad, and Dittmar (2003) show that their nonparametric benchmark model explains roughly half of momentum payoffs. Johnson (2002) provides a rational framework where momentum can arise from a positive relation between expected returns and firm growth rates. Liew and Zhang (2009) document direct empirical support to John's model by showing that the growth rate of industrial production account for more than half of momentum. Kim (2006) show that a risk factor related to unexpected earnings surprises can successfully explain returns on momentum strategy. We add to this literature by providing direct evidence on the relation between momentum and the expected premium for risk that has not been considered in these studies.

in which the marginal utility of consumption is high, making the strategy unattractive to risk-averse investors.

Before our study, Griffin, Ji, and Martin (2003) investigate whether momentum strategies are risky in a manner similar to the analysis of value and growth strategies in Lakonishok, Shleifer, and Vishny. Griffin, Ji, and Martin define economic states in terms of the realized market returns and GDP growth; they identify good states with high, and bad states with low, ex post market returns or GDP growth. Their results show that the average momentum profits are positive during negative GDP growth and even larger during negative market returns than during positive market returns in the Unites States. Therefore, Griffin, Ji, and Martin conclude that momentum strategies cannot be risky because they do not expose investors to a greater downside risk.

However, the ex-post realized market return is a noisy measure for marginal utility or business cycle (see, e.g., Fama, 1981; Stock and Watson, 1999). Petkova and Zhang (2005) argue that more precise measures for aggregate economic conditions are the default spread, the term spread, and the short-term interest rate, macroeconomic variables that are common instruments used to model the expected market risk premium.

Following Petkova and Zhang (2005), we classify economic states of the world based on the expected market risk premium as follows: state “peak” stands for the lowest 10% periods of the expected risk premium; state “expansion” stands for the periods with the negative risk premium other than the 10% lowest; state “recession” stands for the periods with the positive risk premium except the 10% highest; and states “trough” stands for the highest 10% periods of the expected market risk premium.

Note that this sorting procedure is consistent with the stock market return predictability literature, which have shown that expected market risk premium is higher in bad times, and are correlated with business cycle (see, e.g., Fama and Schwert, 1977; Fama and French, 1989). This classification is also consistent with modern asset pricing theories, which features the countercyclical price of risk (see, e.g., Campbell and Cochrane, 1999; Zhang, 2005).

Expected market risk premium is unobservable. To model this risk premium, therefore, we use macroeconomic variables which are known for their ability to predict market returns. These conditioning variables include the default spread (DEF), the term spread (TERM), the three-month T-bill rate (RF), and the variable CAY. The motivation for each of these variables is standard from the time-series predictability literature.[8] The default spread is the yield spread between Moody's BAA and AAA corporate bonds. The term spread is the yield spread between ten-year government bonds and one-year government bonds. Data on bond yields are obtained from the Federal Reserve Bank of St. Louis. The variable CAY represents deviations from a common trend among consumption, asset wealth, and labor income created by Lettau and Ludvigson (2001).[9]

To model the unobservable market risk premium, we regress the realized market return from time *t*-1 to *t* on the macroeconomic variables known at time *t*-1:

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[8] The three-month T-bill rate has been shown to be negatively related to future market returns and act as a proxy for expectations of future economic growth (see, e.g., Fama, 1981; Fama and Schwert, 1977). The default spread has been known to track long term business conditions and higher during recessions and lower during expansions (see, e.g., Keim and Stambaugh, 1986; Fama and French, 1989). Fama and French (1989) show that the term spread is closely related to short term business cycles, identified by the National Bureau of Economic Research (NBER). Finally, Lettau and Ludvigson (2001) show that CAY is a strong and better predictor of future stock market returns in short to medium horizons than other popular forecasting variables.

[9] We thank Lettau and Ludvigson for making their data publicly available. http://faculty.haas.berkeley.edu/lettau/ (Lettau), http://www.econ.nyu.edu/user/ludvigsons/ (Ludvigson)

$$R_{m,t} = c_0 + c_1 DEF_{t-1} + c_2 TERM_{t-1} + c_3 RF_{t-1} + c_4 CAY_{t-1} + e_{m,t}, \quad (1)$$

Then, the estimated expected market risk premium, $E_{t-1}[R_{m,t}]$, is the fitted value from Eq. (1) as follows:

$$E_{t-1}[R_{m,t}] = \widehat{c_0} + \widehat{c_1} DEF_{t-1} + \widehat{c_2} TERM_{t-1} + \widehat{c_3} RF_{t-1} + \widehat{C_4} CAY_{t-1}. \quad (2)$$

3 Empirical Results

A. Data

We construct momentum portfolios exactly same as in Jegadeesh and Titman (1993). For each month *t*, we rank all NYSE and AMEX stocks from the monthly CRSP files into deciles based on their J-month formation period (months *t*-J-1 through *t*-2 with the skip-a-month). Decile portfolios are formed by equally weighting all firms in the decile ranking. The momentum strategy is to take a long position in the top decile portfolio (the winners) and a short position in the bottom decile portfolio (the losers). The positions are held for the following K-month period, *t* though *t*+K. Thus, portfolios have overlapping holding period returns. We consider 16 different momentum strategies, that is, J=3, 6, 9, 12 months for the ranking period, and K = 3, 6, 9, 12 months for the holding period. In fact, available macroeconomic data (the CAY variable) are quarterly in frequency. When it is necessary to match the frequency of the estimated market risk premium and the payoffs to momentum trading, for example, the regression model of Eq. (3) or (4), we convert available monthly holding period return of the momentum strategy into quarterly holding period return.

Table 1 reports the average monthly returns for each strategy over the period from 1954 to 2005. For the strategy of J/K = 6-month/6-month, the difference in returns between the highest (Winner) and the lowest (Loser) past-return portfolios, WML, is an economically and statistically significant 0.85% per month. This result is consistent with Grundy and Martin (2001) who report a profit of 0.86% per month during the period 1962 to 1995 and Chordia and Shivakumar (2002) who document a profit of 0.73% per month during the period 1963 to 1994. The pattern of payoffs to momentum strategies is comparable to that of Jegadeesh and Titman (1993). That is, for all considered strategies past Winners outperformed past Losers. The payoffs to momentum trading are positive in all considered strategies, and most are statistically significant (except the strategies of J/K = 12-month/12-month). Finally, regardless of the ranking period, average profits tend to decrease for longer holding periods, which is consistent with the results of Rouwenhorst (1998).[10]

B. Momentum Profits and Economic States

Our goal is to check whether the times when momentum strategies yield negative profits are "bad" states of the world in which the marginal utility of consumption is high. In addition, we examine whether the profits to momentum trading vary across good and bad times and whether any differences are significant.

[10] Our unreported results suggest that momentum strategies still yield significant profits when we convert monthly return to quarterly returns for most considered strategies. For the strategy of J/K = 6-month/6-month, quarterly holing period return is 2.46% (with the *t*-statistics of 3.55), which is about three-times of monthly holding period return. Further, the momentum strategies are significantly profitable, and quite similar in both subperiods, the 1954 to 1980 and 1981 to 2005 for both monthly and quarterly holding period returns.

Table 2 presents holding period monthly profits for the momentum strategy of J/K = 6-month/6-month in of 4 states of the world, namely, "peak", "expansion", "recession", and "trough" defined as in Section 2.[11] The average momentum profits for each state are reported with *t*-statistics for the test that the average profit is equal to zero. The average difference between the momentum profits in "peak" and "trough" is also reported with the *t*-statistics for testing the equality of the profits across "peak" and "trough" states.

The results in this table are fairly clear. The winner portfolio significantly underperformed the loser portfolio in "trough" states. Over the period from 1954 to 2005, the average momentum profit is a large and statistically significant negative -1.90% in "trough", when the marginal utility of wealth is especially high. Further, the momentum strategy shows a countercyclical pattern of risk. That is, the payoffs to a momentum strategy tend to positively covary with macroeconomic conditions. The average monthly momentum profits are 2.09%, 1.29%, 1.01%, and -1.09% in "peak", "expansion", "recession", and "trough", displaying a monotonic pattern across economic states. As a result, the difference between the momentum profits in extreme good and bad states is a huge and statistically significant 3.99% per month with the *t*-statistics of 3.12. Underlying these average profits, there is a difference between the ratios of WML that are positive. From the lowest to highest expected market risk premium, the ratio that WML profit is positive is 0.75, 0.70, 0.67, and 0.55, respectively. The fact that the ratio of WML that are positive in state "trough" is larger than 0.5 indicates that the magnitude of negative profits are larger on average than that of positive profits.

[11] We focus on the strategy of J/K = 6-month/6month as a benchmark because this horizon is prominent in the momentum literature with significant payoffs after standard risk adjustments. To verify that our results are not sensitive to the formation period nor the holding period, we also report the results for other momentum strategies in Section 4.A.

To investigate the robustness of our results, we examine the performance of momentum portfolio conditioning on the economic states in two separate time periods, the 1954 to 1980 and 1981 to 2005 subperiods. The subperiod results mirror the essential features drawn from the overall samples, that is, negative profits of the momentum strategy are skewed toward economic bad states. In both subperiods, momentum trading generates large negative profits in state “trough” (-1.63% and -1.93% per month during the first and second half period, respectively), which are quantitatively similar to that of the overall period, although statistically insignificant. This lack of statistical power arises from the reduced number of observation, not from the economic magnitude of profits. The subperiod results preserve a monotonic pattern for the payoffs to a momentum trading to be higher as macroeocnomic distress risk becomes low. Also, for both subperiods, the difference between momentum profits across “peak” and “trough” states are still economically and statistically significant.

Next, we examine whether our results are changed after controlling January effect in momentum payoffs. Panel B of Table 2 reports momentum profits across economic states in January. Momentum generates negative profits in all economic states for all considered periods. It is not surprising, given the well-documented seasonality in momentum profits that losers significantly outperform the winners in January. Interesting result we find is that even in January, there exist differences in payoffs to momentum trading between state “peak” and state “trough”, albeit statistically insignificant. Panel C documents momentum profits in each economic state for non-January. The momentum profits in state “trough” for non-January are also negative, but the magnitudes of profits are less than half than those for all months. This indicates that significant negative profits in state “trough” might be driven by January effect in momentum. More importantly, conditioning on the macroeconomic state still has a clear and dramatic effect on the payoffs to momentum trading, and momentum shows a countercyclical pattern of risk after adjusting the January effect.

In order to more thoroughly illustrate that momentum is related to economic distress risk, we plot a time-series of quarterly profits of the momentum strategy in Figure 2. The shaded region denotes state "trough". The figure clearly shows that momentum has earned negative returns when the predicted market risk premium is largest. In particular, during four of five economic troughs, momentum strategy yields negative payoffs. Interestingly, macroeconomic variables successfully forecast the periods when momentum gives three largest negative profits. Three largest negative profits are -64 percent, -44 percent, and -42 percent per quarter occurred at 1990:Q4, 1974:Q4, and 2003:Q1, respectively.

In sum, we provide the evidence that the payoffs to a momentum strategy are closely related to risk arising from macroeconomic states classified by the expected market risk premium. The winner stocks indeed significantly underperform the loser stocks in state "trough" when the marginal value of wealth is highest, indicating that the momentum strategy expose investors to greater downside risk. Thus, our results support the view that momentum strategies are fundamentally risky.

C. The Relation between Momentum Profits and the Expected Market Risk Premium Using Regression Analysis

In this section, we examine the relation between momentum profits and the expected market risk premium as a continuous measure for economic state, not just the discrete states as before. Even though informal, examining the profitability of momentum strategies conditioning on the economic states suggested by Lakonishok, Shleifer, and Vishny (1994) is perhaps the simplest and the most intuitive way to study relation between momentum trading and macroeconomic risk. We supplement this informal test with a more formal test. If momentum strategies expose investors to greater systematic risk, then the payoff to momentum trading should have negative relation with the expected market risk premium. To test this hypothesis, we regress momentum profits on the expected market risk premium as a continuous variable, not just the discrete states as before:

$$\mathrm{WML}_t = \delta_0 + \delta_1 \mathrm{E}_{t-1}\left[\mathrm{R}_{m,t}\right] + \varepsilon_t, \tag{3}$$

where WML_t denotes profits to momentum strategies.

The results of Section 3.B are confirmed here using regression analysis. Panel A of Table 3 reports on whether payoff to a momentum strategy is related to the expected market risk premium. We find that the expected risk premium contains critical information about the returns on the momentum trading strategies. When estimating Eq. (3) for the overall period, the coefficient on the market risk premium is significantly negative with *t*-statistic of -3.25, confirming our finding that momentum is low (high) when investors require high (low) risk premium. One-half subperiod results are consistent with statistically significant negative coefficient estimates.

We are also interested if *change* in momentum payoffs is associated with the expected market risk premium. If profit of a momentum strategy is strongly related to business cycle risk, then not only might the contemporaneous momentum profit be lower with the bad economic state, but also the momentum profit preceding or following that bad economic state should be relatively higher, since times before and after that bad state should have been relatively stronger. To further examine this, we regress two variations of the empirical model

Eq. (3) in a manner similar to the empirical specification of Stivers and Sun (2009):

$$\Delta WML_{t+12,t} = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \varepsilon_t, \tag{4}$$

$$\Delta WML_{t,t-12} = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \varepsilon_t, \tag{5}$$

where $\Delta WML_{t+12,t}$ is the difference between WML_{t+12} and WML_t; $\Delta WML_{t,t-12}$ is the difference between WML_t and WML_{t-12}.

Panel B and C of Table 3 presents on whether the expected market risk premium is related to subsequent changes in momentum profits, $\Delta WML_{t+12,t}$ and $\Delta WML_{t,t-12}$, respectively. We find that the expected premium for risk have reliable information about the subsequent changes in the momentum payoffs. The coefficients on the risk premium for $\Delta WML_{t+12,t}$ (Eq. (4)) are significantly positive, and those for $\Delta WML_{t,t-12}$ (Eq. (5)) are significantly negative for both overall and one-half subperiods. These results suggest that expected risk premium is positively related to the momentum profits that precede or follow the time when investors predict for the market risk premium.

We next examine whether the relation between momentum profits and the expected premium for risk remains valid when controlling for other state variables suggested by the literature. Cooper, Gutierrez, and Hameed (2004) show that the lagged three-year market return contains information about the profitability of momentum strategies. They document evidence that momentum profits are only reliably positive following "UP" market where the three-year market return is positive. In addition, LSV (1994), Liew and Vassalou (2000) and Griffin, Ji, and Martin (2003) use a future GDP growth and/or contemporaneous stock market return to proxy for economic states. We now run a horse race between the expected market risk premium and other state variables by estimating the following three regression models:

$$\mathrm{WML}_t = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \delta_2 \mathrm{LAGMKT}_{t-12,t} + \delta_3 \mathrm{GDP}_{t,t+4} + \delta_4 \mathrm{MKT}_t + \varepsilon_t \quad (6)$$

$$\Delta\mathrm{WML}_{t+12,t} = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \delta_2 \mathrm{LAGMKT}_{t-12,t} + \delta_3 \mathrm{GDP}_{t,t+4} + \delta_4 \mathrm{MKT}_t + \varepsilon_t \quad (7)$$

$$\Delta\mathrm{WML}_{t,t-12} = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \delta_2 \mathrm{LAGMKT}_{t-12,t} + \delta_3 \mathrm{GDP}_{t,t+4} + \delta_4 \mathrm{MKT}_t + \varepsilon_t \quad (8)$$

where ; $\mathrm{LAGMKT}_{t-12,t}$ is the lagged 3-year market return; $\mathrm{GDP}_{t,t+4}$ is the one-year future GDP growth rate; MKT_t is the contemporaneous market return.

Table 4 reports the results. When only the lagged three-year market return is used as an explanatory variable, the estimate on the $\mathrm{LAGMKT}_{t-12,t}$ term is statistically significant (row 1), confirming the result of Gutierrez, and Hameed (2004). The relation between future GDP growth and momentum payoffs is relatively weak and unstable across specification (row 2). This is consistent with Liew and Vassalou (2000) and Griffin, Ji, and Martin (2003). The contemporaneous market return seems to contain information about returns on momentum strategies, but it is related to negatively rather than positively (row 3). Recall that previous studies classify good states with high market returns. Thus, defining economic states based on the realized market return may lead to incorrect inferences. The fourth row presents the results for Eq. (6) through Eq. (8). The expected market risk premium continues to have a significant negative relation with momentum profits after controlling for other state variables. Interestingly, the expected risk premium subsumes the information content of the lagged three-year market return regarding momentum profits. Thus, we interpret this as our findings that momentum profits are critically dependent on the expected market risk premium are substantially distinct from previous findings in Cooper, Gutierrez, and Hameed (2004). Overall, the expected premium for risk contains information about the profitability of momentum strategies, over and above the information contained in other state variables.

D. Results from Robustness Analysis

In this section, we provide results from robustness analysis. Our investigation includes variations in the ranking and holding period in constructing momentum strategies. Additionally, we examine whether our results are sensitive to without skipping the last month between the formation period and the holding period, and including NASDAQ stocks in creating momentum portfolios.

First, we evaluate whether our results are robust to verifying the length of the ranking and holding period. We consider 16 different momentum strategies, that is, J=3, 6, 9, 12 months for the ranking period, and K = 3, 6, 9, 12 months for the holding period. Table 5 reports the results for momentum profits in different economic states for alternative momentum strategies. For all the 16 strategies considered, momentum profits are negative both statistically and economically in state “trough”. Furthermore, differences in profits to momentum strategies between state “peak” and “trough” are again large and statistically significant for all the alternative strategies. Table 6 presents additional results of Eq. (3) for various momentum strategies. The results are comparable to Table 3. The coefficient on the expected risk premium is always significantly negative to momentum payoffs. These results confirm the robustness of our earlier findings to variations in the ranking and holding period.

Second, we do now allow for a month’s gap between the portfolio formation month and the beginning of the holding period since Griffin, Ji, and Martin (2003) and Cooper, Gutierrez, and Hameed (2004) argue that absence of skipping one-month critically affect the profitability of momentum strategies. Further, we include NYSE stocks in our sample for constructing momentum portfolios. Our unreported results show that our main findings are independent of skipping of the month between the formation and holding period and including small firms. Thus, our conclusion is not influenced by microstructure-induced biases.

4 Conclusion

We examine whether momentum profits are related to macroeconomic risk. The main findings are twofold. First, the momentum strategy expose investors to economic distress risk. From 1954 to 2005, the mean monthly momentum profit is an economically and statistically significant negative -1.90% in state “trough” when the marginal utility of consumption is highest. Second, the momentum strategy displays a countercyclical pattern of risk. That is, the payoffs to a momentum strategy tend to positively covary with macroeconomic conditions. When we regress momentum profits on the expected market risk premium as a *continuous* measure of the economic state, the coefficient estimate is always significantly negative. The negative relation between momentum and expected risk premium remains virtually unchanged while controlling for other state variables suggested by the literature. In sum, our findings suggest that time variation in momentum strategy is linked to variations in macroeconomic risk. Thus, our results are consistent with risk-based explanations of momentum.

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Table 1

Descriptive Statistics for Momentum Profits

For each month *t*, we rank all NYSE and AMEX stocks from the monthly CRSP files into deciles based on their J-month formation period (months *t*-J-1 through *t*-2 with the skip-a-month). Decile portfolios are formed by equally weighting all firms in the decile ranking. The momentum strategy is to take a long position in the top decile portfolio (the winners) and a short position in the bottom decile portfolio (the losers). The positions are held for the following K-month period, *t* though *t*+K. The table reports the average monthly buy-and-hold returns on these portfolios for the period 1954 to 2005. Numbers in parentheses are t-statistics.

Ranking		Holding Period			
Period	Portfolio	3 months	6 months	9 months	12 months
3 months	Loser	0.91	0.96	0.94	1.02
	Winner	1.53	1.55	1.56	1.51
	WML	0.62	0.60	0.62	0.49
	(t-stat)	3.27	3.57	4.29	3.74
6 months	Loser	0.84	0.85	0.90	1.05
	Winner	1.73	1.74	1.66	1.53
	WML	0.89	0.90	0.76	0.48
	(t-stat)	3.93	4.50	4.28	2.84
9 months	Loser	0.79	0.85	0.98	1.13
	Winner	1.87	1.77	1.62	1.48
	WML	1.08	0.92	0.64	0.34
	(t-stat)	4.73	4.39	3.23	1.83
12 months	Loser	0.86	0.99	1.11	1.24
	Winner	1.77	1.64	1.51	1.39
	WML	0.91	0.65	0.39	0.15
	(t-stat)	3.91	2.93	1.85	0.74

Table 2

Momentum Profits and Economic States

The table shows holding period monthly profits, WML, for the momentum strategy of J/K = 6-month/6-month in different economic states based on the expected market risk premium, which is estimated as a following model: $R_{m,t} = \alpha + \beta \mathbf{Z}_{t-1} + e_{m,t}$, where $\mathbf{Z}_{t-1}$ is a vector representing macroeconomic variables default spread, term spread, three-month T-bill rate, and variable CAY. State "peak" stands for the lowest 10% periods of the expected risk premium; state "expansion" stands for the periods with the negative risk premium other than the 10% lowest; state "recession" stands for the periods with the positive risk premium except the 10% highest; and states "trough" stands for the highest 10% periods of the expected market risk premium. We report the difference between the momentum profits in "peak" and "trough", denoted "Diff". Panel B reports the results for January, while Panel C reports for non-January months. *t*-statistics are reported in parenthesis. The row titled "ratio of pos" denotes the ratio of WML that are positive.

		Peak	Expansion	Recession	Trough	Diff
			Panel A: All months			
1954-2005	WML	2.09	1.29	1.01	-1.90	3.99
	(t-stat)	2.72	2.84	5.19	-1.86	3.12
	ratio of pos	0.75	0.70	0.67	0.55	
1954-1980	WML	2.19	1.51	0.85	-1.63	3.82
	(t-stat)	1.80	3.89	2.96	-1.25	2.14
	ratio of pos	0.80	0.71	0.68	0.57	
1981-2005	WML	1.98	1.11	1.07	-1.93	3.91
	(t-stat)	2.09	1.85	3.08	-1.17	2.05
	ratio of pos	0.70	0.69	0.65	0.53	
			Panel B: January			
1954-2005	WML	-5.33	-5.68	-3.99	-10.65	5.33
	(t-stat)	-1.43	-1.47	-3.35	-2.85	1.00
	ratio of pos	0.50	0.18	0.29	0.14	
1954-1980	WML	-5.03	-3.09	-4.51	-12.08	7.05
	(t-stat)	-0.86	-3.15	-2.53	-1.90	0.82
	ratio of pos	0.75	0.17	0.23	0.25	
1981-2005	WML	-5.92	-3.05	-5.30	-8.76	2.83
	(t-stat)	-3.45	-3.62	-1.76	-2.40	0.58
	ratio of pos	0.00	0.00	0.38	0.00	
			Panel C: Non-January			
1954-2005	WML	2.91	1.88	1.43	-0.75	3.66
	(t-stat)	4.32	5.69	8.50	-0.78	3.13
	ratio of pos	0.78	0.75	0.70	0.60	
1954-1980	WML	3.30	1.84	1.28	-0.02	3.32
	(t-stat)	3.31	4.75	5.19	-0.02	2.52
	ratio of pos	0.81	0.75	0.72	0.62	
1981-2005	WML	2.55	1.55	1.63	-1.17	3.72
	(t-stat)	2.75	2.52	6.98	-0.67	1.90
	ratio of pos	0.75	0.76	0.68	0.59	

Table 3

Momentum Profits and the Expected Market Risk Premium

This table reports the relation between momentum profits and the expected market risk premium as a continuous measure of the macroeconomic state. We consider following three regression models.

$$\text{Model 1: } WML_t = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \varepsilon_t$$

$$\text{Model 2: } \Delta WML_{t+12,t} = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \varepsilon_t$$

$$\text{Model 3: } \Delta WML_{t,t-12} = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \varepsilon_t$$

where WML_t is the holding period quarterly profit for the momentum strategy of J/K = 6-month/6-month; $\Delta WML_{t+12,t}$ is the difference between WML_{t+12} and WML_t; $\Delta WML_{t,t-12}$ is the difference between WML_t and WML_{t-12}. $E_{t-1}[R_{m,t}]$ is the expected market risk premium. Panel A reports on Model 1 for the contemporaneous momentum profit. Panel B reports on Model 2 for the change between 3-years ahead and contemporaneous momentum profits. Panel C reports on Model 3 for the change between contemporaneous and prior 3-years momentum profits. Newey-West corrected *t*-statistics are reported in parenthesis.

	Intercept	$E_{t-1}[R_{m,t}]$	Adj-R^2 (%)
Panel A: Regression of WML_t on the expected market risk premium			
1954-2005	3.75	-0.77	5.10
	8.09	-3.25	
1954-1980	3.53	-0.56	4.63
	5.20	-2.45	
1981-2005	4.24	-1.13	4.95
	5.54	-2.23	
Panel B: Regression of $\Delta WML_{t+12,t}$ on the expected market risk premium			
1954-2005	-1.55	0.81	3.55
	-1.58	2.60	
1954-1980	-0.84	0.56	2.81
	-0.66	1.98	
1981-2005	-2.66	1.44	4.54
	-1.54	2.09	
Panel C: Regression of $\Delta WML_{t,t-12}$ on the expected market risk premium			
1954-2005	1.43	-1.01	5.83
	2.10	-3.79	
1954-1980	1.60	-0.86	8.05
	1.66	-3.29	
1981-2005	2.11	-1.36	3.43
	1.71	-2.02	

Table 4

Momentum Profits, Expected Market Risk Premium, and Other State Variables

This table examines whether the relation between momentum profits and the expected market risk premium remains significant after controlling for other state variables suggested by the literature. We consider following three regression models.

$$\text{Model 1: } WML_t = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \delta_2 LAGMKT_{t-12,t} + \delta_3 GDP_{t,t+4} + \delta_4 MKT_t + \varepsilon_t$$

$$\text{Model 2: } \Delta WML_{t+12,t} = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \delta_2 LAGMKT_{t-12,t} + \delta_3 GDP_{t,t+4} + \delta_4 MKT_t + \varepsilon_t$$

$$\text{Model 3: } \Delta WML_{t,t-12} = \delta_0 + \delta_1 E_{t-1}[R_{m,t}] + \delta_2 LAGMKT_{t-12,t} + \delta_3 GDP_{t,t+4} + \delta_4 MKT_t + \varepsilon_t$$

where WML_t is the holding period quarterly profit for the momentum strategy of J/K = 6-month/6-month; $\Delta WML_{t+12,t}$ is the difference between WML_{t+12} and WML_t; $\Delta WML_{t,t-12}$ is the difference between WML_t and WML_{t-12}. $E_{t-1}[R_{m,t}]$ is the expected market risk premium; $LAGMKT_{t-12,t}$ is the lagged 3-year market return; $GDP_{t,t+4}$ is the 1-year ahead GDP growth rate; MKT_t is the contemporaneous market return. Panel A reports on Model 1 for the contemporaneous momentum profit. Panel B reports on Model 2 for the change between 3-years ahead and contemporaneous momentum profits. Panel C reports on Model 3 for the change between contemporaneous and prior 3-years momentum profits. Newey-West corrected *t*-statistics are reported in parenthesis.

row	Intercept	$E_{t-1}[R_{m,t}]$	$LAGMKT_{t-12,t}$	$GDP_{t,t+4}$	MKT_t	Adj-R^2 (%)
Panel A: Regression of WML_t on the expected market risk premium and other state variables						
(1)	0.58		4.52			1.71
	0.49		2.13			
(2)	3.78			-0.40		0.40
	4.79			-1.86		
(3)	2.92				-0.27	4.78
	6.72				-2.52	
(4)	2.03	-0.52	2.59	0.18	-0.21	6.92
	1.48	-2.43	1.32	0.73	-1.98	
Panel B: Regression of $\Delta WML_{t+12,t}$ on the expected market risk premium and other state variables						
(5)	1.37		-3.62			0.32
	0.94		-1.26			
(6)	-1.50			0.39		0.05
	-1.11			1.15		
(7)	-0.24				0.01	-0.51
	-0.32				0.10	
(8)	-1.09	0.88	-1.09	0.03	-0.11	2.60
	-0.58	2.48	-0.40	0.07	-0.82	
Panel C: Regression of $\Delta WML_{t,t-12}$ on the expected market risk premium and other state variables						
(9)	-3.28		7.77			3.45
	-2.34		2.83			
(10)	1.85			-0.64		0.88
	1.71			-2.23		
(11)	0.24				-0.32	4.26
	0.35				-2.78	
(12)	-0.96	-0.62	5.14	0.02	-0.22	7.86
	-0.55	-2.44	1.97	0.05	-1.90	

Table 5

Robustness Results for Momentum Profits and Economic States

This table presents additional evidence about momentum profits in different economic states for alternative momentum strategies. The momentum portfolios are formed based on either the prior three, six, nine, or 12 months, and held either for three, six, nine, or 12 months. Economic states are classified based on the expected market risk premium, which is estimated as a following model: $R_{m,t} = \alpha + \beta\mathbf{Z_{t-1}} + e_{m,t}$, where $\mathbf{Z_{t-1}}$ is a vector representing macroeconomic variables default spread, term spread, three-month T-bill rate, and variable CAY. State "peak" stands for the lowest 10% periods of the expected risk premium, and states "trough" stands for the highest 10% periods of the expected market risk premium. We report the difference between the momentum profits in "peak" and "trough", denoted "Diff". *t*-statistics are reported in parenthesis. The row titled "ratio of pos" denotes the ratio of WML that are positive.

Ranking Period		Holding Period											
		3 months			6 months			9 months			12 months		
		Peak	Trough	Diff	Peak	Trough	Diff	Peak	Trough	Diff	Peak	Trough	Diff
3 months	WML	1.49	-1.99	3.48	1.75	-1.59	3.34	1.31	-1.49	2.80	0.99	-1.53	2.52
	(t-stat)	1.97	-2.11	2.88	2.65	-1.88	3.11	2.38	-2.00	3.02	1.94	-2.23	2.95
	ratio of pos	0.67	0.50		0.68	0.55		0.73	0.48		0.68	0.50	
6 months	WML	2.54	-2.21	4.75	2.09	-1.90	3.99	1.50	-1.99	3.50	0.99	-2.29	3.28
	(t-stat)	2.79	-1.92	3.24	2.72	-1.86	3.12	2.21	-2.10	3.00	1.53	-2.47	2.90
	ratio of pos	0.72	0.48		0.75	0.55		0.68	0.52		0.63	0.47	
9 months	WML	2.20	-2.45	4.65	1.79	-2.31	4.10	1.13	-2.54	3.67	0.70	-2.76	3.46
	(t-stat)	2.54	-2.09	3.19	2.27	-2.13	3.06	1.51	-2.44	2.87	0.99	-2.73	2.80
	ratio of pos	0.70	0.52		0.65	0.52		0.63	0.48		0.62	0.47	
12 months	WML	1.90	-2.85	4.75	1.37	-2.89	4.27	0.83	-3.07	3.90	0.39	-3.17	3.56
	(t-stat)	2.17	-2.38	3.21	1.65	-2.49	2.98	1.07	-2.71	2.84	0.54	-2.88	2.70
	ratio of pos	0.67	0.47		0.62	0.48		0.60	0.45		0.57	0.43	

Table 6

Robustness Results for Momentum Profits and the Expected Market Risk Premium

This table presents additional evidence about the relation between momentum profits and the expected market risk premium for alternative momentum strategies. The momentum portfolios are formed based on either the prior three, six, nine, or 12 months, and held either for three, six, nine, or 12 months. Quarterly momentum profit, WML_t,is regressand on the constant and the expected market risk premium, $E_{t-1}[R_{m,t}]$. Newey-West corrected *t*-statistics are reported in parenthesis.

Ranking Period		Holding Period			
		3 months	6 months	9 months	12 months
3 months	Coefficient	-0.65	-0.61	-0.54	-0.51
	(t-stat)	-2.70	-3.05	-3.05	-2.90
	Adj-R^2 (%)	4.33	4.72	4.83	4.66
6 months	Coefficient	-0.89	-0.77	-0.71	-0.68
	(t-stat)	-3.34	-3.25	-3.03	-2.86
	Adj-R^2 (%)	5.65	5.10	4.88	4.48
9 months	Coefficient	-0.90	-0.82	-0.77	-0.72
	(t-stat)	-3.21	-3.03	-2.84	-2.71
	Adj-R^2 (%)	5.27	4.81	4.33	3.92
12 months	Coefficient	-0.95	-0.88	-0.82	-0.76
	(t-stat)	-3.09	-2.95	-2.79	-2.62
	Adj-R^2 (%)	5.18	4.53	4.09	3.61

Figure 1

Momentum Profits and Economic States

The figure shows holding period monthly profits for the momentum strategy of J/K = 6-month/6-month in different economic states based on the expected market risk premium, which is estimated as a following model: $R_{m,t} = \alpha + \beta \mathbf{Z_{t-1}} + e_{m,t}$, where $\mathbf{Z_{t-1}}$ is a vector representing macroeconomic variables default spread, term spread, three-month T-bill rate, and variable CAY. State "peak" stands for the lowest 10% periods of the expected risk premium; state "expansion" stands for the periods with the negative risk premium other than the 10% lowest; state "recession" stands for the periods with the positive risk premium except the 10% highest; and states "trough" stands for the highest 10% periods of the expected market risk premium. The sample period covers from 1954 to 2005.

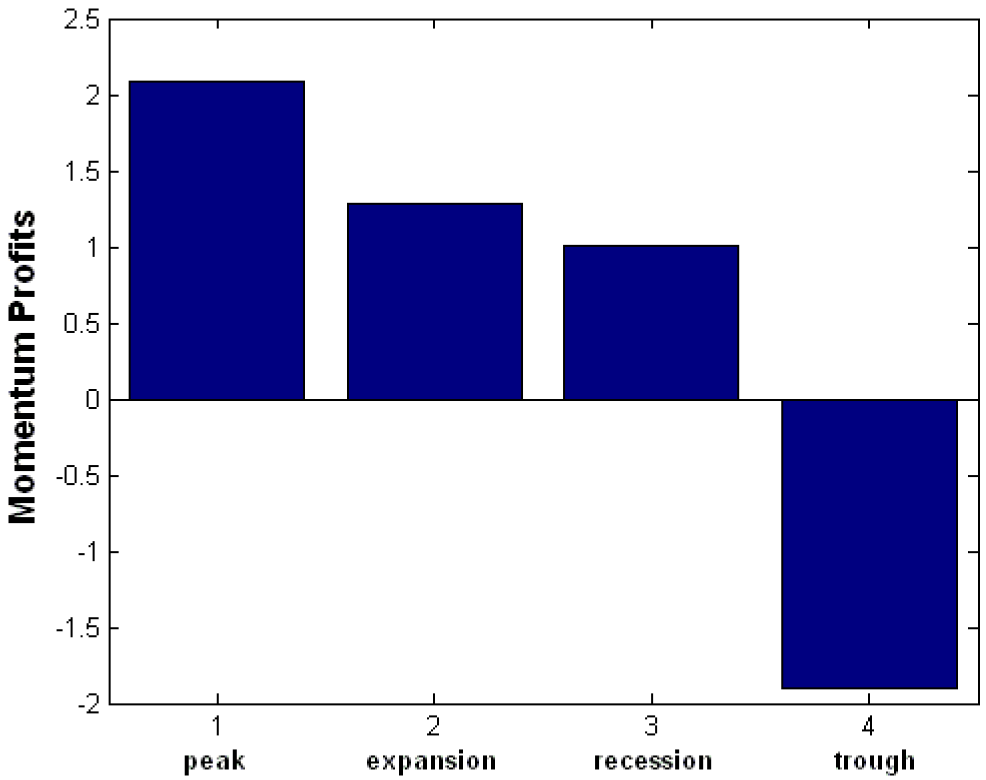

Figure 2

Time-Series of Momentum Profit and Business Cycle Trough

The figure is a time-series plot of holding period quarterly profits for the momentum strategy of J/K = 6-month/6-month. The shaded regions indicate "trough" periods, which stand for the highest 10% periods of the expected market risk premium obtained as a following model: $R_{m,t} = \alpha + \beta \mathbf{Z_{t-1}} + e_{m,t}$, where $\mathbf{Z_{t-1}}$ is a vector representing macroeconomic variables default spread, term spread, three-month T-bill rate, and variable CAY. The sample period is from 1954 to 2005.