Market Volatility and Momentum

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Abstract

This paper provides further evidence to support behavioral explanation of the momentum profit. We use VIX index as an approximate of market participants' degree of fear, which is contrary to overconfidence level and explore the relation between momentum return and VIX index. We find strong negative correlation between them. VIX index is still statistically significant even after we control the cumulative market return used in previous study. The results are consistent with the behavioral explanation of momentum return.

1. INTRODUCTION

Momentum is arguably the most documented anomaly in asset pricing. Jegadeesh and Titman (1993) document that U.S. stocks that perform the best (worst) over a three- to 12-month period tend to continue to perform well (poorly) over the subsequent three to 12 months. In a follow-up study, they show that momentum strategies remained profitable in the nineties in Jegadeesh & Titman (2001); a period subsequent to the sample period in Jegadeesh & Titman (1993). Momentum return attracts much attention since it is one of the most compelling phenomenons against the market efficiency hypothesis. Besides this theoretical appeal, a lot of practitioners use it to guide their investment decision. However, it is quite known that during 2009 this strategy went through a severe crash and negative return of -45% is recorded. From the graph1, it seems that the high stock market volatility in late 2008 is correlated with dramatic losses of momentum strategies. This paper tries to examine whether VIX—the widely followed and actively traded index can account for some of the time series variation of momentum profit.

Several conditioning variables, which is supposed to be proxies of the state of environment, have been proposed to predict time-series variations in momentum profits. These studies estimate monthly time-series regressions of the momentum profits (MOMp) on a conditioning state variable. Chordia & Shivakumar (2002), using standard macro variables, find that the momentum strategy is only profitable during times of economic expansion. However, Griffin et al. (2003) find that macroeconomic variables cannot predict momentum profits in international markets. Cooper et al. (2004) also find that macroeconomic multifactor models that Chordia & Shivakumar use are not robust to standard price screens and skip-a-month returns. However, they find that the lagged three-year market return does predict momentum profits. Specifically, the momentum strategy generates significantly positive returns (0.93% average monthly returns) following positive market returns, but insignificantly negative returns (_0.37% average monthly returns) following negative market returns.

Stivers & Sun (2010) find that higher return dispersion predicts lower future momentum profits. Return dispersion is measured as the standard deviation of 100 size and book-to- market monthly portfolio returns over the prior three months. They suggest that return dispersion may act as a

state variable that has information about subsequent market volatility. Their regression results indicate that the inclusion of return dispersion subsumes the predictive power of the market state in Cooper et al. (2004) and macro factors in Chordia & Shivakumar (2002).

Antoniou et al. (2010) find that investor sentiment predicts momentum profits. Investor sentiment is estimated by taking the residual of a regression of the Conference Board Consumer Confidence Index on a set of macroeconomic variables following the approach used in Baker & Wurgler (2006, 2007). During optimistic states, momentum strategies generate significant average monthly profits of 1.64%, but during pessimistic states yield insignificant average monthly profits of 0.56%. Their results remain with the inclusion of market state variables. Momentum profits are particularly high in up/optimistic states generating 1.8% average monthly profits but only averaging 0.8% for up/pessimistic states. Unlike the previous studies, Antoniou et al. (2010) explicitly test the subsequent long-run reversal effect to momentum strategies and find that momentum profits reverse only after optimist periods.

My paper is different from the above since we use VIX as the predictive variable. First, the Chicago Board Options Exchange Volatility Index (VIX) is popular among investors. If we believe momentum profit is due to collective irrational behavior, some commonly used index should have more power to influence investor's phycology as we as their investment decision since that is what investor can observe and respond to. Second, VIX is a measure of future market volatility rather than realized. It is a more direct measure the prevailing perception about the volatility of the near market. As often referred to as the fear index or the fear gauge, it represents one measure of the market's expectation of stock market volatility over the next 30 day period. It is reasonable to argue that this forward looking variable should have more prediction power than the realized volatility.

Our tests uncover a set of intriguing features of time-variation in momentum profits. First, using monthly stock returns and other data from the 1990-2010 sample period, we find that expected volatility VIX indeed has significant and robust power to forecast momentum payoffs. Second, time-series predictability is asymmetric between the winner and loser portfolios. The predictability of momentum profits arises mainly from loser stocks. Performance of the winner stocks does not deviate from the overall market performance in a predictable way. When the relative performance

is measured using the Fama and French three factor model, the loser stocks are still the dominant source of the time-series predictability.

1. DATA DESCRIPTION

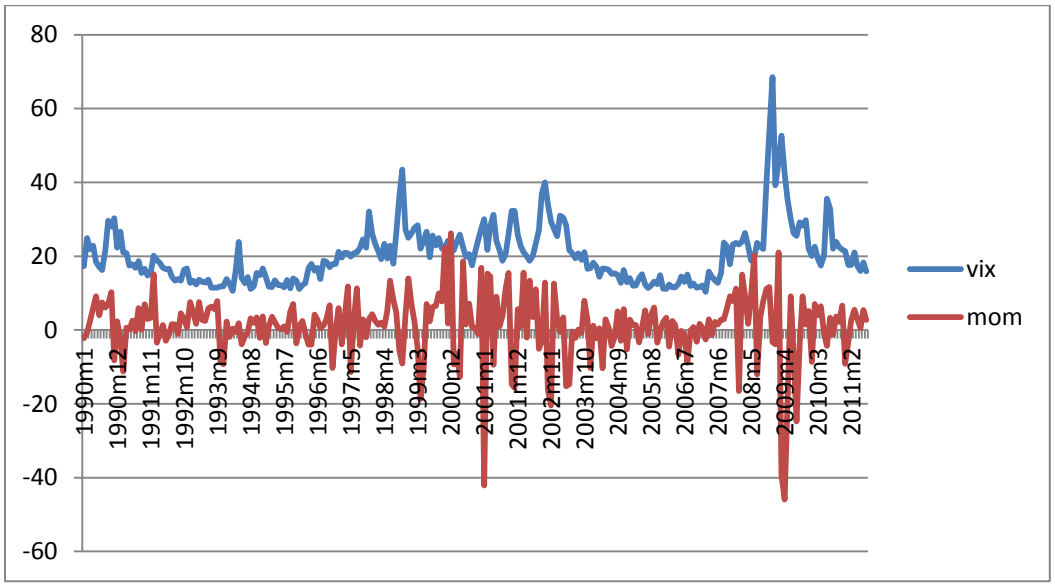
My sample is constructed in the same way as Jegadeesh &Titman (2001). The sample is constructed from all stocks traded on the New York Stock Exchange NYSE, American Stock Exchange, and Nasdaq. I exclude all stocks priced below $5 at the beginning of the holding period and all stocks with market capitalizations that would place them in the smallest NYSE decile. I also exclude these stocks to ensure that the results are not driven primarily by small and illiquid stocks or by bid-ask bounce. Following Jegadeesh and Titman (2001), at the end of each month we rank the stocks in the sample based on their past six-month returns and then group the stocks into 10 equally weighted portfolios based on these ranks. Each portfolio is held for six months following the ranking month. To increase the power of our tests, I construct overlapping portfolios. In other words, a momentum decile portfolio in any particular month holds stocks ranked in that decile in any of the previous six ranking months. Each monthly cohort is assigned an equal weight in this portfolio.

The Fama-French factors data are from French's website and the VIX data from the web site of Chicago Board Options Exchange. Note the VIX data is only available since 1990. Here VIX is daily data, I use the last day of a month to obtain a monthly data.

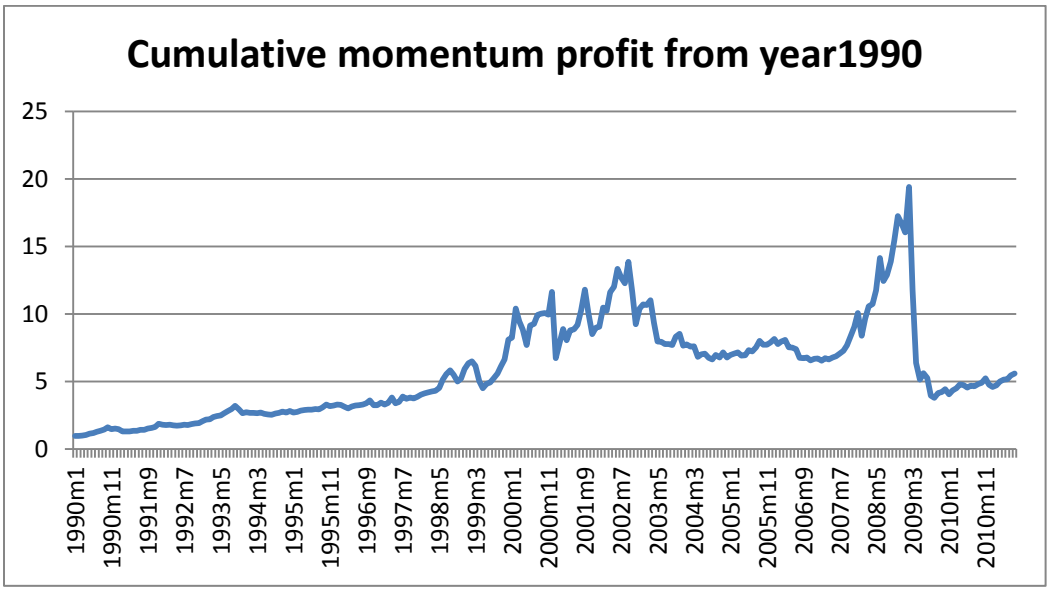
2. MOMENTUM RETURN

Below are some descriptive results I get. First, I plot the monthly momentum returns from 1990 in figure1. It is very volatile and It seems there two severe downs during this sample period— in 2000 and 2009, each with large than 40% off. The cumulative return plot in figure2 basically tells the same story. Especially the 2009 crash is highlighted in this graph.

Graph1 time series of momentum profit and VIX



Graph2 Cumulative momentum profit from year 1990



When I calculate the average return for each decile of momentum portfolio, I find results in table1 quite different from Jegadeesh and Titman (2001). First, the monotonicity of returns does not hold strictly any more. But in broad sense it is still decreasing. Besides, the last two decile's average return are not significantly different from zero, which can be seen from the t-statistics. This result is consistent with the above return graph due to two crashes.

Table1: Momentum profit

	momentum profit 1990-2011										
	winner	2	3	4	5	6	7	8	9	loser	winner-loser
avera return	1.34	0.86	1.06	0.87	0.78	0.75	0.83	0.73	0.70	0.25	1.09
t-statistics	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.10	0.68	0.04

3. REGRESSION RESULTS

This part I examine whether the VIX has predictive power about the future return of momentum profit besides the effect of lagged 36-month market return. The econometric model used in this project is

$$\text{Mom\_return}_t = constant + \gamma * X_{t-1} + \epsilon_t$$

Where X includes the Cooper etc (2004) lagged 36-month market return and lagged market volatility index VIX. To account for the risk born, I also calculated the CAPM-adjusted as well as Fama-French 3-factor adjusted return, following Cooper etc (2004). Stivers & Sun (2010) find that return dispersion in combination with market state(Cooper et al. 2004) predicts momentum profits. Momentum profits tend to be higher following periods of low return dispersion. In particular, the momentum strategy generates especially low average monthly returns during down market/high volatility states. Different from them, I use VIX rather than the realized return dispersion for two reasons. First, the Chicago Board Options Exchange

Volatility Index (VIX) is popular among investors. If we believe momentum profit is due to collective irrational behavior, some commonly used index should have more power to influence investor's phycology as we as their investment decision since that is what investor can observe and respond to. Second, VIX is a measure of future market volatility rather than realized. It is a more direct measure the prevailing perception about the volatility of the near market. It is often referred to as the fear index or the fear gauge, it represents one measure of the market's expectation of stock market volatility over the next 30 day period. It is reasonable to argue that this forward looking variable should have more prediction power than the realized volatilty.

The empirical results is presented in the table 2. As the first step, I run the same regress as in Cooper (2004) to double check my procedure. First, I regress momentum profits on lagged market returns as well as the square of lagged market returns. I report the results using the lagged 36-month market return as the state proxy. As shown in Table 2, the raw and risk-adjusted profits are positively related to lagged market returns, confirming their finding that momentum is high (low) when lagged market return is high (low). Also, the profits are negatively related to the square of lagged market returns, indicating that profits do not increase linearly with lagged market returns. This is consistent with their results. Now, we can examine the effect of expected volatility VIX by adding it to the regression. Before doing this, I run the regression with only VIX included. The coefficient is -0.22 and t statistics -3.29, suggesting that momentum profit robustly decrease with respect to VIX. Surprisingly, It is even a little more significant than market return itself. R-square also a little larger, which means that used individually, VIX can explain more variation of momentum profit than lagged market return. When used simultaneously in the regression, VIX also have t-statistics than lagged market. Both coefficients' sign is consistently with our intuition—momentum profit is larger following a positive market return and perceived future volatility is low. If we run the same regression for the winner and loser portfolios separately, we can find the loser portfolio are way more predictive than the winner portfolio.

Table2: regression results of $\text{Mom\_return}_t = constant + \gamma * X_{t-1} + \epsilon_t$ over sample period 1990-2010

	Raw return				CAPM adjusted return				FF factor adjusted return			
lag_mkt	0.05	0.11		0.04	0.05	0.10		0.04	0.05	0.10		0.03
	(3.01)	(4.02)		(1.94)	(3.03)	(3.82)		(2.04)	(2.94)	(3.87)		(1.83)
lag_mkt2		-0.00				-0.00				-0.00		
		(-2.70)				(-2.43)				(-2.56)		
lag_vix			-0.22	-0.17			-0.20	-0.15			-0.21	-0.17
			(-3.29)	(-2.33)			(-3.08)	(-2.10)			(-3.38)	(-2.46)
_cons	-0.48	0.17	5.59	3.43	-1.50	-0.93	4.07	1.89	-1.44	-0.85	4.40	2.47
	(-0.64)	(0.22)	(3.82)	(1.87)	(-2.09)	(-1.25)	(2.89)	(1.07)	(-2.02)	(-1.15)	(3.17)	(1.42)
N	258	258	258	258	258	258	258	258	258	258	258	258
R-sq	0.03	0.06	0.04	0.05	0.03	0.06	0.04	0.05	0.03	0.06	0.04	0.06

4. CONCLUSION.

I examine in this paper the momentum profit during the recent period from 1990-2010. I find the momentum profit is still robust although two crash presented in the sample period. Also, the most important finding is that VIX do have prediction power for future momentum profit as we expected. In both univariate and bivariate regression, the VIX seems more significant and can explain more variation of the momentum return. Future research can be extended to examine all those variables that have been proposed to predict the return. Finally, we may get a 3-dimention category of the state---lagged market return, expected volatility and investment overall sentiment as in Antoniou et al. (2010).

Reference:

Jegadeesh and Titman ,1993, Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency, Journal of Finance

Jegadeesh & Titman, 2001, Profitability of Momentum Strategies: An Evaluation of Alternative Explanations, Journal of Finance

Chordia & Shivakumar 2002, Momentum, Business Cycles and Time Varying Expected Return, Journal of Finance

Cooper, Gutierrez Jr and Hameed, 2004, Market States and Momentum, Journal of Finance

Griffin, Ji and Martin, 2003, Momentum Investment and Business Cycle Risk: Evidence from Pole to Pole, Journal of Finance

Stivers and Sun, 2010, Cross-sectional Return Dispersion and Time-Variation in Value and Momentum Premia, Journal of Financial and Quantitative Analysis

Antoniou, C., Doukas, J. A., & Subrahmanyam, A. 2010. Sentiment and momentum. SSRN working paper.