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Momentum Effect of Stocks

— Take the Stock Returns of 50 Firms in the U.S. as an Example

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Abstract: This paper randomly selects 50 SP500 US CRSP companies to study the existence of momentum effects in these 50 companies from January 2010 to December 2020. The article uses the CAPM model and the Fama-French model to classify the 50 companies into 10 different portfolios according to the magnitude of the momentum effect and uses the Fama-Macbeth model combined with the momentum factor MOM to investigate whether there is a momentum effect for the 50 companies. The study reveals a momentum effect, evidenced by higher momentum portfolios generally demonstrating better risk-adjusted returns. The momentum effect is only significant when verified by the CAPM model. However, here is an opposite conclusion or it is not significant when verified by the Fama-French three-factor model and the Fama-Macbeth model. It may be because the sample is too small and selected randomly, which is a part of the paper that needs to be improved in the future.

Keywords: SP500, CMPM, Fama-French, Fama-Macbeth

1. Introduction

Before the 'momentum effect' argument was born, the popular view in economics was that the inverse strategy proposed by [1], whereby stock prices would overreact to information, suggested that the inverse strategy would yield abnormal returns, i.e. buying stocks that had performed poorly in the past and selling stocks that had performed well in the past would yield abnormal returns, but this finding is more controversial.

The momentum effect, introduced by Jegadeesh and Titman in 1993, is the opposite conclusion of the inverse strategy theory. The momentum effect is also commonly referred to as the "inertia effect". Introduced by [2], the momentum effect refers to the tendency of stock returns to continue in the direction of their original movement, and they show that superior returns can be achieved by holding a zero-cost portfolio consisting of long positions in stocks that have outperformed in the past (winners) and short positions in stocks that have underperformed over the same period (losers). Is the momentum effect in stock markets still present in recent years, as stock markets are always in a state of flux? What are the sources of momentum profits? It has become a topic of urgent research. To address these questions, this paper examines the stock returns of the 50 US CRSP companies over

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the period from January 2010 to December 2020 and explores whether the momentum effect still exists.

2. Literature review

2.1. The existence of momentum effects

In terms of the existence of momentum effects: since the discovery of momentum effects by Jegadeesh and Titman in 1993, the prevalence of the momentum effect in international stock markets has also been confirmed by scholars such as [3]. [4] as well as [5] also proved the existence of a corresponding momentum. The existence of the momentum effect has been tested by foreign scholars with consistent findings, on the one hand, it shows that the existence of the momentum effect is universal, and on the other hand, it also indicates that the data characteristics of foreign stock markets and other stock markets are relatively similar [6].

2.2. Causes and development of momentum effects

In 1993, Jegadeesh and Titman attempted to explain the momentum effect using the CAPM and found that the market risk taken by the momentum portfolio was not sufficient to explain the high returns; subsequently, [7] also added size and value risk factors to the CAPM model and constructed the Fama-French three-factor model, which could explain many financial anomalies but failed to achieve satisfactory results for the momentum effect. French five-factor model finds that overall market liquidity is significantly negatively correlated with the momentum effect [8], consistent with the liquidity premium theory, which to some extent alleviates the inadequacy of the classical finance school's factor models in explaining the momentum effect [9].

2.3. Summary of literature review

The existence and causes of the momentum effect have been one of the central discussions in the academic community, and the persistence of the momentum effect is also a very important aspect [10]. The traditional CAPM model has been the main validation model for the existence of the momentum effect and the Fama-French multi-factor model has been the main validation model, and the results are still controversial. Therefore, this paper will use Fama-Macbeth regression as the main empirical analysis method, based on the research method innovation, to investigate whether there is a momentum effect in the stock returns of 50 companies in the US CRSP between January 2010 and December 2020 [11].

3. Methodology

3.1. Data Source

This paper randomly selects 50 stocks of SP500 US CRSP listed companies for the study and uses monthly data such as unique stock identifier, stock price, stock return, and the number of shares outstanding of these 50 companies from January 2010 to December 2020 as the database for this study [12].

3.2. CAPM Regression and Fama-French Regression

This empirical analysis examined the performance of 11 different portfolios, derived from the monthly returns of 50 U.S. companies from 2010 to 2020. The portfolios were created based on past 6-month momentum and were held for 6 months, and the focus was on understanding the relationship

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between momentum and subsequent return. Portfolio 1 represents the group with the lowest momentum. Portfolio 10 represents the group with the highest momentum, and Portfolio 11 is a long-short strategy portfolio, resulting from subtracting Portfolio 1 from Portfolio 10.

Table 1: CAPM Regression

PortfolioRank	Beta	ALPHA	ALPHATstat	R2
P1	1.541	0.188	0.488	0.709
P2	1.025	0.507	2.236	0.758
P3	1.044	0.398	2.211	0.837
P4	0.957	0.113	0.659	0.827
P5	1.072	0.130	0.747	0.853
P6	0.959	0.411	2.761	0.864
P7	0.963	0.380	2.412	0.851
P8	1.004	0.250	1.930	0.902
P9	1.072	0.357	1.772	0.813
P10	1.017	0.552	1.860	0.642
P11	-0.522	0.315	0.609	0.129

In the CAPM regression analysis (Table 1), the Beta, Alpha, Alpha T-statistics, and R-squared are reported. Beta represents the systematic risk of the portfolio, while alpha indicates the portfolio's performance above the expected return based on its beta (essentially, it measures the portfolio's risk-adjusted returns). The alpha t-statistics evaluates the significance of the alpha, and the r-squared shows how well the CAPM model fits the portfolio returns. Based on the CAPM regression results, it's apparent that portfolios with higher momentum (from 6 to 10) exhibit higher alphas, implying higher risk-adjusted returns. The alpha for the long-short portfolio (Portfolio 11) is positive as well, suggesting the potential profitability of this momentum strategy. Notably, Portfolio 6 and Portfolio 7 demonstrate significant alpha at the 5% level (with Alpha T-statistics > 2).

Table 2: Fama French Regression

Portfolio Rank	Beta	ALPHA	ALPHA T-stat	R2
P1	1.462	0.405	1.035	0.718
P2	1.041	0.481	2.051	0.755
P3	1.026	0.421	2.259	0.836
P4	0.952	0.149	0.843	0.826
P5	1.083	0.095	0.524	0.851
P6	0.961	0.388	2.525	0.863
P7	0.986	0.310	1.925	0.853
P8	1.011	0.205	1.546	0.903
P9	1.112	0.165	0.869	0.843
P10	1.004	0.436	1.486	0.670
P11	-0.457	-0.014	-0.027	0.186

Table 2 presents the results of the Fama French three-factor model regression. Compared to the CAPM model, this model introduces two additional factors, SMB (small minus big) and HML (high minus low), in order to capture the size and value effects in portfolio returns. The Fama French three-factor shows a different pattern as the CAPM model. Higher momentum portfolios generally show lower alphas, indicating inferior performance. The long-short portfolio (Portfolio 11) in this model

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demonstrates a negative but insignificant alpha. This result means portfolio with higher momentum does not capture higher risk-adjusted return using Fama French three factor model.

3.3. Fama-MacBeth Model

This section begins by estimating the beta coefficient (β) for each stock using a time series regression. The specific formula is as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_{mi}(R_{mt} - R_{ft}) + \beta_{si}SMB_t + \beta_{hi}HML_t + \beta_{momi}MOM_t + \varepsilon_{it}$$

Where R_{it} is the return of stock i at time t, R_{ft} is the risk-free return, R_{mt} is the market, size, value, and momentum factors respectively, α_i is the specific return of stock i, SMB_t, HML_t and MOM_t are the size, value, and momentum factors at time t, and ε_{it} is the error term.

Secondly, perform cross-sectional regressions. For each time point t, the article performs the following regressions:

$$r_{it} - rf_{it} = \lambda_{0t} + \lambda_{mt} \times \beta_{mi} + \lambda_{st} \times \beta_{si} + \lambda_{ht} \times \beta_{hi} + \lambda_{momt} \times \beta_{momi} + \mu_{it}$$

Here, $r_{it} - rf_{it}$ are the excess stock return values obtained in the first step, $\lambda_{0t}, \lambda_{mt}, \lambda_{st}, \lambda_{ht}, \lambda_{momt}$ are the parameters of the cross-sectional regression, and μ_{it} is the error term.

4. Results

Table 3: Fama Macbeth Regression

VARIABLES	(1) Return RF
_b_mkt_rf	0.204
	(0.564)
_b_smb	0.704*
	(0.365)
_b_hml	-1.369***
	(0.372)
_b_mom	1.457
	(0.918)
cons	1.303***
	(0.444)
Observations	6,050
Number of groups	121
R-squared	0.223

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3 provides the Fama-Macbeth regression results, which are used to analyze the cross-sectional returns. The Mom factor is the portfolio 11(long-short) calculated previously. The coefficients represent the average excess return per unit of factor risk. Based on the coefficients, the market risk premium (*_b_mkt_rf*) is not statistically significant, suggesting that market risk does not seem to strongly impact the portfolios' excess returns in this analysis. The *_b_mom* factor in Table 3 represents

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the impact of momentum on portfolio returns in the Fama-Macbeth regression. In this analysis, the *_b_mom* factor has a positive coefficient of 1.457, which indicates that stocks with higher exposure to the momentum factor tend to provide higher returns. This positive value suggests the existence of a momentum effect, as per the past six-month return ranking criterion used to form the portfolios in this study.

5. Conclusion

In conclusion, the empirical analysis of 11 portfolios, based on the monthly returns of 50 U.S. companies from 2010 to 2020, shows nuanced outcomes. The study reveals a momentum effect, evidenced by higher momentum portfolios generally demonstrating better risk-adjusted returns. Particularly, the CAPM regression analysis finds that portfolios with higher momentum exhibit superior alphas, indicating higher risk-adjusted returns, which validates the profitability of momentum strategies.

In Contrast, the Fama-French three-factor model presents a conflicting pattern where higher momentum portfolios tend to show lower alphas, suggesting less optimal performance. This divergence indicates that the choice of model can significantly impact the interpretation of momentum's effect on portfolio returns.

Finally, the Fama-Macbeth regression underlines the presence of a momentum effect, despite it being statistically insignificant in some cases. The implication here is that momentum, as an investment strategy, does bear potential, although its performance is contingent on the portfolio's exposure to other risk factors, such as size and value. Thus, this study underscores the need for further investigation with larger or different datasets to provide more definitive evidence of these relationships and the potential utility of momentum as an investment strategy

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