

Investment Project

A Financial Report On China Market Based on Multi-factor Model & MOM Anomaly

June 26, 2025

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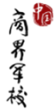
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Part 1

Replication of Five-Factor Model

Introduction

- **Rapid economic development of China**
- **Increasing concern about market return**
- This project utilizes the trading data of the Chinese stock market since 2010 to explore **the complex relationships among stock returns, risks, and various market factors.**

Data

- Sourced from **CSMAR database**
- Covers monthly trading data of China's Stock market from **2010 to 2024**
- Including both **star market and second-board market**
- **ST stocks and financial industry excluded**

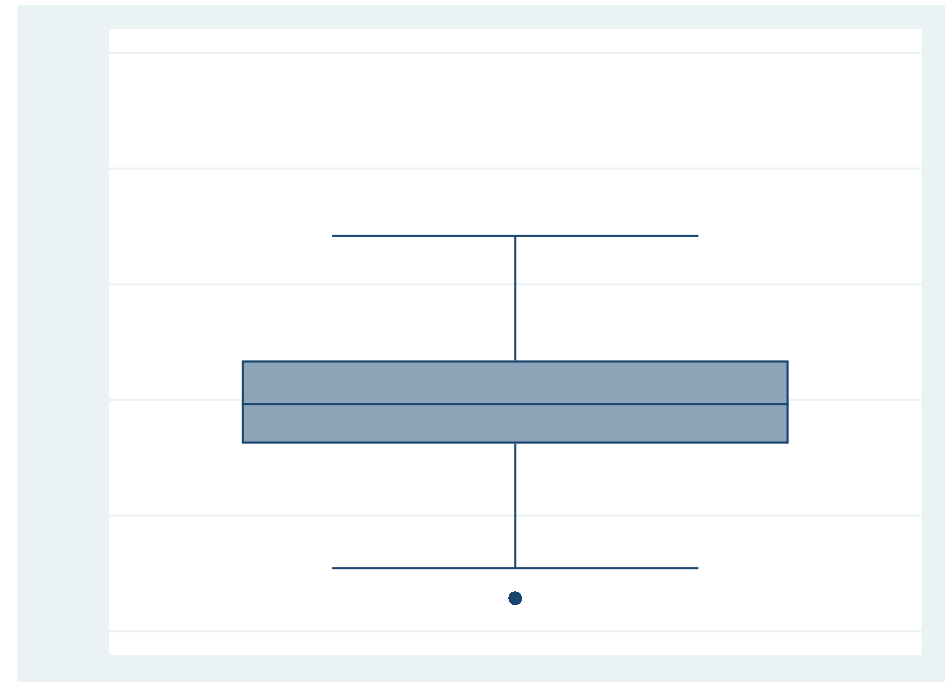
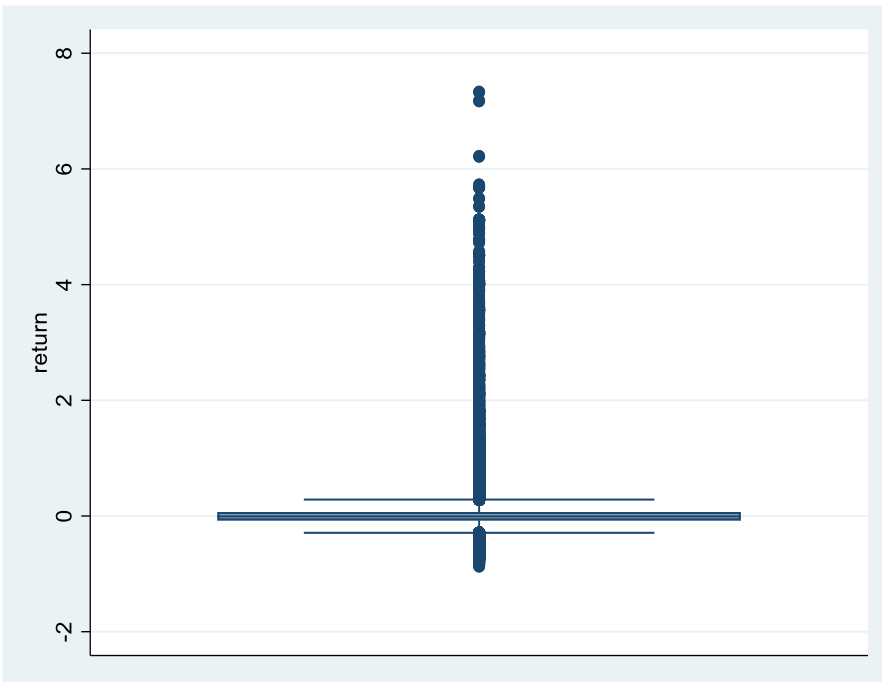
Descriptive Statistics and Truncation

Frequency	Mean	First quartile	Second quartile	Third quartile	Minimum value	Maximum value	Kurtosis	Skewness
552,463	.0060286	-.0764588	-.007174	.0688836	-.8684871	7.329208	118.2978	5.756331

Frequency	Mean	First quartile	Second quartile	Third quartile	Minimum value	Maximum value	Kurtosis	Skewness
552,463	0.002783	-0.0765	-0.00717	0.068884	-0.34546	0.486831	4.727963	0.623896

Truncation

- In order to **avoid significant deviation caused by outliers**
- Winsorizing stock returns at **1% level**
- **Skewness and kurtosis** reduced



Model Specification

- The five-factor asset pricing model, an extension of the Fama-French Three-Factor Model proposed by Fama-French (1994), includes five factors to explain asset returns more comprehensively.

$$R_{it} - R_{ft} = \alpha + a_{it}(R_{Mt} - R_{ft}) + b_{it}SMB_t + c_{it}HML_t + d_{it}RMW_t + e_{it}CMA_t + \varepsilon_{it}$$

Variables Def and Regression Results

Variable	Description
R_{it}	Daily return of stock i in day t .
R_{ft}	Fixed-term deposit (Lump sum deposit for one year rate on a daily basis).
$R_{Mt} - R_{ft}$	Considering the daily market return rate with cash dividend reinvestment (weighted by circulating market capitalization average) minus the daily risk-free rate.
SMB_t	The return difference between small-cap stocks and large-cap stocks.
HML_t	The return difference between high book-to-market ratio stocks and low book-to-market ratio stocks.
RMW_t	The return difference between firms with robust profitability and weak profitability.
CMA_t	The return difference between firms that invest conservatively and those that invest aggressively.

Results & Findings

MktRF	0.510*** (66.361)
SMB	0.077*** (5.859)
HML	0.154*** (10.812)
RMW	-0.888*** (-45.254)
CMA	-0.559*** (-25.101)
_cons	-0.001*** (-4.893)
N	287573
Adj. R2	0.043

$$\begin{aligned}
 R_{it} - R_{ft} &= -0.00133 + 0.5098 * (R_{Mt} - R_{ft}) \\
 &+ 0.0771 * SMB_t + 0.1543 * HML_t \\
 &- 0.888 * RMW_t - 0.5594 * CMA_t
 \end{aligned}$$

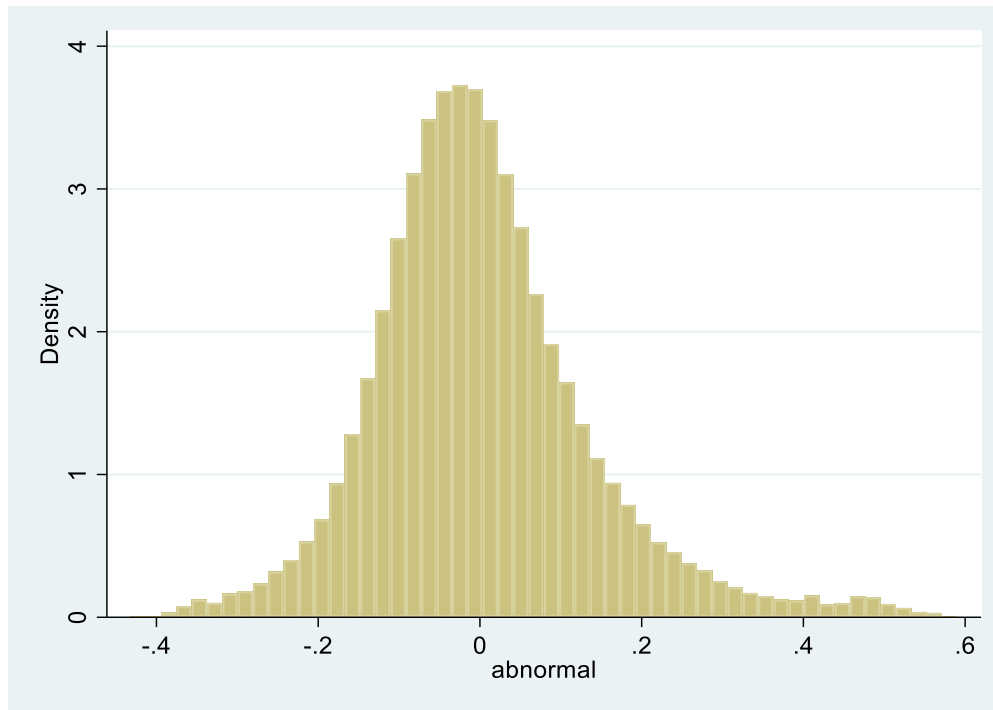
- The market premium coefficient of 0.51*** indicating **a robust exposure to systematic market risk** and consistency with theoretical expectations
- The portfolio(s) behave like small-cap and value-oriented investments—exhibiting higher returns **when small firms outperform large firms, and when value stocks outperform growth stocks.**
- How to explain **RMW & CMA negative coefficients and low R2?**
 - For RMW, **state-owned enterprises (SOEs)** with weaker profitability metrics often benefit from implicit government support & **Profitability Paradox**
 - For CMA, China's high-growth, policy-driven economy often **rewards firms pursuing rapid expansion** through debt-fueled investments, even at inefficient scales, particularly in favored sectors like infrastructure and real estate.
 - Low R2 highlights **a fundamental limitation** in applying the Fama-French five-factor model to explain Chinese stock returns, despite the statistical significance of the coefficients & **Lack of Fixed Effects**

Computation & Descriptive Statistics

Abnormal return

$$= R_{it} - R_{ft} - (-0.00133 + 0.5098 * (R_{Mt} - R_{ft}) + 0.0771 * SMB_t + 0.1543 * HML_t - 0.888 * RMW_t - 0.5594 * CMA_t)$$

Frequency	Mean	Minimum value	Maximum value	Kurtosis	Skewness
268,295	0.002314	-0.43204	0.590055	4.773521	0.777624



- **Persistent Positive Deviation:** Aligns with low R²
- The right-skewed, heavy-tailed distribution reflects **investor irrationality**: a small subset of stocks achieved extremely high abnormal returns
- One of the explanations is about Market Structure, which is the **retail-dominated trading environment (80% of trading volume)** amplifies sentiment-driven volatility, and policy interventions (e.g., STAR Market registration-based IPOs, antitrust regulations) further disconnect factor models from market reality.

Part 2

Anomaly Detection and Corresponding Trading Strategy

We focus on the **Momentum Anomaly**, whereby stocks with the highest (lowest) cumulative returns over the past 11 months tend to continue outperforming (underperforming) the market over the following month. Four key mechanisms jointly drive this phenomenon:

Behavioral Bias

- Investors often react to new information **too slowly or too aggressively**
- **Anchoring and representativeness**: Overreaction
- **Delayed information processing**: Drifting in the same direction

Liquidity Effect

- Highly liquid stocks are **more attractive during uptrends and more resilient in downtrends**, thereby amplifying momentum.

Risk Compensation

- Momentum portfolios face crash risk when market trends abruptly reverse-**these tail risks demand a premium**

Institutional Rebalancing

- Institutional investors (e.g., mutual funds, ETFs, quant hedges) typically rebalance on fixed schedules (monthly or quarterly), buying winners and selling losers.

	0	1	2	3	4	5	6	7	8	9
Momentum (%)	-36.2	-22.5	-15.1	-8.78	-2.66	3.93	11.81	22.34	39.08	94.67
Market value in circulation (Billion)	93.7	104.7	108.8	108.1	115.9	119.5	128.9	149.8	178.5	215.6
PB	7.34	7.13	7.03	6.37	6.06	8.36	6.07	6.84	10.1	25.57

- From 2010 to 2015, at each month-end we sorted all stocks into ten momentum decile portfolios (0–9) **based on their prior 11-month cumulative return (mom_11m).**

- **Key observations:**

Extreme Mom Trend

- -36.17% vs 94.67%: a spread of over 130 percentage points-underscoring **the pronounced strength of the momentum effect**

Size Interaction

- MV increases as MOM rises: **MOM & SIZE effects coexist.**

Rising Valuation

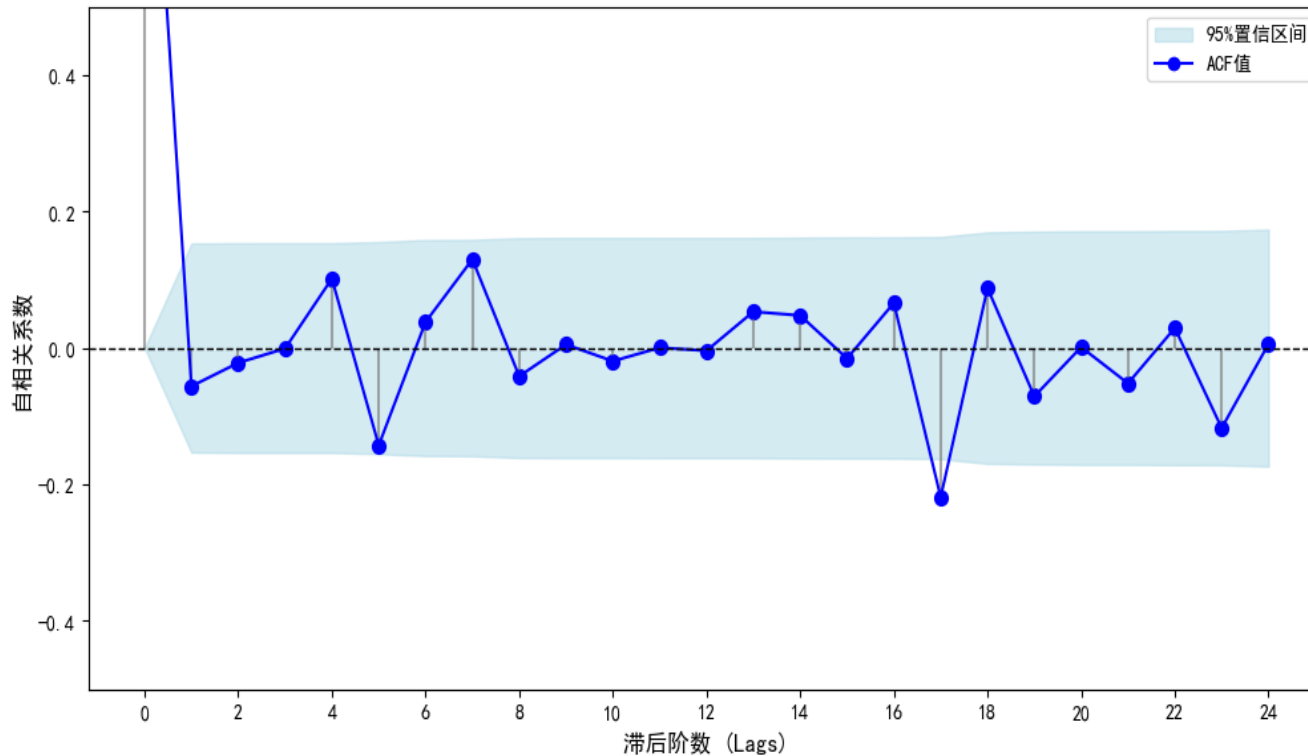
- PB ratio increases as MOM rises: **Stronger MOM stocks enjoy higher valuation, or bullish sentiments.**

Cross-sectional Implications

- MOM: Size + Value. Therefore, when constructing long–short portfolios, one should **jointly regress momentum alongside other risk factors to isolate a cleaner alpha signal.**

Autocorrelation Function (ACF) of the WML Factor Returns

WML因子收益序列的自相关函数 (ACF) 图



- Most autocorrelations fall within the confidence interval
- All coefficients decay rapidly within ± 0.15
- WML return series **exhibits no persistent autocorrelation, making it suitable for OLS regression**

Newey–West–adjusted three-factor regression

	coefficient	t-statistics	P Value
Alpha	0.0007	(0.20)	0.838
Mkt_Rf	0.0001	(0.00)	0.997
SMB	-0.0854	(-2.23)	0.026
HML	0.0302	(0.59)	0.557
R squared	0.01	-	-
Observed value	164.0	-	-

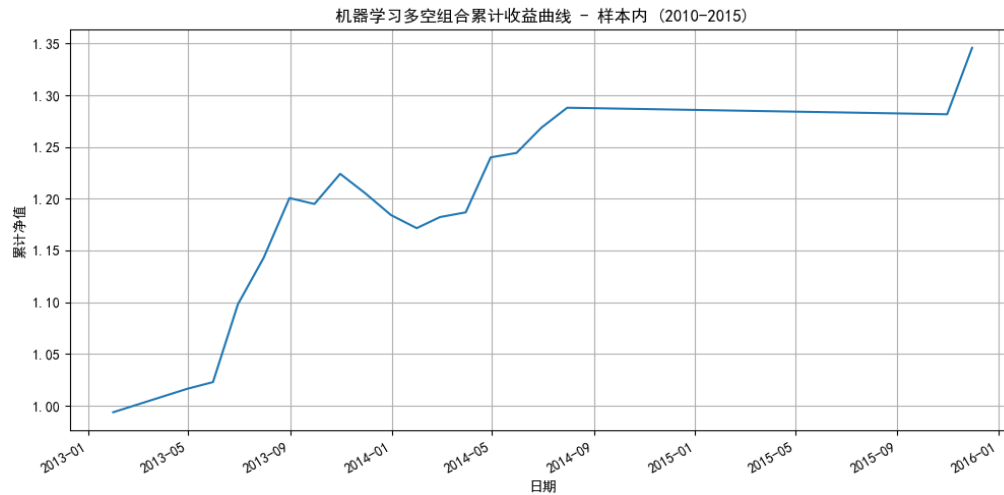
- Intercept not significant: **no remaining abnormal returns**
- Mkt near 0 and insig: **little expo to mkt movement**
- SMB negative & insig: **small-cap tilt**
- HML small & insig: **No value effect**
- R2 small: **WML driven by cross-sectional noise but not these systematic factors.**

Fama–MacBeth cross-sectional test

factor	Average risk premium (%)	Newey West t-statistics
const	1.3779	2.25
Mkt_Rf	2.6053	2.60
SMB	4.2171	1.98
HML	-0.3691	-0.36
MOM	-0.9331	-2.76

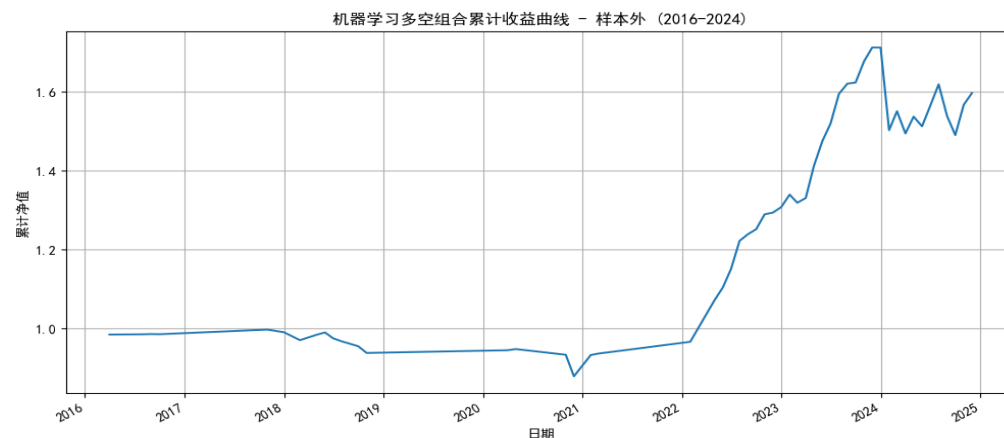
- Mkt & SMB significantly positive: **Most influential in cross-sectional pricing**
- HML insig
- MOM significantly negative: **high MOM portfolio deliver negative-direction abnormal returns; Enduring profitability**
- Intercept sig: **a non-zero average return beyond all five factors**

In-Sample Cumulative Return Curve of the Long-Short Portfolio



- The long-short portfolio starts at a net value of 1.0 and rises gradually, climbing to about 1.29 by mid-2014. After a modest pullback and consolidation, it breaks out again to finish 2015 at approximately 1.35, corresponding to an annualized return of roughly 6%.

Out-of-Sample Cumulative Return Curve of the Long-Short Portfolio



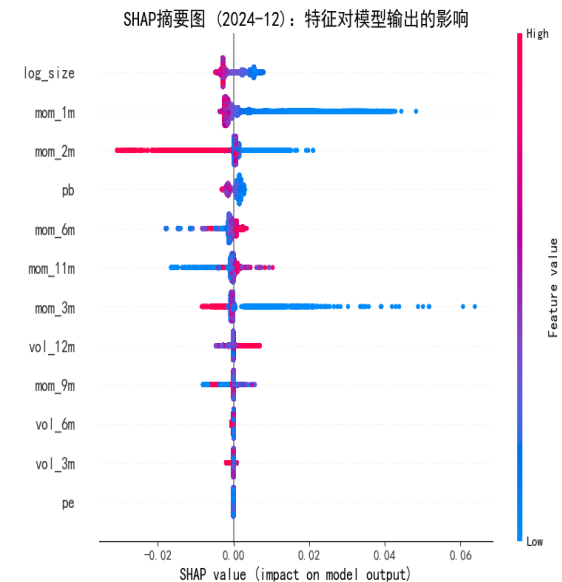
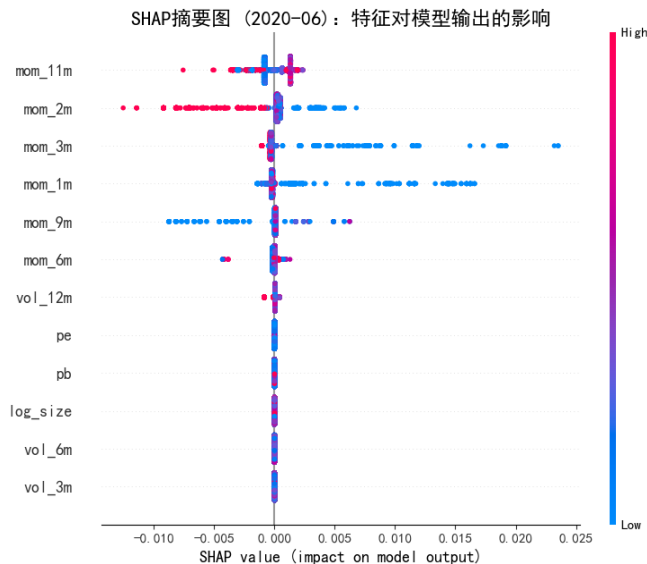
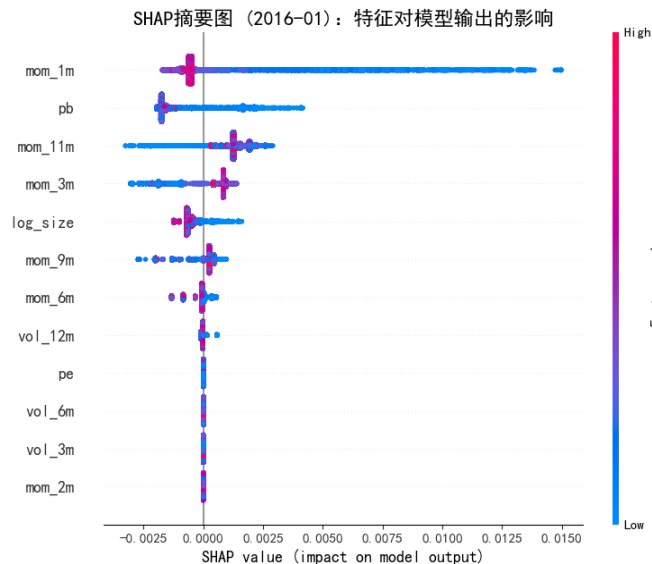
- Its performance first oscillates steadily and even falls below 0.90 during the 2018–2021 downturn-before a sharp rally beginning in early 2022, ultimately reaching around 1.72 by mid-2024.
- Smooth, steady gains internally, but drawdowns in bear phases, followed by rapid recovery and strong excess returns once the market rebounds.

In-Sample vs. Out-of-Sample Predictive Performance

	In sample (2010-2015)	Out-of-sample (2016-2025)
Mean IC	0.0287	0.0330
IC-IR	0.32	0.31
R-squared	-0.043	-0.001
MSE	0.02913	0.01749

- Mean IC rises slightly & IC-IR falls marginally: **ranking stability did not meaningfully deteriorate out of sample**
- R2 near 0: **weak fit to absolute returns**

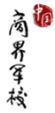
SHAP Visualization: Contribution of Different Feature



- The model's decision logic dynamically shifts with changing market conditions



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Part 3

Conclusion

Five-Factor Model

- RMW & CMA have **reverse effect** in China market
- Low R2: **More explanatory model to be found**

MOM anomaly

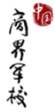
- Four core drivers of MOM: **behavioral biases, liquidity effects, risk compensation, and institutional rebalancing**
- Subsequent regression diagnostics and Fama–MacBeth tests confirmation: **momentum portfolios achieve significant abnormal returns, with a notably negative cross-sectional premium on the momentum factor itself.**
- Backtests: **Long-short strategy delivered robust net-value appreciation ($\approx 5.6\%$ in-sample; $\approx 7.4\%$ out-of-sample, after conservative 0.6% trading costs)**

Practical Recommendation

- Return enhanced by:
 - 1) layering momentum with dynamic size and valuation tilts, while rigorously accounting for trading costs and tail-risk exposures.
 - 2) regularly updating factor weightings in response to market regime shifts



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Thanks For Listening