Value and Momentum Everywhere

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November 7, 2023

Overview

Introduction

- Two Capital Market Phenomena:
  1. Value Effect: Asset return's relationship to its book value relative to market value.
  2. Momentum Effect: Asset return's relation to recent performance.
- This study explores these phenomena across eight diverse markets and asset classes, finding consistent evidence of return premiums for both value and momentum. Returns also exhibit strong comovement across asset classes.
- Value strategies are positively correlated within unrelated markets, while momentum strategies show global positive correlations. However, value and momentum exhibit negative correlations across asset classes.
- A three-factor model is proposed, including a global market index, a zero-cost value strategy for all asset classes, and a zero-cost momentum strategy for all assets. This model captures global returns across various assets and portfolios.

Introduction

- Momentum and value factors should be considered separately due to their negative correlation.
- Liquidity risk affects asset value negatively and momentum positively. A combined value and momentum approach remains resilient even during liquidity shocks.
- Even during liquidity shocks and sell-offs, a combined equal-weighted value and momentum strategy remains robust, yielding significant abnormal returns.
- This underscores that macroeconomic factors offer only a partial explanation for the return premiums and correlations observed in value and momentum strategies, leaving a substantial portion of this relationship unexplained.
- Strong correlations across unrelated asset classes suggest common global risk factors that value and momentum premiums compensate for.

Data A.1:Global Individual Stocks

- Data Focus: US equities from CRSP (sharecodes 10 and 11) with Compustat book value data.
- Dataset Period: Covers historical book value (last 6 months) and past returns (at least 12 months) from January 1972 to July 2011.
- Stock Universe: Includes 90% of total market capitalization, ranked by beginning-of-month market capitalization in descending order.
- Inclusion of Non-US Stocks: UK, continental Europe, and Japan stocks meeting the same criteria.
- Sample Period: January 1972 to July 2011 for US and UK, and January 1974 for Europe and Japan.
- Note: The paper's findings are relatively conservative due to the focus on the liquid market.

Data A.1:Global Individual Stocks

- The paper's findings are relatively conservative due to the focus on the liquid market.
- Using lagged book values ensures that the financial data used in the ratios are based on audited and officially reported figures, which tend to be more reliable than preliminary or estimated data.
- Using the most recent market values for market-related ratios provides investors with real-time information on the market's perception of the company's value and performance.

Data A.2: Global Equity Indices

- 18 developed equity markets analyzed.
- Data sources: MSCI and Bloomberg.
- Period: January 1978 to July 2011.
- Returns exclude collateral returns, representing comparable version as the excess returns over the risk-free rate.

Data A.3: Currencies

- 10 currencies examined.
- Data source: Datastream.
- Period: January 1979 to July 2011.
- Returns computed from currency forward contracts, MSCI spot prices, and Libor rates.
- Returns are in USD and include local interest rate differentials.

Data A.4: Global Government Bonds

- Data sources: Bloomberg, Morgan Markets, Consensus Economics.
- Short rates, 10-year government bond yields, and inflation forecasts included.
- Covers 10 countries.
- Period: January 1982 to July 2011.

Data A.5: Commodity Futures

- Analyzing 27 commodity futures.
- Multiple data sources.
- Period: January 1972 to July 2011.
- Returns calculated from daily excess returns of the most liquid futures contract.
- Returns compounded to create monthly returns.
- All returns in USD and exclude collateral returns.

Value Measure

- Value Measure:
  1. Individual stocks: Book value of equity to market value of equity, BE/ME.
  2. Country indices: Previous month's BE/ME ratio for the MSCI index of the country.
  3. Commodities: Log of the spot price 5 years ago divided by the most recent spot price (negative of the spot return over the last 5 years).
  4. Currencies: Negative of the 5-year return on the exchange rate, calculated as the log of the average spot exchange rate from 4.5 to 5.5 years ago divided by the spot exchange rate today, minus the log difference in the change in CPI in the foreign country relative to the U.S. over the same period. i.e.,

$$Cur_{mea} = \log\left(\frac{e_{t-5}}{e_t}\right) - \log\left(\frac{\Delta CPI_{foreign_t}}{\Delta CPI_{US_t}}\right)$$

  5. Bonds: 5-year change in the yields of 10-year bonds (similar to the negative of the past 5-year return).

Momentum Measure

- Momentum Measure:
    1. Individual stocks: Past 12-month cumulative raw return on the asset, skipping the most recent month to avoid the 1-month reversal in stock returns.

    2. Other asset classes: The return over the past 12 months, skipping the most recent month. Note that momentum returns for these asset classes are stronger when not skipping the most recent month, making the results conservative.

Test Assets

- Rank securities in each asset class based on either value or momentum and divide them into three equal groups.
- Create three portfolios—high, middle, and low—using these groups. For individual stocks, weight returns by their beginning-of-month market capitalization; for non-stock asset classes, use equal weighting.
- This results in the creation of 48 test portfolios, achieved by combining the three portfolios, two ranking criteria (value and momentum), and eight different asset classes.

Factors

- The authors employed zero-cost long-short portfolios encompassing the entire set of securities within an asset class.
- More precisely, for any security $i = 1, \dots, N$ at time t with signal $S_{it} \in \{\text{value}, \text{momentum}\}$, the weight on security i at time t is given by:

$$w_{it}^S = c_t \left(\text{rank}(S_{it}) - \frac{1}{N} \sum_i \text{rank}(S_{it}) \right)$$

  where the weights across all stocks sum to zero, ensuring a dollar-neutral long-short portfolio, c_t represents a scaling factor s.t. overall portfolio is one dollar long and one dollar short.
- The return on the portfolio at time t is then computed as:

$$r_t^S = \sum_i w_{it}^S \cdot r_{it}$$

- Additionally, they construct a 50/50 equal combination (COMBO) factor that combines value and momentum.

Table I

		Value Portfolios					Momentum Portfolios					50/50 Combination	
		P1	P2	P3	P3–P1	Factor	P1	P2	P3	P3–P1	Factor	P3–P1	Factor
U.K. stocks	Mean	10.8%	12.5%	15.3%	4.5%	5.5%	9.2%	13.8%	15.2%	6.0%	7.2%	6.3%	7.2%
01/1972 to	(*t*-stat)	(3.17)	(3.48)	(4.12)	(1.83)	(2.10)	(2.32)	(3.81)	(4.04)	(2.37)	(3.00)	(4.23)	(5.85)
07/2011	Stdev	18.6%	19.7%	20.3%	13.4%	14.4%	24.9%	22.7%	23.7%	15.9%	15.0%	8.1%	6.7%
	Sharpe	0.58	0.64	0.75	0.33	0.38	0.37	0.61	0.64	0.38	0.48	0.77	1.07
	Alpha	– 0.2%	0.5%	3.2%	3.5%	4.4%	– 3.2%	2.1%	3.5%	6.7%	8.0%	6.0%	7.2%
	(*t*-stat)	(– 0.17)	(0.42)	(2.03)	(1.47)	(1.74)	(– 2.13)	(2.06)	(2.31)	(2.66)	(3.36)	(4.05)	(5.84)
									Correlation (Val, Mom) =			– 0.43	– 0.62
Europe stocks	Mean	11.8%	14.6%	16.7%	4.8%	5.2%	9.2%	13.3%	17.3%	8.1%	9.8%	5.9%	6.9%
01/1974 to	(*t*-stat)	(3.53)	(4.43)	(4.61)	(2.32)	(2.95)	(2.72)	(4.65)	(5.56)	(3.37)	(4.59)	(4.77)	(6.55)
07/2011	Stdev	18.3%	18.0%	19.8%	11.5%	9.7%	20.6%	17.5%	19.0%	14.7%	13.1%	6.8%	5.8%
	Sharpe	0.64	0.81	0.84	0.42	0.54	0.44	0.76	0.91	0.55	0.75	0.87	1.20
	Alpha	– 0.4%	2.2%	3.1%	3.5%	4.0%	– 3.5%	2.2%	6.0%	9.1%	10.7%	6.1%	7.1%
	(*t*-stat)	(– 0.30)	(2.06)	(2.57)	(1.71)	(2.32)	(– 2.54)	(2.39)	(4.18)	(3.88)	(5.05)	(4.88)	(6.77)
									Correlation (Val, Mom) =			– 0.52	– 0.55
Japan stocks	Mean	2.6%	8.2%	14.7%	12.0%	10.2%	8.4%	9.9%	10.1%	1.7%	2.2%	6.4%	5.9%
01/1974 to	(*t*-stat)	(0.61)	(2.02)	(3.69)	(4.31)	(4.22)	(2.19)	(2.94)	(2.69)	(0.57)	(0.81)	(4.28)	(4.80)
07/2011	Stdev	23.6%	22.1%	21.8%	15.3%	13.2%	23.5%	20.6%	23.1%	18.6%	16.5%	8.1%	6.7%
	Sharpe	0.11	0.37	0.67	0.79	0.77	0.36	0.48	0.44	0.09	0.13	0.78	0.88
	Alpha	– 5.6%	0.1%	7.3%	13.0%	10.7%	– 1.1%	0.8%	0.5%	1.7%	2.2%	6.8%	6.1%
	(*t*-stat)	(– 3.36)	(0.12)	(3.95)	(4.71)	(4.47)	(– 0.59)	(0.73)	(0.31)	(0.54)	(0.84)	(4.63)	(5.05)
									Correlation (Val, Mom) =			– 0.60	– 0.64

Table I

Table I

		Value Portfolios					Momentum Portfolios					50/50 Combination	
		P1	P2	P3	P3–P1	Factor	P1	P2	P3	P3–P1	Factor	P3–P1	Factor
Panel A: Individual Stock Portfolios													
Global stocks 01/1972 to 07/2011	Mean	8.1%	11.0%	14.6%	6.2%	5.8%	8.5%	11.1%	14.1%	5.6%	7.1%	6.3%	6.8%
	(t-stat)	(3.17)	(4.54)	(5.84)	(3.60)	(3.18)	(3.10)	(4.82)	(5.46)	(2.94)	(3.73)	(6.52)	(8.04)
	Stdev	16.6%	15.2%	15.7%	10.9%	11.4%	17.1%	14.5%	16.2%	12.0%	12.0%	6.1%	5.3%
	Sharpe	0.50	0.72	0.93	0.57	0.51	0.49	0.77	0.87	0.47	0.59	1.04	1.28
	Alpha	– 2.3%	0.7%	4.2%	6.6%	6.1%	– 3.3%	0.5%	3.1%	6.4%	8.1%	6.8%	7.5%
	(t-stat)	(– 1.70)	(0.69)	(3.49)	(3.79)	(3.37)	(– 3.00)	(1.00)	(2.78)	(3.37)	(4.31)	(7.09)	(8.98)
									Correlation (Val, Mom) =			– 0.52	– 0.60
Panel B: Other Asset Class Portfolios													
Country indices 01/1978 to 07/2011	Mean	3.1%	6.6%	9.1%	6.0%	5.7%	2.3%	5.8%	11.0%	8.7%	7.4%	7.3%	10.6%
	(t-stat)	(1.10)	(2.40)	(3.20)	(3.45)	(3.40)	(0.81)	(2.13)	(3.72)	(4.14)	(3.57)	(6.62)	(5.72)
	Stdev	16.2%	15.7%	16.2%	9.8%	9.5%	16.2%	15.4%	16.8%	11.9%	11.8%	6.3%	10.6%
	Sharpe	0.19	0.42	0.56	0.61	0.60	0.14	0.37	0.65	0.73	0.63	1.16	1.00
	Alpha	– 3.2%	0.5%	2.7%	5.9%	5.3%	– 3.9%	– 0.3%	4.4%	8.2%	7.1%	7.1%	10.0%
	(t-stat)	(– 3.24)	(0.48)	(2.76)	(3.45)	(3.24)	(– 3.41)	(– 0.40)	(4.00)	(4.00)	(3.47)	(6.49)	(5.47)
									Correlation (Val, Mom) =			– 0.34	– 0.37
Currencies 01/1979 to 07/2011	Mean	– 0.5%	0.3%	2.8%	3.3%	3.9%	– 0.7%	0.3%	2.8%	3.5%	3.0%	3.4%	5.6%
	(t-stat)	(– 0.30)	(0.23)	(1.98)	(1.89)	(2.47)	(– 0.40)	(0.20)	(1.91)	(1.90)	(1.77)	(3.51)	(3.89)
	Stdev	9.2%	8.3%	7.9%	9.7%	9.0%	9.4%	8.0%	8.2%	10.3%	9.6%	5.4%	8.0%
	Sharpe	– 0.05	0.04	0.35	0.34	0.44	– 0.07	0.04	0.34	0.34	0.32	0.63	0.69
	Alpha	– 1.4%	– 0.6%	2.0%	3.4%	4.1%	– 1.6%	– 0.6%	2.0%	3.6%	3.1%	3.5%	5.7%
	(t-stat)	(– 1.53)	(– 0.94)	(2.25)	(2.04)	(2.63)	(– 1.58)	(– 1.01)	(2.18)	(1.99)	(1.84)	(3.83)	(4.11)
									Correlation (Val, Mom) =			– 0.42	– 0.43

Table I

Key Findings: Table I

1. **Panel A of Table I:**
   - Significant return premiums for both value and momentum in all stock markets.
   - Strongly negative correlation (-0.60) between value and momentum returns.
   - Combining these negatively correlated strategies significantly improves Sharpe ratios.
   - Global application of value and momentum generates an annualized Sharpe ratio not much larger than the average of the Sharpe ratios across each market, which shows strong covariation across markets.
2. **Panel B of Table I:**
   - Value and momentum returns vary across asset classes.
   - Robust combination due to negative correlation (-0.49) within each asset class.
   - Diversified portfolio across asset classes slightly improves Sharpe ratios.

Key Findings: Table I

1. Combining stock and non-stock strategies across all asset classes yields even larger Sharpe ratios.
   - Weighted by inverse of in-sample volatility.
   - The 50/50 value and momentum combination portfolio presents a significant challenge for asset pricing models.
2. Applying value and momentum globally across all asset classes creates a substantial Sharpe ratio hurdle for pricing models, far larger than seen in U.S. equity data alone.

Table II

	Panel A: Correlation of Average Return Series			
	Stock Value	Nonstock Value	Stock Momentum	Nonstock Momentum
Stock value	0.68*	0.15*	−0.53*	−0.26*
Nonstock value		0.07	−0.16*	−0.13*
Stock momentum			0.65*	0.37*
Nonstock momentum				0.21*

	Panel B: Correlation of Average Stock Series with Each Nonstock Series							
	Country Index Value	Currency Value	Fixed Income Value	Commodity Value	Country Index Momentum	Currency Momentum	Fixed Income Momentum	Commodity Momentum
Global Stock value	0.27*	0.13*	−0.03	0.01	−0.28*	−0.20*	−0.01	−0.17*
Global Stock momentum	−0.19*	−0.12*	−0.05	−0.06	0.40*	0.28*	0.09	0.20*

Table II

Key Findings: Table II

- Authors computed average return series for groups and then calculated correlations between these average return series. Volatility-weighted averages were computed for individual stock value/momentum strategies across equity markets and nonequity asset classes.
- In Panel A, diagonal elements represent the average correlation between each market's return series and the average of all other return series in different markets, excluding the market itself. Correlations are based on quarterly returns of signal-weighted zero-cost factor portfolios to account for nonsynchronous trading.
- Panel B breaks down correlations of individual stock value and momentum strategies with nonstock value and momentum strategies.
- An F-test evaluates the joint significance of these correlations.

Key Findings: Table II

- For robustness, we find similar negative correlation numbers between value and momentum strategies when different value definitions are employed.
- Additionally, using the negative of a stock's past 5-year return as a value measure for equities, consistent with non-equity asset classes, also yields negative correlations between value and momentum of similar magnitude.

Figure 1

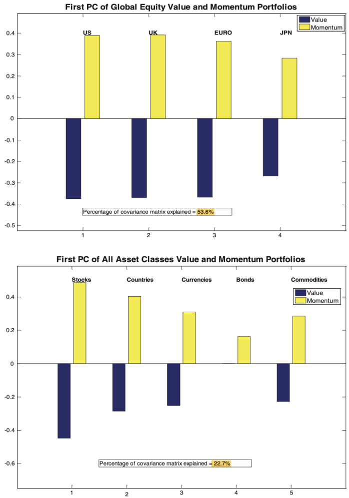

Figure 1

Key Findings:Figure 1

- Figure 1: Principal Component Analysis of Value and Momentum Returns' Covariance Matrix.
  1. Top Panel: Eigenvector weights for individual stock value and momentum strategies in each stock market.
  2. Bottom Panel: Eigenvector weights for the five asset classes, incorporating a global individual stock value and momentum factor across all countries.
- Both panels show opposing factor loadings for value and momentum strategies, reinforcing the authors' observation.
- The commonality among value and momentum strategies across diverse assets and markets with differences in information, structures, and investors, suggests a common global factor structure underlying these phenomena.

Figure 2

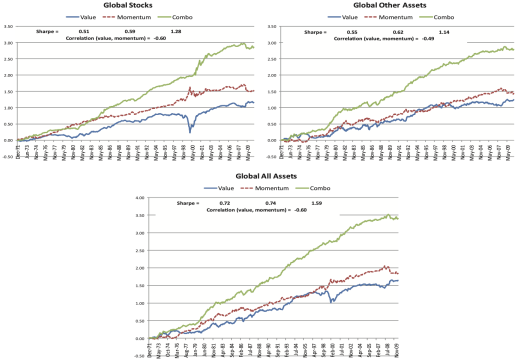

Figure 2

Key Findings:Figure 2

- Figure 2: Cumulative returns of factor portfolios for all strategies in eight asset markets. Returns are scaled to 10% annual volatility for comparison. Each graph includes the annualized Sharpe ratios for these strategies and the correlation between value and momentum in each market.
- The graphs emphasize consistent positive returns, a strong correlation structure across assets, and a negative correlation between value and momentum in every market.

Table III

		U.S. Stocks			Global Stocks		Nonstock Assets		All Asset Classes	
		Value	Momentum		Value	Momentum	Value	Momentum	Value	Momentum
U.S. values	Long-run	0.0004	0.0001	Global values	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
for	consumption growth	(2.06)	(0.33)	for	(0.93)	(0.92)	(0.68)	(0.03)	(1.01)	(0.43)
independent	Recession	−0.0068	−0.0056	independent	0.0037	−0.0044	0.0045	−0.0081	0.0043	−0.0072
variables	dummy	(−1.06)	(−0.73)	variables	(0.66)	(−0.75)	(1.48)	(−2.44)	(1.55)	(−2.26)
	GDP growth	−0.0050	0.0019	(GDP-	−0.0011	0.0023	−0.0005	−0.0034	−0.0006	−0.0020
		(−1.75)	(0.57)	weighted)	(−0.39)	(0.80)	(−0.32)	(−2.08)	(−0.45)	(−1.29)
	Market	−0.3435	0.0219		−0.0615	−0.0709	0.0101	−0.0083	−0.0068	−0.0231
		(−7.46)	(0.40)		(−1.41)	(−1.55)	(0.44)	(−0.32)	(−0.32)	(−0.93)
	TERM	0.2038	−0.0234		0.0523	0.0141	−0.0885	0.0370	−0.0551	0.0316
		(2.64)	(−0.25)		(1.04)	(0.27)	(−3.30)	(1.25)	(−2.23)	(1.11)
	DEF	0.7439	−0.7733		0.2650	−0.3752	−0.0510	−0.0787	0.0240	−0.1490
		(5.25)	(−4.57)		(2.86)	(−3.87)	(−1.03)	(−1.44)	(0.53)	(−2.84)
	R-square	13.1%	5.9%		2.3%	6.4%	3.4%	2.9%	2.9%	4.7%

Table III U.S variables only

Table III

- Table III presents statistical results from time-series regressions of value and momentum strategy returns in various categories, including U.S. individual stocks, global individual stocks, nonstock asset classes, and all asset classes. These regressions examine their relationships with macroeconomic risk measures.
- The macroeconomic variables include:
  1. Long-run consumption growth: 3-year future growth rate in per capita nondurable real consumption (quarterly).
  2. Recession dummy: 0 for peak, 1 for trough.
  3. MSCI world equity index return in excess of the U.S. T-bill rate.
  4. TERM and DEF, representing the term spread on U.S. government bonds and the default spread between U.S. corporate bonds and U.S. Treasuries, respectively.
- For U.S. stock return regressions, only U.S. macroeconomic variables are used. In the global, nonstock, and all-asset-class return regressions, the macroeconomic variables are averaged across all countries, with weights based on their GDP.

Key Finding: Table III

- Long-run U.S. consumption growth relates positively to U.S. stock value strategies but has no correlation with momentum strategies.
- DEF (default spread) shows a positive relationship with value strategies and a negative relationship with momentum strategies.
- The default spread is positively linked to global stock value strategies but has insignificant negative ties to value returns in other asset classes. DEF consistently exhibits a negative relationship with momentum returns in global stock.

Liquidity Risk Exposure

- Table IV: Regression results for liquidity risk proxies and macroeconomic variables. (Dependent variables: value and momentum returns; Independent variables: liquidity shocks)
- Authors consider funding and market liquidity risks. Funding liquidity includes TED spread, LIBOR minus term repo spread, and interest rate swaps vs. local short-term government rates.
- Market liquidity variables include on-the-run minus off-the-run 10-year Treasury note spread, Pastor and Stambaugh's (2003) liquidity measure, and Acharya and Pedersen's (2005) illiquidity measure.
- To capture liquidity effectively, authors use the negative of funding liquidity spreads (wider spread indicates worse liquidity) and Acharya and Pedersen's (2005) measure.
- Shocks to these variables are defined as residuals from an AR(2) model.

Table IV

Panel A: U.S. Liquidity Risk Measures					
		Value	Momentum	50/50 Combination	Val – Mom
Funding liquidity risk	TED spread	–0.0052	0.0129	0.0061	–0.0180
		(–1.44)	(3.07)	(2.13)	(–2.62)
	LIBOR-term repo	–0.0137	0.0087	–0.0058	–0.0223
		(–2.15)	(1.11)	(–1.26)	(–1.71)
	Swap-T-bill	–0.0002	0.0141	0.0104	–0.0143
		(–0.05)	(3.34)	(3.67)	(–2.04)
	Funding liquidity PC	–0.0111	0.0153	0.0042	–0.0264
		(–2.89)	(3.31)	(1.49)	(–3.41)
Market liquidity risk	On-the-run – off-the-run	0.0063	–0.0053	–0.0043	0.0115
		(0.53)	(–0.38)	(–0.50)	(0.49)
	Pástor-Stambaugh	0.0034	0.0107	0.0159	–0.0074
		(0.32)	(0.89)	(1.93)	(–0.37)
	Acharya-Pedersen	0.0010	0.0005	0.0013	0.0004
		(2.02)	(1.44)	(3.05)	(0.70)
	Market liquidity PC	–0.0080	0.0222	0.0200	–0.0302
		(–0.44)	(0.94)	(1.06)	(–0.97)
All liquidity risk	All PC	–0.0154	0.0195	0.0043	–0.0349
		(–2.84)	(2.96)	(1.09)	(–3.17)

Table IV

Table IV

Panel B: Global Liquidity Risk Measures					
		Value	Momentum	50/50 Combination	Val − Mom
Funding liquidity risk	TED spread	−0.0067	0.0094	0.0023	−0.0161
		(−1.69)	(2.00)	(0.74)	(−2.05)
	LIBOR-term repo	−0.0177	0.0139	−0.0005	−0.0316
		(−2.87)	(1.66)	(−0.08)	(−2.36)
	Swap-T-bill	−0.0076	0.0055	−0.0012	−0.0131
		(−2.15)	(1.31)	(−0.46)	(−1.86)
	Funding liquidity PC	−0.0094	0.0112	0.0013	−0.0206
		(−4.74)	(3.58)	(0.58)	(−4.67)
Market liquidity risk	On-the-run − off-the-run	0.0108	−0.0001	0.0037	0.0109
		(0.68)	(−0.01)	(0.32)	(0.34)
	Pástor-Stambaugh	0.0010	−0.0002	0.0003	0.0011
		(1.06)	(−0.15)	(0.43)	(0.61)
	Acharya-Pedersen	0.0009	0.0008	0.0020	0.0001
		(0.39)	(0.28)	(1.30)	(0.02)
	Market liquidity PC	−0.0009	0.0016	0.0012	−0.0025
		(−0.74)	(1.21)	(1.00)	(−1.45)
All liquidity risk	All PC	−0.0079	0.0093	0.0016	−0.0172
		(−3.25)	(4.43)	(0.82)	(−4.63)

Table IV

Liquidity Risk Exposure

- The statistics displayed are coefficient estimates with t-statistics in parentheses from time-series regressions.
- Additionally, the authors derived an index for funding, market, and overall liquidity shocks using the first principal component of the correlation matrix of all respective shocks.
- The dependent variables in our testing encompass the global factor returns for both value and momentum, their 50/50 combination, and the return differential between value and momentum.

Results

- Panel A: U.S. liquidity shock results for different strategies.
- Panel B: Regression results for global funding and market liquidity shocks.
- Findings:
  - Negative link between funding liquidity risk and value returns.
  - Positive correlation with momentum returns, partly explaining the inverse correlation.
  - Market liquidity shocks show weak associations with most strategies, except Acharya-Pedersen (2005).
  - In global factors, funding liquidity shocks negatively impact value returns and enhance momentum returns, while market liquidity shocks have minimal impact.

Figure 3

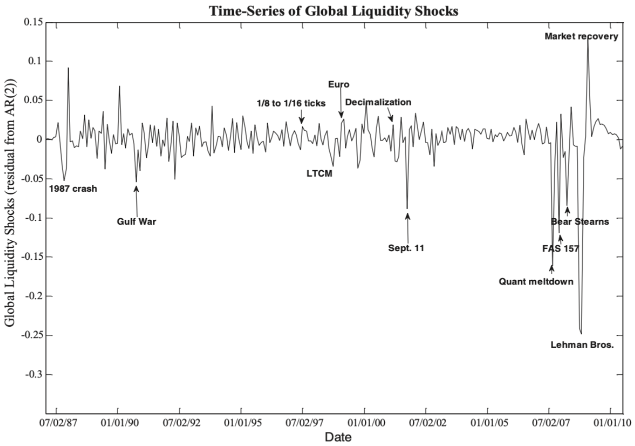

Figure 3

Figure 4

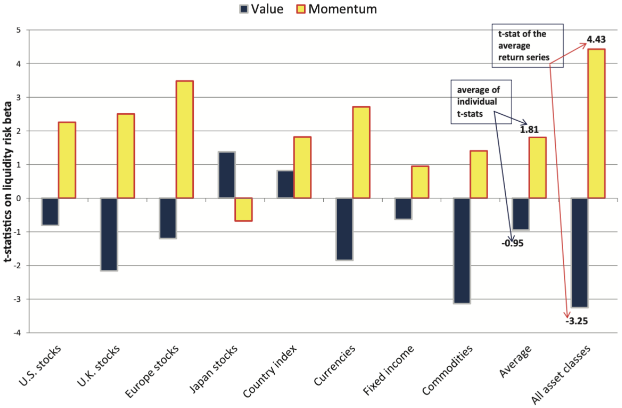

Figure 4

Results

- Figure 3 displays global liquidity shocks encompassing major liquidity events over the past 25 years, including the 1987 stock market crash, Bear Stearns, and Lehman Brothers' bankruptcy.
- Figure 4 shows t-statistics for liquidity betas in individual market and asset class value and momentum strategies.
- To identify a common factor, the authors regressed average value and momentum returns across all markets and asset classes on global liquidity shocks.
- The t-statistics reveal a liquidity beta of -3.25 for value and 4.43 for momentum, stronger than those in individual strategies.
- This underscores the broad scope and uniformity of studying value and momentum holistically.

Comovement

- We assess the relationship between value and momentum in one market or asset class and their counterparts in other asset classes.
- This is achieved through regression analysis, specifically the equation:

$$R_{it}^{p} - r_{f,t}^{p} = \alpha_i^p + \beta_i^p MKT_t + v_i^p \sum_{j \neq i} w_j VAL_{jt} + m_i^p \sum_{j \neq i} w_j MOM_{jt} + \varepsilon_{it}^p$$

  where R_{it}^{p} represents the return to portfolio p at time t among 48 test assets.
- Definitions:
  1. Excess returns: Returns exceeding the 1-month U.S. T-bill rate.
  2. Market portfolio excess returns (MKT): Proxied by the MSCI World Index.
  3. The latter two variables are calculated as equal volatility-weighted averages of the zero-cost signal-weighted factors.
- Each market and asset class is separately analyzed using this regression.

Figure 5

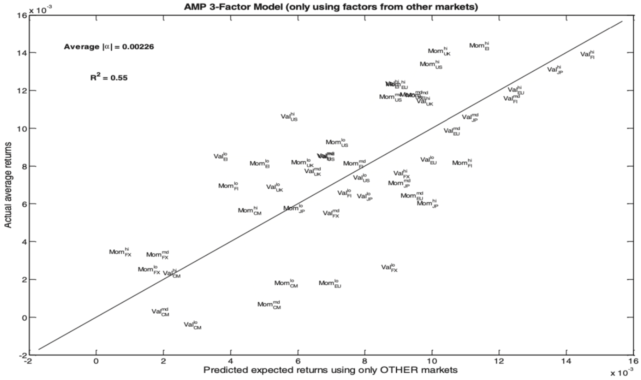

Figure 5

Comovement

- Figure 5 displays a cross-sectional R^2 of 0.55 and an average pricing error (alpha) of 22.6 basis points per month.
- These findings suggest a relationship between value and momentum returns across various markets and asset classes.
- The separate estimations hint at a common global factor structure in value and momentum returns, with potential economic significance.

Asset Pricing Test

- The authors formulated a three-factor model as follows:

$$R_{it}^{p} - r_{f,t}^{p} = \alpha_i^p + \beta_i^p MKT_t + v_i^p VAL_t^{everywhere} + m_i^p MOM_t^{everywhere} + \varepsilon_{it}^{p}$$

  where $VAL_t^{everywhere}$ and $MOM_t^{everywhere}$ are equal-volatility-weighted factors across asset classes.
- In Panel A of Figure 6, the cross-sectional R^2 is 0.71, and the average alpha has an absolute value of 18 basis points from the global three-factor model. However, the GRS (1989) test rejects the null hypothesis based on F-statistics and p-values.
- The study also compares the global three-factor model with the global CAPM, Fama–French four and six-factor model, which produce twice the magnitude of pricing errors compared to the three-factor global model and have lower R^2 values.

Figure 6

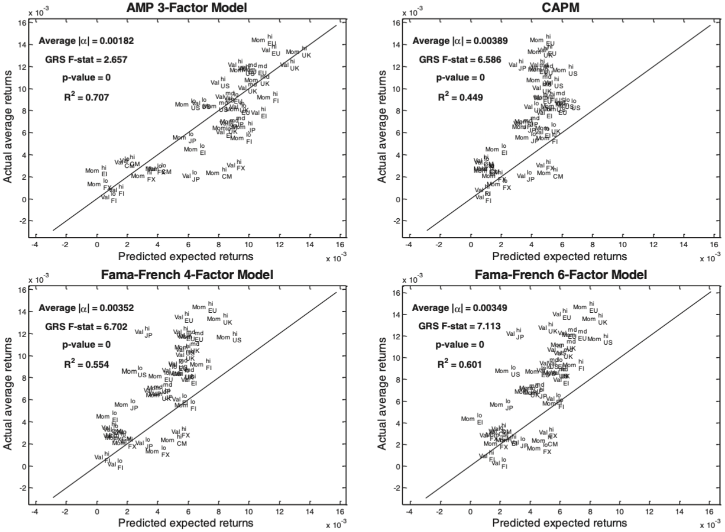

Figure 6

Figure 6

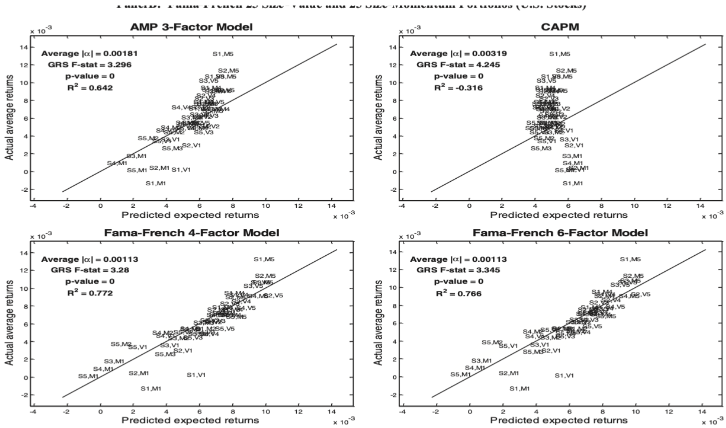

Figure 6

Asset Pricing Test

- In Figure 6, Panel B, Fama-French factors, derived from U.S. stocks, slightly outperform the global three-factor model. However, excluding the two smallest stocks from the Fama-French portfolios makes our three-factor model match the performance of the Fama-French model.
- Across both panels, the global three-factor model demonstrates superior explanatory power for value and momentum returns across various markets, while also showing comparable performance to local U.S. factors within the U.S. market. This suggests a more robust set of asset pricing factors with broader applicability.

Table V

Fama–MacBeth Cross-Sectional Regressions							
$\beta_{Liquidity\ risk}$	$\beta_{GDP\ growth}$	β_{LRCG}	β_{TERM}	β_{DEF}	β_{Mkt}	β_{Value}	$\beta_{Momentum}$
Dependent variable: Cross-section of 48 value and momentum portfolios							
0.0024							
(3.05)							
	0.0003	0.0005	0.0021	0.0023			
	(0.43)	(0.42)	(2.19)	(2.18)			
0.0023	–0.0001	0.0012	0.0014	0.0001			
(2.29)	(–0.13)	(1.01)	(1.59)	(0.11)			
0.0005			0.0015	0.0020	0.0029		
(0.56)			(1.75)	(2.22)	(2.58)		
0.0016	0.0018	–0.0001	0.0033	0.0014	–0.0006	0.0031	0.003
(1.38)	(2.87)	(–0.03)	(2.87)	(1.12)	(–0.38)	(3.96)	(3.53)
Funding liquidity variables only							
0.0022	–0.0002	0.0019	0.0011	0.0015			
(2.06)	(–0.30)	(1.45)	(1.05)	(1.30)			
0.0012	0.0019	0.0003	0.0027	0.0011	0.0008	0.0034	0.0031
(1.80)	(3.28)	(0.17)	(2.19)	(0.84)	(0.58)	(4.40)	(3.50)
Market liquidity variables only							
0.0001	0.0003	0.0005	0.0021	0.0022			
(0.07)	(0.48)	(0.44)	(2.67)	(2.63)			
–0.0013	0.0019	–0.0010	0.0045	0.0030	0.0004	0.0038	0.0040
(–0.88)	(3.19)	(–0.77)	(5.05)	(2.73)	(0.31)	(5.94)	(5.82)

Table V

Further Pricing Tests: Cross-sectional test

- Table V: Mean and t-statistics of Fama–MacBeth cross-sectional regression coefficients for 48 value and momentum test portfolios. Factors include funding liquidity risk, GDP growth, long-run consumption growth, TERM, and DEF.
- Fama-Macbeth regression involves monthly returns regressed on rolling 60-month betas (estimated).
- The coefficient estimates from Fama–MacBeth regressions over time represent the returns of a minimum variance portfolio with unit exposure to that factor.
- Therefore, the time series of monthly coefficient estimates effectively represents a factor mimicking portfolio. e.g., for liquidity risk, denoted as $FP_{\text{liquidity risk}}$.

Further Pricing Tests: Cross-sectional test

- Liquidity risk betas explain 24 basis points per month or about 3% annually of cross-sectional portfolio variation.
- GDP growth and long-run consumption growth have limited impact on returns, whereas TERM and DEF do.
- Incorporating betas from the global three-factor model enhances performance but partially overlaps with other explanatory factors.
- When solely considering principal component-weighted average funding liquidity risk without three global factors, it seems to be priced in the cross section of our global assets.

Time-Series Pricing Tests: Economic Magnitudes

- The authors employ factor mimicking portfolios from Fama–MacBeth regressions for time-series asset pricing tests. They regress the monthly returns of 48 portfolios on factor mimicking portfolio returns, including market factors.
- They present GRS F-statistic, p-value, and average alpha values for pricing error.
- They also report cross-sectional R^2 and the Eig% metric, where the Eig% metric is the sum of eigenvalues from the covariance matrix of the model's implied test assets divided by the sum of eigenvalues of the sample covariance matrix.
- Measures above quantifies how much of the covariance matrix of returns among the test assets each model can explain.

Table VI

	Asset Pricing Models	GRS F-Stat	p-Value	Average $\|\alpha\|$	Average Time-Series R^2	Cross-Sectional R^2	% of Covariances
Panel A: 48 Value and Momentum Portfolios Globally across Asset Classes							
Global Asset Pricing Factors	Mkt (Global CAPM)	6.02	0.000	0.0035	0.40	0.52	57%
	Mkt, $FP_{\text{liq risk}}$	5.02	0.000	0.0031	0.48	0.54	64%
	Mkt, $FP_{\text{liq risk}}$, FP_{GDPg}, FP_{LRCG}, TERM, DEF	4.09	0.000	0.0027	0.59	0.56	80%
	Mkt, $VAL_{\text{everywhere}}$, $MOM_{\text{everywhere}}$	2.66	0.000	0.0018	0.68	0.72	74%
	Mkt, $VAL_{\text{everywhere}}$	3.72	0.000	0.0028	0.42	0.43	68%
	Mkt, $MOM_{\text{everywhere}}$	3.80	0.000	0.0022	0.42	0.57	70%
U.S. Asset Pricing Factors	Mkt (U.S. CAPM)	6.59	0.000	0.0039	0.30	0.44	47%
	FF 3-Factor	7.18	0.000	0.0036	0.31	0.50	53%
	FF 4-Factor	6.70	0.000	0.0035	0.33	0.55	63%
	FF 6-factor	7.11	0.000	0.0035	0.39	0.62	64%

Table VI

Table VI

	Asset Pricing Models	GRS F-Stat	p-Value	Average $\lvert\alpha\rvert$	Average Time-Series R^2	Cross-Sectional R^2	% of Covariances
	Panel B: Fama–French 25 Size-Value and 25 Size-Momentum Portfolios						
Global Asset Pricing Factors	Mkt (Global CAPM)	4.09	0.000	0.0030	0.41	0.20	48%
	Mkt, $FP_{\text{liq risk}}$	4.12	0.000	0.0030	0.42	0.20	49%
	Mkt, $FP_{\text{liq risk}}$, FP_{GDPg}, FP_{LRCG}, TERM, DEF	4.76	0.000	0.0035	0.57	0.38	61%
	Mkt, $VAL_{\text{everywhere}}$, $MOM_{\text{everywhere}}$	3.22	0.000	0.0019	0.70	0.68	66%
U.S. Asset Pricing Factors	Mkt (U.S. CAPM)	4.25	0.000	0.0032	0.73	0.17	82%
	FF 3-Factor	3.81	0.000	0.0023	0.87	0.30	93%
	FF 4-Factor	3.28	0.000	0.0011	0.91	0.77	97%
	FF 6-factor	3.35	0.000	0.0011	0.91	0.77	97%
	Panel C: 13 Hedge Fund Indexes						
Global Asset Pricing Factors	Mkt (Global CAPM)	12.14	0.000	0.0032	0.30	0.20	43%
	Mkt, $FP_{\text{liq risk}}$	12.36	0.000	0.0025	0.34	0.30	47%
	Mkt, $FP_{\text{liq risk}}$, FP_{GDPg}, FP_{LRCG}, TERM, DEF	11.86	0.000	0.0022	0.46	0.17	53%
	Mkt, $VAL_{\text{everywhere}}$, $MOM_{\text{everywhere}}$	7.26	0.000	0.0018	0.41	0.47	54%
U.S. Asset Pricing Factors	Mkt (U.S. CAPM)	12.14	0.000	0.0028	0.30	0.18	43%
	FF 3-Factor	12.64	0.000	0.0026	0.35	0.19	47%
	FF 4-Factor	13.03	0.000	0.0022	0.37	0.36	49%
	FF 6-factor	12.25	0.000	0.0021	0.44	0.36	51%

Table VI

Time-Series Pricing Tests: Economic Magnitudes

- In Panel A of Table VI, the global three-factor model provides the best fit. It has an average absolute alpha of 18 b.p., a cross-sectional R^2 of 72%, and captures 84% of the covariation among test assets. Value or momentum alone does not yield benefits.
- In Panel B, the global value and momentum factors have an average absolute alpha of 19 b.p. and a cross-sectional R^2 of 68%. However, they perform slightly worse than portfolio-specific factor models.
- Panel C demonstrates that globally applied value and momentum factors capture a significant portion of hedge fund returns with minimum average absolute alpha.

Time-Series Pricing Tests

- Overall, the global three-factor model performs well in most cases. Local U.S. factors excel in explaining U.S. equity returns but may not perform as strongly globally or across asset classes.
- Despite the effectiveness of our three-factor global model, the GRS test rejects it in all cases, indicating the need for further research.