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Factor momentum and stock momentum in the UK: Spanning and its limits

James Foye

Birmingham City University, 4 Cardigan Street, Birmingham, B4 7BD, United Kingdom

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ABSTRACT

We examine whether Ehsani and Linnainmaa's (2022) factor-autocorrelation account of stock momentum extends to the UK, a market in which momentum is well established but its relationship with the wider factor structure remains unsettled. Using a broad set of UK factor returns spanning nearly four decades, we find that no statistically detectable momentum alpha remains once time-series factor momentum is controlled for - in this sense, factor momentum spans the conventional momentum factor - although the confidence interval around the residual alpha still admits economically meaningful values. This interpretation is reinforced by a pooled conditional-return difference consistent with, though not by itself establishing, factor-return persistence, correlations with stock momentum that reverse with the sign of prior factor performance, and stronger momentum among the principal components that capture the greatest share of common factor variation. The full-sample result masks subperiod variation: conventional momentum retains a significant alpha before 2006 but none is detectable thereafter, although the difference between the subperiod estimates is not itself statistically significant. Factor momentum also fails to span the wider UK factor universe. Residual momentum and a small set of valuation- and financing-related factors retain significant alphas after multiple-testing correction, whereas the Amihud illiquidity factor does not. Ehsani and Linnainmaa's account therefore carries over to the UK in a specific rather than general sense: no detectable alpha remains for conventional stock momentum, while residual momentum and a small set of other factors retain significant alphas after multiple-testing correction.

1. Introduction

Since the seminal study of Jegadeesh and Titman (1993), few return anomalies have attracted as much scrutiny as momentum. Ehsani and Linnainmaa (2022) trace momentum to the factor structure itself: many equity factors are positively autocorrelated, so buying factors after a positive own year and selling them after a negative one - factor momentum - is persistently profitable, and the US momentum factor earns no alpha once that strategy is included as a control (see also Gupta and Kelly, 2019). On this account, momentum is not a distinct phenomenon but a by-product of the predictability already present in the factor structure.

The UK is a well-suited market in which to examine this claim. Momentum was documented in UK stocks early and repeatedly (Liu et al., 1999; Hon and Tonks, 2003; Galariotis et al., 2007) and survives transaction costs (Agyei-Ampomah, 2007), while the identity of the UK factor model that should price it remains unsettled (Gregory et al., 2013; Foye, 2018; Fletcher, 2019). Yet the factor-momentum evidence to date comes either from single markets outside Europe - notably China (Ma et al., 2024; Ouyang et al., 2024) - or from

E-mail address: James.foye@bcu.ac.uk.

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international panels (Zaremba and Shemer, 2018; Cakici et al., 2025). The international evidence includes country-specific UK results: Cakici et al. (2025) report that principal-component factor momentum absorbs conventional price momentum in the UK. We therefore position the present study as a focused UK extension, using empirical factor-momentum strategies and additional factor-level tests to examine where the spanning result does and does not extend. The question is also newly contested: Graef et al. (2025) argue that stock momentum is driven by its firm-specific component rather than by systematic factor returns, and Gao et al. (2024) re-examine whether factor momentum subsumes stock momentum in the United States. Fresh single-market evidence on the factor-momentum channel is therefore directly relevant.

We use the UK setting to test both the portability and the limits of the factor-autocorrelation account, drawing on the UK country file of the Jensen et al. (2023) Global Factor Data: up to 153 delisting-inclusive long-short factor series over 1986–2025. Three results emerge. First, UK momentum earns 68 basis points per month (t = 3.31), yet its alpha on time-series factor momentum is statistically indistinguishable from zero - although the confidence interval does not rule out economically meaningful alphas - with a loading above three and an R-squared of 0.71. Second, the strength of the result varies descriptively across subperiods: a significant residual alpha in 1987–2005 is no longer detectable in 2006–2025, although a formal interaction test does not reject parameter stability across the halves. The subperiod regressions use the same factor-momentum series as the stability test, so construction differences cannot account for the change, and the monthly factor count differs only modestly between the halves; the weaker post-2005 momentum premium may contribute, although the split cannot identify the source of the change. Third, factor-by-factor regressions indicate where the spanning power of factor momentum ends: valuation-related factors - free cash flow-to-price, Ebitda-to-market enterprise value,

Table 1
Factor momentum and the momentum factor in the UK.

Panel A. Strategy returns (annualised)

Strategy	Mean (% ann)	SD (% ann)	t-value	Sharpe
Equal-weighted portfolio	2.35	2.62	5.64	0.90
Time-series factor momentum	2.04	4.25	2.98	0.48
Winners	3.41	4.43	4.78	0.77
Losers	0.02	4.65	0.02	0.00
Cross-sectional factor momentum	3.52	7.88	2.77	0.45

Equal-weighted portfolio of all factors, time-series factor momentum (long factors with a positive own prior year, short the rest) with its Winners and Losers legs, and cross-sectional factor momentum (long the top half, short the bottom half of factors ranked by trailing twelve-month return). Plain t-values of the mean. The equal-weighted portfolio is available for the full data period, January 1986 to July 2025 (475 months); the factor-momentum strategies and their legs require the trailing formation window and run from January 1987 to July 2025 (463 months). The Winners and Losers rows report the equal-weighted average raw return of the factors whose own trailing twelve-month return was positive and non-positive, respectively; because the numbers of factors in the two groups vary month by month, the difference of their means does not equal the FM_TS mean. Data: UK country file of the Jensen-Kelly-Pedersen Global Factor Data library (capped value-weighted, monthly, delisting-inclusive), January 1986 to July 2025. Long-short factors are raw self-financing returns; t-statistics are Newey-West with twelve lags unless noted.

Panel B. Spanning regressions: momentum on time-series factor momentum

Sample	Eligible factors	Momentum mean bps/mo (t)	alpha on FM_TS bps/mo (t)	95% CI (alpha)	beta (t)	R2	N	FM_TS SR (ann)
Jan 1987-Jul 2025	153	67.6 (3.31)	16.4 (1.35)	[−7.4, 40.3]	3.02 (16.11)	0.71	463	0.48
Jan 1987-Dec 2005	153	87.1 (2.95)	33.5 (2.49)	[7.2, 59.7]	2.88 (16.98)	0.79	228	0.44
Jan 2006-Jul 2025	153	48.8 (1.77)	−2.8 (−0.15)	[−40.5, 34.8]	3.36 (11.20)	0.62	235	0.57
Jan 1987-Jul 2025, ex momentum family	144		16.8 (1.28)	[−8.9, 42.4]	2.99 (16.01)		463	
Jan 1987-Jul 2025, theme-balanced	153 in 13 themes		19.3 (1.38)	[−8.1, 46.7]	3.47 (20.43)	0.67	463	0.47
Jan 1987-Jul 2025, theme-balanced ex Momentum	145 in 12 themes		23.6 (1.44)	[−8.5, 55.7]	3.48 (14.58)	0.57	463	0.46

The momentum factor (12–1 sort) regressed on FM_TS by sample period and construction; alphas in basis points per month with Newey-West (twelve lags) 95% confidence intervals; the R2 column reports the ordinary (unadjusted) R-squared. Eligible factors is the number of factors with at least 120 non-missing monthly observations in the full sample. Dates are the effective regression periods; the underlying data begin in January 1986, with the first year supplying the formation window. The subperiod rows slice the single full-sample FM_TS series - the same series used by the stability test below - so the construction is identical across rows; on average 137 factors enter FM_TS each month in the first subperiod and 153 in the second. Equivalence tests (two one-sided tests) reject residual alphas larger in absolute value than 36.4, 55.5, 34.4, 38.3, 42.3, and 50.5 basis points per month (rows in order); no equivalence margin is chosen by us - these are the smallest bounds at which the test rejects at the 5% level. An interaction regression with post-2005 shift terms gives an alpha shift of −36.3 bps (t = −1.55) and a loading shift of 0.49 (t = 1.42); the joint Wald test does not reject parameter stability (chi2(2) = 3.19, p = 0.203). The ex-momentum-family row rebuilds FM_TS excluding all momentum-family factors, following Ehsani and Linnainmaa. Theme-balanced rows equal-weight factors within each of the thirteen Jensen et al. (2023) themes - formed by the provider's hierarchical clustering of US factor returns, and so determined independently of our UK results - and then across themes (at least two factors per theme and seven themes per month). FM_TS denotes time-series factor momentum; SR denotes Sharpe ratio. Data: UK country file of the Jensen-Kelly-Pedersen Global Factor Data library (capped value-weighted, monthly, delisting-inclusive), January 1986 to July 2025. Long-short factors are raw self-financing returns; t-statistics are Newey-West with twelve lags unless noted.

intrinsic value-to-market - retain alphas of up to 0.8% per month against it that survive family-wise multiple-testing corrections, while the Amihud Measure retains no detectable alpha. In the UK, then, no statistically significant momentum alpha remains once factor momentum is controlled for, but residual momentum and a small set of valuation- and financing-related factors are left unspanned.

2. Data and methodology

Our data are the UK country file of the Jensen et al. (2023) Global Factor Data library: 153 long-short factors built on a uniform methodology from delisting-inclusive data, capped value-weighted and at the monthly frequency, from January 1986 to July 2025 (475 months). Returns are denominated in US dollars. Factor signs follow the library's conventions and long-short factors enter every test as raw self-financing returns. The momentum factor is the library's 12–1 return sort.

The tests are those of Ehsani and Linnainmaa (2022). Time-series factor momentum (FM_TS) signs each factor by its own cumulative return over the prior twelve months and equal-weights the signed returns; cross-sectional factor momentum (FM_CS) is long the top half and short the bottom half of factors ranked by trailing-year return. The initial universe comprises the 153 factors in the UK country file. A factor is eligible for the factor-momentum construction if it has at least 120 non-missing monthly observations over the full sample, not necessarily contiguous; all 153 factors meet this threshold, and the eligibility screen is fixed once for the whole analysis. In each month, FM_TS is then formed from the eligible factors for which the current return and the trailing twelve-month signal are both available - the signal requiring at least nine non-missing returns among the prior twelve months - with no imputation of missing observations. Because the signals require a trailing twelve-month formation window, FM_TS is first available in January 1987: the first year of data supplies the formation window, so the underlying data period (January 1986-July 2025) precedes the regression period (January 1987-July 2025). We assess spanning by regressing the momentum factor on FM_TS with Newey-West (1987) standard errors (twelve lags); we examine the account's empirical signatures with the pooled autocorrelation-indicator regression (Driscoll and Kraay (1998) standard errors with twelve lags, robust to cross-sectional and serial dependence; momentum-family factors excluded from the pool), conditional correlations with momentum, and momentum in the principal components of the factor correlation matrix (unit-variance PC portfolios, factors with at least 240 continuous months); and we ask which factors escape FM_TS by regressing each factor on a leave-one-out FM_TS that excludes the factor being tested, ranking the resulting residual alphas by their t-statistics, and reporting Holm (1979) and Romano and Wolf (2005) multiple-testing-adjusted p-values for the screen. Tables of unconditional mean returns report conventional t-statistics. For the spanning alphas we also report Newey-West 95% confidence intervals and the smallest bound at which an equivalence test (two one-sided tests) rejects at the 5% level. We retain the term 'spans' for consistency with the literature and use it to mean that no statistically detectable intercept remains in the spanning regression - a statement of statistical non-detection, not of economic equivalence. Principal components are estimated from the full-sample correlation matrix - a diagnostic decomposition of the factor structure rather than a real-time strategy - and Section 3.2 reports a robustness check in which eigenvectors are re-estimated each month on a rolling 240-month window using only information available at formation. As robustness checks, we split the sample into halves at end-2005 - slicing the single full-sample FM_TS series, so that the subperiod regressions and the formal stability test use an identical construction - and rebuild FM_TS excluding the momentum-family factors from the factor set, as Ehsani and Linnainmaa exclude the stock-momentum factors from theirs.

3. Results

3.1. No detectable momentum alpha after controlling for factor momentum

Table 1 contains the headline test. Factor momentum is present in the UK: FM_TS earns 2.04% per year ($t = 2.98$; Sharpe ratio 0.48), and essentially all of the profit is generated by the winners leg (3.41%, $t = 4.78$), while the losers leg earns nothing (0.02%, $t = 0.02$) - an asymmetry mirroring the US pattern (Panel A). The momentum factor earns 67.6 basis points per month ($t = 3.31$) over the full sample - similar in magnitude to the published US premium - yet when it is regressed on FM_TS the alpha falls to 16.4 basis points with a t-statistic of 1.35, statistically indistinguishable from zero, with a loading of 3.02 ($t = 16.11$) and an ordinary R-squared of 0.71 (Panel B). The 95% confidence interval for the alpha is [−7.4, 40.3] basis points - an interval that, although it comfortably includes zero, still admits economically meaningful positive alphas - and an equivalence test rejects residual alphas larger than 36.4 basis points in absolute value at the 5% level; economic equivalence to zero at tighter margins cannot be established, and statistical non-detection should not be read as economic equivalence. Rebuilding FM_TS without the momentum-family factors leaves the central non-detection result essentially unchanged (alpha 16.8, $t = 1.28$), so it does not depend on momentum-family factors entering FM_TS. The result is also robust to redundancy in the factor list: rebuilding FM_TS with equal weight across the library's thirteen factor themes (Jensen et al., 2023) rather than across individual factors gives an alpha of 19.3 basis points ($t = 1.38$), and excluding the entire Momentum theme, 23.6 basis points ($t = 1.44$; Panel B). Balancing raises the point estimate and widens the equivalence bound (from 36.4 to 50.5 basis points in the ex-Momentum-theme construction): the alpha is never statistically distinguishable from zero, but the spanning result is measurably less precise under the balanced constructions.

The subperiod split refines the picture. The subperiod regressions slice the full-sample FM_TS series described in Section 2, identical to the series the stability test uses. In January 1987-December 2005 momentum earns 87.1 basis points per month and a significant residual alpha of 33.5 basis points ($t = 2.49$) survives the spanning regression. In January 2006-July 2025 the residual is minus 2.8 basis points ($t = -0.15$): no residual remains detectable. A formal test does not, however, reject stability: in an interaction regression with post-2005 shift terms, the alpha shift is −36.3 basis points ($t = -1.55$), the loading shift 0.49 ($t = 1.42$), and the joint Wald test has $p = 0.203$. The point estimates differ substantially, but the difference is imprecisely estimated. The factor list underlying FM_TS is fixed

across periods, and the number of factors entering each month differs only modestly between the halves (137 versus 153 on average; Table 1, Panel B), so breadth differences are unlikely to account for it. The raw momentum premium itself is weaker after 2005, falling to 48.8 basis points per month (t = 1.77), although the subperiod split cannot identify why the point estimates differ across the two periods.

3.2. Empirical signatures

Table 2 reports the empirical signatures that accompany the spanning result. Pooling all non-momentum factors, the conditional-return difference is 0.30% per month (t = 2.82), compared with the 0.45% pooled estimate reported by Ehsani and Linnainmaa (2022) for US and global non-momentum factors. This positive difference is consistent with persistence in factor returns, but because the regression pools factors it may also reflect differences in average returns across factors and does not by itself isolate within-factor persistence. The correlation structure shifts with each factor's own past year: factors correlate at +0.27 with the momentum factor after a positive own year and at −0.29 after a negative one; a circular block bootstrap that resamples twelve-month blocks of calendar months and recomputes both conditional correlations formally rejects equality of the two (difference 0.56, 95% confidence interval [0.38, 0.68], $p < 0.001$). And the predictability sits where the account says it should - in the large-eigenvalue components of the factor correlation matrix: momentum in the ten high-eigenvalue principal components - which absorb 71% of the common variation - is significant (t = 2.12), momentum in the ten low-eigenvalue components is not (t = −1.61), and the high-minus-low spread is itself significant (0.078% per month, t = 2.57). Re-estimating eigenvectors each month on a rolling 240-month window that uses only formation-date information leaves high-eigenvalue momentum intact (0.060% per month, t = 2.62), although the smallest-eigenvalue components are then too imprecisely estimated for a meaningful contrast. All three signatures are qualitatively consistent with the US evidence.

3.3. Factors that escape FM_TS

Table 3 reports which factors escape. Each factor is regressed on a leave-one-out version of FM_TS that excludes the factor itself, so the dependent factor never appears inside the explanatory variable; the mechanical overlap this removes is of order one in one hundred and fifty, and the composition and ordering of the factors displayed in Table 3 are unchanged. Ranked by the residual-alpha t-statistic, the list is dominated by valuation-related factors: free cash flow-to-price (0.82% per month, t = 4.31), Ebitda-to-market enterprise value (0.72%, t = 3.92), and intrinsic value-to-market (0.66%, t = 4.48) - together with cash-based operating profitability (0.36%, t = 3.38) and financing factors such as net total issuance (0.59%, t = 3.61). Because the exercise screens 152 factors, Table 3 reports Holm and Romano-Wolf p-values adjusted for multiple testing across the full screen: seven of the ten displayed factors, including the leading valuation factors, remain significant at the 5% level under both corrections. Residual momentum - the 12–1 sort on Fama and French (1993) three-factor residuals - also survives correction (0.54%, t = 5.41): no detectable alpha remains for total-return momentum, yet its residual variant retains one, consistent with a continuing role for the firm-specific channel identified by Graef et al. (2025). By contrast, the Amihud Measure loads on factor momentum and retains no detectable premium (alpha −0.04%, t = −0.27). The factors that escape FM_TS in the UK appear to lie along valuation and financing lines; at least for the Amihud Measure, they do not lie along liquidity lines.

Table 2
Empirical signatures: autocorrelation, comovement, and eigenvalue concentration.

Sample	alpha %/mo (t)	beta %/mo (t)	N factor-months	rho+	rho-	High-eig PCs: var %; mom t	Low-eig PCs: mom t
1986–2025	−0.00 (−0.03)	0.30 (2.82)	63,184	0.27	−0.29	PC1–10: 71%; t 2.12	t −1.61
1986–2005	−0.02 (−0.15)	0.34 (1.81)	29,362	0.31	−0.37	PC1–10: 75%; t 2.61	t 0.58
2006–2025	0.02 (0.26)	0.26 (2.39)	33,822	0.20	−0.17		

Columns 2–3: pooled regression of each non-momentum factor's monthly return (percent) on an indicator for a positive own prior year, with Driscoll-Kraay standard errors (Bartlett kernel, twelve lags), robust to cross-sectional and serial dependence; alpha is the return after a negative own year, beta the increment after a positive one (two-way clustering by factor and month gives t = 2.55 for the full-sample beta). Columns 5–6: average correlation with the momentum factor conditional on the factor's own prior-year sign. Subperiod rows condition on the same full-sample trailing-year windows as the full-sample row, consistent with Table 1. The difference between rho+ and rho- is tested with a circular block bootstrap that resamples twelve-month blocks of calendar months and recomputes both conditional correlations, as displayed, in each of 2000 resamples - preserving cross-sectional dependence and serial dependence within blocks: difference 0.56, 95% bootstrap confidence interval [0.38, 0.68], $p < 0.001$. Columns 7–8: momentum in the ten highest- and ten lowest-eigenvalue principal components of the factor correlation matrix (factors with at least 240 continuous months; unavailable for the 2006–2025 half, which is shorter than 240 months); the percentage reported is the share of common factor variation absorbed by the ten high-eigenvalue components. The high-minus-low spread is significant (0.078% per month, NW t = 2.57). Eigenvectors are estimated from the full-sample correlation matrix, a diagnostic decomposition; with eigenvectors re-estimated each month on a rolling 240-month window using only formation-date information, high-eigenvalue momentum is intact (0.060% per month, t = 2.62), although the smallest-eigenvalue components are then too imprecisely estimated for a meaningful contrast. rho+ and rho- denote the average correlation with momentum conditional on positive and negative prior-year factor returns, respectively. Data: UK country file of the Jensen-Kelly-Pedersen Global Factor Data library (capped value-weighted, monthly, delisting-inclusive), January 1986 to July 2025. Long-short factors are raw self-financing returns; t-statistics are Newey-West with twelve lags unless noted.

Table 3
Factors that escape FM_TS, ranked by residual-alpha t-statistic.

Factor	Label	alpha %/mo	NW t	N	Holm p	Romano-Wolf p
resff3_12_1	Residual momentum t-12 to t-1	0.54	5.41	421	<0.001	<0.001
ival_me	Intrinsic value-to-market	0.66	4.48	463	0.001	0.002
fcf_me	Free cash flow-to-price	0.82	4.31	463	0.002	0.004
fnl_gr1a	Change in financial liabilities	0.36	4.05	463	0.008	0.006
ebitda_mev	Ebitda-to-market enterprise value	0.72	3.92	463	0.013	0.012
inv_gr1	Inventory growth	0.37	3.82	463	0.019	0.032
netis_at	Net total issuance	0.59	3.61	461	0.045	0.045
cowc_gr1a	Change in current operating working capital	0.41	3.48	463	0.073	0.050
seas_6_10na	Years 6–10 lagged returns, nonannual	0.41	3.46	355	0.077	0.091
cop_at	Cash-based operating profits-to-book assets	0.36	3.38	463	0.104	0.064
ami_126d	Amihud Measure	−0.04	−0.27	391	1.000	1.000

The ten factors with the largest positive residual-alpha t-statistics from regressions of each factor on a leave-one-out FM_TS that excludes the factor being tested, full sample; rows are ordered by the t-statistic, not the alpha; alphas in percent per month. The screen covers 152 factors; the Holm (1979) and Romano and Wolf (2005) columns report p-values adjusted for multiple testing across the full screen (Romano-Wolf stepdown from 2000 circular twelve-month-block bootstrap resamples of the calendar months, resampled jointly across factors). Across the full screen, eight factors survive Holm and nine survive Romano-Wolf at the 5% level (the ninth, the displayed working-capital factor, has a Romano-Wolf p of 0.0495 before rounding), and Benjamini and Hochberg (1995) control at the 5% false discovery rate retains 25 of the 152. The screen is two-sided, and these counts include firm age, the one significantly negative case under both corrections (−1.21% per month, $t = -3.79$). Labels are the official Global Factor Data names with the library code in the Factor column. The final row shows the Amihud Measure, which retains no detectable alpha. FM_TS denotes time-series factor momentum. Data: UK country file of the Jensen-Kelly-Pedersen Global Factor Data library (capped value-weighted, monthly, delisting-inclusive), January 1986 to July 2025. Long-short factors are raw self-financing returns; t-statistics are Newey-West with twelve lags unless noted.

4. Conclusion

Applying Ehsani and Linnainmaa's (2022) core empirical battery to 153 delisting-inclusive UK factor series over 1986–2025, we find that their central result extends to the UK in the statistical sense defined in Section 2: the momentum factor's alpha on time-series factor momentum is statistically indistinguishable from zero, the residual present before 2006 is no longer detectable after 2005 - although the subperiod difference is not itself statistically significant - and the autocorrelation, comovement, and eigenvalue-concentration signatures are all qualitatively consistent with the US evidence. Relative to recent evidence, we extend Cakici et al. (2025) by testing the UK spanning result using empirical factor-momentum strategies and factor-level regressions, while the persistence of residual momentum complements the firm-specific interpretation of Graef et al. (2025). At the same time, the factor-by-factor regressions suggest where the spanning power of factor momentum ends: alphas of up to 0.8% per month survive family-wise multiple-testing corrections on valuation- and financing-related factors, while none survives for the Amihud Measure. UK momentum, on this evidence, is consistent with the factor-momentum account: its alpha is statistically undetectable after controlling for factor momentum, although the confidence interval still admits economically meaningful positive values, and the wider UK factor universe remains unspanned. Extending the comparison of these limits across markets, and asking why residual momentum escapes a strategy that spans its total-return counterpart, are natural next steps.

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Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work the author used Claude (Anthropic) in order to assist with the preparation of the data-processing and statistical code and with the preparation of tables. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the content of the published article.

CRediT authorship contribution statement

James Foye: Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The author declares that there are no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The factor data used in this study are publicly available from the Global Factor Data library (jkpfactors.com).

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