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Understanding Cross-Sectional Variability in Equity Returns Using a Conditional Asset Pricing Model

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ABSTRACT

A common practice in the literature examining Turkish equity premia involves the application of time-invariant models that assume the constancy of parameters across time. The present study examines whether the cross-sectional variability among equity returns can be explained by market, size, value and momentum factors and whether the parameters are time varying, utilizing a conditional asset pricing model formulated by Ferson and Harvey (1999). The study yields four main findings. Firstly, I find that the market dividend yield has a positive and significant effect on portfolio returns over the period from July 1989 to May 2021. Secondly, I reject the time-invariance in betas, while not rejecting it for alpha. Thirdly, none of the factors I examined have been priced, indicating that the four-asset pricing model is not sufficient to explain time-varying premia. Finally, the results are sensitive to the methodology employed for portfolio construction.

Keywords: Equity Risk Premium, Conditional Asset Pricing Models, Risk Factors

JEL Classification: G12

Koşullu Varlık Fiyatlama Modeli Kullanarak Hisse Senedi Getirilerinde Kesitsel Varyasyonun Anlaşılması

ÖZ

Türk hisse senetleri üzerine yapılan çalışmalarda genel olarak, parametrelerin zaman içerisinde değişmediğini varsayan modeller kullanılmaktadır. Bu çalışma, Ferson ve Harvey'in (1999) geliştirdiği koşullu varlık fiyatlama modelini kullanarak, hisse senedi getirileri arasındaki kesitsel değişkenliğin piyasa, büyüklük, değer ve momentum faktörleri tarafından açıklanabilirliğini ve parametrelerin zamanla değişip değişmediğini incelemektedir. Çalışma dört ana bulgu ortaya koymaktadır. İlk olarak, Temmuz 1989'dan Mayıs 2021'e kadar olan dönemde, piyasa temettü getirisinin, portföy getirileri üzerinde pozitif ve anlamlı bir etkiye sahip olduğu saptandı. İkinci olarak, betaların zaman içerisinde sabit kaldığı hipotezi reddedilirken, alfaların zaman içerisinde sabit kaldığı hipotezi reddedilmedi. Üçüncü olarak, incelenen faktörlerin hiçbirinin fiyatlandırılmadığı belirlendi, bu da dört varlık fiyatlandırma modelinin zamanla değişen primleri açıklamak için yeterli olmadığını göstermektedir. Son olarak, sonuçların, portföy oluşturma için kullanılan yönteme duyarlı olduğu tespit edildi.

Anahtar Kelimeler: Hisse Senedi Risk Primi, Koşullu Varlık Fiyatlama Modellleri, Risk Faktörleri

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1. INTRODUCTION

The equity risk premium is an additional reward that investors require for undertaking a heightened level of risk. Understanding the equity risk premium is vital for various reasons. It affects the cost of capital, influences saving choices, reflects market risk tolerance, and offers insights into future market expectations. Therefore, estimating the equity premium is extensively discussed in finance literature.

Early studies commonly employ time-invariant models to analyze risk premia, assuming that key parameters such as betas (asset sensitivities to factor risks) or premia remain constant. This assumption simplifies the modelling process and makes it easier to estimate parameters of interest, however, it is unrealistic to expect them to stay unchanged as the firm evolves. Ferson and Harvey (1999) pioneered the study of time-varying parameters, developing a conditional model that incorporates conditional information. This analysis adopts their model as it simultaneously allows for the comparison of time-invariant and time-varying versions of parameters and the assessment of predictive power of conditional information on risk premia.

This research specifically examines market, size, value, and momentum factors, which are widely acknowledged as significant contributors to risk, among the various risk factors found in the literature. While choosing conditional variables, local variables are preferred because according to Harvey (1995), the lower degree of integration of emerging markets with the global market makes local conditional variables more effective than global ones in explaining risk premia. However, due to the limited data availability, there often isn't a local equivalent for many global information variables. My information set comprises four local variables and two global variables, and I computed returns using asset prices denominated in the local currency.

The conventional two-step approach, known as two-pass regression, is commonly used to assess factor significance. It estimates betas in the first step through a time series regression and then estimates premia in the second step using cross-sectional regression with the previously estimated betas. However, calculating risk premia using estimated betas introduces errors-in-variables (EIV) bias. Fama-MacBeth (1973) suggest that using portfolios can mitigate this bias as individual stock estimation errors cancel each other out. However, Lewellen, Nagel and Shanken (2010) argue that portfolios created based on factor sorting inherently exhibit factor variation. To address this issue, I include industry portfolios alongside 25 Fama-French portfolios formed on size and value factors as test assets.

Previous studies using time-varying models tend to examine Türkiye in the context of emerging market countries and draw conclusions about the entire group rather than solely on Türkiye. Additionally, these studies rely on dollar-denominated variables. On the other hand, studies focusing specifically on Türkiye assume time-invariant parameters. This study contributes to the literature in two ways. Firstly, I evaluate the performance of variables in local currencies, especially important for emerging markets. Secondly, I examine the impact of time-varying parameters on Türkiye's equity market, which is regarded as a significant market within its group, also known as Borsa Istanbul (BIST).

2. LITERATURE REVIEW

Asset pricing models rely on two main arguments in general: relative asset pricing and absolute asset pricing. Relative asset pricing ensures a market without arbitrage by setting prices accordingly. Ross's (1976) arbitrage pricing model examplifies this principle, assuming investors exploit arbitrage opportunities until equilibrium is reached. In contrast, absolute pricing values assets based on their exposure to non-diversifiable risk. The Capital Asset Pricing Model (CAPM) uses equity index excess return as a proxy for market risk (Treynor, 1961; Sharpe, 1964).

However, studies suggest that additional factors like size and value (Fama and French, 1992) and momentum (Carhart, 1997) contribute to cross-sectional variations in stock returns.

Stability of parameters such as alpha (the unexplained part of an asset's returns) or beta (the asset's sensitivity to underlying risk factors) is important when determining asset prices. Because parameters are unlikely to remain constant, models with parameter variation have been developed. Conditional models incorporate both time-varying parameters and conditional information, which can enhance their ability to predict asset returns. Harvey (1989) tested the conditional CAPM using United States (US) data but found evidence rejecting its validity. Subsequently, he extended the test to other developed countries, resulting in further rejection (Harvey, 1991). Conditional information variables include the first lag of the market's excess return, the junk bond premium, the dividend yield, the term permium and a January dummy variable.

In contrast, Lettau and Ludwigson (2001) found that using the consumption-to-wealth ratio as an information variable improves the conditional CAPM's ability to explain cross-sectional returns. Jagannathan and Wang (1996) measured the market's response to business cycles using the yield spread between BAA- and AAA-rated bonds, without adding conditional variables. Their findings align with Lettau and Ludwigson's. Ferson and Harvey (1991) developed a multi-beta version of the conditional model, applying it to US data and later to equity returns across 18 countries. Assuming globally integrated capital markets, risk premia are functions of global information variables, whereas betas are determined by local information variables. Researchers concluded that the primary factor explaining the differences in returns across countries is the world's excess market return, while the primary factor explaining asset returns within a country is the country's excess market return; the contribution of information variables is relatively small.

Ferson and Harvey (1999) formulated alpha and betas as functions of conditional variables and then conducted a comparative analysis of time-invariant and time-varying results. Methodological details are available in the "Data and Methodology" section. Their analysis revealed that five conditional variables significantly contribute to the variation among stock returns: (1) the difference between the one-month lagged returns of a three-month and one-month Treasury bill, (2) S&P 500 index dividend yield, (3) Moody's Baa and Aaa corporate bond yield spread, (4) ten-year and one-year Treasury bond yield spread and (5) the lagged value of a one-month Treasury bill yield.

In addition to Ferson and Harvey's model (1999), other studies propose alternative models for estimating time-varying risk premia. Previously mentioned, Jagannathan and Wang (1996) tested conditional CAPM by incorporating bond yield spread as an additional factor. Jegadeesh et al. (2019) utilize instrumental variable approach with individual stocks and portfolios to estimate time-varying risk premia, assuming uncorrelated betas between even-month and odd-month data. Several studies employ the pricincipal component method to address omitted variable and errors-in-variables biases, such as Giglio and Xiu's (2021) study and Kelly, Pruitt and Su's (2020) instrumented principal component analysis.

As mentioned in the introduction section, a large body of research has identified new factors. While the number of studies on conditional variables is lower compared to factors, there is still a considerable number of them. These include lagged returns (Fama and French, 1988a); short-term interest rates (Ferson, 1989); changes in short-term interest rates (Campbell, 1987), the dividend price ratio (Fama and French, 1988b), the dividend yield and the earnings-to-price ratio (Lewellen, 2004). However, Kim, Nelson and Startz (1991) demonstrate that the explanatory power of conditional variables is not consistent. Paye and Timmermann (2006) confirm that the significance of conditional variables varies over time and across countries.

Although there is limited research on time-varying risk premia using Turkish data, I aim to summarize the findings from existing studies. Karatepe, Karaaslan, and Gokgoz (2002) found conditional CAPM performs well except during financial crises. In contrast, Yalcin and Ersahin (2011) concluded it does not outperform the unconditional model. Harvey (1995) included Türkiye in his study on emerging markets, revealing that conditional models don't fully explain asset return variations. However, local variables have higher predictive capability than global ones for emerging market returns. Likewise, Chaieb, Langlois and Scaillet (2021) incorporated Türkiye in their analysis, supporting both Harvey's assertion that local variables are more important for emerging markets and Ferson and Harvey's (1991) argument that a country's excess return is the most crucial factor.

Candemir and Karahan (2022) studied risk premia dynamics in the BIST. Only the market premium exhibited statistical significance at the conventional level of 5%. They found evidence that dividend yield has a positive effect on market premium, whereas CPI has a negative effect and rejected the hypothesis that risk premia are time-invariant. However, the significance of conditional information variables varied across different time periods and data intervals, aligning with Paye and Timmermann's (2006) findings. Unlike their research, this study's model doesn't rely on ex-post data for risk premia estimation.

3. DATA AND METHODOLOGY

This analysis covers the most extensive and dependable dataset for the BIST, spanning from 1989 to 2021, including all available stocks.[1] After making adjustments based on the availability of other information such as size, book-to-market, or conditional information set, the final dataset consists of 552 stocks, covering 383 months. Data starting from 2000 was separately analyzed due to high volatility in the 1990s. Market return is computed as the average return of all stocks using a value-weighted method. I calculated the risk-free rate by adding the local inflation rate to the 1-month US Treasury bill rate, while also subtracting the US inflation rate.[2] The reason I use this proxy as risk-free rate is because government debt in emerging markets, including Türkiye, cannot be considered as risk-free and ratings of these bonds are generally below investment grade. Additionally, interest rates on government bonds exceed stock returns for an extensive period, leading to a negative equity premium. Koller et al. (2020), Damodaran (2014) and Bruner et al. (2003) suggest using differential inflation approach to estimate risk-free rate especially for emerging markets. Moreover, I used exponential smoothing to make the data more stable.

Excess market return, size, value and momentum have been extensively studied and recognized as significant factors in the literature, accordingly, I have selected them as my factors. Excess market return is market return minus risk-free rate. Size (SMB), value (HML), and 1-year momentum (MOM) returns are computed using standard procedures. My test assets consist of 25 Fama-French portfolios, and to address the inherent factor variation problem, 49 industry portfolios. Fama-French portfolios are constructed yearly in June. These portfolios are intersections of 5 portfolios formed on size (market capitalization) and 5 portfolios formed on book-to-market ratio. S1 and B1 represent the stocks with lowest value of underlying

[1] Finnet is the chosen data provider for BIST.

[2] US risk-free rates were sourced from Ken French's website at https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. CPI data for Türkiye (TURCPIALLMINMEI) and the US (CPALTT01USM657N) were obtained from FRED, the Federal Reserve Bank of St. Louis website at https://fred.stlouisfed.org

characteristic, while S5 and B5 are the highest. Industry portfolios are based on the industry to which each stock belongs. Portfolio returns used instead of stock returns to reduce EIV bias, as explained in the introduction.

My information set includes lagged BIST dividend yield (div), USDTRY rate change (fx), consumer price index change (cpi), industrial production index change (ipi), Brent price change (brent) and term spread between ten-year and two-year US Treasury bond yields (term). These information variables are widely recognized in the literature. Other potential alternatives were excluded due to their unavailability. To avoid look-ahead bias, I used one-month lagged cpi and two-month lagged ipi. After computing the changes in these variables, I applied a 12-month moving average to create a smoother trend.

Carhart's four factor model is the unconditional version:

$$\mathrm{R_{i,t}} - \mathrm{R_{f,t}} = \alpha_{\mathrm{i,t}} + \beta^{T}_{i,M}\left(\mathrm{R_{m,t}} - \mathrm{R_{f,t}}\right) + \beta^{T}_{i,SMB}(\mathrm{SMB})_{\mathrm{t}} + \beta^{T}_{i,HML}(\mathrm{HML})_{\mathrm{t}} + \beta^{T}_{i,MOM}(\mathrm{MOM})_{\mathrm{t}} + \varepsilon_{\mathrm{i,t}}$$

where $R_{i,t}$ represents the asset return for the period t, $R_{f,t}$ is the risk-free rate, $R_{m,t}$ is the market return, $\alpha_{\mathrm{i,t}}$ represents the abnormal return , β_i is the asset sensitivity to the underlying risk factor and $\varepsilon_{\mathrm{i,t}}$ is the zero-mean error. To make the aforementioned model conditional, alpha and betas are defined as linear functions of the conditional variables.

$$\mathrm{E_{t-1}}\left(\mathrm{r_{i,t}}\right) = \alpha_{\mathrm{i,t-1}} + \beta^{T}_{i,t-1}\mathrm{E_{t-1}}(\mathrm{r_{F,t}})$$

$$\beta_{\mathrm{i,t-1}} = \mathrm{b_{0i}} + \mathrm{b}^{T}_{1i}\mathrm{Z_{t-1}}$$

$$\alpha_{\mathrm{i,t-1}} = \alpha_{\mathrm{0i}} + \alpha^{T}_{1i}\mathrm{Z_{t-1}}$$

where $\mathrm{E_{t-1}}\left(\mathrm{r_{i,t}}\right)$ is the conditional expected excess return at time t-1 for asset i, $\mathrm{E_{t-1}}(\mathrm{r_{F,,t}})$ is the expected return of risk factors at time t-1 and $\mathrm{Z_{t-1}}$ represents the information variables. If the factors are sufficient to explain equity returns, the above model can be expressed as follows:

$$\mathrm{r_{i,t}} = \left(\alpha_{\mathrm{0i}} + \alpha^{T}_{1i}\mathrm{Z_{t-1}}\right) + \left(\mathrm{b_{0i}} + b^{T}_{1i}\mathrm{Z_{t-1}}\right)\mathrm{r_{F,t}} + \epsilon_{\mathrm{i,t}}$$

since $\mathrm{r_{i,t}} = \mathrm{E_{t-1}}\left(\mathrm{r_{i,t}}\right) + \beta^{T}_{i,t-1}\{\mathrm{r_{F,t}} - \mathrm{E_{t-1}}(\mathrm{r_{F,t}})\} + \varepsilon_{\mathrm{i,t}}$

In the model with constant alpha and constant beta, the excess portfolio returns are the dependent variables, while the independent variables are the factor returns. To introduce time-varying alpha, lagged information variables are included as independent variables. Likewise, time-varying beta is incorporated through interaction terms between factor returns and lagged information variables. An F-test is used to compare time-invariant and time-varying model results. Adjusted R-squared values are also presented.

Similar to the Fama-MacBeth regression, time-varying premia are estimated using both time series and cross-sectional regressions. First, betas are calculated through a time series regression. I used two techniques while conducting the time series regression. The first involves using a rolling window approach that considers data from the previous 60 months. The second technique is an expanding approach that uses data up to the current date. In the second step, cross-sectional regression across assets is used to compute premia.

To investigate whether actual values of size and book-to-market ratio are more accurate indicators of nondiversifiable risk, I conducted a new analysis using natural logarithms of these variables as independent variables instead of corresponding factor returns.

4. EMPIRICAL RESULTS

Table 1A summarizes regression results for excess Fama-French portfolio returns on conditional information variables. Although the adjusted R-squared reaches 8%, some information variables still have an impact on portfolio returns. At a 5% significance level, the dividend yield demonstrates statistical significance in 23 of the 25 portfolios examined. Another noteworthy information variable is the industrial production index, which is significant for 12 portfolios. Additionally, the results indicate that the market and size factors can be partially explained by the dividend yield.

When analyzing data from the year 2000, the effectiveness of both the dividend yield and the industrial production index as explanatory factors decreases. Table 1B shows that only three portfolios are significantly impacted by dividend yield, while the other information variables appear to lack significance. Additionally, the maximum adjusted R-squared value decreases from 8% to 4%. Nevertheless, the dividend yield remains relevant to the market factor.

The results of examining industry portfolios, as presented in Table 1C, are similar to those obtained from investigating Fama-French portfolios. Dividend yield is significant in 32 of 49 portfolios, while the significance of the industrial production index is observed in 16 portfolios. Although there are some significant autocorrelation values, the number of such results is insufficient to contradict my claims. The Fama-French portfolios have eight such results, while the industry portfolios have seven.

4.1. Stability Assessment for Alpha and Betas

To assess the variability of betas, I compared models with time-varying and constant betas. Table 2A displays the adjusted R-squared values, where the first part assumes time-varying alphas and the second part assumes constant alphas. It is apparent that although the average explained variance of the four models ranges from 71% to 74%, the F-test outcomes reject the time-invariance of betas in both cases (varying or constant alphas). In the first part, 18 out of 25 results reject time-invariance, while in the second part, 20 out of 25 results reject it.

According to Table 2B, which presents the outcomes after the year 2000, there is a small increase of approximately 3% in the average adjusted R-squared values. However, compared to the results based on the data starting from 1989, the ability to reject the time-invariance in betas decreases. The number of rejection outcomes for beta time-invariance is half of those observed when pre-2000 data is included. As data stability increases, it is understandable that the ability of both the time-invariant and the time-varying models to explain the data becomes more similar.

The same analysis is redone using industry portfolios and the results are reported in Table 2C. Lewellen et al. (2010) argue that portfolios formed based on factors, such as size and book-to-market ratio, are better at capturing time variation in size and value returns than portfolios formed on other factors, such as momentum and liquidity. In other words, portfolios exhibit inherent factor variation that is consistent with the factors they are based on. My results support this argument. Using industry portfolios, I found a significant decrease in the range of average explained variance, from 71%-74% to 51%-56%. Still, the majority of F-test results indicate that betas are time-varying.

I examined the alpha variability across data types and time intervals and documented results in Tables 3A, 3B and 3C. Similar to Ferson and Harvey's (1999) findings, unconditional alpha is not statistically different from zero. Unlike them, I found no meaningful difference between the constant and time-varying alpha models in explaining the returns. Assuming constant betas, only one outcome rejects the time-invariance of alpha in the analysis using Fama-French portfolio returns. Allowing beta variation, none of the outcomes contradict the null hypothesis. Furthermore, in the analysis of industry portfolios, only two outcomes significantly reject the time-invariance of alpha, regardless of constant or varying betas.

4.2. An Analysis on Time-Varying Risk Premia

The classical method for testing factor models involves regressing excess asset returns on factor returns to examine the alpha's equality to zero. However, factor returns serve as a proxy for risk premiums. Fama-MacBeth (1973) developed a methodology to investigate the risk premium of underlying factors. Betas are estimated using time series regression, followed by premium estimation using cross-sectional regression. In this analysis, information variables are used to create a "fit" variable, representing the expected fitted return obtained by regressing excess portfolio returns on lagged information variables. The cross-sectional regression function is

$$r_{i,t} = \gamma_{0,t} + \gamma_t^T \beta_{i,t-1} + \gamma_{4,t} \delta_{i,t-1}^T Z_{t-1} + \varepsilon_{i,t}$$

where $r_{i,t}$ is the excess portfolio return, $\gamma_{0,t}$ is the constant premium, γ_t is the vector for factor premiums, $\beta_{i,t-1}$ is the vector for factor betas, γ_4 is the premium for the "fit", $\delta_{i,t-1}^T Z_{t-1}$ is the "fit", $\varepsilon_{i,t}$ is the error term, i is the asset number and t is the time period. The time series regression for the "fit" is $r_{i,t} = \delta_{i,t}^T Z_{t-1} + \eta_{i,t}$

Table 4A demonstrates cross-sectional results and t-ratios obtained using Fama-French portfolio returns from July,1989 to May,2021 as dependet variables. For each panel, there are three distinct models: (1) factor returns as independent variables, (2) "fit" as an independent variable, and (3) both factor returns and "fit" as independent variables. The premiums for size, momentum and fit do not differ significantly from zero. While I found a significant and positive value premium, its significance diminishes when using a rolling window approach for betas or when including interaction terms in the model. Conversely, a positive constant premium is consistently present and influential across various models.

The analysis using industry portfolios, as shown in Table 4B, reveals limited evidence for factor premiums. Moreover, the constant premium is not different from zero, except in Panel C. Thus, it is difficult to conclude that these risk factors are priced. These findings align with Candemir and Karahan (2022), who also found no pricing for size, value, and momentum factors in time-varying setting. However, they did identify a significant market premium, albeit diminished when excluding the volatile 1990s period.

To capture size and value factors more accurately, I conducted a new analysis using actual size and book-to-market ratios instead of factor returns. Table 5A displays the outcomes of this examination when taking the natural logarithms of market capitalization and book-to-market ratio as size and value factors. The majority of models still exhibit a positive and constant premium. Additionally, the models without interaction terms exhibit a noteworthy and negative size premium, indicating small firms outperform large ones.

Conversely, the analysis of industry portfolios in Table 5B reveals no significant influence of market, size, value, and fit factors on the returns. Furthermore, a meaningful constant premium is absent. In summary, the conclusions drawn from the analysis are influenced by the construction of the test portfolios. It is, therefore, important to assess the models' validity across different portfolio constructions to discern whether the observed outcomes are specific to the portfolio's construction or are valid across diverse test assets.

5. CONCLUSION

This study aims to examine if the cross-sectional variability in equity returns can be explained by market, size, value and momentum factors, considering the possibility of time-varying parameters. The study employs a conditional asset pricing model developed by Ferson and Harvey (1999), which redefines the parameters as functions of lagged variables. The Fama-MacBeth two-pass regression method is utilized to estimate time-varying factor premiums. My dataset covers 383 months from July,1989 to May,2021, and includes two types of test assets: Fama-French portfolio returns and industry portfolio returns formed from 552 stocks in BIST.

Following the literature, I prioritize local information variables over global ones for their higher explanatory power in emerging markets. My conditional information set contains lagged values of the dividend yield, USDTRY rate change, the consumer price index change, the industrial production index change, Brent price change and the term spread between the ten-year and two-year US Treasury bond yields.

After examining the relationship between test asset returns and information variables, the results show that while maximum adjusted R-squared values are not very high for different portfolios, 8% for Fama-French portfolios and 11% for industry portfolios, the dividend yield still has a significant impact on both portfolio returns. This conclusion aligns with the findings of Candemir and Karahan (2022), highlighting the significance of the dividend yield as an information variable for the BIST. Furthermore, the importance of conditional variables varies over time.

Results of the tests comparing the model with constant betas and the model with time-varying betas indicate that betas vary over time. Whether alpha is assumed to be constant or varying, the conclusion about betas does not change. However, the ability to reject time-invariance in betas diminishes when analyzing post-2000 data. Furthermore, the explained variance of returns decreases significantly when using industry portfolio returns instead of Fama-French portfolio returns. This suggests that portfolios constructed based on size and value factors better capture variations in size and value factor returns compared to industry portfolios, supporting the argument for inherent factor variation. Hence, it is crucial to evaluate the outcomes with different portfolio types to determine if they are influenced by specific portfolio construction. In contrast to Ferson and Harvey (1999), stability assessment of alpha reveals similar explanatory abilities for constant and time-varying alpha models, indicating no rejection of time-invariance in alpha.

Based on my findings, it appears that the market, size, value and momentum factors are not priced in a time-varying setting. This conclusion remains consistent when analyzing the impact of actual characteristics as proxies for size and value factors instead of factor returns. Additionally, the coefficients' significance varies when changing the test assets. For instance, a significant positive constant premium is observed for Fama-French portfolio returns, while industry portfolio returns do not exhibit such a premium. Similarly, size, as a characteristic, negatively affects Fama-French portfolio returns, but does not have the same impact on industry portfolio returns. Hence, I draw a parallel conclusion to the stability analysis of alpha and betas that the construction of portfolios can influence the study's outcomes.

In conclusion, the study unveils significant findings. The dividend yield shows a positive and significant impact on asset returns. Allowing time-varying betas enhances return explanation. None of the examined factors appear to be priced, indicating that the four asset pricing model is insufficient in explaining time-varying premia. Lastly, the chosen portfolio construction methodology significantly affects the obtained results.

Declaration of Research and Publication Ethics

This study has been carried out in accordance with the rules of scientific research and publication ethics.

Authors' Contribution

This study is prepared by a single author.

Declaration of Conflict of Interest

There is no conflict of interest.

Table 1A: Portfolio Return Predictability

Portfolio	constant	div	fx	cpi	ipi	Term	brent	R^2	Autocorr
S1-B1	0.0440	0.6094	0.0803	-0.3999	-1.0813	-0.0225	-0.0457	0.0144	0.0242
	1.3801	1.6432	0.0865	-0.3474	-0.5297	-1.5308	-0.0995	-0.0013	0.4728
S1-B2	0.0131	0.6106	-1.0939	0.9169	-4.0274	0.0013	0.1303	0.0371	0.0546
	0.5616	2.2495	-1.6112	1.0882	-2.6956	0.1228	0.3876	0.0218	1.0690
S1-B3	0.0018	1.1525	-0.0176	-0.4953	-2.8345	-0.0045	0.2556	0.0646	0.1322
	0.0821	4.5459	-0.0277	-0.6294	-2.0314	-0.4439	0.8141	0.0497	2.5873
S1-B4	0.0231	1.6223	0.3933	-1.2299	-2.7173	-0.0254	0.1507	0.0999	0.0840
	0.9491	5.7329	0.5557	-1.4002	-1.7446	-2.2622	0.4301	0.0855	1.6443
S1-B5	0.0346	1.1014	-0.7834	0.0454	-2.7677	-0.0162	0.2723	0.0509	0.0688
	1.3871	3.8016	-1.0812	0.0504	-1.7357	-1.4059	0.7590	0.0357	1.3465
S2-B1	0.0081	0.3042	-0.4765	0.4612	-1.5672	-0.0010	0.0464	0.0110	0.0913
	0.4037	1.3006	-0.8146	0.6353	-1.2175	-0.1028	0.1603	-0.0048	1.7863
S2-B2	0.0053	1.0497	-0.3356	-0.2326	-3.7014	-0.0039	0.2712	0.0675	0.0802
	0.2549	4.3526	-0.5563	-0.3107	-2.7885	-0.4125	0.9082	0.0526	1.5699
S2-B3	0.0281	0.5381	-1.0186	0.7369	-3.5965	-0.0067	0.3199	0.0386	0.0160
	1.3562	2.2358	-1.6921	0.9864	-2.7149	-0.6995	1.0731	0.0233	0.3125
S2-B4	0.0231	0.5732	-0.7822	0.3792	-4.2490	-0.0025	0.3702	0.0374	0.1505
	1.0490	2.2408	-1.2225	0.4777	-3.0181	-0.2456	1.1686	0.0221	2.9449
S2-B5	0.0229	0.9418	-0.8482	-0.2241	-4.5649	-0.0005	0.1211	0.0632	0.1144
	1.0737	3.7999	-1.3683	-0.2913	-3.3465	-0.0475	0.3945	0.0482	2.2387
S3-B1	0.0160	0.8225	-0.8372	0.1062	-2.7570	-0.0040	0.2091	0.0374	0.0501
	0.7174	3.1760	-1.2926	0.1321	-1.9343	-0.3934	0.6520	0.0220	0.9796
S3-B2	0.0261	0.7821	-1.0284	0.1705	-3.3500	-0.0090	0.1476	0.0445	0.0750
	1.2312	3.1736	-1.6685	0.2230	-2.4698	-0.9213	0.4838	0.0293	1.4675
S3-B3	0.0171	0.7805	-0.5672	-0.1817	-2.5051	-0.0050	0.1452	0.0384	0.1239
	0.8547	3.3449	-0.9718	-0.2509	-1.9504	-0.5436	0.5025	0.0230	2.4240
S3-B4	0.0096	1.1061	-0.2349	-0.6104	-3.3411	-0.0039	0.3228	0.0676	0.1125
	0.4665	4.6347	-0.3935	-0.8240	-2.5436	-0.4072	1.0921	0.0527	2.2026
S3-B5	0.0145	0.7853	-0.2842	-0.2204	-2.2317	-0.0035	0.2551	0.0361	0.0559
	0.7103	3.3167	-0.4799	-0.2999	-1.7126	-0.3730	0.8700	0.0207	1.0937
S4-B1	0.0053	1.1287	-0.0373	-0.8741	-1.5778	-0.0110	0.0712	0.0573	-0.0733
	0.2523	4.6097	-0.0610	-1.1502	-1.1707	-1.1359	0.2349	0.0423	-1.4354
S4-B2	0.0190	1.1302	-0.4853	-0.8157	-2.7761	-0.0114	0.2265	0.0778	0.1197
	1.0079	5.1414	-0.8827	-1.1955	-2.2946	-1.3112	0.8321	0.0630	2.3424
S4-B3	0.0241	0.6893	-0.8987	0.1211	-2.4519	-0.0075	0.1104	0.0346	0.0856
	1.1825	2.9132	-1.5186	0.1649	-1.8828	-0.7947	0.3769	0.0192	1.6752
S4-B4	0.0248	0.6713	-1.0035	0.3981	-3.2696	-0.0060	0.2963	0.0437	0.1238
	1.2573	2.9275	-1.7497	0.5594	-2.5905	-0.6591	1.0435	0.0285	2.4219
S4-B5	0.0117	0.9018	-0.7808	-0.3420	-3.0180	-0.0018	0.0938	0.0491	0.1117

	0.5609	3.7083	-1.2836	-0.4531	-2.2548	-0.1851	0.3115	0.0339	2.1857
S5-B1	0.0122	0.7812	-0.5324	-0.3617	-1.6685	-0.0088	-0.1082	0.0414	-0.0810
	0.6507	3.5967	-0.9800	-0.5365	-1.3958	-1.0197	-0.4024	0.0261	-1.5862
S5-B2	0.0098	0.9705	-0.8049	-0.1698	-1.5636	-0.0075	0.1662	0.0548	-0.0682
	0.4987	4.2492	-1.4090	-0.2394	-1.2438	-0.8228	0.5874	0.0398	-1.3356
S5-B3	0.0009	1.3275	-0.8300	0.0468	-2.1688	-0.0108	0.0346	0.0809	-0.0212
	0.0428	5.2224	-1.3054	0.0593	-1.5502	-1.0685	0.1098	0.0662	-0.4152
S5-B4	0.0012	0.8786	-0.6147	-0.0304	-1.5733	-0.0055	0.1625	0.0371	-0.0243
	0.0570	3.4802	-0.9735	-0.0388	-1.1322	-0.5470	0.5198	0.0218	-0.4758
S5-B5	0.0083	1.1045	-0.6926	0.0092	-4.3079	-0.0049	0.2962	0.0720	0.0440
	0.3827	4.3696	-1.0955	0.0117	-3.0965	-0.4840	0.9462	0.0572	0.8610
Market	0.0094	0.9527	-0.7209	-0.1025	-2.5529	-0.0079	0.1376	0.0686	-0.0052
	0.5296	4.6376	-1.4030	-0.1608	-2.2578	-0.9721	0.5408	0.0537	-0.1021
SMB	0.0121	-0.2601	-0.0333	0.2696	-0.5982	0.0008	0.0594	0.0180	-0.0392
	1.2482	-2.3117	-0.1183	0.7720	-0.9660	0.1883	0.4260	0.0023	-0.7671
HML	-0.0016	0.2012	0.1044	-0.0450	-1.3095	0.0010	0.1920	0.0226	0.0415
	-0.1511	1.6291	0.3379	-0.1175	-1.9265	0.2064	1.2557	0.0070	0.8118
MOM1Y	0.0066	0.0604	-0.4880	0.0691	0.3138	-0.0046	0.0165	0.0180	0.1136
	0.5816	0.4584	-1.4803	0.1690	0.4326	-0.8762	0.1013	0.0023	2.2230

This table presents regression analysis results for excess Fama-French portfolio returns and factor returns on conditional information variables from July,1989 to May,2021. The first line of each regression shows the coefficients, R-squared value and residual autocorrelation. The second line shows t-ratios of the coefficients and autocorrelation as well as the adjusted R-squared value.

Table 1B: Portfolio Return Predictability

Portfolio	constant	div	fx	cpi	ipi	term	brent	R^2	Autocorr
S1-B1	0.0060	1.0304	1.7337	-1.5191	-0.0710	-0.0127	0.0580	0.0197	-0.0211
	0.0768	0.5526	1.6943	-0.7875	-0.0310	-0.8779	0.1119	-0.0038	-0.3375
S1-B2	-0.0668	2.5425	-0.6094	1.2694	-1.3045	0.0032	-0.1442	0.0424	-0.0276
	-1.4601	2.3259	-1.0157	1.1225	-0.9702	0.3738	-0.4746	0.0194	-0.4422
S1-B3	-0.0512	2.1501	0.1002	0.1245	0.4987	-0.0003	-0.1966	0.0233	-0.0391
	-1.0188	1.7910	0.1521	0.1003	0.3377	-0.0291	-0.5893	-0.0002	-0.6272
S1-B4	-0.0419	2.4814	-0.0145	1.1241	-0.2920	-0.0135	-0.5039	0.0475	0.0834
	-0.8289	2.0533	-0.0219	0.8991	-0.1964	-1.4354	-1.5005	0.0247	1.3362
S1-B5	0.0012	1.0216	-0.5099	1.9111	0.1124	-0.0116	-0.2065	0.0127	-0.1142
	0.0193	0.7157	-0.6509	1.2941	0.0640	-1.0431	-0.5205	-0.0110	-1.8305
S2-B1	-0.0319	1.2881	-0.2032	0.1483	-0.3354	0.0032	-0.2896	0.0231	0.1183
	-0.7266	1.2268	-0.3526	0.1365	-0.2597	0.3900	-0.9926	-0.0004	1.8967
S2-B2	-0.0064	1.0299	-0.1630	-0.5053	-0.8558	-0.0002	-0.2271	0.0274	-0.0067
	-0.1486	0.9977	-0.2878	-0.4731	-0.6740	-0.0305	-0.7918	0.0040	-0.1079
S2-B3	0.0079	1.0073	-0.8315	0.4458	-1.6623	-0.0053	-0.1390	0.0274	0.0218
	0.1846	0.9794	-1.4731	0.4189	-1.3139	-0.6652	-0.4862	0.0041	0.3499
S2-B4	-0.0368	1.9102	-0.5958	1.2074	-1.6887	-0.0017	-0.0397	0.0284	0.0156
	-0.8018	1.7414	-0.9897	1.0640	-1.2516	-0.1991	-0.1302	0.0051	0.2493
S2-B5	-0.0049	1.5098	-0.9293	-0.0711	-2.2618	0.0012	-0.3056	0.0684	0.0137
	-0.1135	1.4576	-1.6348	-0.0663	-1.7752	0.1500	-1.0615	0.0461	0.2204
S3-B1	-0.0116	1.4630	-0.6885	-0.4291	-1.5950	0.0029	-0.0410	0.0310	0.0220
	-0.2115	1.1132	-0.9545	-0.3156	-0.9867	0.2865	-0.1121	0.0078	0.3532
S3-B2	-0.0217	1.7460	-0.4905	-0.3559	-0.7770	-0.0032	-0.1916	0.0451	-0.0042
	-0.4956	1.6691	-0.8545	-0.3289	-0.6038	-0.3945	-0.6592	0.0222	-0.0679
S3-B3	-0.0265	1.8558	-0.6941	0.2390	-1.1415	-0.0022	-0.0313	0.0393	-0.0018
	-0.6256	1.8356	-1.2509	0.2285	-0.9179	-0.2783	-0.1113	0.0163	-0.0289
S3-B4	-0.0107	1.2405	-1.0012	0.9550	-0.5259	-0.0033	-0.3223	0.0300	-0.0193
	-0.2551	1.2415	-1.8257	0.9238	-0.4279	-0.4214	-1.1605	0.0067	-0.3093
S3-B5	0.0011	1.0660	-0.8083	0.2756	-0.9854	-0.0010	-0.1763	0.0274	0.0264
	0.0265	1.0543	-1.4565	0.2635	-0.7923	-0.1304	-0.6273	0.0041	0.4229
S4-B1	-0.0258	1.4366	-0.3626	-0.2148	-0.1420	-0.0003	-0.2795	0.0409	0.0037
	-0.6676	1.5527	-0.7141	-0.2244	-0.1248	-0.0405	-1.0871	0.0179	0.0588
S4-B2	0.0018	0.8685	-0.2860	-0.5422	-0.5026	-0.0004	-0.2686	0.0327	0.0247
	0.0458	0.9346	-0.5607	-0.5639	-0.4397	-0.0494	-1.0401	0.0095	0.3966
S4-B3	-0.0033	1.0245	-0.9605	0.3517	-0.4056	-0.0003	-0.3770	0.0355	0.0674
	-0.0758	0.9947	-1.6992	0.3301	-0.3201	-0.0375	-1.3172	0.0124	1.0807
S4-B4	0.0104	0.6180	-0.2988	-0.6697	-1.0808	0.0025	-0.2819	0.0366	-0.0019
	0.2628	0.6539	-0.5761	-0.6849	-0.9297	0.3364	-1.0732	0.0135	-0.0306
S4-B5	-0.0325	1.8011	-0.5298	-0.3207	-1.3614	0.0046	-0.0979	0.0536	-0.0278

	-0.7598	1.7591	-0.9428	-0.3027	-1.0810	0.5799	-0.3440	0.0309	-0.4451
S5-B1	-0.0334	1.5636	-0.4944	-0.1149	-0.1871	0.0013	-0.4734	0.0607	-0.1824
	-0.8526	1.6685	-0.9614	-0.1185	-0.1623	0.1801	-1.8178	0.0381	-2.9240
S5-B2	-0.0407	1.8600	-0.5616	0.3627	0.4665	-0.0013	-0.2792	0.0409	-0.1528
	-1.0187	1.9466	-1.0710	0.3669	0.3969	-0.1789	-1.0516	0.0179	-2.4490
S5-B3	-0.0382	1.7998	-0.6336	-0.1958	-0.5557	0.0021	-0.2008	0.0547	-0.1292
	-0.9248	1.8205	-1.1678	-0.1914	-0.4570	0.2726	-0.7310	0.0321	-2.0707
S5-B4	-0.0596	1.9008	-0.4913	0.7241	0.1795	0.0057	-0.2012	0.0335	-0.1008
	-1.4736	1.9655	-0.9257	0.7238	0.1509	0.7531	-0.7488	0.0103	-1.6165
S5-B5	-0.0470	2.1991	-0.8910	0.3499	-2.0951	0.0048	0.0196	0.0612	-0.0228
	-1.0756	2.1074	-1.5557	0.3241	-1.6322	0.5923	0.0675	0.0387	-0.3649
Market	-0.0427	1.8693	-0.6178	0.1417	-0.4582	0.0018	-0.2341	0.0611	-0.1217
	-1.1799	2.1593	-1.3003	0.1582	-0.4303	0.2652	-0.9729	0.0386	-1.9504
SMB	0.0248	-0.4508	0.1566	0.0051	-0.5076	-0.0035	0.0330	0.0171	0.0425
	1.0597	-0.8066	0.5105	0.0088	-0.7385	-0.8039	0.2123	-0.0065	0.6813
HML	0.0108	0.0198	-0.2824	0.1575	-0.9587	-0.0022	0.1259	0.0124	0.0383
	0.4784	0.0366	-0.9498	0.2809	-1.4386	-0.5184	0.8361	-0.0113	0.6145
MOM1Y	0.0654	-1.2713	-0.1804	-1.5093	-0.3155	-0.0080	0.1942	0.0619	-0.0030
	2.5956	-2.1119	-0.5459	-2.4235	-0.4261	-1.7035	1.1609	0.0394	-0.0477

This table presents regression analysis results for excess Fama-French portfolio returns and factor returns on conditional information variables from Jan,2000 to May,2021. The first line of each regression shows the coefficients, R-squared value and residual autocorrelation. The second line shows t-ratios of the coefficients and autocorrelation as well as the adjusted R-squared value.

Table 1C: Portfolio Return Predictability

Portfolio	constant	div	fx	cpi	ipi	term	brent	R^2	Autocorr
P1	0.0620	-0.6684	0.3378	-0.0827	-1.5492	-0.0106	-0.4544	0.0643	0.1276
	1.1283	-0.5708	0.4671	-0.0211	-1.2813	-0.9021	-1.5797	0.0294	1.6534
P2	0.0248	0.9440	-1.4829	0.6906	-3.6481	-0.0136	0.0927	0.0613	0.0080
	1.1128	3.6427	-2.2878	0.8586	-2.5577	-1.3249	0.2887	0.0464	0.1573
P3	0.0142	0.7699	-0.0705	0.2538	-0.4277	-0.0185	0.1820	0.0270	-0.0017
	0.4937	2.2948	-0.0840	0.2437	-0.2316	-1.3902	0.4382	0.0114	-0.0338
P4	-0.0259	1.3098	-0.4508	-0.6006	1.1031	0.0076	-0.7984	0.0606	0.0780
	-0.5544	1.1716	-0.7347	-0.5046	0.7981	0.8652	-2.4891	0.0376	1.2384
P5	0.0067	0.9601	-0.0998	-0.8505	-2.3589	-0.0029	0.3025	0.0497	0.1125
	0.3313	4.1113	-0.1709	-1.1734	-1.8353	-0.3088	1.0461	0.0345	2.2017
P6	0.0006	1.2765	-0.5790	-0.5051	-2.2759	-0.0045	0.2084	0.0528	0.0068
	0.0253	4.3337	-0.7859	-0.5525	-1.4038	-0.3853	0.5714	0.0377	0.1331
P7	0.0019	0.9326	-0.7891	0.2460	-2.4800	-0.0035	0.4145	0.0428	0.0052
	0.0834	3.4460	-1.1658	0.2929	-1.6650	-0.3222	1.2367	0.0276	0.1017
P8	0.0103	0.6811	-0.7293	0.1872	-2.5637	-0.0011	0.2043	0.0382	0.0979
	0.5438	3.1006	-1.3275	0.2745	-2.1206	-0.1246	0.7509	0.0228	1.9152
P9	0.0116	0.7785	-0.5430	-0.1020	-2.1786	-0.0039	-0.0234	0.0366	0.0312
	0.5741	3.3035	-0.9212	-0.1394	-1.6796	-0.4175	-0.0803	0.0212	0.6109
P10	-0.0028	1.0483	0.2225	-1.0801	-2.0830	-0.0028	0.6939	0.0426	-0.0592
	-0.1121	3.6641	0.3109	-1.2163	-1.3229	-0.2435	1.9585	0.0273	-1.1591
P11	0.0249	0.1516	-1.0673	1.2549	-2.5587	-0.0046	0.3582	0.0090	0.0215
	0.7675	0.2795	-1.1040	1.0355	-1.2210	-0.2921	0.7437	-0.0080	0.4064
P12	0.0157	0.6751	-0.7129	-0.0413	-1.9174	-0.0027	-0.0905	0.0223	0.0732
	0.6655	2.4629	-1.0398	-0.0486	-1.2709	-0.2467	-0.2667	0.0067	1.4326
P13	0.0017	1.2987	-0.0059	-1.0228	-3.0959	-0.0078	0.4056	0.0631	-0.0099
	0.0701	4.6601	-0.0084	-1.1824	-2.0183	-0.7054	1.1750	0.0481	-0.1934
P14	0.0110	0.8298	-0.5368	-0.0252	-1.8266	-0.0098	-0.1788	0.0366	-0.0914
	0.4998	3.2335	-0.8363	-0.0316	-1.2932	-0.9636	-0.5627	0.0212	-1.7887
P15	0.0230	1.1719	-0.7295	-0.2015	-5.0663	-0.0052	0.1215	0.0273	-0.0099
	0.6420	1.5256	-0.8305	-0.1810	-2.6261	-0.3559	0.2727	0.0092	-0.1797
P16	0.0526	0.4987	-1.1722	0.2308	-4.1762	-0.0102	0.1616	0.0214	0.0537
	1.9709	1.1573	-1.5123	0.2355	-2.4438	-0.8033	0.4184	0.0055	1.0419
P17	0.0471	0.9781	0.1196	-1.2256	-6.4590	-0.0121	0.5074	0.0373	0.0566
	1.4830	1.8397	0.1265	-1.0334	-3.1447	-0.7896	1.0724	0.0208	1.0674
P18	0.0303	0.7503	-0.2570	-0.9881	-2.3225	-0.0069	-0.1517	0.0346	0.0497
	1.4047	2.9884	-0.4093	-1.2680	-1.6806	-0.6905	-0.4878	0.0192	0.9736
P19	0.0441	-0.4872	0.3871	-0.2106	-4.2655	-0.0020	0.9834	0.0381	0.0617
	1.2947	-0.6606	0.4608	-0.2147	-2.5010	-0.1546	2.5436	0.0193	1.0931
P20	0.0151	0.6269	-0.9978	0.3803	-3.5009	-0.0040	0.1868	0.0264	0.0201

	0.6069	2.1718	-1.3821	0.4245	-2.2037	-0.3503	0.5225	0.0109	0.3926
P21	-0.0050	1.4467	-0.9139	-0.2921	-4.2597	-0.0033	0.3648	0.0702	0.0864
	-0.2322	4.3903	-1.4699	-0.3705	-3.1024	-0.3240	1.1784	0.0553	1.6838
P22	0.0308	0.6550	-0.8118	0.0362	-2.4442	-0.0090	0.0921	0.0244	0.1398
	1.3162	2.4092	-1.1939	0.0429	-1.6334	-0.8318	0.2736	0.0088	2.7364
P23	-0.0005	1.2468	-0.8519	0.2113	-1.5719	-0.0124	0.0860	0.0627	-0.0027
	-0.0196	4.4872	-1.2259	0.2450	-1.0279	-1.1286	0.2498	0.0477	-0.0537
P24	0.4827	-10.2204	6.7353	-17.9761	10.6472	-0.0937	0.7484	0.1385	0.0726
	1.9864	-2.0497	2.0596	-1.2412	2.0361	-1.6324	0.6965	0.0873	0.7542
P25	0.0725	-0.3064	-1.7958	-0.9926	3.6031	-0.0283	0.1778	0.0389	0.0174
	0.5468	-0.1126	-1.0063	-0.1256	1.2616	-0.9024	0.3032	-0.0188	0.1803
P26	0.0240	1.8888	-2.2992	0.6724	-3.6720	-0.0275	0.1765	0.1288	-0.0509
	0.9144	6.1886	-3.0118	0.7098	-2.1859	-2.2681	0.4670	0.1149	-0.9954
P27	0.0022	1.1745	-0.0692	-0.8365	-3.2683	-0.0021	0.5399	0.0559	0.0573
	0.0927	4.2153	-0.0993	-0.9673	-2.1313	-0.1903	1.5647	0.0408	1.1208
P28	0.0028	0.9978	-0.3327	-0.6051	-2.1157	-0.0023	0.3651	0.0537	0.0467
	0.1394	4.2932	-0.5724	-0.8388	-1.6539	-0.2445	1.2683	0.0386	0.9146
P29	0.0047	0.8361	0.5684	-1.2536	-1.5528	-0.0058	0.2124	0.0441	0.0634
	0.2509	3.8516	1.0469	-1.8605	-1.2997	-0.6768	0.7900	0.0289	1.2413
P30	0.0322	0.0385	0.9676	-1.6607	-2.5813	-0.0012	0.6439	0.0355	0.0987
	1.1421	0.0604	1.4684	-2.0821	-1.9587	-0.1290	2.2065	0.0159	1.7157
P31	-0.0065	1.1307	-0.7310	0.1541	-0.8667	0.0018	-0.0520	0.0136	-0.1135
	-0.1894	1.4119	-0.9753	0.1691	-0.5770	0.1651	-0.1564	-0.0066	-1.9632
P32	0.0227	0.6453	-0.3956	-0.2985	-2.5093	-0.0092	0.1697	0.0212	0.1570
	0.9469	2.3192	-0.5685	-0.3456	-1.6385	-0.8382	0.4924	0.0056	3.0716
P33	0.0657	0.2493	-0.7952	0.2894	-7.2360	-0.0170	1.1102	0.0460	0.0081
	2.1151	0.4974	-0.8820	0.2539	-3.6404	-1.1506	2.4716	0.0306	0.1572
P34	0.0305	0.4462	-0.8881	0.5543	-4.4914	-0.0081	0.0157	0.0232	-0.0058
	1.1556	1.0197	-1.1415	0.5701	-2.6572	-0.6335	0.0409	0.0072	-0.1112
P35	0.0279	0.2069	-0.2905	-0.1022	-4.9848	0.0026	0.5513	0.0419	0.0916
	1.3603	0.6025	-0.4751	-0.1333	-3.7610	0.2617	1.8090	0.0254	1.7301
P36	0.0036	0.8144	-0.3997	-0.2407	-2.5471	-0.0017	0.0761	0.0239	0.0741
	0.1722	2.3813	-0.6519	-0.3117	-1.8938	-0.1665	0.2504	0.0080	1.4347
P37	-0.0011	1.3751	-0.5294	-0.6793	-2.2843	-0.0004	0.3361	0.0663	0.0062
	-0.0456	4.8980	-0.7539	-0.7795	-1.4784	-0.0316	0.9666	0.0514	0.1219
P38	0.0012	0.7190	-0.0714	-0.4659	-2.3559	0.0028	0.3990	0.0346	0.0969
	0.0626	3.1045	-0.1232	-0.6481	-1.8482	0.3033	1.3913	0.0192	1.8958
P39	-0.0201	1.4227	0.0012	-0.5059	-0.6337	-0.0039	-0.1068	0.0843	-0.0349
	-1.2199	5.1702	0.0024	-0.8172	-0.5949	-0.4867	-0.4370	0.0689	-0.6642
P40	0.0050	0.6918	0.1103	-0.3031	-1.5938	-0.0043	-0.0053	0.0157	-0.1196
	0.2147	1.9062	0.1647	-0.3569	-1.0780	-0.3967	-0.0160	-0.0001	-2.3285
P41	-0.0102	1.0200	0.0938	-0.6958	-2.0023	-0.0012	0.4892	0.0677	-0.0869

	-0.5581	4.8032	0.1765	-1.0557	-1.7131	-0.1450	1.8602	0.0528	-1.7005
P42	0.0207	0.5436	-0.7626	0.1945	-2.5762	-0.0047	0.0209	0.0149	0.0475
	0.9275	1.4665	-1.1572	0.2362	-1.7995	-0.4346	0.0644	-0.0013	0.9167
P43	0.0119	1.3309	-2.2277	-1.2578	0.3898	-0.0086	-0.2022	0.0548	-0.1737
	0.2224	0.9943	-2.8887	-0.8084	0.2450	-0.8350	-0.5578	0.0295	-2.6403
P44	0.0051	0.8600	0.9607	-1.8279	-1.9037	0.0017	0.6160	0.0281	-0.0612
	0.2169	2.2520	1.3981	-2.1077	-1.2602	0.1547	1.8044	0.0122	-1.1860
P45	0.0105	1.1970	-0.5382	-0.4587	-3.7800	-0.0119	0.3245	0.0783	0.0641
	0.5016	4.8976	-0.8804	-0.6046	-2.8101	-1.2288	1.0721	0.0636	1.2549
P46	-0.0784	2.2169	-0.4722	0.5277	0.4212	0.0113	-0.2774	0.0349	-0.1264
	-1.6343	1.9327	-0.7500	0.4256	0.2971	1.2381	-0.8389	0.0111	-1.9985
P47	0.0105	0.9551	-0.5743	-0.3065	-1.7162	-0.0137	0.0192	0.0376	0.0096
	0.4444	3.4726	-0.8349	-0.3591	-1.1338	-1.2516	0.0564	0.0222	0.1877
P48	-0.0136	0.9858	0.1778	-0.2495	-0.0123	-0.0044	-0.1103	0.0217	-0.0545
	-0.4797	2.4731	0.2163	-0.2406	-0.0068	-0.3343	-0.2701	0.0060	-1.0628
P49	0.0357	1.2869	-1.7603	0.7714	-2.8699	-0.0267	0.0279	0.0678	0.0554
	1.2960	4.0177	-2.1972	0.7759	-1.6279	-2.1026	0.0703	0.0529	1.0835

This table presents regression analysis results for excess industry portfolio returns and factor returns on conditional information variables from July,1989 to May,2021. The first line of each regression shows the coefficients, R-squared value and residual autocorrelation. The second line shows t-ratios of the coefficients and autocorrelation as well as the adjusted R-squared value.

Table 2A: Stability Assessment of Betas

	Time-Varying α			Time-Invariant α		
Portfolio	**R^2 Time-Invariant β**	**R^2 Time-Varying β**	**p-value**	**R^2 Time-Invariant β**	**R^2 Time-Varying β**	**p-value**
S1-B1	0.3261	0.3991	0.0000	0.3284	0.3985	0.0000
S1-B2	0.6775	0.6983	0.0026	0.6795	0.7014	0.0015
S1-B3	0.5799	0.5971	0.0280	0.5726	0.5897	0.0283
S1-B4	0.6148	0.6734	0.0000	0.5838	0.6636	0.0000
S1-B5	0.5892	0.6260	0.0001	0.5907	0.6275	0.0001
S2-B1	0.6971	0.7238	0.0002	0.6959	0.7227	0.0001
S2-B2	0.7354	0.7675	0.0000	0.7331	0.7676	0.0000
S2-B3	0.6877	0.7085	0.0020	0.6897	0.7085	0.0036
S2-B4	0.7878	0.7971	0.0211	0.7885	0.7995	0.0090
S2-B5	0.8095	0.8332	0.0000	0.8053	0.8287	0.0000
S3-B1	0.6290	0.6848	0.0000	0.6337	0.6894	0.0000
S3-B2	0.6546	0.6701	0.0196	0.6587	0.6738	0.0190
S3-B3	0.7633	0.7848	0.0001	0.7647	0.7864	0.0001
S3-B4	0.7803	0.8032	0.0000	0.7788	0.8003	0.0000
S3-B5	0.7877	0.8113	0.0000	0.7875	0.8129	0.0000
S4-B1	0.6790	0.7805	0.0000	0.6766	0.7785	0.0000
S4-B2	0.7962	0.8197	0.0000	0.7930	0.8190	0.0000
S4-B3	0.7529	0.7733	0.0003	0.7533	0.7745	0.0002
S4-B4	0.7046	0.7110	0.1322	0.7063	0.7127	0.1259
S4-B5	0.7578	0.7731	0.0030	0.7549	0.7717	0.0015
S5-B1	0.7846	0.8159	0.0000	0.7860	0.8145	0.0000
S5-B2	0.7662	0.8000	0.0000	0.7676	0.7950	0.0000
S5-B3	0.8096	0.8434	0.0000	0.8070	0.8401	0.0000
S5-B4	0.7807	0.8181	0.0000	0.7811	0.8139	0.0000
S5-B5	0.8259	0.8525	0.0000	0.8259	0.8498	0.0000
Corrected p-value			0.002			0.002
# < Corrected p-value			18			20

This table presents adjusted R-squared values from regression models spanning July,1989 to May,2021. α represents alpha, β represents betas. The first column shows a model regressing excess Fama-French portfolio returns on information variables and factor returns. The second column displays a model with additional interaction terms between information variables and factor returns. In the fourth and fifth columns, the information variables are incorporated into the model solely as interaction terms due to the assumption of constant alpha. The table also includes alpha values for F-tests, comparing restricted and unrestricted models. Corrected significance levels and the count of significant alphas after applying Bonferroni correction are provided.

Table 2B: Stability Assessment of Betas

	Time-Varying α			Time-Invariant α		
Portfolio	**R^2 Time-Invariant β**	**R^2 Time-Varying β**	**p-value**	**R^2 Time-Invariant β**	**R^2 Time-Varying β**	**p-value**
S1-B1	0.3365	0.5010	0.0000	0.3332	0.4888	0.0000
S1-B2	0.6668	0.6765	0.1600	0.6681	0.6811	0.0951
S1-B3	0.6048	0.6178	0.1353	0.6039	0.6194	0.0949
S1-B4	0.5837	0.6918	0.0000	0.5656	0.6778	0.0000
S1-B5	0.5116	0.5703	0.0005	0.4952	0.5664	0.0001
S2-B1	0.7121	0.7078	0.6701	0.7147	0.7114	0.6307
S2-B2	0.7461	0.7720	0.0019	0.7490	0.7750	0.0014
S2-B3	0.7242	0.7273	0.3253	0.7283	0.7300	0.3832
S2-B4	0.8036	0.8105	0.1216	0.8018	0.8126	0.0411
S2-B5	0.8333	0.8406	0.0775	0.8270	0.8328	0.1231
S3-B1	0.7200	0.7750	0.0000	0.7226	0.7768	0.0000
S3-B2	0.6706	0.6713	0.4378	0.6710	0.6748	0.3195
S3-B3	0.8036	0.8116	0.0925	0.8065	0.8147	0.0796
S3-B4	0.8220	0.8373	0.0061	0.8198	0.8384	0.0015
S3-B5	0.7866	0.7861	0.5013	0.7894	0.7888	0.5101
S4-B1	0.7788	0.7735	0.7847	0.7802	0.7772	0.6574
S4-B2	0.8455	0.8523	0.0796	0.8438	0.8485	0.1509
S4-B3	0.7854	0.7790	0.8492	0.7847	0.7791	0.8156
S4-B4	0.8033	0.8173	0.0166	0.8005	0.8135	0.0212
S4-B5	0.8594	0.8728	0.0032	0.8586	0.8682	0.0186
S5-B1	0.7943	0.8559	0.0000	0.7945	0.8544	0.0000
S5-B2	0.8324	0.8455	0.0102	0.8324	0.8421	0.0343
S5-B3	0.8764	0.8969	0.0000	0.8773	0.8983	0.0000
S5-B4	0.8629	0.8948	0.0000	0.8605	0.8881	0.0000
S5-B5	0.8493	0.8852	0.0000	0.8481	0.8828	0.0000
Corrected p-value			0.002			0.002
# < Corrected p-value			9			10

This table presents adjusted R-squared values from regression models spanning Jan,2000 to May,2021. α represents alpha, β represents betas. The first column shows a model regressing excess Fama-French portfolio returns on information variables and factor returns. The second column displays a model with additional interaction terms between information variables and factor returns. In the fourth and fifth columns, the information variables are incorporated into the model solely as interaction terms due to the assumption of constant alpha. The table also includes alpha values for F-tests, comparing restricted and unrestricted models. Corrected significance levels and the count of significant alphas after applying Bonferroni correction are provided.

Table 2C: Stability Assessment of Betas

	Time-Varying α			Time-Invariant α		
Portfolio	**R^2 Time-Invariant β**	**R^2 Time-Varying β**	**p-value**	**R^2 Time-Invariant β**	**R^2 Time-Varying β**	**p-value**
P1	0.3597	0.4839	0.0003	0.3464	0.4560	0.0010
P2	0.7682	0.8428	0.0000	0.7666	0.8421	0.0000
P3	0.3720	0.4346	0.0000	0.3699	0.4216	0.0003
P4	0.5898	0.6011	0.1757	0.5788	0.5901	0.1750
P5	0.6699	0.6838	0.0251	0.6677	0.6798	0.0391
P6	0.5009	0.5525	0.0000	0.4976	0.5560	0.0000
P7	0.7224	0.7393	0.0039	0.7235	0.7374	0.0106
P8	0.6270	0.6326	0.2075	0.6317	0.6370	0.2114
P9	0.6480	0.6893	0.0000	0.6520	0.6918	0.0000
P10	0.6483	0.6667	0.0094	0.6443	0.6633	0.0077
P11	0.2524	0.3229	0.0002	0.2579	0.3269	0.0002
P12	0.6776	0.7047	0.0003	0.6747	0.7030	0.0002
P13	0.5746	0.6054	0.0011	0.5739	0.6084	0.0003
P14	0.6281	0.6698	0.0000	0.6294	0.6710	0.0000
P15	0.2472	0.2447	0.5261	0.2553	0.2531	0.5191
P16	0.4271	0.4660	0.0020	0.4301	0.4693	0.0016
P17	0.2796	0.3111	0.0291	0.2808	0.3215	0.0085
P18	0.3339	0.5232	0.0000	0.3348	0.5164	0.0000
P19	0.4958	0.5654	0.0000	0.4771	0.5476	0.0000
P20	0.4805	0.5361	0.0000	0.4874	0.5383	0.0000
P21	0.6532	0.6689	0.0191	0.6506	0.6644	0.0309
P22	0.6120	0.6206	0.1269	0.6135	0.6218	0.1295
P23	0.7525	0.8032	0.0000	0.7515	0.8036	0.0000
P24	0.2058	0.2939	0.0940	0.0875	0.2315	0.0271
P25	0.1676	0.1538	0.5576	0.1677	0.1121	0.8019
P26	0.5624	0.7126	0.0000	0.5337	0.6927	0.0000
P27	0.6153	0.6615	0.0000	0.6155	0.6604	0.0000
P28	0.7366	0.7547	0.0017	0.7349	0.7519	0.0025
P29	0.5564	0.5774	0.0152	0.5504	0.5763	0.0051
P30	0.4351	0.4447	0.2326	0.4276	0.4417	0.1540
P31	0.2793	0.2684	0.7095	0.2851	0.2787	0.6147
P32	0.5724	0.6044	0.0008	0.5763	0.6082	0.0007
P33	0.3764	0.3882	0.1645	0.3633	0.3799	0.0957
P34	0.4560	0.5130	0.0000	0.4575	0.5070	0.0001
P35	0.6491	0.6772	0.0009	0.6368	0.6693	0.0002
P36	0.5921	0.6298	0.0001	0.5953	0.6332	0.0001
P37	0.6655	0.7288	0.0000	0.6636	0.7271	0.0000
P38	0.7131	0.7255	0.0227	0.7103	0.7222	0.0253
P39	0.5083	0.6052	0.0000	0.4779	0.5672	0.0000
P40	0.5139	0.5869	0.0000	0.5142	0.5889	0.0000
P41	0.5082	0.6079	0.0000	0.5036	0.6115	0.0000
P42	0.6534	0.7038	0.0000	0.6539	0.7071	0.0000
P43	0.1525	0.1582	0.3901	0.1383	0.1327	0.5493
P44	0.3278	0.3648	0.0080	0.3237	0.3580	0.0112
P45	0.5950	0.6055	0.0975	0.5896	0.5980	0.1401
P46	0.5523	0.6727	0.0000	0.5590	0.6680	0.0000
P47	0.5767	0.5939	0.0288	0.5794	0.5980	0.0193
P48	0.4355	0.4884	0.0001	0.4319	0.4828	0.0001
P49	0.5354	0.5989	0.0000	0.5320	0.5930	0.0000
Corrected p-value			0.001			0.001
# < Corrected p-value			26			27

This table presents adjusted R-squared values from regression models spanning July,1989 to May,2021. α represents alpha, β represents betas. The first column shows a model regressing excess industry portfolio returns on information variables and factor returns. The second column displays a model with additional interaction terms between information variables and factor returns. In the fourth and fifth columns, the information variables are incorporated into the model solely as interaction terms due to the assumption of constant alpha. The table also includes alpha values for F-tests, comparing restricted and unrestricted models. Corrected significance levels and the count of significant alphas after applying Bonferroni correction are provided.

Table 3A: Stability Assessment of Alpha

Portfolio	**Annual Constant (Time-invariant α, time-invarint β)**	**Unconditional α**	**Test Time-invariant α (Time-invariant β)**	**Test Time-invariant α (Time-varying β)**
S1-B1	0.1498	0.2129	0.5845	0.3845
S1-B2	-0.0050	0.9349	0.7220	0.8788
S1-B3	0.0734	0.2757	0.0533	0.0558
S1-B4	0.1659	0.0286	0.0000	0.0122
S1-B5	0.2110	0.0049	0.6043	0.6000
S2-B1	-0.0326	0.5225	0.2802	0.2881
S2-B2	0.0088	0.8621	0.1652	0.4301
S2-B3	0.0761	0.1566	0.7333	0.4130
S2-B4	-0.0157	0.7392	0.5770	0.9308
S2-B5	-0.0212	0.6322	0.0287	0.0192
S3-B1	0.0445	0.4779	0.9737	0.9902
S3-B2	0.0043	0.9406	0.9545	0.9190
S3-B3	0.0081	0.8585	0.7156	0.7687
S3-B4	0.0339	0.4580	0.2016	0.0868
S3-B5	0.0808	0.0648	0.3766	0.8068
S4-B1	-0.0096	0.8644	0.1881	0.1665
S4-B2	-0.0023	0.9547	0.0660	0.2942
S4-B3	0.0229	0.6257	0.5000	0.6644
S4-B4	0.0748	0.1344	0.7014	0.6980
S4-B5	-0.0929	0.0557	0.1077	0.2205
S5-B1	-0.0353	0.3815	0.7315	0.1958
S5-B2	0.0591	0.1839	0.7211	0.0231
S5-B3	0.0741	0.1058	0.0854	0.0402
S5-B4	-0.0196	0.6780	0.5190	0.0311
S5-B5	0.0520	0.2264	0.4130	0.0556
Corrected p-value		0.002	0.002	0.002
# < Corrected p-value		0	1	0

This table analyzes alpha variability using Fama-French portfolio returns from July, 1989 to May, 2021. α represents alpha, β represents betas. Columns: annualized intercept value (1st), p-values testing if alpha is equal to zero (2nd), F-test p-values for alpha variability with constant betas (3rd), F-test p-values for alpha variability with varying betas (4th). To obtain time-varying alphas, information variables in addition to factors are included in the regression model as independent variables. To test the alpha variability while assuming that betas vary over time, interaction terms are included in the model as independent variables. Corrected significance levels and the count of significant alphas after applying Bonferroni correction are provided.

Table 3B: Stability Assessment of Alpha

Portfolio	**Annual Constant (Time-invariant α, time-invarint β)**	**Unconditional α**	**Test Time-invariant α (Time-invariant β)**	**Test Time-invariant α (Time-varying β)**
S1-B1	0.0942	0.4545	0.3002	0.0777
S1-B2	0.0104	0.8430	0.5443	0.8377
S1-B3	0.0166	0.7904	0.3635	0.5413
S1-B4	0.0915	0.1717	0.0112	0.0144
S1-B5	0.2183	0.0095	0.0278	0.2390
S2-B1	-0.0773	0.0971	0.7153	0.7808
S2-B2	-0.0260	0.5453	0.7907	0.8077
S2-B3	0.0576	0.1965	0.8933	0.7086
S2-B4	0.0299	0.4608	0.2247	0.7523
S2-B5	0.0164	0.6528	0.0188	0.0105
S3-B1	0.0247	0.6673	0.7224	0.6522
S3-B2	-0.0072	0.8859	0.4602	0.7312
S3-B3	0.0267	0.4726	0.8909	0.8994
S3-B4	0.0369	0.2962	0.1783	0.6097
S3-B5	0.0790	0.0410	0.8399	0.7853
S4-B1	-0.0430	0.2368	0.6145	0.8897
S4-B2	0.0328	0.2842	0.1925	0.0700
S4-B3	0.0421	0.2912	0.3405	0.4411
S4-B4	0.0243	0.4908	0.1468	0.1045
S4-B5	-0.0200	0.5378	0.2894	0.0294
S5-B1	0.0034	0.9253	0.4527	0.2156
S5-B2	0.0673	0.0404	0.4395	0.0923
S5-B3	-0.0186	0.5232	0.6667	0.8244
S5-B4	0.0141	0.6384	0.1082	0.0030
S5-B5	0.0038	0.9124	0.2438	0.1062
Corrected p-value		0.002	0.002	0.002
# < Corrected p-value		0	0	0

This table analyzes alpha variability using Fama-French portfolio returns from Jan,2000 to May,2021. α represents alpha, β represents betas. Columns: annualized intercept value (1st), p-values testing if alpha is equal to zero (2nd), F-test p-values for alpha variability with constant betas (3rd), F-test p-values for alpha variability with varying betas (4th). To obtain time-varying alphas, information variables in addition to factors are included in the regression model as independent variables. To test the alpha variability while assuming that betas vary over time, interaction terms are included in the model as independent variables. Corrected significance levels and the count of significant alphas after applying Bonferroni correction are provided.

Table 3C: Stability Assessment of Alpha

Portfolio	**Annual Constant (Time-invariant α, time-invarint β)**	**Unconditional α**	**Test Time-invariant α (Time-invariant β)**	**Test Time-invariant α (Time-varying β)**
P1	0.1439	0.0473	0.1615	0.0421
P2	0.0377	0.4577	0.1982	0.2892
P3	0.2005	0.0591	0.3032	0.0298
P4	-0.0293	0.6347	0.0531	0.0636
P5	-0.0191	0.7245	0.2058	0.1113
P6	-0.0125	0.8818	0.2082	0.7763
P7	0.0279	0.6252	0.6146	0.2068
P8	0.0390	0.4655	0.9740	0.9411
P9	0.0526	0.3445	0.9469	0.7902
P10	0.0084	0.9019	0.1166	0.1457
P11	0.0439	0.7372	0.7585	0.6669
P12	-0.0338	0.5865	0.1572	0.2383
P13	-0.0095	0.8980	0.3581	0.7759
P14	-0.0085	0.8914	0.5839	0.5747
P15	0.0673	0.5871	0.8658	0.8513
P16	0.0613	0.5098	0.6725	0.7000
P17	0.0599	0.6400	0.4917	0.9831
P18	0.0467	0.5680	0.4882	0.0898
P19	0.0301	0.7388	0.0090	0.0085
P20	-0.1004	0.2225	0.9839	0.6342
P21	-0.0710	0.2370	0.1915	0.0990
P22	0.0375	0.5768	0.6034	0.5606
P23	0.0832	0.1390	0.2767	0.5121
P24	0.5671	0.1013	0.0032	0.0562
P25	0.0373	0.8280	0.4312	0.1484
P26	0.0959	0.2740	0.0000	0.0001
P27	0.0450	0.5194	0.4536	0.3021
P28	-0.0020	0.9663	0.2139	0.1263
P29	-0.0146	0.8030	0.0896	0.3261
P30	0.0379	0.5998	0.1316	0.2837
P31	0.0777	0.3948	0.7261	0.9007
P32	-0.0585	0.4155	0.8593	0.8564
P33	0.0207	0.8580	0.0336	0.1010
P34	-0.0157	0.8616	0.5463	0.1184
P35	-0.0521	0.3770	0.0062	0.0323
P36	-0.0561	0.3641	0.8021	0.8225
P37	0.1239	0.0617	0.2331	0.2290
P38	0.0027	0.9566	0.1411	0.1212
P39	0.1642	0.0047	0.0001	0.0000
P40	0.0704	0.3421	0.4520	0.6347
P41	0.0553	0.3638	0.1480	0.8444
P42	0.0057	0.9247	0.4896	0.9027
P43	0.0201	0.8452	0.1404	0.0647
P44	0.1228	0.1722	0.2221	0.1417
P45	-0.0616	0.3366	0.0898	0.0509
P46	-0.0209	0.7442	0.8820	0.1705
P47	-0.0967	0.1759	0.7296	0.8775
P48	0.0758	0.4417	0.2125	0.1367
P49	0.1215	0.1733	0.1902	0.0868
Corrected p-value		0.001	0.001	0.001
# < Corrected p-value		0	2	2

This table analyzes alpha variability using industry portfolio returns from July, 1989 to May, 2021. α represents alpha, β represents betas. Columns: annualized intercept value (1st), p-values testing if alpha is equal to zero (2nd), F-test p-values for alpha variability with constant betas (3rd), F-test p-values for alpha variability with varying betas (4th). To obtain time-varying alphas, information variables in addition to factors are included in the regression model as independent variables. To test the alpha variability while assuming that betas vary over time, interaction terms are included in the model as independent variables. Corrected significance levels and the count of significant alphas after applying Bonferroni correction are provided.

Table 4A: Time-Varying Risk Premia on Factors

γ_0	γ_1 (mkt)	γ_2 (smb)	γ_3 (hml)	γ_4 (mom)	γ_5 (fit)
Panel A: Expanding Approach					
0.0262	-0.0144	0.0033	0.0110	0.0041	-
1.8773	-1.0751	0.9994	2.8415	0.7549	-
0.0157	-	-	-	-	-0.0508
2.4350	-	-	-	-	-1.0358
0.0294	-0.0175	0.0041	0.0119	0.0037	-0.0486
2.0283	-1.2410	1.1518	2.9083	0.6763	-0.8664
Panel B: Rolling Approach					
0.0161	-0.0058	0.0050	0.0064	-0.0049	-
1.6724	-0.6722	1.3950	1.8003	-0.7955	-
0.0157	-	-	-	-	-0.0508
2.4350	-	-	-	-	-1.0358
0.0151	-0.0050	0.0058	0.0068	-0.0030	-0.0314
1.5683	-0.5757	1.5738	1.8301	-0.4770	-0.5348
Panel C: Expanding Approach with Conditional Betas					
0.0137	0.0044	0.0017	-0.0092	0.0174	-
2.3424	0.8341	0.2194	-1.1179	1.2129	-
0.0157	-	-	-	-	-0.0508
2.4350	-	-	-	-	-1.0358
0.0134	0.0029	0.0001	-0.0089	0.0207	0.0034
2.3954	0.5799	0.0142	-1.0992	1.6036	0.5700
Panel D: Rolling Approach with Conditional Betas					
0.0116	0.0018	0.0068	-0.0015	0.0016	-
2.1481	0.3601	1.2036	-0.2933	0.2075	-
0.0157	-	-	-	-	-0.0508
2.4350	-	-	-	-	-1.0358
0.0103	0.0022	0.0058	-0.0029	0.0027	0.0027
1.9759	0.4665	1.0424	-0.5991	0.4009	0.6470

This table displays the cross-sectional regression results of excess Fama-French portfolio returns on factor betas, and the “fit” from July,1989 to May,2021. The monthly coefficients with t-ratios below are presented. For conditional betas, interaction terms between factors and information variables are included in the model as independent variables. Betas are estimated using two approaches: expanding and rolling. The expanding approach adds one month of data for each subsequent regression, using the previous 60 months initially. The rolling approach uses a 60-month rolling window. The "fit" represents the fitted expected return from regressing excess portfolio returns on conditional information variables. $\gamma 0$ is the average constant premium, while the remaining columns denote corresponding factor premiums.

Table 4B: Time-Varying Risk Premia on Factors

γ_0	γ_1 (mkt)	γ_2 (smb)	γ_3 (hml)	γ_4 (mom)	γ_5 (fit)
Panel A: Expanding Approach					
0.0108	0.0071	0.0012	-0.0028	-0.0030	-
0.9669	0.6419	0.2338	-0.3699	-0.4308	-
0.0181	-	-	-	-	-0.0161
10.6611	-	-	-	-	-0.4634
0.0127	0.0047	0.0019	-0.0033	-0.0025	-0.0162
1.1391	0.4149	0.3515	-0.4218	-0.3576	-0.4353
Panel B: Rolling Approach					
0.0112	0.0080	-0.0002	-0.0011	0.0087	-
1.3478	0.9737	-0.0553	-0.2381	1.3674	-
0.0181	-	-	-	-	-0.0161
10.6611	-	-	-	-	-0.4634
0.0136	0.0052	-0.0002	-0.0017	0.0075	-0.0404
1.5992	0.6195	-0.0541	-0.3597	1.1645	-1.0540
Panel C: Expanding Approach with Conditional Betas					
0.1128	-0.0874	-0.0088	-0.0398	0.0103	-
2.1291	-1.7816	-0.7849	-1.2728	0.4090	-
0.0181	-	-	-	-	-0.0161
10.6611	-	-	-	-	-0.4634
0.0798	-0.0500	-0.0338	-0.0070	-0.0120	-0.1249
2.6795	-2.0039	-1.9088	-0.5195	-0.4727	-1.1653
Panel D: Rolling Approach with Conditional Betas					
-0.0404	0.0533	-0.0040	-0.0062	-0.0499	-
-0.8430	1.2880	-0.4396	-0.4805	-0.7930	-
0.0181	-	-	-	-	-0.0161
10.6611	-	-	-	-	-0.4634
0.0180	0.0014	0.0008	-0.0234	0.0098	0.0075
0.8481	0.0645	0.0949	-1.7905	0.6247	0.1173

This table displays the cross-sectional regression results of excess industry portfolio returns on factor betas, and the “fit” from July,1989 to May,2021. The monthly coefficients with t-ratios below are presented. For conditional betas, interaction terms between factors and information variables are included in the model as independent variables. Betas are estimated using two approaches: expanding and rolling. The expanding approach adds one month of data for each subsequent regression, using the previous 60 months initially. The rolling approach uses a 60-month rolling window. The "fit" represents the fitted expected return from regressing excess portfolio returns on conditional information variables. $\gamma 0$ is the average constant premium, while the remaining columns denote corresponding factor premiums.

Table 5A: Time-Varying Risk Premia on Characteristics

γ_0	γ_1 (β_{mkt})	γ_2 (lnSize)	γ_3 (ln(B/M))	γ_4 (fit)
Panel A: Expanding Approach				
0.1076	0.0040	-0.0358	0.0024	-
2.8538	0.2891	-2.4726	1.5158	-
0.0157	-	-	-	-0.0508
2.4350	-	-	-	-1.0358
0.1221	0.0012	-0.0393	0.0028	-0.0253
2.9225	0.0831	-2.5453	1.6352	-0.4271
Panel B: Rolling Approach				
0.1179	0.0022	-0.0387	0.0020	-
2.6672	0.2337	-2.3848	1.1756	-
0.0157	-	-	-	-0.0508
2.4350	-	-	-	-1.0358
0.1324	0.0002	-0.0426	0.0024	-0.0490
2.8087	0.0248	-2.5216	1.3567	-0.8498
Panel C: Expanding Approach with Conditional Betas				
0.0832	-0.0003	-0.0257	0.0006	-
1.6685	-0.0166	-1.4366	0.2904	-
0.0157	-	-	-	-0.0508
2.4350	-	-	-	-1.0358
0.0982	0.0028	-0.0315	0.0008	-0.0184
1.8230	0.1607	-1.6664	0.3021	-0.2729
Panel D: Rolling Approach with Conditional Betas				
0.0713	-0.0104	-0.0176	0.0014	-
1.4802	-0.8785	-0.9615	0.6784	-
0.0157	-	-	-	-0.0508
2.4350	-	-	-	-1.0358
0.0625	-0.0118	-0.0136	0.0014	-0.0728
1.2675	-0.9415	-0.7367	0.6453	-1.2262

This table presents the regression results of excess Fama-French portfolio returns on the market factor beta (β_{mkt}), natural logarithms of size (lnSize), book-to-market ratio (ln(B/M)) and the "fit" from July,1989 to May,2021. The monthly coefficients with t-ratios below are presented. For conditional betas, interaction terms between factors and information variables are included in the model as independent variables. Betas are estimated using two approaches: expanding and rolling. The expanding approach adds one month of data for each subsequent regression, using the previous 60 months initially. The rolling approach uses a 60-month rolling window. The "fit" represents the fitted expected return from regressing excess portfolio returns on conditional information variables. $\gamma 0$ is the average constant premium, while the remaining columns denote corresponding factor premiums.

Table 5B: Time-Varying Risk Premia on Characteristics

γ_0	γ_1 (β_{mkt})	γ_2 (lnSize)	γ_3 (ln(B/M))	γ_4 (fit)
Panel A: Expanding Approach				
-0.0137	-0.0012	0.0134	0.0012	-
-0.4261	-0.1145	0.9915	0.4470	-
0.0181	-	-	-	-0.0161
10.6611	-	-	-	-0.4634
-0.0120	-0.0047	0.0134	0.0012	0.0060
-0.3663	-0.4160	0.9754	0.4104	0.1669
Panel B: Rolling Approach				
-0.0036	0.0002	0.0088	0.0004	-
-0.1130	0.0244	0.6910	0.1334	-
0.0181	-	-	-	-0.0161
10.6611	-	-	-	-0.4634
-0.0031	-0.0021	0.0090	0.0000	0.0011
-0.0942	-0.2783	0.6813	0.0176	0.0299
Panel C: Expanding Approach with Conditional Betas				
-0.0207	0.0064	0.0128	-0.0017	-
-0.5455	0.6202	0.8351	-0.5563	-
0.0181	-	-	-	-0.0161
10.6611	-	-	-	-0.4634
-0.0285	0.0025	0.0177	-0.0009	-0.0207
-0.7314	0.2378	1.1221	-0.2913	-0.4672
Panel D: Rolling Approach with Conditional Betas				
-0.0141	0.0050	0.0106	-0.0014	-
-0.3736	0.5570	0.7243	-0.4386	-
0.0181	-	-	-	-0.0161
10.6611	-	-	-	-0.4634
-0.0085	0.0044	0.0090	-0.0013	-0.0110
-0.2236	0.4926	0.6047	-0.4011	-0.2786

This table presents the regression results of excess industry portfolio returns on the market factor beta (β_{mkt}), natural logarithms of size (lnSize), book-to-market ratio (ln(B/M)) and the “fit” from July,1989 to May,2021. The monthly coefficients with t-ratios below are presented. For conditional betas, interaction terms between factors and information variables are included in the model as independent variables. Betas are estimated using two approaches: expanding and rolling. The expanding approach adds one month of data for each subsequent regression, using the previous 60 months initially. The rolling approach uses a 60-month rolling window. The "fit" represents the fitted expected return from regressing excess portfolio returns on conditional information variables. γ0 is the average constant premium, while the remaining columns denote corresponding factor premiums.

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