Chapter

Firm-specific News and Anomalies

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Abstract

This study investigates the relation between idiosyncratic volatility and future returns around the firm-specific news announcements in the Korean stock market from July 1995 to June 2018. The excess returns of decile portfolios that are formed by sorting the stocks based on news and non-news idiosyncratic volatility measures. The Fama and French three-factor model is also examined to see whether systematic risk affects news and non-news idiosyncratic volatility profits. The pricing of our news and non-news idiosyncratic volatility are confirmed in the cross-sectional regression using the Fama and MacBeth method. Market beta, size, book to market, momentum, liquidity, and maximum return are controlled to determine robustness. Our empirical evidence suggests that the pricing of the non-news idiosyncratic volatility is more strongly negative compared to the news idiosyncratic volatility, which is contrary to the limited arbitrage explanation for the negative price of the idiosyncratic volatility. We find that the non-news idiosyncratic volatility has a robust negative relation to returns in non-January months. Macro-finance factors drive the conditioned on the missing risk factor hypothesis, the pricing of idiosyncratic volatility. This study contributes to a better understanding of the role of the conditional idiosyncratic volatility in asset pricing. As the Korean stocks provide a fresh sample, our non-U.S. investigation delivers a useful out-of-sample test on the pervasiveness of the non-news volatility effect across the emerging markets.

Keywords: idiosyncratic volatility, news idiosyncratic volatility, firm-specific news, macro-finance factors, Korea
JEL classification: G12, G17, G12

1. Introduction

Idiosyncratic volatility (IV) has been recently well documented in the field of empirical finance. However, empirical results on the nature of the idiosyncratic volatility and future return are mixed and show the significantly negative to the insignificant or significant positive relationship (see [1–6]). Of these studies on the relationship between IV and expected returns, Ang et al. [1, 7] have received a lot of attention. Thus, a large number of studies have been trying to solve the IV puzzle, such as missing risk factor [8, 9], lottery preference [10], limited arbitrage [11], Liquidity and microstructure issues [12]; Lag and expected IV [3], and influence of macroeconomic and financial variables [13].

More recently, the short-sale constraints were reported to keep an important role in the IV puzzle explanation [11]. This is the most promising interpretation of the negative price relation and the "mispricing-correction" stemming from the idiosyncratic volatility limited arbitrage. However, the mispricing correction hypothesis cannot sufficiently resolve the deep idiosyncratic volatility puzzle as the firm-specific news moves prices and the news announcements should increase the likelihood of mispricing [14]. Moreover, high mispricing should focus on stocks with great idiosyncratic volatility because of the limited arbitrage effect [11]. Consequently, the idiosyncratic volatility relative to the firm-specific news should be strongly negatively priced compared to the idiosyncratic volatility without the effect of firm-specific news. However, regarding the empirical tests, results reported by DeLisle et al. [14] are reverse of the mispricing correction hypothesis for the negative price of idiosyncratic volatility, stating that the non-news volatility is priced more strongly than news volatility. In addition, the non-news volatility is strongly significantly negative, which seems to violate the established features of the mispricing correction hypothesis.

On the other hand, the realized idiosyncratic volatility is believed to exist due to a risk factor that is neglected in the Fama and French [15] three factors model [16]. Additionally, the stock volatility and the macroeconomy are mentioned to be strongly related. In particular, Chen et al. [17] and Ferson and Harvey [18] propose that the term structure spread, inflation, industrial production, and spread of bonds are significant risk factors for the US stock market. Added to this, Shi et al. [19] postulate that the perceived negative IV-expected return relation can be the artifact of the confounding effect of public news arrivals. More recently, the negative relation between expected idiosyncratic volatility and stock returns are proved to reverse to a positive relationship when accounting for the macro-finance effects [13]. However, the IV around the firm-specific news return, which is not considered by DeLisle et al. [14], still remains highly statistically significant in all sample periods.

Motivated by these above discussions, in this study, the relationship between the idiosyncratic volatility and future returns around the firm-specific news announcements is examined in the Korean stock market. Based on this examination, the sufficiency of the limited arbitrage explanation of the pricing of idiosyncratic volatility can be evaluated. In particular, the pricing of idiosyncratic volatility news and no-news regarding the mispricing correction hypothesis will be examined as mention above. Next, portfolio analysis will be performed to understand whether idiosyncratic volatility is driven by some systematic variations, such as the macro-finance variables.

The Korean stock market can be regarded as an ideal setting to study the idiosyncratic volatility. The demand for IV is largely driven by individual investors than institutional investors [20]. The Korean market is driven by individual investors [21] and most of the explanations in the US market cannot be applied well in some emerging stock markets, such as China and South Korea [22]. Added to this, the test out-of-sample will be performed in one of the emerging equity markets characterized by its high volatility [23].

To test the hypotheses empirically, the firm-specific news is defined as a public announcement or declaration of 22 types of events. Following DeLisle et al. [14], the IVnews is defined as the idiosyncratic volatility around the firm-specific news announcements and the IVnonews is the idiosyncratic volatility unrelated to the firm-specific news announcements. Since the firm-specific news may fluctuate stock prices, news announcements should increase the likelihood of mispricing. Thus, we expect to see the stronger effect of IVnews compared to IVnonews in the empirical test.

From the empirical results, by conducting portfolio-level analysis and Fama and MacBeth [24] regressions, the IVnonews is found to be more strongly negatively associated with future returns, rather than the IVnews. The results from univariate portfolio sorting analysis show that the monthly equal-weighted (value-weighted) Fama and French [15] three-factor alpha on the high-minus-low (H-L) IVnonews portfolio is −0.0182 (−0.0179) with a Newey-West *t*-statistics of −5.09 (−5.11), while IVnews is not priced. This observation is consistent with that of DeLisle et al. [14] in the US market and is robust after controlling for several well-known predictors, such as market beta, book-to-market ratio, momentum, liquidity, and maximum return. The relationship between IVnonews and future returns is statistically significantly and economically negative, indicating that the pricing of idiosyncratic volatility must be driven by some factor that is beyond the limited arbitrage.

For further empirical tests related to the IVnonews characteristics, first, given the January seasonality in the monthly idiosyncratic volatility found by Peterson and Smedema [25], we examine the seasonality in the pricing of IVnonews. As a result, the IVnonews has a significantly positive and negative relation to the return in January and non-January months, respectively. In addition, motivating by recently empirical findings, such as Chen and Petkova [8] and Aslanidis et al. [13], the explanation of the IVnonews anomaly is also investigated based on the missing risk factor hypothesis. In more detail, we examine whether the more recent asset-pricing model of Fama and French [26] and macro-finance risk factors can price the portfolios formed on IVnonews relative to the Fama and French [15] three-factor model. For the construction of the macro-finance variables, we follow the recent trend in the financial literature exploiting information obtained from a large amount of macro-finance variables in predicting the asset returns (e.g., [27, 28]). The macro-finance factors are then constructed from a large set of macroeconomic and financial variables by using the first principal component of the variables in the group.

Consistent with the missing risk factor hypothesis and previous empirical findings, the IVnonews still exists after controlling for the Fama and French [26] five factors model. However, interestingly, results in this study show that the IVnonews is not priced conditional on the macro factors. Especially, the IVnonews coefficient attenuation is toward zero from the inclusion of macro-finance risk factors and is enough to eliminate the statistical significance. These observations indicate that the pricing of non-news volatility is driven by macro-finance factors. In other words, the macroeconomy can capture the common component in the idiosyncratic volatility [29].

The empirical results in the current study provide an important understanding of the idiosyncratic volatility puzzle on the asset pricing models, especially relative to the firm-specific news. First, this study empirically demonstrates the pricing of news and non-news idiosyncratic volatility in the Korean stock market. This finding is in line with that reported by DeLisle et al. [14] in the US market. Second, the limited arbitrage is also proved to not fully explain the negative relationship between IV and return in the Korean stock market. Third, the IVnonews is interpreted by considering the relationship between the idiosyncratic volatility and the macroeconomy.

The remainder of this study is organized in four sections: Section 2 addresses the dataset, variable constructions, and methodology; Section 3 presents the empirical test and reports the results; and the conclusion is provided in Section 4.

2. Data, variable constructions, and methodology

2.1 Data and variable constructions

The sample data used in this study is drawn primarily from the DataGuie database (http://dataguide.co.kr), containing the daily, monthly, and yearly data of all stocks listed and delisted in the Korean Stock Exchange (KSE) from July 1995 to June 2018. The financial firms, firms with a negative book value of equity, and other non-common stocks are excluded.

Following DeLisle et al. [14], we compute the monthly idiosyncratic volatility estimates with the daily data by applying the factors of Fama and French [15] three factors model, which is the excess market return (MKT), size (SMB), and book-to-market equity (HML). Specifically, the model can be defined as below (1), (2), and (3).

$$R_j = \alpha + \sum_{k=1}^{K} \gamma_{kj}\beta_k + \epsilon \tag{1}$$

$$\hat{i}_d = R_d - R_{fd} - \sum_{k=1}^{K} \gamma_{dk}\hat{\beta}_k \tag{2}$$

$$IV_{t-1} = \sqrt{\frac{30}{D_{t-1}}} \times \sqrt{\sum\nolimits_{d=1}^{D_{t-1}} \hat{i}_d^{\,2}} \tag{3}$$

In more detail, first, the stock's loading on the k^{th} factor is estimated in each month using the previous 60 months return data (from month t-61 to month t-2) following Eq. (1). A minimum of 36 months of valid returns is required during the study period. R_j is the excess return relative to the risk-free rate of month j, α represents the intercept of the month, γ_{kj} is the month j return of the k^{th} factor portfolio (k = 3, $\gamma_{MKTj}, \gamma_{SMBj}, \gamma_{HMLj}$), β_k is the stock's loading on the k^{th} factor ($\beta_{MKT}, \beta_{SMB}, \beta_{HML}$), and ϵ is a regression error term.

Then, we use the factor loading estimates in Eqs. (1) and (2) to estimate the daily idiosyncratic returns during month t-1. R_d is the raw return of the firm i in the day d, R_{fd} is the risk-free on day d, γ_{dk} is the day d return of the k^{th} factor portfolio (k = 3, $\gamma_{dMKT}, \gamma_{dSMB}, \gamma_{dHML}$), and $\hat{\beta}_k$ is an estimate of the stock's loading on the k^{th} factor ($\hat{\beta}_{MKT}, \hat{\beta}_{SMB}, \hat{\beta}_{HML}$). $\hat{i}_d$ is the estimate of day d idiosyncratic return. Finally, the stock idiosyncratic risk (IV) in Eq. (3) is measured in month t-1. D_{t-1} is the number of trading days in month t-1. $\hat{i}_d^2$ is square of the $\hat{i}_d$, estimated from Eq. (2). The scaling factor is selected as 30 because the potential for stocks has a different number of trading days in a month (we require a minimum of 15 trading days in a month to have a viable volatility estimate [1, 14]).

For the news and non-news idiosyncratic volatility measures, the firm-specific news is incorporated into the pricing of idiosyncratic volatility and the volatility is decomposed into the news and non-news volatility following Eqs. (4) and (5).

$$IVnews_{t-1} = \sqrt{\frac{30}{N_{t-1}}} \times \sqrt{\sum\nolimits_{d=1}^{D_{t-1}} \left(\eta_d \times \hat{i}_d^2\right)} \tag{4}$$

$$IVnonews_{t-1} = \sqrt{\frac{30}{D_{t-1} - N_{t-1}}} \times \sqrt{\sum\nolimits_{d=1}^{D_{t-1}} \left((1-\eta_d) \times \hat{i}_d^2\right)} \tag{5}$$

where N_{t-1} is the number of trading days during month $t-1$ in which the firm-specific news announcement occurs, η_d is an indicator variable that equal to 1 in case the firm-specific news announcement occurs in day d. Otherwise, the η_d is zero. We employ an eight-day window (N_t = 8) around the reported announcement date, except the case where the news announcement is made on the first or last day of a calendar month. For instance, for a given firm, when a firm-specific news announcement is made on day d, the days from d-3 to d + 4 over month t-1 are defined as event dates and η_d equals one.

For the other controlling variables, several standard controls variables are used, including market beta, size and book to market ratio following Fama and French [15], momentum returns (the cumulative return over months t-7 to t-2), the turnover following Han and Lesmond [12], and the maximum daily return during month t-1 following Bali et al. [10].

Table 1 shows the time-series average of the cross-sectional statistics of idiosyncratic volatility (IV), news idiosyncratic volatility (IVnews) and non-news idiosyncratic volatility (IVnonews). The mean, standard deviation, median, Q1, Q3, and number of the monthly stock observation of the volatility measures are computed in each month. Then, these five statistics are averaged across cross-sections.

As can be seen in **Table 1**, the news volatility, rather than the non-news volatility, is higher and more dispersed across stocks. The time-series means of the cross-sectional news volatility and the non-news volatility are 0.1415 and 0.1235, respectively. The standard deviations of the news volatility and the non-news volatility in the typical cross-section are 0.0937 and 0.0888, respectively.

A number of 22 types of firm-specific news are obtained from the DataGuie database. The firm-specific news is defined as a public announcement or declaration of 1) Capital introduction technology, 2) Cash dividends, 3) Chane of the sector, 4) Change business objective, 5) Change of CEO, 6) DR issuance, 7) Facility investment or resource, 8) Investor relation, 9) Lawsuit, 10) Paid in the capital, 11) Paid in incineration, 12) Reverse stock split, 13) Sale transfer, 14) Stock dividend, 15) Stock split, 16) Suspension of the business case, 17) Take overbid, 18) Tangible asset acquisition disposal, 19) Write-down of income, 20) Merge, 21) Gratuitous pay-off, and 22) Patent application.

Similar to Ludvigson and Ng [28], the macro-finance variables in the current study are primarily obtained from Datastream and DataGuie database. Then, a number of 118 macro-finance variables are classified into five groups, including employment and hours; interest rate and import–export; compensation and labor cost; sale; and price. Details concerning the macro-finance variables are described in Appendix A. For each macro-finance variable group, a macro-finance factor, which is the first principal component of the variables in the group, is constructed. On average, the macro-finance factors account for 78.13% and 87.45% of the total variation of the group, indicating that they provide strong information about the macro-finance variables.

Variable	Mean	Std Dev	Median	Q1	Q3
IV	0.1387	0.0847	0.1146	0.0795	0.1768
IVnews	0.1415	0.0937	0.1170	0.0810	0.1799
IVnonews	0.1235	0.0888	0.0997	0.0714	0.1491

This table shows the grand averages of several summary statistics of the main idiosyncratic volatility estimates, including the summary statistics of idiosyncratic volatility (IV), news idiosyncratic volatility (IVnews) and non-news idiosyncratic volatility (IVnonews). The summary statistics for each monthly cross-section are computed in the sample and then the equal-weighted average of these statistics is calculated. In this table, we only use the firm-months having a firm-specific news announcement in the previous month. Due to data requirements and availability, the sample period is from July 1995 to June 2018.

Table 1.
Summary statistics.

2.2 Methodology

Motivated by the results of DeLisle et al. [14], the portfolio-level analysis and Fama and MacBeth [24] cross-sectional regressions are conducted to directly investigate whether the relationship between idiosyncratic volatility and future returns around the firm-specific news announcements is priced in the Korean stock market.

First, the time-series portfolios are constructed to examine the relationship between the idiosyncratic volatility and future returns conditional on firm-specific news. At the beginning of each month, the IV, IVnews, and IVnonews are sorted independently into quintile portfolios. Then, the significance of the value-weighted (VW) and equal-weighted (EW) portfolio returns is calculated and tested. Finally, the zero-investment "high minus low" (H–L) portfolios along with their Newey-West adjusted *t*-statistics are constructed by buying a portfolio of stocks in the highest IV (IVnews, IVnonews) quintile and shorting the stocks in the lowest one. Furthermore, three-factor alphas of the H-L portfolio and their Newey-West adjusted *t*-statistics are reported as FF3 alpha. Therefore, the significance of the H-L portfolio return and FF3 alpha indicate the existence of IV, IVnews, and IVnonews effects.

The portfolio sorts, which are interpreted easily, do not impose a functional form on the relationship between IV (IVnews, IVnonews) and expected returns. Therefore, the pricing of our idiosyncratic volatility (IV, IVnews, IVnonews) is confirmed in the cross-sectional regression using the Fama and MacBeth [24] method. Particularly, the procedure for estimation of the cross-sectional impact of the IV, IVnews, IVnonews measures follows this regression:

$$R_{it} - R_{ft} = \alpha + \beta_{IVn} IVn_{it} + \beta_{Xt} X_{it} + \varepsilon_{it} \quad (6)$$

where R_{it} is the return of firm i in month t, R_{ft} is the month t risk-free rate and IVn_{it} is one of our three idiosyncratic volatility measures (n = 1,2,3). X_{it} denotes a vector of control variables specific to firm i in month t. In all cross-sectional regressions, X_{it} is regarded as X_{it} = [BETA, LOGME, LOGBM, MOM, REV, LIQ, MAX].

To address the seasonal effect of the negative risk–return relation, we examine the pricing power of IV in the separated sample: January and Non-January. However, we focus only on the IVnonews, considered as an IV anomaly. To estimate the January effect, only observations in January are used. On the contrary, the January observations are excluded for the estimation of the Non-January effect.

Next, a possibly missing factor is tested by considering the recently well-known factor model, such as Fama and French [26] five-factor model and Macro-finance factors. The returns of zero portfolios are regressed and measured relative to the IVnonews on the MKT, SMB, HML, RMW, and CMA or five groups of Macro-finance factors. These two specifications are estimated as below:

$$(H-L)_t = \alpha + \beta_{MKT} MKT_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{RMW} RMW_t + \beta_{CMA} CMA_t + e_t \quad (7)$$

$$(H-L)_t = \alpha + \beta_{MKT} MKT_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{RMW} RMW_t + \beta_{CMA} CMA_t + \beta_X X_{t-1} + e_t \quad (8)$$

where $(H\text{-}L)_t$ is the IVnonews return on the H-L portfolio in month t. The independent variables include MKT, SMB, HML, UMD, RMW, and CMA following

Fama and French [26]. X_{t-1} is the vector of Macro-finance factors at time t-1 as mentioned above.

3. Results

3.1 Pricing of the news and non-news idiosyncratic volatility

3.1.1 Univariate portfolio sort

The portfolio-level analysis is firstly conducted to investigate the relationship between the idiosyncratic volatility (as in [1]) or the news idiosyncratic volatility and the non-news idiosyncratic volatility (as in [14]) in the Korean stock market. Specifically, at the beginning of each month *t*-1, the stocks are sorted into quintiles based on their idiosyncratic volatility, news volatility, or non-news volatility. We then hold these quintile portfolios over month t and estimate the average portfolio returns and Fama and French [15] three-factor alphas in month t on equal-weighted (EW) and value-weighted (VW) basis. Then, a zero-cost portfolio, that is short for the lowest quintile portfolio and long for the highest quintile portfolio, is formed. Next, the time-series average of monthly returns and Fama and French [15] three-factor alphas are reported.

Table 2 shows the results of the value-weighted (VW) and equal-weighted (EW) returns on portfolios sorted based on the idiosyncratic volatility (IV in Panel A, IVnews in Panel B, and IVnonews in Panel C). The zero-investment portfolio

	L	2	3	4	H	H-L	FF3 Alpha
Panel A: Idiosyncratic Volatility – IV							
EW	0.0108**	0.0120**	0.0106*	0.0077	−0.0045	−0.0153***	−0.0162***
	(2.19)	(2.14)	(1.87)	(1.21)	(−0.63)	(−3.14)	(−4.73)
VW	0.0100**	0.0114**	0.0100*	0.0072	−0.0051	−0.0151***	−0.0159***
	(2.03)	(2.04)	(1.77)	(1.13)	(−0.72)	(−3.14)	(−4.75)
Panel B: News Idiosyncratic Volatility - IVNEWS							
EW	0.0119**	0.0148**	0.0032	0.0103	0.0101	−0.0018	0.0017
	(2.25)	(2.44)	(0.54)	(1.42)	(1.11)	(−1.04)	(1.09)
VW	0.0113**	0.0146**	0.0031	0.0102	0.0099	−0.0014	0.0024
	(2.16)	(2.39)	(0.52)	(1.43)	(0.11)	(−1.07)	(1.23)
Panel C: Non-News Idiosyncratic Volatility – IVNONEWS							
EW	0.0127**	0.0135**	0.0125**	0.0088	−0.0042	−0.0169***	−0.0182***
	(2.51)	(2.38)	(2.15)	(1.35)	(−0.56)	(−3.29)	(−5.09)
VW	0.0119**	0.0129**	0.0119**	0.0082	−0.0048	−0.0167***	−0.0179***
	(2.37)	(2.27)	(2.05)	(1.26)	(−0.66)	(−3.29)	(−5.11)

This table shows the average returns and Fama–French (1993) three-factor alphas for the idiosyncratic volatility sorted portfolios. In Panel A, the portfolios are formed based on idiosyncratic volatility. In Panel B (Panel C), the portfolios are formed based on the news (non-news) idiosyncratic volatility following DeLisle et al. [14]. In each month, all stocks are sorted into quintiles based on their idiosyncratic volatility in the last month and the portfolios are held for month t*. Finally, the average return and alphas in the equal weighting (EW) and value weighting (VW) portfolio scheme are reported. In the (H–L) column, the return is for a zero-investment portfolio, that is long the quintile of stocks with the highest idiosyncratic volatility and shorts the quintile of stocks with the lowest idiosyncratic volatility. The sample period is from July 1995 to June 2018. The Robust Newey–West* t*-statistics are given in parentheses. The statistical significance at the 1%, 5%, and 10% levels are marked by the ***, **, and * characters, respectively.*

Table 2.
Return on portfolios sorted on news and non-news idiosyncratic volatility.

returns, that are long the quintile of stocks with the highest idiosyncratic volatility and short the quintile of stocks with the lowest idiosyncratic volatility, are seen in the rightmost columns of **Table 2**. The Newey and West [30] adjusted *t*-statistic are reported in parentheses.

Panel A presents the EW and VW returns of portfolios sorted on IV. The returns are roughly decreasing in IV for both the VW and EW portfolios. The average returns (FF3 alpha) of the EW H–L portfolio and the VW H-L portfolio are −0.0153 (−0.0162) and − 0.0151 (−0.0159), respectively and significant at the 1% level, suggesting that the IV puzzle is confirmed in the Korean data sample. This result is consistent with that reported by Nartea et al. [21], Cheon and Lee [31]. Panel B of **Table 2** shows the sorted IVnews. The average portfolio returns are fluctuant in the idiosyncratic volatility for both the VW and EW portfolios. The returns (FF3 alpha) of the EW H–L portfolio and VW H-L portfolio are −0.0018 (0.0017) and − 0.0014 (0.0024), respectively and statistically insignificant with the t-statistic of −1.04 (1.09) and − 1.07 (1.23), respectively. In Panel C, the returns are fluctuation and decreasing in IVnonews for both the EW and VW portfolios. The EW H–L and VW H-L portfolio returns (FF3 alpha) are −0.0169 (−0.0182) and − 0.0167 (−0.0179), respectively and both of them are significant at the 1% level.

As seen in **Table 2**, the results of IV and IVnonews are similarly priced feature while those of the IVnews are not priced. These findings are not consistent with the limits of arbitrage explanation, meaning that the pricing of IVnews should be significant and stronger than the IVnonews. This result is also in line with that reported by DeLisle et al. [14].

3.1.2 Firm-level cross-sectional regressions

In the current study, the firm-specific news effect on the pricing of idiosyncratic volatility has been observed in the Korean stock market using a single portfolio sort method. However, the portfolio tests are limited by the number of control variables at one time [32]. Therefore, the Fama and MacBeth [24] cross-sectional regressions, which are necessary to control the large set of potential covariates, are performed as a robustness test. Based on this test, we can re-examine the pricing of news and no-news idiosyncratic volatility in the firm-level regression and control other relevant variables affecting the pricing of news and no-news idiosyncratic volatility in the cross-section of stock returns. The control variables are size, book-to-market ratio [15], momentum, turnover [33], and maximum return [10]. The results are present in **Table 3**.

As seen in Model 1, the coefficient on IV is negative (−0.1769) and significant at 1% level (*t*-statistics of −4.02). The average slope of IV remains negative and statistically significant in Model 1, indicating that none of the control variables can explain the IV anomaly individually. This finding is consistent with that in previous studies [10, 34]. In Model 2, the coefficient of IVnews is positive (0.0074) and insignificant (*t*-statistics of 1.23), however, that of the IVnonews is negative (−0.0826) and significant at 1% level (*t*-statistics of −2.69). Moreover, the pricing of IVnews and IVnonews in Model 3 is same as that in Model 2. The predicting power of the other control variables is the same as that in Model 1, Model 3, and previous studies about the Korean stock market [21, 31].

As shown in **Tables 1** and **2**, there is no evidence of the predictive power of stock returns by IVnews. Nevertheless, a strong negative predicted power of the IVnonews, which cannot be eliminated by the other control variables, is observed in the Korean stock market. This finding is in line with that of the portfolio analysis and those in the US market [14], suggesting that the IVnonews is strongly priced in the Korean stock market. This result also indicates that the mispricing correction hypothesis is not sufficient to resolve the deep idiosyncratic volatility puzzle.

MODEL	IV	IVnews	IVnonews	BETA	LOGME	LOGBM	MOM	REV	LIQ	MAX
1	−0.1769***			0.0008	−0.0055***	0.0060***	−0.0019	0.0048	−0.0307***	0.0048
	(−4.02)			(0.49)	(−3.86)	(3.72)	(−0.41)	(1.59)	(−4.23)	(1.59)
2		0.0074	−0.0826***							
		(1.23)	(−2.69)							
3		0.0114	−0.1630***	0.0010	−0.0057***	0.0060***	−0.0020	0.0043	−0.0316***	0.0043
		(1.43)	(−4.34)	(0.58)	(−3.99)	(3.68)	(−0.42)	(1.45)	(−4.33)	(1.45)

*In this table, we present the coefficient estimates and t-statistics from the Fama-MacBeth (1973) cross-sectional regressions of individual stock excess returns on the listed variables. Model 1 is regression models with the idiosyncratic volatility and the other control variables. Model 2 is regression models with the news idiosyncratic volatility and the non-news idiosyncratic volatility. Model 3 is regression models with both news and non-news idiosyncratic volatility and the other control variables, including size, the book to market, momentum, liquidity, and maximum return. The sample period is from July 19,955 to June 2018. The Robust Newey–West t-statistics are given in parentheses. The statistical significance at the 1%, 5%, and 10% levels are marked with the ***, **, and * characters, respectively.*

Table 3.
The pricing of news and non-news idiosyncratic volatility in cross-sectional regressions.

3.2 Additional test

3.2.1 Seasonality in pricing of non-news idiosyncratic volatility

The January seasonality is reported to affect the relations between idiosyncratic volatility and future returns [25]. Therefore, in this part, the effect of seasonality on the relationship between IVnonews and return is also investigated in the Korean stock market. To address the seasonality, the average returns and risk-adjusted alpha (FF3) are calculated in only January (Panel A of **Table 4**) and non-January (Panel B of **Table 4**). The results of the portfolio-level analysis are also reported in **Table 4**.

In panel A, the stocks are sorted based on the IVnonews for only the January data. The portfolio returns fluctuate and both of the VW and EW H–L portfolio returns, as well as the FF3 alpha, are positive and significant. Particularly, the return of the EW (VW) H–L portfolio is 0.0251 (0.0252) and significant at the 5% level (5% level), whereas that of the EW (VW) FF3 portfolio is 0.0124 (0.0122) with the *t*-statistics of 1.95 (1.92).

Panel B reports results for the non-January data, which is expected to observe the strongly negative IVnonews. The results show that the returns monotonically decrease in the IVnonews for the VW and EW portfolios. In particular, the EW (VW) H–L portfolio return and the EW (VW) FF3 alpha portfolio return are −0.0206 (−0.0205) and − 0.204 (−0.0200), respectively and significant at the 1% (1%) level. Furthermore, the average return in **Table 4** is stronger compared to that in **Table 2**. The negative predicting power of IVnonews is strong and robust to the value weighting and equal weighting outside of January month. In general, these results are consistent with those reported by Peterson and Smedema [25] for the idiosyncratic volatility analysis, and DeLisle et al. [14] for the non-news idiosyncratic volatility in the US market.

	L	2	3	4	H	H-L	FF3 alpha
Panel A: January – IVnonews							
EW	0.0375*	0.0612**	0.0581**	0.0711**	0.0626**	0.0251**	0.0124*
	(1.67)	(2.04)	(2.31)	(2.51)	(2.66)	(2.26)	(1.95)
VW	0.0368	0.0604**	0.0580**	0.0706**	0.0620**	0.0252**	0.0122*
	(1.62)	(2.01)	(2.25)	(2.50)	(2.64)	(2.26)	(1.92)
Panel B: Non-January - IVnonews							
EW	0.0105**	0.0092	0.0084	0.0032	−0.0101	−0.0206***	−0.0204***
	(1.89)	(1.46)	(1.30)	(0.45)	(−1.27)	(−3.61)	(−5.43)
VW	0.0097*	0.0087	0.0078	0.0026	−0.0108	−0.0205***	−0.0200***
	(1.73)	(1.36)	(1.19)	(0.36)	(−1.36)	(−3.61)	(−5.49)

This table shows the average returns and Fama–French (1993) three-factor alphas for the non-news idiosyncratic volatility sorted portfolios. In Panel A (Panel B), we form portfolios based on the non-news idiosyncratic volatility in January (Non-January). In each month, all stocks are sorted into quintiles based on their idiosyncratic volatility in the last month and the portfolios are held for month t*. Finally, we report the average return and alphas in the equal weighting (EW) and value weighting (VW) portfolio scheme are reported. In the (H–L) column, the return is for a zero-investment portfolio, which is long the quintile of stocks with the highest idiosyncratic volatility and short the quintile of stocks with the lowest idiosyncratic volatility. The sample period is from July 1995 to June 2018. The Robust Newey–West* t*-statistics (estimated with six lags) are given in parentheses. The statistical significance at the 1%, 5%, and 10% levels are marked with the ***, **, and * characters, respectively.*

Table 4.
Seasonality return of portfolios sorted on non-news idiosyncratic volatility.

3.2.2 The non-news idiosyncratic volatility and missing risk factors

In this section, the time-series alphas are estimated for the zero-investment portfolios of the non-news idiosyncratic volatility measured by DeLisle et al. [14] mothed. We present the time-series results from regressing the VW (EW) H–L IVnonews portfolio returns based on the five control variables (i.e., MKT, SMB, HML, RMW, and CMA as in [26]), and the Macro-finance variables [13], for further details consult **Tables 6** and **7** in the Appendix. The procedure for portfolio construction is the same as that reported in **Table 2**.

For the FF5 alpha results, the results shown in **Table 5** are almost the same as those in **Tables 2** and **4**. The strongly negative time-series alphas are found in all months and non-January months after controlling for Fama and French [26] five factors model. The pricing power of the IVnonews is negatively stronger in the non-January months compared to the other months. For instance, the EW (VW) FF5 alpha in all months is −0.0180 (−0.0176) and significant at the conventional level, while those in the months excluding January is −0.0203 (−0.0210) with t-statistics of −5.44 (−5.49).

Next, we are interested in controlling for the macro-finance variables following Aslanidis et al. [13] findings. Regarding the results of the Macro-finance panel, the time series alpha is toward zero when the Macro-finance variables are included. Additionally, the time series alpha is strong enough to eliminate the statistical significance, suggesting that the IVnonews in the Korean stock market can be explained by the Macro-finance variables. Added to this, these coefficients are lower than their corresponding values in the FF5 alpha as well as in **Tables 2** and **4**. These observations reflect that the pricing of IV is driven by the macro variables, which is also consistent with the findings reported by Goyal and Welch [27], Aslanidis et al. [13].

	FF5 Alpha		**Macro-finance**	
	EW portfolios	**VW portfolios**	**EW portfolios**	**VW portfolios**
All months	−0.0180***	−0.0176***	−0.0120	−0.0143
	(−5.09)	(−5.11)	(−0.97)	(−1.01)
January	0.0126*	0.0129*	0.0553	0.0573
	(1.95)	(1.95)	(0.99)	(1.01)
Non-January	−0.0203***	−0.0210***	−0.0151	−0.0169
	(−5.44)	(−5.49)	(−0.90)	(−0.97)

This table presents the estimated alphas from the return regressions of the IVnonews zero-investment portfolios. In each month, all stocks are sorted into quintiles based on the IVnonews in the last month and the portfolios are held for month t*. Finally, the estimated alphas in the equal weighting (EW) and value weighting (VW) portfolio scheme are reported. The returns of each portfolio are regressed on two specifications of the risk factor model. This procedure follows the below Equation.*

$(H—L)_t = \alpha + \beta_{MKT}MKT_t + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \beta_{RMW}RMW_t + \beta_{CMA}CMA_t + e_t$ (1)

$(H—L)_t = \alpha + \beta_{MKT}MKT_t + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \beta_{RMW}RMW_t + \beta_{CMA}CMA_t + \beta_X X_{t-1} + e_t$ (2)

The first specification, the Fama and French [26] factors, is illustrated in Eq. (1). MKT is the excess market return of the KOSPI index in the Korean stock market. SMB (HML) is the return on a value weight portfolio that is long a portfolio of small (value) stocks and short a portfolio of large (growth) stocks. Following Fama and French [26], RMW (Robust Minus Weak) is the average return of the two robust operating profitability portfolios minus the average return of the two weak operating profitability portfolios; CMA (Conservative Minus Aggressive) is the average return of the two conservative investment portfolios minus the average return of the two aggressive investment portfolios. X_{t-1} *is a set of five macro-finance variables defined in the methodology section. The sample period is from July 1995 to June 2018. The robust Newey–West* t*-statistics are given in parentheses. The statistical significance at the 1%, 5%, and 10% levels are marked with the ***, **, and *, characters, respectively.*

Table 5.
Return on the portfolios sorted on the non-news idiosyncratic volatility for the five-factor model and macro-finance variables.

The findings in this study are also supported by several recent empirical findings, such as the IV puzzle explanation based on the missing risk factor [1, 8]. Additionally, this study also indicates that the common component, existing in the idiosyncratic volatility [29], is related to the macro-finance variables.

4. Conclusions

This study investigates the effect of firm-specific news on the idiosyncratic volatility and future return relationship in the Korean stock market from July 1995 to June 2018. The results show that the non-news volatility relative to the firm-specific news, defined as in DeLisle et al. [14], is negatively priced and positively priced in the months excluding and including January, respectively. These findings are robust after controlling for several important factors, such as market beta, size, book-to-market ratio, momentum, liquidity, and maximum return.

In addition, the effect of firm-specific news on the idiosyncratic volatility and future return relationship suggests that the usage of limited arbitrage content cannot fully support the interpretation of idiosyncratic volatility in the Korean stock market. The strong evidence of the significantly negative IVnonews is found, however, no evidence is observed for the IVnews in the Korean stock market. Thus, this study contributes to a better understanding of the role of the conditional idiosyncratic volatility in asset pricing. As the Korean stocks provide a fresh sample, our non-U.S. investigation delivers a useful out-of-sample test on the pervasiveness of the non-news volatility effect across the emerging markets.

Moreover, this study also shows that non-news volatility is driven by the macro-finance variables. The macro-finance factors are constructed from a large pool of macroeconomic and financial variables. This finding is confirmed by using different kinds of methods, including portfolio analysis and Fama and Macbeth [24] cross-sectional regression tests. These tests represent methods that aim to validate and qualify the data as well as the establishment of empirical evidence appropriate for the evaluation of the objectives.

Appendix: macro-finance variables

STT	VARIABLE	CODE
Employment and Hours		
1	KO ACTIVE POPULATION(LABOUR FORCE),ALL PERSONS(AGES 15 & OVER)	KOMLFT06R
2	KO ACTIVE POPULATION(LABOUR FORCE),FEMALES(AGES 15 & OVER) VOLA	KOMLFF06O
3	KO ACTIVE POPULATION(LABOUR FORCE),MALES (AGES 15 AND OVER) VOLA	KOMLFM06O
4	KO BOP: INCOME - COMPENSATION OF EMPLOYEES CURA	KOBPIEMNB
5	KO CALL MONEY/INTERBANK RATE NADJ	KOOIR060R
6	KO CIVILIAN LABOUR FORCE: TOTAL(DISC.) SADJ	KOOPL032Q
7	KO EMPLOYED REGULAR EMPLOYEES VOLN	KOEMPRGRP
8	KO EMPLOYED SELF-EMPLOYED WORKERS VOLN	KOEMPSELP
9	KO EMPLOYED TEMPORARY EMPLOYEES VOLN	KOEMPTPRP

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STT	VARIABLE	CODE
10	KO EMPLOYEES: TOTAL (HOUSEHOLD SURVEY)(DISC.) VOLA	KOOEM103O
11	KO EMPLOYEES: TOTAL VOLA	KOMLF007O
12	KO EMPLOYMENT - 15-19 YEARS OLD VOLN	KOEMPM15P
13	KO EMPLOYMENT - 20-29 YEARS OLD VOLN	KOEMPM20P
14	KO EMPLOYMENT - 30-39 YEARS OLD VOLN	KOEMPM30P
15	KO EMPLOYMENT - 40-49 YEARS OLD VOLN	KOEMPM40P
16	KO EMPLOYMENT - 50-59 YEARS OLD VOLN	KOEMPM50P
17	KO EMPLOYMENT - 60 YEARS OLD & OVER VOLN	KOEMPM60P
18	KO EMPLOYMENT - AGRICULTURE, FORESTRY, HUNTING & FISHING VOLN	KOEMPAGRF
19	KO EMPLOYMENT - FEMALE VOLN	KOEMPFEMP
20	KO EMPLOYMENT - MALE VOLN	KOEMPMALP
21	KO EMPLOYMENT - MANUFACTURING & MINING VOLN	KOEMPMANF
22	KO EMPLOYMENT - MANUFACTURING VOLN	KOEMPMANP
23	KO EMPLOYMENT VOLA	KOEMPTOTO
24	KO EMPLOYMENT, FEMALES (AGES 15 AND OVER) VOLA	KOMLFF12O
25	KO EMPLOYMENT, MALES (AGES 15 AND OVER) VOLA	KOMLFM12O
26	KO EMPLOYMENT, MFG, ALL PERSONS VOLA	KOMLF005O
27	KO HARMONIZED UNEMPLOYMENT RATE: ALL PERSONS(DISC.) SADJ	KOOUN014Q
28	KO HARMONIZED UNEMPLOYMENT: LEVEL, ALL PERSONS (ALL AGES) VOLA	KOMLFT15O
29	KO HOURS WORKED - ALL EMPLOYEES VOLN	KOHWRWEMP
30	KO LABOUR FORCE: ALL PERSONS(DISC.) VOLA	KOOPL032O
31	KO LABOUR MARKET - NUMBER OF WORKING DAYS VOLN	KOLMNOWDP
32	KO LAGGING INDEX: REGULAR EMPLOYEES NUMBER (%MOM)(DISC.) NADJ	KOCYLAE5R
33	KO UNEMPLOYMENT LEVEL: SURVEY-BASED (ALL PERSONS)(DISC.) VOLA	KOOUN010O
Interest rate and Import–Export		
34	BOND YIELDS FINANCIAL DEBENTURES(3YAA-)(%)	E11.02.003.012
35	BOND YIELDS GOVERNMENT BONDS(10Y)(%)	E11.02.003.021
36	BOND YIELDS GOVERNMENT BONDS(1Y)(%)	E11.02.003.013
37	BOND YIELDS GOVERNMENT BONDS(20Y)(%)	E11.02.003.031
38	BOND YIELDS GOVERNMENT BONDS(3Y)(%)	E11.02.003.008
39	BOND YIELDS GOVERNMENT BONDS(5Y)(%)	E11.02.003.014
40	BOND YIELDS KEP(3Y) BONDS(%)	E11.02.003.019
41	BOND YIELDS MONEY STAB. BONDS(%)	E11.02.003.009
42	BOND YIELDS MONEY STAB. BONDS(2Y)(%)	E11.02.003.016
43	BOND YIELDS MONEY STAB. BONDS(91 DAYS)(%)	E11.02.003.032
44	CALL RATES OVERNIGHT(%)	E11.02.003.003
45	COFIX RATE FOR NEW LOANS(%)	E11.02.003.034
46	COFIX RATE FOR OUTSTANDING LOANS(%)	E11.02.003.033

STT	VARIABLE	CODE
47	CORPORATE BONDS(3YBBB-)(%)	E11.02.003.020
48	KO BOP: GOODS(FOB) - EXPORTS CURA	KOEXPBOPB
49	KO EXPORT PRICE INDEX - BASIC METAL PRODUCTS NADJ	KOEXMBMTF
50	KO EXPORT PRICE INDEX - CHEMICAL PRODUCTS NADJ	KOEPIPCHF
51	KO EXPORT PRICE INDEX - COAL PRODUCTS & PETROLEUM PRODUCTS NADJ	KOEXCPPPF
52	KO EXPORT PRICE INDEX - ELECTRICAL EQUIPMENT NADJ	KOEXPEEEF
53	KO EXPORT PRICE INDEX - FABRICATED METAL PRODUCTS NADJ	KOEXMETPF
54	KO EXPORT PRICE INDEX NADJ	KOEXPPRCF
55	KO EXPORT PRICE INDEX-AGRICULTURAL, FORESTRY & MARINE PRODS. NADJ	KOEXAGRIF
56	KO EXPORTS FOB (CUSTOMS CLEARANCE BASIS) CURN	KOEXPGDSA
57	KO IMPORT PRICE INDEX NADJ	KOIMPPRCF
58	KO IMPORTS CIF (CUSTOMS CLEARANCE BASIS) CURN	KOIMPGDSA
59	KO INCOME TERMS OF TRADE INDEX NADJ	KOTOTPRCF
60	KO TRADE BALANCE (CUSTOMS CLEARANCE BASIS) CURN	KOVISGDSA
61	OVERNIGHT: INTERBANK DIRECT TRANSACTIONS(%)	E11.02.003.002
62	OVERNIGHT: INTERMEDIATED TRANSACTIONS(%)	E11.02.003.001
63	UNCOLLATERALIZED CALL RATES(ALL TRANSACTIONS)(%)	E11.02.003.004
64	YIELD ON CD(91 DAYS)(%)	E11.02.003.005
65	YIELD ON CP(91 DAYS)(%)	E11.02.003.017
66	YIELDS OF FINANCIAL DEBENTURES(%)	E11.02.003.010
67	YIELDS OF NATIONAL HOUSING BONDS TYPE1(5YR)(%)	E11.02.003.007
Compensations and Labour cost		
68	KO BOP: INCOME - COMPENSATION OF EMPLOYEES CURA	KOBPIEMNB
69	KO BOP: INCOME - COMPENSATION OF EMPLOYEES, CREDIT CURA	KOBPIEMCB
70	KO CURRENT A/C.: INCOME-DEBIT, COMPENSATION OF EMPLOYEE (DISC CURA	KOCUIDCEB
71	KO FOREIGN DIRECT INVESTMENT BY PURPOSE - LOW LABOR COST CURN	KOFDOPLLA
72	KO LCI: 12MONTH SMOOTHED CHANGES(DISC.) NADJ	KOCY1200R
73	KO MONTHLY EARN: MFG - PROXY(DISC.) SADJ	KOMLC007E
74	KO MONTHLY EARN: MFG(DISC.) SADJ	KOOLC009E
75	KO MONTHLY EARN: PRIVATE SECTOR(DISC.) SADJ	KOMLC034E
76	KO REAL EFFECTIVE FX RATE (REER) BASED ON UNIT LABOUR COSTS NADJ	KOI.RELF
Sale		
77	KO AVG MONTHLY DAYS WORKED- WHOLESALE & RETAIL TRADE (DISC.) VOLN	KODWRWROP
78	KO AVG.MONTHLY EARN.: FEMALE - WHSLE. & RETAIL TRADE(DISC.) CURN	KOERAFWRA
79	KO AVG.MONTHLY EARN.: MALE-WHSLE.& RETAIL,HOTELS & R (DISC.) CURN	KOERAMWHA

STT	VARIABLE	CODE
80	KO BOK BUSINESS SVY: DOM.SALES GROWTH-MANUFACTURING, ACTUAL NADJ	KOBSIDMPR
81	KO BOK BUSINESS SVY: EXPORTS GROWTH - MANUFACTURING, ACTUAL NADJ	KOBSIXMPR
82	KO BOK BUSINESS SVY: SALES GROWTH - ALL INDUSTRIES, ACTUAL NADJ	KOBSISAPR
83	KO BOK BUSINESS SVY: SALES GROWTH - MANUFACTURING, ACTUAL NADJ	KOBSISMPR
84	KO BOK BUSINESS SVY: SALES GROWTH-NON-MANUFACTURING, ACTUAL NADJ	KOBSISNPR
85	KO BOK BUSINESS SVY: SALES PRICE - MANUFACTURING, ACTUAL NADJ	KOBSIPMPR
86	KO BOK CONSUMER SVY: EXPECT.OF HSG.& SHOPPING CENTER,NEXT (D NADJ	KOCSEHSCR
87	KO BUS SALES VOLN	KOSLSBUSP
88	KO CAR SALES VOLN	KOSLSCARP
89	KO CENTRAL GOVT.FINANCE: CASH-LIABILITIES, TRANSACTI(DISC.) CURN	KOICC3LBA
90	KO COINCIDENT INDEX: RETAIL SALE INDEX (%MOM) NADJ	KOCYCORSR
91	KO DAYS WORKED PER MONTH - WHOLESALE & RETAIL TRADE (DISC.) VOLN	KODAYWHSP
92	KO EMPLOYMENT - WHOLESALE & RETAIL TRADE VOLN	KOEMPWREP
93	KO EMPLOYMENT-W'SALE., RETAIL TRADE, HOTELS & RESTAURANTS VOLN	KOEMPWRHP
94	KO EXPORTS - COMMODITIES & TRANSACTIONS NEC(DISC.) CURN	KOEXNECXA
95	KO FOREIGN DIRECT INVESTMENT BY IND-W'SALE. & RETAIL TRADE CURN	KOFDOWRTA
96	KO IMPORT OF COMMODITIES AND TRANSACTIONS, N.E.C(DISC.) CURN	KOOICOMMA
97	KO INDUSTRIAL INVENTORIES - MINING VOLA	KOIPMINFG
98	KO INDUSTRIAL SHIPMENTS - MINING VOLA	KOIPMINEG
99	KO LIGHT TRUCK SALES VOLN	KOSLSLTRP
Price		
100	KO CPI - EXCLUDING AGRICULTURAL PRODUCT & OIL NADJ	KOCPCOREF
101	KO CPI NADJ	KOCONPRCF
102	KO CPI: ALCOHOL BEVERAGES & TOBACCO NADJ	KOCPALTOF
103	KO CPI: CLOTHING & FOOTWEAR NADJ	KOCPCLFTF
104	KO CPI: COMMUNICATION NADJ	KOCPCOMMF
105	KO CPI: EDUCATION NADJ	KOCPEDCNF
106	KO CPI: FOOD & NON-ALCOHOL BEVERAGES NADJ	KOCPFDBVF
107	KO CPI: FURNISHINGS, HOUSEHOLD EQP.& ROUTINE HOUSEHOLD MAINTENANCE	KOCPFUHEF
108	KO CPI: HEALTH NADJ	KOCPHLTHF
109	KO CPI: HOUSING, WATER, ELECTRICITY, GAS & OTHER FUELS NADJ	KOCPHWEFF

STT	VARIABLE	CODE
110	KO CPI: MISCELLANEOUS GOODS & SERVICES NADJ	KOCPMSGSF
111	KO CPI: RECREATION & CULTURE NADJ	KOCPRECUF
112	KO CPI: RESTAURANTS & HOTELS NADJ	KOCPREHOF
113	KO CPI: TRANSPORT NADJ	KOCPTRNSF
114	KO DUBAI SPOT PRICE OF CRUDE OIL (US$/BBL) CURN	KODUBOILA
115	KO FOREIGN DIRECT INVESTMENT CURN	KOFDI...A
116	KO INFLATION RATE NADJ	KOCPANNL
117	KO KERI BSI: BUSINESS CONDITIONS, PROSPECTS NADJ	KOBUSCBCR
118	KO PPI NADJ	KOPROPRCF

Below we list the data used to construct the macro factors. The data are monthly and obtained from Datastream and DataGuie database from 1995 to 2018. The table presents a brief series description, series mnemonic (code).

Table 6.
Macro-finance variables.

	Average variation explained (%)	Average correlation coefficient
Employment and Hours	81.91	0.61
Interest rate and Import–Export	80.94	0.52
Compensations and Labour cost	78.13	0.49
Sale, Order, and Purchase	83.39	0.56
Price and Inflation	87.45	0.68

The table show the average proportion of variation in the underlying 118 indicators of macro-finance variables by using the method of principal component analysis. The second column is the average correlation coefficient of the factor with the other factors. The data are monthly and obtained from Datastream and DataGuie database from 1995 to 2018.

Table 7.
Descriptive statistics for macro-finance factors.

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