

“Foreign ownership and firm-level stock return volatility in Taiwan”

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FOREIGN OWNERSHIP AND FIRM-LEVEL STOCK RETURN VOLATILITY IN TAIWAN

Abstract

With the increasing presence of foreign investors and their importance in the stock markets, the authors investigate the effects of foreign ownership on stock return volatility by using Taiwanese firm-level data covering a period from 1994 to 2014. The results demonstrate that foreign ownership is negatively correlated with stock return volatility during the whole sample period, the so-called stabilizing effect. For the sub-sample test, this effect is the largest during the period 2002–2007, the years following Taiwan joins WTO. However, the stabilizing effect did not exist after the global financial crisis in 2008 and recent years. The results are also robust after correcting the potential endogeneity issue.

Keywords

foreign ownership, volatility, stabilizing effect

JEL Classification G32

INTRODUCTION

With the continuation of economic and financial liberalization in the world, the participation by foreign investors in the local market has increased over the years, as discussed and shown in a large amount of literature. Many countries open their capital markets and allow foreign investors to participate for some purposes such as to increase the supply of capital, reduce the cost of capital and finance economic growth (Bekaert & Harvey, 2000; Bekaert et al., 2001; Ramaswamy & Li, 2001; Li, Nguyen, Pham, & Wei, 2011), and thus also ensure liquidity and efficiency of these markets (Bekaert & Harvey, 2000). In addition, Stulz (1999) and Doidge, Karolyi, and Stulz (2004) provide evidence that foreign investors play a potential monitoring role and provide emerging market firms with the tools and incentives to improve corporate governance.

Despite the benefits of equity market liberation mentioned above, there are also opponents of international capital flows arguing the speculative short-term behavior of international capital likely to destabilize the stock market and increase its risk (Stiglitz, 1999; Bae, Chan, & Ng, 2004). More recently, there have been some empirical studies examining foreign ownership on firm-level stock return volatility, the so called stabilizing effect. The economic mechanism of this effect is due to increased risk sharing, and the improvement on the corporate governance, disclosure and operations from the foreign trading. However, the results in the existing literature are mixed, including Bae et al. (2004) and Chen, Du, Li, and Ouyang (2013), and document a positive impact of foreign ownership on firm-level stock return volatility. On the other hand, Li, Nguyen, Pham, and Wei (2011), Wang (2013) and Vo (2015) document a negative impact of foreign ownership on firm-level stock return volatility.

There were three stages of stock market liberalization in Taiwan. First, Taiwan opened its stock market in 1983 by attracting overseas funds to invest in the local market through domestic investment trust companies. Second, Qualified Foreign Institutional Investors (QFIIs) were allowed to invest directly in Taiwan stock market in 1991. Third, Taiwan removed almost all the limitations of foreign ownership when she joined the WTO in 2002. As shown in Table 1, the number of listed firms in the Taiwan Stock Exchange increased from 313 in 1994 to 854 in 2014, the total market value from NTD 6,504,368 million in 1994 to NTD 26,891,503 million in 2014. In addition, the percentage of market value held by foreign investors is 38.3% in 2014.

With the increasing importance of foreign investors in Taiwan stock markets, this study investigates whether foreign ownership would affect a firm's stock return volatility by using firm-level data covering a period from 1994 to 2014. Our results demonstrate that the coefficients of foreign ownership are significantly negative with stock return volatilities for the whole period, indicating that foreign ownership has a negative impact on stock return volatilities, even after controlling for, firm size, turnover, and leverage, and correcting for potential endogeneity problems. The result implies the stabilizing role of foreign investors in Taiwan stock markets.

To provide a more complete picture of the same issue, we also divide the whole period into two sub-periods: 1994 to 2001 (before Taiwan joining WTO) and 2002 to 2014 (after Taiwan joining WTO). Then, the latter period is further divided into three sub-periods: 2002 to 2007 (before global financial crisis), 2008 to 2009 (during global financial crisis) and 2010 to 2014 (after global financial crisis). Our results provide evidence that the stabilizing effect is significant during the sub-periods 1994–2001 and 2002–2007, and the effect is the largest during the period 2002–2007, the years following Taiwan joins WTO. However, there is no impact in the recent years after 2008, indicating no further stabilizing effect from foreign ownership since the 2008 global financial crisis.

The framework of this study is organized as follows: section 1 briefly introduces the literature related to foreign ownership on stock return volatility, section 2 details on the sample, variables and methodology, section 3 presents the results. Finally, last section concludes the study.

1. LITERATURE REVIEW

Bekaert and Harvey (1997) analyze the reasons that volatility is different across 20 emerging markets and demonstrate that the correlation between the local and world market returns increases through capital market liberalization. However, the volatility of local market does not increase.

Kim and Singal (2000) estimate changes in the level and volatility of stock return, inflation and exchange rate around market openings of 20 emerging stock markets. The results show that stock returns increase immediately after market opening without a concomitant increase in volatility.

By using firm-level data from 33 countries in the period 1993–2000, Bae et al. (2004) employ a cross-sectional approach to study the impact of foreign ownership on emerging market securities by ex-

amining the relation between a stock's investibility (the maximum allowable percentage of foreign holding) and its return volatility. Their results find a positive relation between return volatility and the investibility of individual stocks.

Li et al. (2011) construct a firm-level measure of large foreign ownership (LFO) and investigates its impact on stock return volatility in 31 emerging markets. They demonstrate a negative relationship between LFO and volatility and suggest a stabilizing role of LFO in emerging markets.

Chen et al. (2013) investigate the impact of foreign institutional ownership on firm-level stock return volatility in China between 1998 and 2008. The empirical results show that share ownership by foreign institutions increases firm-level stock return volatility due to poor governance practice and inadequate regulation in China.

Wang (2013) uses firm-level data in the period 1996–2000 and documents a negative relationship between foreign ownership and future volatility of Indonesian stocks. This calming effect of foreign ownership is present before, during, and after the 1997 Asian financial crisis, and the effect increases with the level of foreign holdings.

Vo (2015) examines the effects of foreign ownership on the firm-level volatility of stock returns in Vietnam for the period from 2006 to 2012. His empirical results show that foreign ownership decreases firm stock price volatility in Vietnam stock market, indicating the stabilizing role of foreign investors.

Some literature also suggests that foreign ownership may lead to lower volatility. (1) Since foreign ownership increases investor base, it may lead to greater risk sharing (Merton, 1987) and also reduces volatility (Wang, 2007). (2) Foreign investors are mainly institutional investors from developed countries and are better monitors (Khanna & Palepu, 1999). Stulz (1999) and Doidge, Karolyi, and Stulz (2004) provide evidence that foreign investors play a potential monitoring role and provide emerging market firms with the tools and incentives to improve corporate governance. Thus, the corporate governance and quality of disclosure of invested firms tend to improve, which again leads to lower volatility.

2. DATA AND METHODOLOGY

2.1. Data and research period

In this study, we use non-financial firms on Taiwan Stock Exchange and the data are from the TEJ (Taiwan Economic Journal) databank. The sample period covers from 1994 to 2014 with yearly data. Following the literature, financial firms are excluded due to many of their characteristics are very different from non-financials in business nature. In addition, we exclude firms with missing data and also those were broken up, rearranged, or merged during this period. Finally, all variables

are winsorized at their upper and lower 0.1% to mitigate the impact of outliers.

In addition to the whole period, we divide it into two sub-periods: 1994 to 2001 (before Taiwan joining WTO) and 2002 to 2014 (after Taiwan joining WTO). Then, since our sample also covers the 2008 global financial crisis, we further divide the second sub-period into three sub-periods to investigate in detail: 2002 to 2007 (before global financial crisis), 2008 to 2009 (during global financial crisis) and 2010 to 2014 (after global financial crisis).

2.2. Variables definition

VOL

VOL is firm-level annual volatility measure calculated through two ways, *VOL1* and *VOL2*, following Bae et al. (2004), Chen et al. (2013) and Vo (2015). Using daily stock price on the Taiwan Stock Exchange for the period from 1994 to 2014, we calculate the natural logarithm of squared daily return and standard deviation of daily stock returns, respectively, as follows:

$$VOL1_{i,t} = \frac{1}{n} \sum_1^n \ln(\text{return}_{i,k})^2, \quad (1)$$

$$VOL2_{i,t} = \sqrt{\frac{1}{n-1} \sum_1^n (\text{return}_{i,k} - MEAN_{i,t})^2}, \quad (2)$$

where $\text{return}_{i,k}$ is the daily return of stock i in day k , n is the number of trading days for stock i in a year, and $MEAN_{i,t}$ is the annual average of stock returns in year t of firm i .

FOREIGN

FOREIGN is foreign aggregate ownership, representing the proportion of total shareholdings by foreign investors in one particular firm's total number of shares¹.

¹ Due to the special relationship between Taiwan and China, the investments from China are regulated, and only QDIIs (Qualified Domestic Institutional Investors) from China are allowed to invest in Taiwan stock market, and the amounts are also limited. Many investments from Hong Kong and Macau are combined with some from China. However, it is difficult to distinguish each other. Thus, the figure of foreign and Chinese ownership does not separate from the official data provided by Taiwan Stock Exchange, and also a research limitation of this study.

2.3. Control variables

Following literature such as Chen et al. (2013), we use firm size, market to book ratio, leverage ratio and turnover as control variables.

(1) *SIZE*

SIZE is firm size, calculated by the natural logarithm of a firm's total assets at the end of the fiscal year.

(2) *MTB*

MTB is market to book ratio, calculated as the stock price divided by the book value per share of the firm at the year end.

(3) *LEV*

LEV is leverage ratio, which is the ratio of long-term liability to total equity at the end of the fiscal year.

(4) *TURNOVER*

TURNOVER is annual average number of shares traded in a day divided by the number of shares outstanding during the year. This variable is a proxy for the market growth expectation of stock.

2.4. Model and methodology

Our model is similar to Chen et al. (2013).

$$VOL_{i,t} = \beta_0 + \beta_1 \cdot FOREIGN_{i,t} + \beta_2 \cdot LEV_{i,t} + \beta_3 \cdot MTB_{i,t} + \beta_4 \cdot SIZE_{i,t} + \beta_5 \cdot TURNOVER_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where *VOL* is the annual volatility measure, including *VOL1* and *VOL2*, calculated by two definitions mentioned above, *FOREIGN* is foreign ownership, *SIZE* is firm size, *LEV* is firm leverage, *MTB* is market to book ratio, and *TURNOVER* is turnover ratio.

The model is firstly estimated using ordinary least squares (OLS) regression estimator. We then employ both fixed effects and random effects panel estimator.

To address the potential endogeneity issue, we also employ the dynamic GMM estimation of Arellano

and Bond (1991) and Holtz-Eakin et al. (1988) to investigate the dynamic relationship between foreign ownership and stock return volatility.

3. EMPIRICAL RESULTS

3.1. Descriptive statistics

We estimate the descriptive statistics of foreign ownership and firm characteristics from 1994 to 2014, as presented in Table 2. On average, foreign ownership is 9.04%. The mean values of *VOL1* and *VOL2* are -8.5358 and 0.0271, respectively. Table 2 also presents the correlation matrix of the main variables in order to check for multicollinearity. As shown in Table 2, the explanatory variables are not highly correlated with one another; that is, there is no serious problem of multicollinearity². The results of Table 2 provide evidence that stock return volatility is negatively correlated with foreign ownership for both *VOL1* and *VOL2*, indicating the stabilizing role of foreign ownership on stock return volatility. We also find that stock return volatility is negatively correlated with leverage ratio and firm size, and positively correlated with market to book value ratio and turnover.

In addition, foreign ownership is negatively correlated with leverage ratio and positively correlated with firm size and market to book ratio, indicating that foreigners prefer firms with large size and high growth rate; however, they tend to avoid firms with higher leverage ratio. With asymmetric information, foreign investors tend to have preferences for some firms specific attributes mentioned above (Kang & Stulz, 1997; Dahlquist & Robertsson, 2001; Lin & Shiu, 2003; Jiang & Kim, 2004). Our results from Table 2 are consistent with the arguments suggested by literature.

3.2. Results of OLS, panel least and GMM analysis

We employ OLS, fixed effects and random effects panel estimator. The Hausman tests suggest that the panel fixed effects estimation is preferred to the panel random effects estimation in our databank, and the results are also consistent with

² We also check the Variance Inflating Factor (VIF) of all variables in this study and find that VIFs are all below 10. Hence, the variables are not highly collinear by the rule of thumb.

those of the OLS estimator. To conserve space, we only report the panel fixed effects estimation as shown in Table 3.

Panel A of Table 3 presents the results of using *VOL1* as dependent variable. During the whole sample period, the coefficient of *FOREIGN* is -0.1498 , significantly negative with *VOL1*, indicating that firm-level foreign ownership reduces the stock return volatility. Panel B of Table 3 presents the results of using *VOL2* as dependent variable. During the whole sample period, the coefficient of *FOREIGN* is -0.0031 and insignificant. Both Panels A and B show that the coefficients of *SIZE* are significantly negative and *TURNOVER* are significantly positive, indicating that as firm size increases or turnover ratio decreases, the stock return volatility decreases. In sum, the results of Panel A and B using different proxies of *VOL* are quite similar.

We then divide the whole sample period into two sub-periods: 1994 to 2001 (before Taiwan joining WTO) and 2002 to 2014 (after Taiwan joining WTO). Panel A of Table 3 shows that the coefficients of *FOREIGN* are -0.1851 and -0.1564 , respectively. Both of the coefficients are significantly negative. Panel B of Table 3 shows that the coefficients of *FOREIGN* are -0.0043 and -0.0033 , respectively. The former coefficient is significantly negative, also indicating the stabilizing effect of stock return volatility from foreign investors. Comparing the coefficients, our results provide evidence that the stabilizing effect is larger before Taiwan joined WTO. As for the control variables, the coefficients of *MTB* are significantly positive during the first sub-period, the coefficients of *SIZE* are significantly negative during the second sub-period, and *TURNOVER* are significantly positive during both periods.

Since our sample also covers the 2008 global world financial crisis, we further divide the second sub-period into three sub-periods: 2002 to 2007 (before global financial crisis), 2008 to 2009 (during global financial crisis) and 2010 to 2014 (after global financial crisis). Panel A of Table 3 shows that the coefficient of *FOREIGN* during the period 2002 to 2007 is -0.3973 and significantly negative. However, the coefficients become insignificant in the periods 2008–2009 and 2010–2014. Panel B shows that the coefficient of *FOREIGN* during the period 2002 to 2007 is -0.0083 and significantly negative, and the coefficients also become insignificant in the periods 2008–2009 and 2010–2014. Again, most of the coefficients of *SIZE* are significantly negative and *TURNOVER* are significantly positive, indicating that as firm size increases or turnover ratio decreases then stock return volatility decreases.

For the comparison of the five sub-periods, the stabilizing effect of foreign investors is shown to be the largest during the period 2002–2007, that is, the period after Taiwan joined WTO and before the 2008 global financial crisis. However, the effect becomes insignificant after 2008.

To correct the potential endogeneity issue, we also employ the dynamic GMM as shown in Table 4. The results of GMM are consistent with those of Table 3 and confirm that foreign ownership is negatively correlated with stock return volatility after correcting for possible endogeneity problems. Also, the effect is the largest during the period 2002–2007, which indicates that a higher proportion of shares held by aggregate foreign investors contribute to a lower risk of corresponding company stock returns. Then, the effect disappears after 2008. Therefore, foreign investors play a stabilizing role in Taiwan stock market before the 2008 global financial crisis happened³.

CONCLUSION

By using non-financial firms listed on the Taiwan stock market as sample, this study aims to investigate the possible impact of foreign ownership on a firm's stock return volatility by implementing OLS, panel least regression, and GMM during the period 1994–2014.

³ Thanks for the reminder of reviewer, the sub-period studied in this paper is probably too short for GMM to yield reliable results. Despite this limitation, the results of panel least regression and GMM are quite similar and we would focus more on the GMM results while also acknowledging the potential limitation of the study (weak test power) caused by testing short sub-periods.

By using the whole sample period, our results demonstrate that foreign ownership has a significantly negative impact on stock return volatilities, the so-called stabilizing effect.

We also divide sample period into two sub-periods: 1994 to 2001 (before Taiwan joining WTO) and 2002 to 2014 (after Taiwan joining WTO). Then, we further divide the latter into three sub-periods: 2002 to 2007 (before financial crisis), 2008 to 2009 (during global financial crisis) and 2010 to 2014 (after global financial crisis) and compare the results. Our results demonstrate that the stabilizing effect is present during the sub-periods 1994 to 2001 and 2002–2007, and the latter has the largest negative effect of foreign ownership on stock return volatilities during the whole sample period. However, the stabilizing effect did not exist after 2008.

Table 1. Summary data of Taiwan stock market

Source: Taiwan Stock Exchange.

| Year | Number of listed companies | Number of shares listed (NTD million) | Total market value (NTD million) | Percentage of market value held by foreign investors (%) |
|------|----------------------------|---------------------------------------|----------------------------------|--|
| 1994 | 313 | 107,171 | 6,504,368 | 7.03 |
| 1995 | 347 | 132,462 | 5,108,437 | 9.32 |
| 1996 | 382 | 162,680 | 7,528,851 | 10.44 |
| 1997 | 404 | 206,632 | 9,696,113 | 11.15 |
| 1998 | 437 | 269,666 | 8,392,607 | 11.25 |
| 1999 | 462 | 305,654 | 11,803,524 | 16.37 |
| 2000 | 531 | 363,018 | 8,191,474 | 16.31 |
| 2001 | 584 | 406,400 | 10,247,599 | 19.83 |
| 2002 | 638 | 441,040 | 9,094,936 | 16.28 |
| 2003 | 669 | 470,551 | 12,869,101 | 22.57 |
| 2004 | 697 | 503,132 | 13,989,100 | 23.19 |
| 2005 | 691 | 538,995 | 15,633,858 | 31.84 |
| 2006 | 688 | 549,493 | 19,376,975 | 33.99 |
| 2007 | 698 | 555,864 | 21,527,298 | 32.94 |
| 2008 | 718 | 569,040 | 11,706,527 | 30.40 |
| 2009 | 741 | 577,290 | 21,033,640 | 31.89 |
| 2010 | 758 | 581,128 | 23,811,416 | 32.86 |
| 2011 | 790 | 602,677 | 19,216,183 | 32.34 |
| 2012 | 809 | 625,798 | 21,352,161 | 34.02 |
| 2013 | 838 | 648,800 | 24,519,560 | 34.63 |
| 2014 | 854 | 666,533 | 26,891,503 | 38.29 |

Table 2. Descriptive statistics and correlation coefficients

| Variable | MEAN | STD. | VOL1 | VOL2 | FOREIGN | LEV | MTB | SIZE | TURNOVER |
|----------|---------|--------|---------|---------|---------|---------|--------|--------|----------|
| VOL1 | -8.5358 | 0.8612 | 1.0000 | | | | | | |
| VOL2 | 0.0271 | 0.2003 | 0.1591 | 1.0000 | | | | | |
| FOREIGN | 0.0904 | 1.7500 | -0.1181 | -0.0211 | 1.0000 | | | | |
| LEV | 0.2119 | 0.1014 | -0.0012 | -0.0039 | -0.0038 | 1.0000 | | | |
| MTB | 1.3976 | 0.2539 | 0.2678 | 0.0188 | 0.0196 | -0.0126 | 1.0000 | | |
| SIZE | 15.6499 | 0.1295 | 0.0101 | -0.0179 | 0.0248 | 0.3044 | 0.0257 | 1.0000 | |
| TURNOVER | 2.0377 | 0.0798 | 0.4074 | 0.0544 | -0.0579 | -0.0017 | 0.4068 | 0.0097 | 1.0000 |

Table 3. Results of panel least regression (fixed effect)

| Panel A: VOL1 | | | | | | |
|--------------------|------------------------|---------------------------|------------------------|--------------------------------------|------------------------|------------------------|
| Variables | Whole period | Before /after joining WTO | | Before/during/after financial crisis | | |
| | 1994–2014 | (1) 1994–2001 | (2) 2002–2014 | (1) 2002–2007 | (2) 2008–2009 | (3) 2010–2014 |
| C | –8.6711*** (0.0534) | –8.2399*** (0.0925) | –8.7295*** (0.0900) | –8.6574*** (0.1317) | –7.9727*** (0.2163) | –9.1266*** (0.1465) |
| FOREIGN | –0.1498*** (0.0453) | –0.1851* (0.0947) | –0.1564*** (0.0506) | –0.3973*** (0.0767) | –0.0138 (0.1186) | –0.0037 (0.0803) |
| LEV | 0.0144 (0.0238) | 0.0279 (0.0411) | 0.0027 (0.0278) | –0.0084 (0.0404) | –0.0350 (0.0653) | 0.0272 (0.0458) |
| MTB | 0.0015 (0.0056) | 0.0248*** (0.0058) | –0.0675 (0.0655) | –0.0454 (0.0944) | –0.2378 (0.1670) | –0.0224 (0.1059) |
| SIZE | –0.0087** (0.0034) | 0.0034 (0.0059) | –0.0108*** (0.0040) | 0.0010 (0.0058) | –0.0158* (0.0091) | –0.0195*** (0.0066) |
| TURNOVER | 0.1376*** (0.0032) | 0.1042*** (0.0053) | 0.1445*** (0.0037) | 0.1194*** (0.0049) | 0.1349*** (0.0083) | 0.1945*** (0.0073) |
| Adjusted R-squared | 0.5292 | 0.3825 | 0.4498 | 0.3499 | 0.2579 | 0.2526 |
| F-statistic | 491.7676*** | 139.207*** | 413.1608*** | 197.8458*** | 78.8632*** | 134.9953*** |
| Panel B: VOL2 | | | | | | |
| C | 0.0328*** (0.0042) | 0.0273*** (0.0011) | 0.0389*** (0.0077) | 0.0295*** (0.0021) | 0.0338*** (0.0032) | 0.0503*** (0.0183) |
| FOREIGN | –0.0031 (0.0035) | –0.0043*** (0.0012) | –0.0033 (0.0043) | –0.0083*** (0.0012) | –0.0038 (0.0017) | 0.0012 (0.0100) |
| LEV | 0.0003 (0.0019) | 0.0005 (0.0005) | –6.32E–05 (0.0024) | 5.62E–05 (0.0006) | –0.0001 (0.0010) | 0.0001 (0.0057) |
| MTB | 1.31E–05 (0.0004) | 0.0002*** (7.17E–05) | –0.0043 (0.0056) | –0.0011 (0.0015) | –0.0012 (0.0024) | –0.0084 (0.0132) |
| SIZE | –0.0005* (0.0003) | 1.88E–05 (7.25E–05) | –0.0006* (0.0003) | –0.0001 (9.29E–05) | –0.0002 (0.0001) | –0.0013 (0.0008) |
| TURNOVER | 0.0011*** (0.0003) | 0.0009*** (6.52E–05) | 0.0012*** (0.0003) | 0.0011*** (7.86E–05) | 0.0014*** (0.0001) | 0.0011 (0.0009) |
| Adjusted R-squared | 0.0110 | 0.4584 | 0.0075 | 0.1822 | 0.1460 | 0.0022 |
| F-statistic | 5.8445*** | 189.8070*** | 4.8159*** | 81.2618*** | 38.1088*** | 0.8654 |

Notes: *, **, *** denote significance at the 10%, 5%, 1% level. Figure in the () is standard error.

Table 4. Results of GMM

| Panel A: VOL1 | | | | | | |
|--------------------|------------------------|---------------------------|------------------------|--------------------------------------|------------------------|------------------------|
| Variables | Full period | Before /after joining WTO | | Before/during/after financial crisis | | |
| | 1994–2014 | (1) 1994–2001 | (2) 2002–2014 | (1) 2002–2007 | (2) 2008–2009 | (3) 2010–2014 |
| C | -7.4281*** (0.0946) | -6.2335*** (0.1687) | -7.6221*** (0.1268) | -7.2853*** (0.1861) | -6.9848*** (0.3024) | -8.2263*** (0.2067) |
| VOL(-1) | 0.1429*** (0.0089) | 0.2415*** (0.0174) | 0.1245*** (0.0100) | 0.1587 (0.0153) | 0.1211 (0.0252) | 0.0956 (0.0155) |
| FOREIGN | -0.1913*** (0.0456) | -0.2351** (0.0933) | -0.2039*** (0.0510) | -0.4457*** (0.0774) | -0.0431 (0.1188) | -0.0601 (0.0810) |
| LEV | 0.0058 (0.0241) | 0.0002 (0.0413) | -0.0029 (0.0280) | -0.0147 (0.0404) | -0.0783 (0.0673) | 0.0301 (0.0461) |
| MTB | 0.0003 (0.0057) | 0.0227*** (0.0057) | -0.0768 (0.0658) | -0.0276 (0.0944) | -0.2087 (0.1662) | -0.0592 (0.1069) |
| SIZE | -0.0095*** (0.0034) | -0.0004 (0.0058) | -0.0108*** (0.0039) | -0.0006 (0.0058) | -0.0166* (0.0091) | -0.0177*** (0.0066) |
| TURNOVER | 0.1320*** (0.0033) | 0.0921*** (0.0053) | 0.1393*** (0.0038) | 0.1107*** (0.0050) | 0.1343*** (0.0084) | 0.1904*** (0.0074) |
| Adjusted R-squared | 0.5431 | 0.4344 | 0.4617 | 0.3702 | 0.2782 | 0.2623 |
| J-statistic | 10332 | 2633 | 8228 | 3482 | 1278 | 3456 |
| Panel B: VOL2 | | | | | | |
| C | 0.0330*** (0.0043) | 0.0272*** (0.0011) | 0.0378*** (0.0079) | 0.0243*** (0.0021) | 0.0278*** (0.0031) | 0.0501*** (0.0188) |
| VOL(-1) | -4.57E-06 (0.0001) | -7.50E-06 (1.89E-05) | 0.0553** (0.0277) | 0.1761 (0.0169) | 0.1921*** (0.0257) | 0.0401 (0.0448) |
| FOREIGN | -0.0030 (0.0036) | -0.0042*** (0.0011) | -0.0033 (0.0044) | -0.0088*** (0.0012) | -0.0042 (0.0016) | 0.0011 (0.0102) |
| LEV | 0.0002 (0.0019) | 0.0003 (0.0005) | -0.0001 (0.0024) | -0.0001 (0.0006) | -0.0009 (0.0009) | 0.0001 (0.0058) |
| MTB | 1.76E-05 (0.0004) | 0.0002*** (7.40E-05) | 0.0057 (0.0056) | -0.0009 (0.0015) | -0.0010 (0.0023) | -0.0091 (0.0136) |
| SIZE | -0.0005* (0.0003) | 2.05E-05 (7.46E-05) | -0.0006* (0.0003) | -0.0001 (9.26E-05) | -0.0002 (0.0001) | -0.0012 (0.0008) |
| TURNOVER | 0.0011*** (0.0002) | 0.0008*** (6.74E-05) | 0.0011*** (0.0003) | 0.0010*** (7.90E-05) | 0.0013*** (0.0001) | 0.0010 (0.0009) |
| Adjusted R-squared | 0.0103 | 0.4714 | 0.0075 | 0.2096 | 0.1937 | 0.0004 |
| J-statistic | 10331 | 2632 | 8228 | 3482 | 1278 | 3456 |

Note: *, **, *** Significance at the 10%, 5%, 1% level. Figure in the () is standard error.

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