International Journal of Economics, Commerce and Management
United Kingdom Vol. III, Issue 5, May 2015
http://ijecm.co.uk/ ISSN 2348 0386

THE ROLE OF EARNINGS VOLATILITY SOURCES IN FORECASTING

Ben Mhamed Yosra ✉
Department of finance, Faculty of Economic sciences and Management of Tunis,
University of Tunis El Manar, Tunisia
yosrabenmhamed@yahoo.fr

Jilani Faouzi
Department of finance, Faculty of Economic sciences and Management of Tunis,
University of Tunis El Manar, Tunisia
Faouzi.jilani@Fsegt.rnu.tn

Abstract

Tan and Sidhu (2012) document that analysts' forecasts fully incorporate information contained in earnings variability for firms with high income smoothing and for firms with low operating variability. We revisit their findings using other study's approach. Sample in this study comprises of 295 Canadian firms and covers 2006-2011 period. Firstly, following Mishkin's (1983) method of testing market efficiency, our findings confirm that investors recognize the earnings volatility effect on time series correlations of earnings in a post-earnings announcement drift context. Secondly, we examine whether the efficiency of investors' forecasts with respect to earnings variability information is due to income smoothing and/or to volatility in operating activities. The empirical test document that income smoothing is a primary determinant of reported earnings volatility, while operating performance play a secondary role. The findings are consistent with the signal theory and the view that managers use income smoothing to convey information about a firm's future earnings prospects.

Keywords: Earnings volatility; Income smoothing; Operating volatility; Investors' forecast

INTRODUCTION

Earnings volatility contains incremental information that improves the prediction of future firm performance (Dichev and Tang, 2009 ; Frankel and Litov, 2009 ;Petrovic et al, 2009 ; Hamzavi and Aflatooni, 2011 ; khodadadi et al, 2012 ; Cao et Narayanamoorthy, 2012). However, investors do not understand information on volatility in equity valuation (Minton et al., 2002). Likewise, Dichev and Tang (2009) demonstrate that analysts' forecasts do not fully incorporate the information contained in earnings volatility. Specially, they show that analysts appear to ignore predictable implications of earnings variability for future earnings. Contrary of their tests, Frankel and Litov (2009) conduct a stock market based tests. They argued that investors do not underestimate the effects of earnings volatility. In this review of volatility implications literature, Cao and Narayanamoorthy (2012) demonstrate that the market systematically underestimates the time-series properties resulting from earnings volatility; otherwise known as Post-Earnings announcement drift anomaly (PEAD). Tan and Sidhu (2012) show that analysts recognize the earnings variability effect for firms with high income smoothing and for firms with low operating volatility. Earnings volatility are shaped by both economic factors and managerial opportunism (Dichev and Tang, 2009; Frankel and Litov, 2009, Ghosh and Olsen, 2009; Donelson et al., 2011). This paper investigates the possibility that stock prices reflect fully the implications of volatility for time-series behavior of earnings. We also exploit the causes of volatility to assess the market reaction. In other words, we examine if the relevance of earnings volatility for investors expectations depends on the extent to which the earnings volatility is primarily caused by economic forces or managerial opportunism.

Several studies argue the existence of a PEAD, in which the market ignores the serial correlation in standardized unexpected earnings (SUE). Beginning with Ball and Brown (1968), the financial literature exploit a setting in which stock return continue to move in the same direction as the earnings surprise. According to Bernard and Thomas (1990), the PEAD anomaly has centered around the failure of stock prices to reflect the implication of current earnings for future earnings. Specifically, they find that investors do not fully exploit the past time series properties of the quarters series. Narayanamoorthy (2006) extend the finding of Bernard and Thomas by exploiting a new cross sectional setting. They show that the market ignore SUE autocorrelation resulting from accounting conservatism. Recently, Cao and Narayanamoorthy (2012) argue that investors tend to underreact to the effects of earnings volatility for SUE autocorrelation; generating PEAD abnormal return.

In this study, we investigate if investors underreact to the information content of earnings volatility. Our findings confirm that capital market fully incorporate information contained in reported earnings variability. An additional test extends and solidifies this result. To understand the market's reaction, we have focused to look at the sources of earnings volatility. Understanding the drivers for the trend in earnings volatility is important because both variability in operating performance (Minton et al., 2002; Chen el al., 2008) and income smoothing (Tucker and Zarowin, 2006; Tan and Sidhu, 2012) have convey different information about future earnings prospects. Our results highlight the roles of both accounting factor and economic factor in explaining earnings volatility. Finally, we find that the trend in earnings volatility is primarily caused by increases in income smoothing, while operating performance play a secondary role.

This paper makes a significant contribution to the literature. It supplements the vast body of PEAD studies and extends research that identifies the factors leading to increase earnings volatility. This paper brings these strands of literature together. Our approach is distinct from similar studies looking at the relation between market reaction and firms' characteristics. Dichev and Tang (2009) suggest that earnings volatility is determined by economic and accounting factors and that analyst do not fully understand the implications of earnings volatility. They don't try to develop a link between these two strands of literature. A similar picture can be seen in the research of Frankel and Litov (2009). Tan and Sidhu (2012) sort the sample into portfolios based on the level of income smoothing and variability in operating performance. They find evidence that analysts' forecasts efficiently incorporate information about earnings volatility, at high degree of income smoothing and low operating performance volatility. However, our study examines the expectations of investors and uses other study's approach

PRIOR RESEARCH AND MOTIVATION

This paper seeks to investigate the relevance of earnings volatility for investors expectations, and to examine if this result depends on the extent to which the trend in earnings volatility is primarily caused by income smoothing or operating volatility.

In this section, first we focus on PEAD type of study, especially, the market's reaction to the earnings surprises. Then, we investigate the determinants of earnings volatility which can provide a satisfactory explanation to the market reaction.

Market efficiency studies: PEAD context

In the last 40 years, an extensive amount of literature analyses anomalies in the capital market. One of the most puzzling market anomalies, that are dependent on earnings surprises, is the post earnings announcement drift (PEAD) (Bird et al, 2013). Previous research (Foster et al., 1984; Bernard and Thomas, 1990; Ball and Bartov, 1996; Rangan and Sloan, 1998; Soffer and Lys, 1999) show that PEAD is due to naive investors' failure to recognize the time-series properties of earnings; stock returns continue to drift in the direction of quarterly earnings surprises for the time following an earnings announcement. In other words, if a firm announces, in quarter t, positive (negative) surprise the market tend to be positively (negatively) surprised in quarter t+1.

Several studies document that standardized unexpected earnings (denoted SUE) in quarter t is positively correlated to the SUE for adjacent quarters (t-1 to t-3); but this correlation become negative in quarter t-4 (Foster, 1977; Bernard and Thomas, 1990; Bartov, 1992; Ball and Bartov, 1996). The PEAD literature finds that the market does not revise immediately its expectations for future SUE based on quarter's SUE.

A large amount of studies document that irrational behavior of investors are the main cause of the PEAD existence (Bernard and Thomas (1990) Ball and Bartov (1996) Soffer and Lys (1999)). Other researches provide more powerful test of the SUEs autocorrelation pattern by exploiting the cross-sectional variation. For example, Rangan and Sloan (1998) document that PEAD arise from the integral method of reporting "cross quarter effect". They find that autoregressive coefficient is larger when the quarters used belong to the same fiscal year than for quarters in different fiscal year. Then, they show that investors do not recognize the larger autoregressive coefficients between quarters in the same fiscal year.

Similar to Rangan and Sloan (1998), the study of Narayanamoorthy (2006) utilizes predictable cross-sectional variation in the autocorrelation SUE to examine variation in PEAD. He demonstrates that investors fail to fully incorporate the differential persistence resulting from accounting conservatism. On other words, the findings indicate that stock prices fail to differentiate the time-series properties arising from conservatism accounting. Interestingly, in a similar vein, Cao and Narayanamoorthy (2012) exploit more this new cross-sectional setting. They examine the earnings volatility-stock return relation by exploring cross-sectional differences in earnings persistence. Cao and Narayanamoorthy discover that autocorrelation of the SUEs are significantly lower for the top deciles of volatility than for the bottom deciles, consistent with volatile earnings having a greater tendency to mean revert faster than persistent earnings. Consequently, they document a negative correlation between earnings volatility and PEAD.

Market efficiency hypothesis have provided conflicting evidence. Dichev and Tang (2009) conclude that analysts cannot understand the implications of earnings volatility for earnings predictability. But, Frankel and Litov (2009) contend that the market recognize correctly the earnings volatility implications in a stock return test. Tan and Sidhu (2012) document that analysts' forecasts of earnings incorporate information contained in reported earnings volatility only for firms with a high degree of income smoothing. Under a PEAD context, Cao and Narayanamoorthy (2012) find evidence that investors fail to update its expectations to reflect the information in SUE autocorrelations attributable to volatility. In this study, we analyze market' expectations under a PEAD context.

The sources of earnings volatility

A firm's reported earnings variability is affected by the uncertainty of operations and of accounting choices (Ghosh and Olsen, 2009). The increase in earnings volatility is related to fluctuations in a firm's operating performance. For example, companies with changes in demand have high variability in their reported earnings. With accruals accounting, it is feasible to offset operating variability and to smooth earnings volatility. Our analysis of earnings volatility begins with the simple variance decomposition of earnings volatility given by:

Earnings variance=cash flow variance+ accruals variance+2 $\rho_{CF,ACC}\sqrt{Var(CF)}\sqrt{Var(ACC)}$ (1)

We note that earnings volatility could be caused by any of the three components: Cash flow volatility, accruals volatility, and correlation between cash flow and accruals (denoted $\rho_{CF,ACC}$). Accruals volatility and ρCF, ACC measure simultaneously income smoothing (Gu et al., 2005; Bandyopadhyay et al., 2011). Firms achieve smooth earnings by a high level of accruals volatility and/or by a large, negative ρ*CF, ACC*. To smooth earnings, manager would offset the volatility of operating activity with an opposite accruals, resulting in a negative *CF-ACC* correlation (Dechow, 1994). Based on this composition, the trend in earnings volatility is also associated in cash flow volatility. In other words, accounting factor (income smoothing) and economic factor (operating volatility) play a substantial role in explaining earnings volatility.

It is widely suggested in the literature that operating variability and income smoothing communicate information about future firm's profitability to investors. The smoothing literature suggests that management should smooth reported income to meet or beat analyst earnings forecasts and to report increasing earnings patterns over time (Bartov et al.,2002; Kasznik and McNichols, 2002). Market punishes those firms that do not (Barth et al., 1999). Managers smooth earnings to improve informativeness of current prices for future earnings (Tucker and Zarowin 2006, Sankar and Subramanyam (2001)). They use income smoothing as a vehicle to communicate their private information about future earnings and thereafter stock prices.

If income smoothing is informative, information about future earnings can be reflected in current earnings. Subramanyam (1996) shows that the discretionary component of accruals is priced by investors, suggesting that managers use discretionary accruals to signal information concerning the firm's future performance. Tucker and Zarowin (2006) find that stock returns are more associated with future earnings for higher-smoothing firms than for lower-smoothing firms. They document that the earnings informativeness is positively associated with income smoothing. This support that income smoothing plays an important role in communicating private information about future earnings.

There is evidence in the literature suggesting that the increase in earnings volatility is related to increasing volatility in firm's operating performance. In environments subject to large economic shocks, firms are likely to have more variability in reported earnings. Many studies document that economic-based factors are a primary determinant of the documented temporal patterns of earnings volatility (Dichev and Tang, 2009; Frankel and Litov, 2009, Ghosh and Olsen, 2009; Donelson et al., 2011).Minton et al. (2002) provide evidence that incorporating information about the operating variability improve the quality of forecasting models. They further show that investors are not fully aware of the importance of the firm's operating volatility in the stock valuation process.

Interestingly, Tan and sidhu (2012) find evidence that analysts' earnings forecasts fully incorporate information conveyed in earnings variability for firms with a high level of income smoothing and a low level of variability in operating performance. Our research is a test of the validity of these results. However, we conduct a stock market based tests and we use other study's approach. Otherwise, we investigate the determinants of earnings volatility to provide a satisfactory explanation to the market reaction.

METHODOLOGY

Sample selection and variable measurement

Quarterly data is obtained from Reuters base. Our sample consists of non-financial firms listed on Toronto stock exchange from 2006 to 2011. Our sample comprises 13,464 firms quarterly observations. The variable used as a measure of standardized unexpected earnings (SUE) is the change in current earnings from the earnings of the corresponding quarter in the previous year. We use the previous fiscal quarter's closing market value as the scaling factor for SUE. We then measure *DSUE* as the transformed decile ranking of scaled SUE (numbered from 0 through 9). We then divide the decile ranks by 9 and subtract 0.5 we obtain a scaled ranks which vary from -0.5 to +0.5. Because the most drift studies use decile ranks in the regressions, this transformation facilitates comparison of our results to previous research (Bernard and Thomas, 1990; Rangan and Sloan, 1998; Narayanamoorthy, 2006; Livnat and Mendenhall, 2006; Cao and Narayanamoorthy, 2012). Earnings volatility is calculate by taking the standard deviation of earnings for the most recent twelve quarters (Wei et Zhang, 2006 ; Chen et al, 2008 et Bandyopadhyay, 2011). We also use decile partitions (from -0.5 to +0.5) of earnings volatility for easier comparison with past PEAD findings.

We compute daily abnormal return as the raw daily return minus CRSP value-weighted index return. Referring to Rangan and Sloan (1998), Soffer (1999), Cao and Narayanamoorthy (2012) and Chen (1012), we use abnormal returns primarily from a three-day window, centered on the next earnings announcement date. We use size as control variable in the regression because prior studies (Bernard and Thomas, 1990; Bhushan, 1994; Narayanamoorthy, 2006) shown that the drift is correlated with this variable. DSize is the decile rank of the market capitalization at the end of the previous quarter, ranging from -0.5 to +0.5.

For the next test of the sources of earnings volatility, we use other variables. Cash flow is defined as cash flow from operations available in Cash flow statements. Accruals are estimated by taking the difference between earnings and cash flows. We define earnings volatility (VOL) as the standard deviation of earnings over the past 12 quarters. Cash flow volatility (CFV), accruals volatility (ACCV) are defined analogously. We use other factors as control variables to explain earnings volatility. These variables include: quality of accruals (Qacc), the correlation between revenues and expenses (ρRev,Exp), leverage and size (Dichev and Tang, 2008, 2009). Dichev and Tang (2008) show that poor matching of revenues and expenses increases volatility, leading to a negative relation with earnings volatility. Low-quality accruals are expected to manifest as noise in the determination of earnings. The Dechow and Dichev (2002) model determine an inverse firm-specific measure of accrual quality. Based on this argument, we expect a positive relation with earnings volatility (Dechow and Dichev, 2002). Watts and Zimmerman (1978) find that larger firms will adopt less risky investments to avoid potential government intervention. By the same argument, larger firms tend to have less earnings volatility. Volatile firms choose or are restricted to low levels of debt (Dichev and Tang, 2009).

ANALYSIS AND FINDINGS

Descriptive statistics

Table 1 presents the descriptive statistics of the variables (the test of the market reaction) defined previously in our analysis.

Tableau 1: Summary statistics (the first test)

	Mean	10%	25%	50%	75%	90%
CAR_S	0.4190	-7.5168	-3.383	-0.2926	3.2047	8.1926
CAR_I	0.3375	-10.162	-4.111	-0.289	4.0433	11.304
SUE	-0.0502	-0.411	-0.0299	0.00005	0.0280	0.346
VOL	0.0450	0.0057	0.0106	0.0223	0.0479	0.0924
Size	3188.3	25	89	340	1600	8900

CAR_S: is the market-adjusted buy and hold return, calculated from the short window. CAR_L: is the market-adjusted buy and hold return, calculated from the long window. *SUE* is the difference between the current quarter's earnings and the earnings of the corresponding quarter in the previous year. *VOL* is the variance of the most recent twelve quarterly. $Size_{i,t}$ is the market value at the end of the previous quarter.

As can be seen in this table 1, the mean SUE is negative, although the median is positive, which is consistent with a higher magnitude of negative earnings surprises. These statistics are similar to those reported in Ball and Bartov (2006) and Jegadeesh and Livnat (2006). In contrast, table 1 reports the mean Vol as positive for our sample, as is the median, which is consistent with sequential volatility increase for most firms. Table 1 also clearly shows that historical data sample has a wide distribution of SUE, VOL and size. By transforming variables into decile ranks, the effect of outliers can be undermined.

In table 2 contains the descriptive statistics for variables of the second test (sources of earnings variability).

Tableau 2: Summary statistics (the second test)

	Mean	Standard deviation	P25	Median	P75
VOL	0.033	0.132	0.011	0.021	0.042
ρCF,ACC	-0.816	0.255	-0.976	-0.923	-0.755
ACCV	0.064	0.041	0.034	0.054	0.082
CFV	0.057	0.035	0.029	0.048	0.074
ρRev,Exp	0.578	0.421	0.287	0.739	0.938
Qacc	0.035	0.041	0.009	0.024	0.050
SIZE	8.636	0.887	8.002	8.591	9.222
Leverage	0.390	0.217	0.216	0.394	0.544

Notes: *VOL* is the variance of the most recent twelve quarterly CFV is the variance of cash flow, ACCV is the variance of accruals, ρCF,ACC is the correlation between cash flow and accruals, ρ Rev,Exp is the correlation between revenues and expenses, Qacc is the quality of accruals based on Dechow and Dichev's (2002) model, SIZE is the log natural of total assets, Leverage is the long-term debt to book value of assets.

The mean of earnings volatility is less than that of cash flow volatility and accruals volatility. Table 2 show that VOL have a large standard deviation of 13.2%, indicating large differences in earnings volatility across firms. As can be seen, the mean of the correlation between cash flow and accruals is negative (-0.816). This result shows that firms use accruals to offset cash flow volatility. Our sample consists of a perfect smoother firms so that its ρCF,ACC is close to −1 (Bandyopadhyay, 2012).

Main empirical test

Market efficiency test: earnings volatility effect

To test whether the expectation of investors reflect the information in SUE autocorrelation attributable to volatility, we conduct two sets of tests. Firstly, we investigate the implications of earnings volatility on earnings surprises persistence. Secondly, we verify if the variation in the abnormal return mirrors the variation in SUE autocorrelation. Thus, we follow the model used by Cao and Narayanamoorthy (2012), The regression model is as follows:

$$DSUE_{t+1} = a + b\ DSUE_t + cDVOL_t + d\ (DSUE_t * DVOL_t) + e_{t+1} \quad (2)$$

DVOL is the *VOL* decile ranking for each quarter ranging from -0.5 to + 0.5. *DSUE* is the earnings surprise measure, defined as in the previous section. To examine the effect of earnings volatility, we used the product of DSUE and DVOL as an independent variable in the regression. The interaction is reasonable when the implicit assumption is that the higher the level of earnings surprise, the greater the effect of volatility's variable. We include *DVOL* as a separate independent variable in the regression to eliminate the correlated omitted variable problem. In table 3 we provide the results for the hypothesis that the earnings volatility has an inverse effect on the persistence of standardized unexpected earnings (SUE).

Table 3: Earnings Volatility Effect on Seasonal Difference Earnings Autocorrelation

Dependant Variable $DSUE_{t+1}$	**Coefficient**	**Z-stat**	**P > |Z|**
DSUE	0.370	22.9	0.000
DVOL	0.031	2.32	0.02
DSUE*DVOL	-0.085	-1.85	0.065
DSize	0.031	2.26	0.024
DSUE*DSize	-0.102	-2.25	0.024

SUE is the difference between the current quarter's earnings and the earnings of the corresponding quarter in the previous year. $DSUE_{i,t}$ is the scaled decile rank for each quarter transformed by dividing by 9 and then subtracting 0.5. Thus, $DSUE_{i,t}$ is ranging from -0.5 and +0.5. *VOL* is the variance of the most recent twelve quarterly earnings. $DVOL_{i,t}$ is the earnings volatility (*VOL*) decile rank for each quarter transformed by dividing the rank by 9 and subtracting 0.5, resulting in values that range from-0.5 to +0.5. $DSize_{i,t}$ is the decile rank of the market value at the end of the previous quarter, ranging from -0.5 to +0.5 after transformation.

We observe consistently negative coefficients for the earnings surprise-volatility interaction term. This reaffirms that the SUE autocorrelations decrease in ex-ante volatility. for the median earnings volatility firm (*DVOL*=0), the coefficient on DSUE has the predicted positive sign (0.37). Then, we observe that this coefficient vary depending on the different level of earnings volatility. For the bottom decile of volatility, the first-order autoregressive coefficient is 0.412 (0.37+0.085/2), but it is only 0.327 (0.37-0.085/2) for those stocks in the top decile. We also conclude that size is negatively related to earnings persistence. This result contradicts Cao and Narayanamoorthy's (2012) result, as they detect a positive correlation between size and earnings persistence.

In this section, we test whether the capital market can fully reflect the relation between current and future earnings surprise and the effect of earnings volatility on earnings persistence. For this reason, we use an abnormal return tests that mirror the SUE autocorrelation tests. Abnormal return regressions is estimated as follows:

$$CAR_{t+1} = a' + b'\, DSUE_t + c' DVOL_t + d'\,(DSUE_t * DVOL_t) + \epsilon'_{t+1} \qquad (3)$$

Table 4 presents results of the ability of the capital market to understand the earnings volatility effect on earnings persistence.

Table 4: earnings Volatility Effect on PEAD Returns

Dependant Variable CAR_{t+1}	**Coefficient**	**Z-stat**	**P > |Z|**
DSUE	-0.0018	-3.11	0.002
DSUE*DVOL	0.0041	2.41	0.016
DVOL	-0.0022	-3.73	0.000
DSize	0.0018	2.98	0.003
DSUE*DSize	0.0036	2.34	0.020

CAR_S: is the market-adjusted buy and hold return, calculated from the short window. CAR_L: is the market-adjusted buy and hold return,
calculated from the long window. *SUE* is the difference between the current quarter's earnings and the earnings of the corresponding quarter
in the previous year. $DSUE_{i,t}$ is the scaled decile rank for each quarter transformed by dividing by 9 and then subtracting 0.5. Thus, $DSUE_{i,t}$
is ranging from -0.5 and +0.5. *VOL* is the variance of the most recent twelve quarterly earnings. $DVOL_{i,t}$ is the earnings volatility (*VOL*)
decile rank for each quarter transformed by dividing the rank by 9 and subtracting 0.5, resulting in values that range from-0.5 to +0.5.
$DSize_{i,t}$ is the decile rank of the market value at the end of the previous quarter, ranging from -0.5 to +0.5 after transformation.

We expected the middle group of earnings volatility to have positive drift (similar to previous result in table 3). Even so, table shows that the coefficient on DSUE (DVOL=0) is negative. Contrary to what is provided, the median earnings volatility portfolio had a mean drift of -0.18 (percent. Firm in the top portfolio had a mean drift of 0.025%(-0.0018+0.0041/2), which is larger than the return of the bottom group of volatility at -0.38%(-0.0018-0.0041/2).

Next, we use a market efficiency test that takes the form of the Mishkin test (1983). The objective is to analyze how the market understands the earnings autocorrelation and the effect of earnings volatility in such a process. In this test, a simultaneous equations system are estimated jointly. Firstly, the forecasting equation is identical to equation 2. Secondly, the pricing equation represents the capital market's response to the forecast error (e_{t+1}) in the forecasting equation. Thus, we estimate the following two equations simultaneously:

$$DSUE_{t+1} = a + b\,DSUE_t + cDVOL_t + d\,(DSUE_t * DVOL_t) + \text{e}_{t+1} \quad (4)$$

$$AR_{t+1} = \alpha + \beta\,£_{t+1} + \infty \quad (5)$$

$£_{t+1}$in Equation 5 represents the earnings surprise. Under market efficiency, the market expectation of earnings and the earnings volatility effect should equal the expectation that is based on the forecasting equation. The market should react only to the earnings surprise. Otherwise, $£_{t+1}$in Equation 5 should be identical to e_{t+1}in Equation 4. Thus, we substitute e_{t+1}into Equation 4 and get the following:

$$CAR_{t+1} = \alpha + \beta\,DSUE_{t+1} - \beta\,b''\,DSUE_t - \beta\,c''\,DVOL_t - \beta\,d''(DSUE_t * DVOL_t) + \infty_{t+1} \quad (6)$$

In Equations 4 and 6, b and d are the actual coefficients of the current SUE and SUE -volatility interaction term while b'' and d'' are the inferred coefficients from the market expectation. Table 5 presents the results simultaneous nonlinear procedure proposed by Mishkin.

Table 5: Mishkin Test of Market Efficiency for Earnings Volatility Effect

We estimate coefficients simultaneously of the two following equations using the simultaneous nonlinear procedure proposed by Mishkin [1983]:

$$DSUE_{t+1} = a + b\,DSUE_t + cDVOL_t + d\,(DSUE_t * DVOL_t) + \text{e}_t \quad (4)$$

$$CAR_{t+1} = \alpha + \beta\,DSUE_{t+1} - \beta\,b''\,DSUE_t - \beta\,c''\,DVOL_t - \beta\,d''(DSUE_t * DVOL_t) + \infty_{t+1} \quad (6)$$

	Coef	**P > |Z|**
b	0.2376	0.0000
b''	0.0021	0.0060
d	**-0.0738**	**0.0880**
d''	**-0.1097**	**0.0605**

Chi-square to Test Market Efficiency Constraints *

	Khi2	P >Chi2
b=b''	0.0605	0.8056
d=d''	0.0486	0.8255

*A significant chi-square value implies that the real coefficient in Equation 4 and the inferred coefficient in Equation 6 are significantly different.

The coefficient of current surprise (b) is positive. The likelihood ratio statistic for the restriction *b=b"* is not significant. The post-estimation test shows that coefficients are different. This result implies that the stock market understands the quarterly earnings process.

In terms of the relation between volatility and SUE autocorrelation, table 5 document two significantly negative Coefficients. Then, the post-estimation test reveals that the market do not underestimates the effect of earnings volatility on SUE persistence with a not significative value of chi-square. Under the PEAD context, we find solid evidence that market recognize SUE autocorrelation and earnings volatility effect on this process. A similar finding is observed by Frankel and Litov (2009), Chen (2012) and Tan and Sidhu (2012).

Estimation model: The sources of earnings volatility

The evidence presented in the previous tests suggests that the investors understand the effect of earnings volatility on SUE persistence. In this subsection, we examine whether the efficiency of investors' forecasts with respect to earnings variability information is because of earnings volatility is related to income smoothing and/or the increasing volatility in operating activities. In other words, we now investigate the determinants for earnings volatility.

Earlier we highlight the role of both volatility due to economic shocks (cash flow volatility) and volatility due to problems in the accounting determination of income (income smoothing) in explaining earnings volatility. Our multivariate test controls for other factors that prior empirical work has shown to have significant effect on earnings volatility. The regression model is as follows:

$$\mathbf{VOL_{it} = \alpha_0 + \alpha_1\, CFV_{it} + \alpha_2\, ACCV_{it} + \alpha_3\, \rho Cf,Acc_{\,it} + +\alpha_4\, \rho Rev,Exp_{\,it} + \alpha_5 Qacc_{it} + \alpha_6\, SIZE_{it} + \alpha_7\, Leverage_{it} + e_{it}}$$

Table 6: the sources of earnings volatility

Dependant Variable VOL	**Coefficient**	**t-stat**	**P >|Z|**
CFV	**0.3779**	**50.75**	**0.000**
ACCV	**-0.759**	**-137.32**	**0.000**
ρCf,Acc	**0.0480**	**77.48**	**0.000**
ρRev,Exp	**-0.0037**	**-14.90**	**0.000**
Qacc	**0.5187**	**11.96**	**0.000**
SIZE	**-0.0010**	**-4.52**	**0.000**
Leverage	**0.0008**	**1.48**	**0.140**

Notes: VOL is the variance of the most recent twelve quarterly, CFV is the variance of cash flow, ACCV is the variance of accruals, ρ Cf,Acc is the correlation between cash flow and accruals, ρ Rev,Exp is the correlation between revenues and expenses, Qacc is the quality of accruals based on Dechow and Dichev's (2002) model , SIZE is the log natural of total assets, Leverage is the long-term debt to book value of assets.

In table 6 we see strong evidence of a positive relation between cash flow volatility and earnings volatility. This most likely reflects the fact that the increase in operating volatility is almost fully reflected in earnings volatility (Dichev and Tang, 2009; Frankel and Litov, 2009; Donelson et al., 2011). Further, the results exhibit that VOL is negatively associated with ACCV. This finding confirms our prediction, indicating that larger accruals volatility dampens the volatility of reported earnings. The other set of results in table 6 is for the correlation between cash flow and accruals. The result closely mirrors that ρCf,Acc is negatively related to VOL. A high degree of income smoothing signifies large negative values of Cash flow-Accruals correlation and leads to less volatility in reported earnings. This relation confirms the positive coefficient (ρCf,Acc) observed in the regression test. Summarizing, income smoothing reduce earnings volatility. The results of the control variables (ρRev,Exp, Qacc and SIZE) are consistent with our expectations.

Table 6 confirms that accounting and economic factors play a substantial role in explaining earnings volatility. Nevertheless, these results cannot tell whether income smoothing or operating volatility is the most significant contributor. To examine this question, we test the hypothesis that income smoothing is more significant than economic factor ($|\alpha_1$ VOLacc$|>|\alpha_3$ VOLeco$|$ and $|\alpha_2$ ρacc,cf$|>|\alpha_3$ VOLeco$|$). So we need to do two one-sided tests that have the following null hypothesis:

$|\alpha_2$ ACCV$|=|\alpha_1$ CFV$|$ and $|\alpha_3$ ρCf,Acc$|=|\alpha_1$ CFV$|$.

The two one sides tests have a chi-squared highly significant. In this case, we reject the nulls hypothesis. In other words, we observe that ACCV and ρCf,Acc make the most significant contribution to earnings volatility. The result suggests that income smoothing is a primary determinant of reported earnings volatility, while operating performance play a secondary role.

Summarizing, this supplemental result is useful to explain the result of previous subsection, which suggest that capital market is efficient with regards to earnings volatility. In fact, we can explain the relevance of the volatility in determining stock prices with reference to the signal theory. Signaling took root in the idea of asymmetric information. This theory suggests that we use income smoothing to convey information about a firm's future earnings prospects.

This finding is generally consistent with Tucker and Zarowin (2006) who find evidence that income smoothing contain information that is useful in the prediction of a firm's future earnings performance. Interestingly, our results are similar to those of Tan and Sidhu (2012) who document that analysts' forecasts fully incorporate information conveyed in earnings variability for firms with low variability in operating performance and for firms with high income smoothing.

CONCLUSION

In this paper, we have focused to look at the sources of earnings volatility to understand the Canadian market' efficiency. In the first phase of this study, under the PEAD context we examine the role of earnings volatility in predicting post announcement abnormal returns. Following Mishkin's (1983) method, we find solid evidence that market recognize the earnings volatility effect on quarterly earnings process. In the second, we show that earnings volatility is arising from two factors, volatility due to economic shocks and to income smoothing. Finally, we document that income smoothing play a primary role in determining earnings volatility. Referring to the signal theory, we can extend and solidifies the market finding. In other words, we provide evidence that income smoothing contain information that is useful in the prediction of a firm's future earnings performance. This study has the following limitation. We assume that daily abnormal return can be captured by the raw daily return minus CRSP value-weighted index return.

These findings open a number of possibilities for future research. One potential direction is to expand and solidify these results using other samples and variable explaining earnings volatility. Another future direction is exploring the link between the identified fundamental relations and derived or observed equity values.

REFERENCES

Ball R. and Bartov E. (1996), « How naïve is the stock market's use of earnings information? », *Journal of Accounting and Economics*, Vol.21, n°3, pp.319–337.

Ball R. and Brown P. (1968), « An empirical evaluation of accounting income numbers », *Journal of Accounting Research,* Vol. 6, n°2, pp.159–178.

Bandyopadhyay S., Huang A. and Wirjanto T., (2011), « Does Income Smoothing Really Create Value ?», *University of Waterloo, Working Paper*.

Bartov E. (1992), « Patterns in unexpected earnings as an explanation for post-announcement drift », *The Accounting Review*, Vol .27, n°3, pp.610–622.

Barth M.E., Elliott J.A. and Finn M.W. (1999), "Market Rewards Associated with Patterns of Increasing Earnings", *Journal of Accounting Research*, Vol.37, pp.387-413.

Bernard V.L. and Thomas J.K. (1990), "Evidence That Stock Prices Do Not Fully Reflect the Implications of Current Earnings for Future Earnings"*, Journal of Accounting and Economics*, Vol.13, n°4, pp. 305-340.

Cao S.S. and Narayanamoorthy G.S. (2012), « Earnings volatility, Post-Earnings Anouncement Drift and Trading Frictions», *Journal of Accounting Research*, Vol.50, n°1, pp.41-74.

Chen C., Huang A.G. and Jha R. (2008), « Trends in Earnings Volatility, Earnings Quality and Idiosyncratic Return Volatility: Managerial Opportunism or Economic Activity », *School of Accounting and Finance, University of Waterloo.*

Dechow P.M. (1994), "Accounting Earnings and Cash Flows as Measures of Firm Performance: The Role of Accounting Accruals", *Journal of Accounting and Economics*, Vol.18, pp.3–42.

Dechow P. and Dichev I.D. (2002), "The quality of accruals and earnings: the role of accrual estimation errors", *The Accounting Review*, Vol. 77, pp. 35–59.

Dichev I.D. and Tang V.W. (2008), "Matching and the changing properties of accounting earnings over the last 40 years", *The Accounting Review*, Vol.83, pp.1–36.

Dichev I.D. and Tang V.W., (2009), "Earnings volatility and earnings predictability", *Journal of Accounting and Economics*, Vol.47, pp.160-181.

Donelson D.C., Jennings R. and McInnis J. (2011), « Changes over Time in the Revenue-Expense Relation: Accounting or Economics? », *The Accounting Review*, Vol.86, n° 3, pp.945-974.

Frankel. and Litov. (2009), « Earnings Persistence », *Journal of Accounting and Economics*, Vol.47, pp.182-190.

Foster G. (1977), "Quarterly accounting data: time-series properties and predictive-ability results", *The Accounting Review*, Vol.52, pp.1–21.

Foster G., Olsen C. and Shevlin T. (1984), « Earnings releases, anomalies, and the behavior of security returns », *The Accounting Review*, Vol.59, n°4, pp.574–604.

Ghosh D. and Olsen L. (2009), « Environmental uncertainty and managers' use of discretionary accruals », *Accounting, Organizations and Society*, Vol.34, n°2, pp.188–205.

Gu Z., Lee J. and Rosset J. (2005), « What determines the volatility of accounting accruals? », *Review of Quantitative Finance and Accounting*, Vol. 24, pp. 401-439.

Hamzavi M.A. and Aflatooni A. (2011), « Earnings Smoothing and Earnings Predictability », *Business Intelligence Journal*, pp. 187-201.

Khodadadi V., Tamjidi N., Fazeli Y.S. and Hushmandi K.B. (2012), « Earnings Predictability and its Components Volatility », *International Reserch Journal of Finance and Economics*, Vol.86, pp.72-85.

Minton B., Schrand C. and Walther B. (2002), « The Role of Volatility in Forecasting", *Review of Accounting Studies*, Vol. 7, pp. 195–215.

Narayanamoorthy G. (2006), « Conservatism and cross-sectional variation in the post-earnings announcement drift », *Journal of Accounting Research*, Vol.44, n°3, pp.769–789.

Petrovic N., Manson S. et Coakley J. (2009), « Does Volatility Improve UK Earnings Forecasts ? », *Journal of Business Finance & Accounting*, Vol.36, n°9-10, pp. 1148-1179.

Rangan S. and Sloan R.G. (1998), « Implications of the integral approach to quarterly reporting for the post-earnings-announcement drift », *The Accounting Review*, Vol.73, n°3, pp.353–371.

Soffer L.C. and Lys T. (1999), « Post-earnings-announcement drift and the dissemination of predictable information », *Contemporary Accounting Research*, Vol.16, n°2, pp.305–331.

Subramanyam K.R. (1996), « The pricing of discretionary accruals », *Journal of Accounting and Economics*, Vol.22, pp.249-281.

Tan H.C. and Sidhu B. (2012), « Sources of earnings variability and their effect on earnings forecasts », *Accounting and Finance*, Vol.52, pp. 343–371.

