“The impact of SFAS No. 8 on stock market based on a new Fama-French 3-factor model: an empirical evidence from US stock market”

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The impact of SFAS No. 8 on stock market based on a new Fama-French 3-factor model: an empirical evidence from US stock market

Abstract

In this paper, the impact of the accounting rule (SFAS No.8) on stock market is analyzed with a new model, which is based on the 3-factor model of Fama-French (1993), the EGARCH-type volatility of Nelson (1991) and non-Normal distribution of SSAEPD of Zhu and Zinde-Walsh (2009). Fama-French 25 portfolios for US stock market (1926-2011) is analyzed. Data is divided into 2 sub-samples: sample 1 (pre-announcement of SFAS No.8) and sample 2 (post-announcement of SFAS No.8). The authors try to test whether 3 factors in Fama-French (1993) are still alive in both samples and find any differences in the coefficients of 3 factors. MLE is used to estimate the model. Empirical results show this new model is adequate for the data. And the Market factor, the Size factor and the Book-to-market factor are alive in both samples. The estimates of these factors (β_1, β_2, and β_3) are smaller in post-announcement of SFAS No.8.

Keywords: Fama-French 3-factor model, standardized standard asymmetric exponential power distribution (SSAEPD), EGARCH, statement of financial accounting standards No.8 (SFAS No.8).
JEL Classification: F31, M41, C13.

Introduction

In 1975, the Statement of Financial Accounting Standards No.8 (SFAS No.8) requires that all transactions measured in a foreign currency should be translated at the exchange rate on the date when they were measured.

Before 1975, there were various accounting methods for the foreign currency translation. In general, the methods can be classified into 2 different groups: (1) the measurement method, (2) the disposal method. For the 1st group, there can be further divided into 3 kinds of methods: (a) the current/non-current method, (b) monetary/non-monetary method, (c) hybrid method. For the 2nd group, there are also 3 sub-categories: (a) direct write-off of all gains and losses, (b) deferral of all gains and losses, (c) deferral of all gains but direct write-off of all losses.

After 1975, Financial Accounting Standard Board (FASB) choose to apply the approaches of both monetary/non-monetary and direct write-off of all gains and losses. All gains and losses in foreign currency were required to be included in income at the period when they arose. It required translation gains and losses to be recognized immediately in the income statement.

The impacts of the accounting rule (SFAS No.8) are studied by different researchers. For example, Ziebart and Kim (1987) find out firms which used the monetary/non-monetary approach (the current/non-current method, or the hybrid method) before 1975 are not influenced (have a negative effect, or have a mixed effect). Also, firms using the deferral method (the direct write-off method, or the deferred gains and recognized losses) before 1975 lead to negative reactions (are not influenced, or have a mixed effect).
Dukes (1978) compares the variance of error term in OLS regressions between pre- and post-announcement of SFAS No.8. He finds that the erorr term in 1976 was no larger than before and concludes that no significant return differences are found. Shank, Dillard and Murdock (1979) find that the firms are negatively affected to some extent, but a comparison to unaffected firms did not reveal a significant difference. Kelly (1985) shows, without controlling for firm size, the results there generally indicated that firms which lobbied against SFAS No.8 possessed higher leverage and asset size, but lower management ownership proportion. Ziebart and Kim (1987) show that the changes in accounting standard for foreign currency translation did have a negatively impact on capital market. For more reseaches, one can refer to Table 1.

The main purpose of this paper is to reexamine the impact associated with the announcement of SFAS No.8 on stock market using a new model. This new model is first proposed by Yang (2013) and based on the 3-factor model in Fama-French (1993), the EGARCH-type volatility in Nelson (1991) and non-Normal error of SSAEPD in Zhu and Zinde-Walsh (2009). The reason why we choose this new model is because it has better in-sample fit than that of Fama-French (1993). Fama-French 25 portfolios for US stock market (1926-2011) is analyzed. Similar to Dukes (1978), we separate the data into two subsamples: pre-announcement of SFAS No.8 (1926-1975), and post-announcement of SFAS No.8 (1975-2011). We compare the coefficients before and after the announcement of the SFAS No.8. In this paper, we will test following two hypotheses.

1. Are the 3 factors in Fama-French (1993) still alive in both samples?

2. Can we find any differences in the coefficients of 3 factors?

To answer these questions, we analyze the 2 subsamples with the MatLab program of Yang (2013)[1]

[1] See Yang (2013).

Likelihood Ratio test (LR) is used for testing parameter restrictions. Kolmogorov-Smirnov test (KS) is used for model diagnostics.

Empirical results show this new model is adequate for the data. The Market factor, the Size factor and the Book-to-market factor are alive in both samples. And after the issuance of SFAS No.8, most of the 25 portfolios have smaller coefficients (β_1, β_2, and β_3).

This paper is organized as follows. Section 1 is the model and methodology. Section 2 is the empirical results. Section 3 includes the Estimation results The final section comprises conclusions and recommendations.

1. Model and methodology

1.1. FF-SSAEPD-EGARCH model. We use a new 3-factor model which is proposed by Yang (2013)[2] to analyze the impact of annoucement of SFAS No. 8. Its math formula is:

$$R_t - R_{ft} = \beta_0 + \beta_1 (R_{mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + u_t,\ t = 1, 2, ..., T, \quad (1)$$

$$u_t = \sigma_t z_t,\ z_t \sim SSAEPD\ \{a, p_1, p_2\},$$

$$\ln(\sigma_t^2) = \alpha + \sum_{i=1}^{s} g(z_{t-i}) + \sum_{j=1}^{m} b_j \ln(\sigma_{t-j}^2).$$

Table 1. Researches about SFAS No.8 and extensions about the Fama-French 3-factor model

Author (year)	Research purpose	Model	Estimate method	Compute: algorithn	Data / Country	Variables	Frequency and period
Panel A: researches about the economic impact of SFAS N0. 8							
Evans,T. G., William R.F.JR. and Michael J. (1978)	Empirical analyses	-	questionnare	-	USA	-	1975-1978
John K.S. Jesse F. Dand R. J.M. (1979)	Empirical analyses	-	interwievs	-	USA	-	1975-1979
Roland E. Dukes (1978)	Empirical analyses	-	OLS	-	USA	risk adjusted secutity returns	1968-1976
Kelly, Lauren (1985)	Empirical analyses	logit model	*t*-tests	-	USA	leverage	1978-1981
David A.Ziebart and David H.Kim (1987)	Empirical analyses	-	-	-	USA	standardized abnormal returns	1975-1987
Salatka, William K (1989)	Empirical analyses	-	cross-sectional regressions	-	USA	size, adopter	1975-1989
Panel B: Extensions for Fama-French 3-factor model							
Carhart (1997)	Model comparsion	CAPM, FF, Carhart 4-factor	OLS	-	USA	ER, RP.SMB.HML, Momentum	M196:2l-1993:12
Gharghori et al.(2007)	Default risk	FF with Default factor	GMM	-	Australia	ER, RP, SMB.HML. DEF	M1996:-2004:12
He (2008)	Model comparsion	FF, FF with State Switch	OLS	-	China	ER, RP, SMB.HML,State Switch	M1995:6-2005:12
Wang (2012)	Model extension	FF with PE factor	OLS	Eviews	China	ER, RP, SMB.HML.PE Factor	M2004:7-2011:6
Yu et al.(2012)	World price of sustainability	FF with Sustainability Factor	GMM	-	Global	ER, RP, SMB.HML.SUS	M1999-2007
Yang (2013)	Model extension	FF-EGARCH-SSAEPD	MLE	MATLAB	USA	ER, RP, SMB.HML	M1926-2011

Note: "-" means information is not available or the method is not used in the paper.

$$g(z_{t-i}) = (c_i z_{t-i} + d_i[|z_{t-i}| - E([|z_{t-i}|)],$$
$$= \begin{cases} (c_i + d_i) z_{t-i} - d_i E(|z_{t-i}|), if\ z_{t-i} \geq 0, \\ (c_i + d_i) z_{t-i} - d_i E(|z_{t-i}|), else \end{cases} \quad (2)$$

Here, R_t, R_{ft} and R_{mt} are the rate of return for stock portfolio, the risk-free rate and the return rate of the market (at time *t*), respectively. SMB_t stands for small size (market capitalization) minus big size (market capitalization) and *HMLt* for high book-to-market ratio minus low book-to-market ratio. The conditional standard deviation is σ*t*, i.e., volatility. $в = (\beta_0, \beta_1, \beta_2, \beta_3, a, p_1, p_2, a, \{b_j\}^m{}_{j=1}, \{c_j\}_{i=1}, \{d_i\}_i = 1)$ are the parameters to be estimated. The error term z_t is distributed as the Standardized Standard Asymmetric Exponential Power Distribution (SSAEPD) proposed by Zhu and Zinde-Walsh (2009). The probability density function (PDF) of z_t is:

[1] Yin (2011) suggests the FF-AEPD model and Yang (2013) proposes the FF-SSAEPD-EGARCH model. And in this paper, we examine the simulation program of Yang (2013) and then apply this model and methodology to analyze data.

$$f(z_t)=\begin{cases}\delta\left(\frac{\alpha}{\alpha^*}\right)K(p_1)\,exp(-\frac{1}{p_1}|\frac{\omega+\delta z_t}{2\alpha^*}|^{P_1}),\ if\ z_t\le-\frac{\omega}{\delta},\\ \delta\left(\frac{1-\alpha}{1-\alpha^*}\right)K(p_2)\,exp(-\frac{1}{p_1}|\frac{\omega+\delta z_t}{2\alpha^*}|^{P2}),if\ z_t\le-\frac{\omega}{\delta}\\ z_t=\frac{x_t-\omega}{\delta},\end{cases}$$

$$\omega=E(x_t)=\frac{1}{B}\left[(1-\alpha)^2\frac{p_2\Gamma(2/p_2)}{\Gamma^2(1/p_2)}-\alpha^2\frac{p_1\Gamma(2/p_1)}{\Gamma^2(1/p_1)}\right],$$

$$\delta^2=Var(x_t)=\frac{1}{B^2}\left[(1-\alpha)^3\frac{p_2^2\Gamma(3/p_2)}{\Gamma^3(1/p_2)}-\alpha^3\frac{p_1^2\Gamma(3/p_1)}{\Gamma^3(1/p_1)}\right], \quad (3)$$

$$-\frac{1}{B^2}\left[(1-\alpha)^3\frac{p_2\Gamma(2/p_2)}{\Gamma^3(1/p_2)}-\alpha^2\frac{p_1^2\Gamma(2/p_1)}{\Gamma^3(1/p_1)}\right]^2,$$

$$K(p_1)=\frac{1}{2p_1^{1/p_1}\Gamma(1+1/p_1)},$$

$$K(p_2)=\frac{1}{2p_2^{1/p_2}\Gamma(1+1/p_2)},$$

$$B=\alpha K(p_1)+(1-\alpha)K(p_2).$$

x_t is distributed as the standard AEPD (SAEPD)[1] And Γ (.) is the gamma function. $\alpha \in (0, 1)$ is the skewness parameter. $p_1 > 0$ and $p_2 > 0$ are the left and right tail parameters, respectively. When $\alpha = 0.5$, $p_1 = p_1 = 2$, SSAEPD will be reduced to Standard Normal, i.e., Normal (0, 1).

1.2. Method of maximum likelihood estimation. The method of maximum likelihood estimation (MLE) is used to estimate the parameters. The maximum likelihood function is:

$$L(\{R_t-R_{ft},R_{mt}-R_{ft}\}_{t=1}^T;\theta)=\prod_{t=1}^T\begin{cases}\frac{\delta}{\sigma_t}\left(\frac{\alpha}{\alpha^*}\right)K(p_1)\,exp(-\frac{1}{p_1}|\frac{\omega+\delta z_t}{2\alpha^*}|^{P_1}),if\ z_t\le-\frac{\omega}{\delta},\\ \delta\left(\frac{1-\alpha}{1-\alpha^*}\right)K(p_2)\,exp(-\frac{1}{p_1}|\frac{\omega+\delta z_t}{2\alpha^*}|^{P2}),if\ z_t\le-\frac{\omega}{\delta}\end{cases} \quad (4)$$

where

$$z_t=\frac{R_t-R_{ft}-\beta_0-\beta_1(R_{mt}-R_{ft})-\beta_2SMB_t-\beta_3SMB_t}{\sigma_t}, \quad (5)$$

$$\ln(\sigma_t^2)=\alpha\sum_{i=1}^{s}g(z_{t-1})+\sum_{j=1}^{m}b_j\ln(\sigma_{t-1}^2). \quad (6)$$

2. Empirical analysis

2.1. Data. In this paper, we study the effect of an announcement of accounting rule (SFAS No.8) on stock returns. Data of Fama-French 25 portfolios are used, which is downloaded from the French's Data Library Following Dukes (1978), we select 1975 as the break point, and set pre-announcement of SFAS No.8 as sample 1 (from 1926 to October 1975) and post-announcement of SFAS No.8 as sample[2] (from November 1975 to 2011).

The descriptive statistics of these samples are calculated by MatLab and listed in Table 2. For each observation, the skewness of the stock portfolio is not 0[3] and the kurtosis is more than the p-value of Jarque-Bera test for each portfolio is 0, which is smaller than 5% significance level. Hence, we conclude the asset returns in both samples do not follow Normal distribution.

[1] By changing variable techniques, we obtain *PDF* of *SSAEPD* (a, p_1, p_2) from *SAEPD* (a, p_1, p_2). When X is distributed as the standard *AEPD*, its probability density function is:

$$f(z_t)=\begin{cases}\left(\frac{\alpha}{\alpha^*}\right)K(p_1)\,exp(-\frac{1}{p_1}|\frac{x}{2\alpha^*}|^{P_1}),\ if\ x\le 0,\\ \delta\left(\frac{1-\alpha}{1-\alpha^*}\right)K(p_2)\,exp(-\frac{1}{p_2}|\frac{\omega+\delta z_t}{2(1-\alpha^*)}|^{P2}),if\ x>0.\end{cases}$$

[2] Thanks Yin (2011) who provides the well organized Excel files. Thanks Professor French for kindly providing the risk free rate by e-mail.

[3] Only the skewness of one portfolio (the small size quintile and the 2nd book-to-market quintile in sample 2) is zero.

Table 2. Descriptive statistics

Size quintile	Book-to-market quintiles									
	Low	2	3	4	High	Low	2	3	4	High
Sample 1: Pre-announcement of SFAS No. 8 (1926-1975)										
	Mean					Median				
Small	0.84	0.96	1.29	1.45	1.76	0.13	0.52	1.02	1.20	1.30
2	0.84	1.27	1.30	1.34	1.54	1.01	1.34	1.52	1.34	1.55
3	1.00	1.12	1.28	1.28	1.32	1.20	1.40	1.57	1.56	0.95
4	0.94	0.99	1.10	1.22	1.38	1.26	1.39	1.50	1.53	1.52
Big	0.93	0.78	0.94	0.98	-0.78	1.26	0.95	1.11	1.07	1.33
	Maximum					Minimum				
Small	147.50	139.27	81.04	105.07	105.31	-49.36	-43.09	-36.58	-35.78	-34.87
2	54.13	84.41	78.79	72.57	87.37	-32.52	-32.50	-30.58	-32.77	-34.64
3	60.75	44.32	64.27	56.21	82.06	-27.93	-27.48	-33.49	-31.58	-37.28
4	34.47	57.56	64.91	70.67	86.43	-28.88	-26.90	-32.03	-34.45	-40.08
Big	35.52	32.24	48.41	65.04	56.82	-28.21	-25.10	-31.12	-36.42	-99.99
	Standard deviation					Skewness				
Small	14.77	12.80	11.19	10.48	11.64	2.80	4.56	1.84	2.84	3.15
2	8.40	9.07	8.55	9.04	10.40	0.74	2.39	2.53	1.95	2.00
3	8.20	7.28	7.85	8.00	10.48	1.68	0.59	1.29	1.39	2.01
4	6.23	6.94	7.18	8.34	11.03	-0.22	1.37	1.41	2.00	2.01
Big	5.85	5.63	6.53	8.36	17.24	0.04	0.09	1.12	1.92	-3.88
	Kurtosis					*p*-value of Jarque-Bera test				
Small	26.02	50.94	15.11	27.70	27.24	0	0	0	0	0
2	9.48	24.04	23.98	18.63	18.05	0	0	0	0	0
3	16.61	9.95	16.38	14.73	18.41	0	0	0	0	0
4	8.02	16.85	18.66	20.75	19.52	0	0	0	0	0
Big	9.60	9.19	17.93	22.07	24.56	0	0	0	0	0
Sample 2: Post-announcement of SFAS No. 8 (1975-2011)										
	Mean					Median				
Small	0.59	1.25	1.31	1.44	1.55	1.06	1.50	1.47	1.64	1.56
2	0.89	1.17	1.35	1.38	1.41	1.39	1.75	1.58	1.70	1.87
3	0.91	1.21	1.24	1.27	1.54	1.66	1.33	1.55	1.41	1.65
4	1.01	1.07	1.15	1.23	1.26	1.11	1.26	1.57	1.52	1.56
Big	0.81	1.03	0.94	0.97	1.00	0.71	1.25	1.20	1.11	1.18
	Maximum					Minimum				
Small	39.80	38.64	28.35	27.82	32.77	-34.18	-30.93	-28.53	-28.96	-28.73
2	29.71	25.83	26.87	27.03	30.36	-32.82	-31.56	-27.76	-26.36	-29.32
3	24.47	25.00	21.92	23.41	28.98	-29.57	-29.19	-24.47	-22.71	-26.22
4	25.67	20.58	23.93	24.32	27.90	-25.94	-28.83	-26.03	-21.32	-23.84
Big	22.35	16.50	19.08	19.76	17.57	-21.64	-22.36	-21.71	-19.32	-19.13
	Standard deviation					Skewness				
Small	8.18	7.03	6.03	5.68	6.22	-0.02	0.00	-0.24	-0.31	-0.33
2	7.46	6.16	5.56	5.43	6.23	-0.33	-0.56	-0.58	-0.63	-0.55
3	6.91	5.70	5.14	5.09	5.63	-0.38	-0.54	-0.54	-0.35	-0.51
4	6.25	5.44	5.34	4.98	5.58	-0.20	-0.59	-0.54	-0.29	-0.35
Big	4.99	4.74	4.65	4.57	5.13	-0.17	-0.42	-0.34	-0.24	-0.41
	Kurtosis					*p*-value of Jarque-Bera test				
Small	5.51	6.69	6.28	6.60	6.84	0	0	0	0	0
2	4.56	5.53	6.33	6.65	6.57	0	0	0	0	0
3	4.38	5.87	5.59	5.70	6.73	0	0	0	0	0
4	4.58	5.97	6.33	5.42	6.16	0	0	0	0	0
Big	4.53	4.66	5.13	5.07	4.30	0	0	0	0	0

3. Estimation results

3.1. Pre-announcement of SFAS No.8. The estimation results for the new model in sample 1 (preannouncement of SFAS No.8) are listed in Table 3 (Appendix). According to the results, all estimates of β_1 are around 1, and statistically significant under 5% significance level. Estimates of β_2 are statistically significant β_3 under 5% significance level and declining when size becomes bigger. 24 out of the 25 portfolios have statistically significant coefficient β_3 under 5% significance level. Thus, we conclude the market factor, the size factor and the book-to-market factor are alive in sample 1. And the skewness parameter a are all approximately equal to 0.5, which means that after considering the 3 factors and EGARCH-type volatility, the error terms of the data show no obvious skewness. Mostof the left tail parameter p_1 and right tail parameter p_2 of all the 25 portfolios are smaller than 2, whichdocuments the fat-tail characteristics.

3.2. Post-annoucement of SFAS No.8. The estimation results for the new model in sample 2 (post-announcement of SFAS No.8) are listed in Table 4 (Appendix). According to the results, all estimates of β_1 are around 1, and all are statistically significant under 5% significance level. Estimates of β_2 decreases gradually as size increases, and are statistically significant under 5% significance level 22 out of the 25 portfolios have statistically significant coefficient β_3 under 5% significance level. Hence, we conclude the market factor, the size factor and the book-to-market factor are alive in sample 2. Results of a, p_1, p_2 are similar to those in sample 1 (i.e., pre-annoucement of SFAS No.8).

3.3. Comparisons of pre- and post-annoucement of SFAS No.8. To compare the estimates from sample 1 and 2, we plot the estimates of β_1, β_2, β_3 in Figure 1. We discover that during the period after the announcement of SFAS No.8, most of the 25 portfolios have smaller β_1, β_2 and β_3.

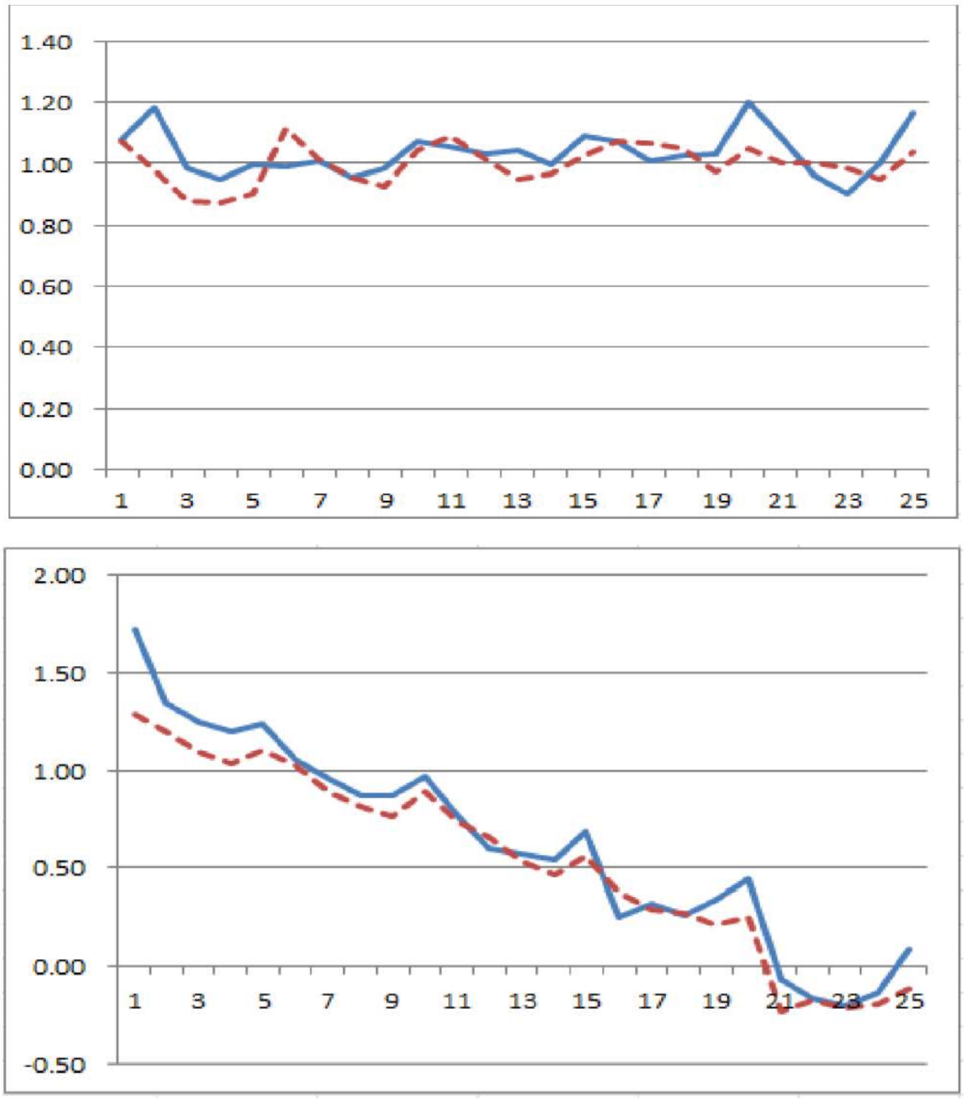

Fig. 1. Comparisons of slope coefficient estimates in the mean equation during pre- and post- annoucement of SFAS No.8 (*Y*-axis is the value of β_i (i = 1, 2, or 3). *X*-axis is the Fama-French 25 Portfolios. Solid line represents pre-annoucement of SFAS No.8 and dotted line represents post-annoucement of SFAS No.8.)

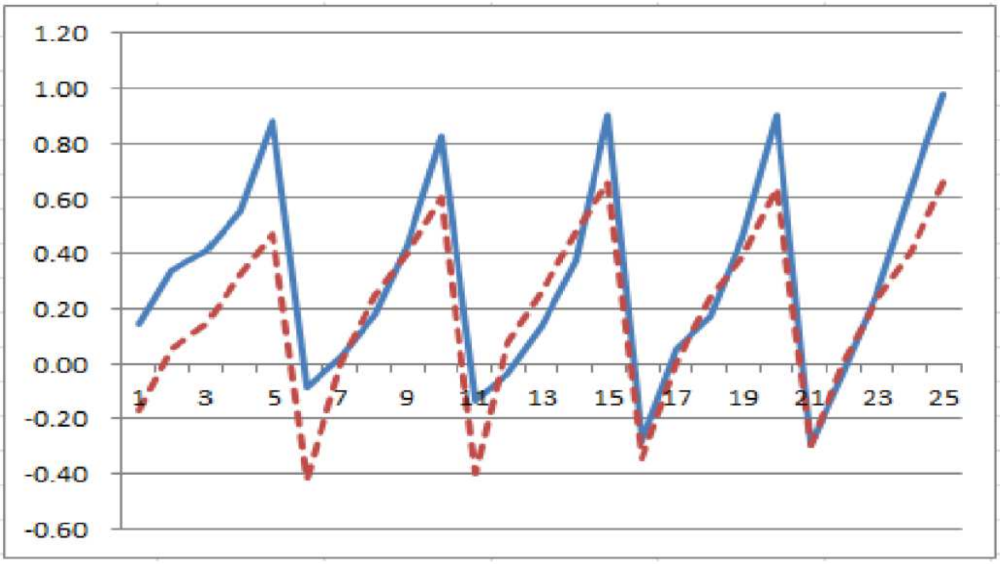

Fig. 1 (cont.). Comparisons of slope coefficient estimates in the mean equation during pre- and post- annoucement of SFAS No.8 (*Y*-axis is the value of β_i (*i* = 1, 2, or 3). *X*-axis is the Fama-French 25 portfolios. Solid line represents pre-annoucement of SFAS No.8 and dotted line represents post-annoucement of SFAS No.8.)

3.4. Model diagnostics. To test the signicance of coefficients in FF-SSAEPD-EGARCH, Likelihood Ratio test (LR) is applied, which is calculated using Equation (7).

LR = −2*lnb* (*likelihood for null*) + 2*ln* (*likelihood for alternative*).

3.4.1. Tests for parameter restrictions. The null hypothesis of the joint signicance test is H_0: $\beta_1 = \beta_2 = \beta_3 = 0$. The results are listed in Table 5. The *p*-values of the joint test for all the 25 portfolios are 0, which means the coefficient of β_1, β_2 and β_3 are statistically joint significant under 5% level. Hence, we conclude the market factor, the size factor and the book-to-market factor are alive in both samples.

Table 5. *P*-values of likelihood ratio test (LR)

	Book-to-market quintiles				
	Low	2	3	4	High
Panel A: Sample 1					
Small	0*	0*	0*	0*	0*
2	0*	0*	0*	0*	0*
3	0*	0*	0*	0*	0*
4	0*	0*	0*	0*	0*
Panel B: Sample 2					
Small	0*	0*	0*	0*	0*
2	0*	0*	0*	0*	0*
3	0*	0*	0*	0*	0*
4	0*	0*	0*	0*	0*
Big	0*	0*	0*	0*	0*

3.4.2. Residual check. In this subsection, the residuals for previous models are checked with both Kolmogorov-Smirnov test and graphs. Our results show all the 25 portfolios have residuals which do follow SSAEPD. That means, the FF-SSAEPD-EGARCH is adequate for the Fama-French 25 portfolios. The *p*-values of KS tests are displayed in Table 6. For example, in sample 1, the *p*-value of the portfolio with small size and low book-to-market is 0.08, greater than 5%. That means, under 5% significance level, the null hypothesis is not rejected and the residuals from the FF-SSAEPD-EGARCH model do follow the SSAEPD. Similar results are documented for all portfolios in sample 2. Hence, we conclude the errors of the model do follow SSAEPD, i.e., the FF-SSAEPDEGARCH model is adequate for most Fama-French 25 portfolios.

Table 6. *p*-values of KS test for residuals

Size quintile	Book-to-market quintiles									
	Low	2	3	4	High	Low	2	3	4	High
	Sample 1: 1926-1975					Sample 2: 1975-2011				
Small	0.08	0.28	0.35	0.24	0.55	0.24	0.26	0.33	0.29	0.25
2	0.17	0.23	0.08	0.20	0.08	0.35	0.28	0.44	0.17	0.06
3	0.40	0.19	0.25	0.07	0.07	0.15	0.27	0.39	0.31	0.28
4	0.33	0.09	0.07	0.15	0.28	0.14	0.36	0.25	0.18	0.34
Big	0.26	0.19	0.14	0.22	0.07	0.22	0.08	0.37	0.23	0.29

Note: The null hypothesis of KS test is *HQ:* FF-SSAEPD-EGARCH residuals are distributed as SS AEPD ($\hat{\alpha}, \hat{p}_1, \hat{p}_2$). If the *p*-value of KS test is smaller than 5% significance level, the null hypothesis is rejected. Otherwise, the null hypothesis is accepted.

Conclusions and recommendations

In this paper, we analyze the impact of announcement of the SFAS No.8 in 1975 on stock market with a new model. This new model considers the EGARCH-type volatility in Nelson (1991), non-Normal error of SSAEPD in Zhu and Zinde-Walsh (2009), and the 3-factor model of Fama and French (1993). This new 3-factor model is first proposed by Yang (2013). Data of Fama-French 25 portfolios are used. We divide data into 2 sub-samples: sample 1 (pre-announcement of the SFAS No.8, from 1926 to October 1975), sample 2 (post-announcement of the SFAS No.8, from November 1975 to 2011). We try to test whether 3 factors in Fama-French (1993) are still alive in both samples and find any differences in the coefficients of 3 factors. Method of maximum likelihood estimation is used to estimate this model and likelihood ratio test (LR) is used to test parameter restrictions. The residuals are checked by Kolmogorov-Smirnov test (KS).

Empirical results show this new model fits the data well. It is found that, in sample 1, all estimates of β_1 are around 1, and statistically significant under 5% significance level. Estimates of β_2 are statistically significant under 5% significance level and declining when size becomes bigger. 24 out of the 25 portfolios have statistically significant coefficient β_3 under 5% significance level. Meanwhile, in Sample 2, all estimates of β_1 are around 1, and all are statistically significant under 5% significance level. Estimates of β_2 decreases gradually as size increases, and are statistically significant under 5% significance level. 22 out of the 25 portfolios have statistically significant coefficient β_3 under 5% significance level. Thus, we conclude the market factor, the size factor, and the book-to-market factor are alive in both samples. And according to the Comparisons of pre- and post-annoucement of SFAS No.8, the estimates of β_1, β_2, and β_3 are smaller in sample 2 (post-announcement of the SFAS No.8).

In view of the foregoing, further research is recommended on three aspects. Future extensions will include but not limited to follows. First, other models can be used to study the impact of the accounting rule (SFAS No.8) on stock market. We can compare our results with those from other models. Also, different stock market can be analyzed. Data from other stock market can be used to check the robustness of our results. Lastly, the further research attempt to overcome the possible contamination caused by other anomalies occurring shortly before and after the event date such as January effect and tax effect.

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Appendix

Table 3. Estimates from sample 1 (Pre-announcement of SFAS No.8)

Size quintile	Book-to-market quintiles																			
	Low	2	3	4	High	Low	2	3	4	High	Low	2	3	4	High	Low	2	3	4	High
	β_0					β_1					β_2					β_3				
Small	-0.59*	-0.35*	-0.17	0.02*	-0.01	1.08*	1.18*	0.99*	0.95*	0.99*	1.72*	1.35*	1.25*	1.20*	1.24*	0.14*	0.34*	0.41*	0.55*	0.88*
2	-0.47	-0.04*	0.15	-0.09*	0.09*	0.99*	1.01*	0.96*	0.99*	1.07*	1.06*	0.95*	0.87*	0.87*	0.97*	-0.09*	0.02*	0.18*	0.43*	0.83*
3	-0.17*	0.05*	0.06	-0.09	-0.32*	1.05*	1.03*	1.04*	1.00*	1.09*	0.76*	0.60*	0.57*	0.55*	0.69*	-0.14*	-0.04*	0.14*	0.38*	0.90*
4	0.00	-0.10*	-0.07	-0.04	-0.11	1.07*	1.01*	1.03*	1.03*	1.20*	0.26*	0.32*	0.26*	0.34*	0.45*	-0.28*	0.05*	0.17*	0.46*	0.90*
Big	0.03	-0.09	0.05*	-0.14*	-0.17	1.08*	0.96*	0.91*	1.00*	1.17*	-0.07*	-0.16*	-0.21*	-0.14*	0.09*	-0.30	-0.04*	0.25*	0.64*	0.98*
	α					p_1					p_2									
Small	0.50	0.50	0.50	0.50	0.50	1.50	1.98	1.50	1.50	1.49	2.00	1.50	1.20	1.00	1.19	-	-	-	-	-
2	0.49	0.50	0.50	0.50	0.50	1.20	1.20	1.00	1.00	1.00	1.00	1.00	1.20	1.20	1.20	-	-	-	-	-
3	0.50	0.50	0.50	0.49	0.50	1.20	1.20	1.51	1.50	2.00	1.00	1.00	1.51	1.50	1.51	-	-	-	-	-
4	0.50	0.50	0.50	0.49	0.50	1.50	1.45	2.00	1.50	1.49	1.00	1.01	1.50	1.00	1.20	-	-	-	-	-
Big	0.50	0.50	0.50	0.50	0.50	1.50	1.20	1.20	1.20	1.18	1.20	1.10	1.10	1.10	1.11	-	-	-	-	-
	α					b					c					d				
Small	0.02	0.34	0.00	0.00	0.08	1.00	0.87	1.00	1.00	0.92	-0.13	-0.11	-0.01	-0.04	-0.09	0.23	0.59	0.17	0.20	0.44
2	0.19	0.02	0.01	0.06	0.01	0.92	0.99	0.99	0.95	0.99	-0.15	0.01	0.00	0.02	-0.03	0.24	0.23	0.21	0.42	0.17
3	0.11	0.04	0.06	0.07	0.16	0.93	0.98	0.98	0.92	0.92	0.10	0.00	-0.08	-0.05	-0.05	0.35	0.18	0.26	0.45	0.41
4	0.02	0.08	0.09	0.01	0.16	0.98	0.88	0.91	1.00	0.93	0.07	0.04	-0.08	-0.03	-0.02	0.13	0.44	0.39	0.18	0.29
Big	0.00	0.02	0.05	0.04	0.47	0.91	0.97	0.95	0.98	0.90	0.00	-0.05	-0.05	-0.06	0.36	0.30	0.21	0.20	0.22	1.12

Note: * means the data is statisticaly significant under 5% significance level.

Table 4. Estimates from sample 2 (Post-announcement of SFAS No.8)

Size quintile	Book-to-market quintiles																			
	Low	2	3	4	High	Low	2	3	4	High	Low	2	3	4	High	Low	2	3	4	High
	β_0					β_1					β_2					β_3				
Small	-0.49*	-0.03	0.16*	0.11*	0.17*	1.07*	0.98*	0.88*	0.87*	0.91*	1.29*	1.20*	1.10*	1.03*	1.10*	-0.17*	0.05*	0.14*	0.33*	0.47*
2	-0.25*	0.00	0.17*	0.18*	0.07*	1.11*	1.01*	0.96*	0.93*	1.04*	1.03*	0.89*	0.81*	0.76*	0.89*	-0.42*	0.00*	0.25 *	0.40*	0.61*
3	-0.07*	0.09*	0.10*	0.11	0.18*	1.09*	1.01*	0.95*	0.97*	1.03*	0.74*	0.66*	0.53*	0.47*	0.56*	-0.40*	0.07*	0.26*	0.48*	0.66*
4	0.03	-0.05*	-0.05	0.09*	0.06*	1.07*	1.06*	1.05*	0.97*	1.05*	0.38*	0.30*	0.27*	0.21*	0.25*	-0.35*	0.00	0.24*	0.38*	0.64*
Big	0.01	0.12*	0.03	-0.01	-0.14	1.00*	1.00*	0.99*	0.95*	1.04*	-0.24*	-0.18*	-0.22*	-0.19*	-0.11*	-0.29*	0.00*	0.24*	0.41*	0.66*
	α					p_1					p_2									
Small	0.50	0.50	0.50	0.50	0.50	2.00	1.50	1.50	2.00	1.50	1.50	1.00	1.00	1.50	1.00	-	-	-	-	-
2	0.50	0.50	0.50	0.50	0.50	1.50	1.50	1.50	2.00	2.00	2.00	1.00	1.20	1.50	1.50	-	-	-	-	-

Table 4. Estimates from sample 2 (Post-announcement of SFAS No.8)

Size quintile	Book-to-market quintiles																			
	Low	2	3	4	High	Low	2	3	4	High	Low	2	3	4	High	Low	2	3	4	High
	β_0					β_1					β_2					β_3				
3	0.50	0.50	0.50	0.50	0.50	1.20	1.20	2.00	2.00	1.50	1.50	1.00	1.50	2.00	1.50	-	-	-	-	-
4	0.50	0.50	0.50	0.50	0.50	1.20	1.20	1.49	2.00	1.50	1.49	1.50	1.50	1.50	1.20	-	-	-	-	-
Big	0.50	0.50	0.50	0.50	0.50	1.20	2.00	1.50	2.00	1.50	1.50	1.50	1.20	1.50	2.00	-	-	-	-	-
	α					*b*					*c*					*d*				
Small	0.09	0.08	0.07	0.05	0.04	0.94	0.93	0.93	0.95	0.97	0.00	0.15	0.00	0.08	-0.06	0.37	0.41	0.38	0.35	0.21
2	0.03	0.03	0.04	0.07	0.04	0.98	0.92	0.94	0.92	0.98	-0.08	0.04	0.06	0.02	0.08	0.18	0.33	0.30	0.47	0.28
3	0.03	0.04	0.04	0.07	0.07	0.97	0.95	0.97	0.93	0.95	0.00	0.03	0.01	0.06	0.12	0.23	0.28	0.31	0.45	0.29
4	0.03	0.06	0.06	0.08	0.20	0.97	0.95	0.94	0.94	0.87	0.00	-0.07	-0.05	0.03	0.05	0.19	0.30	0.35	0.22	0.34
Big	0.05	0.08	0.08	0.06	0.15	0.91	0.93	0.92	0.93	0.92	-0.11	0.01	0.06	0.05	-0.01	0.23	0.33	0.28	0.30	0.49

Note: * means the data is statisticaly significant under 5% significance level.