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TOM EFFECTS DURING QUIET AND TURBULENT TIMES

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This paper investigates the turn-of-the-month effects presence on stock markets from 32 countries during two periods of time: a relative quiet one from January 2000 to December 2006 and a turbulent one from January 2000 to October 2013. We found some significant changes that occurred from the quiet to the turbulent times and some differences between emerging and developed markets.

Keywords: Calendar Anomalies, GARCH, Emerging and Developed Capital Market, Volatility, Persistence in Time

JEL Classification: G02, G14, G19

1. Introduction

TOM effect is one of the most known stock markets calendar anomalies consisting in significant differences between the stock returns from the so called TOM period (which includes the first trading days of a month plus the last trading days from the precedent month) and the stock returns from the other days (Ariel, 1987; Thaler, 1987; Lakonishok and Smidt, 1988; Pettengill and Jordan, 1988; Ogden, 1990; Ziemba, 1991; Cadsby, 1992; Martikainen et al., 1994; Hensel et al., 1996; Compton, 2000; Booth, 2001; Kunkel et al., 2003; Joshi and Fatta, 2005; McGuinness, 2006; Xu and McConnell, 2006; Wiley and Zumpano, 2009; Desai and Trivedi, 2012; Liu, 2013). There are many hypotheses that explain this seasonality. Pay Day Hypothesis is based on the fact that usually before TOM period many investors need cash money for some payments such as the dividends, the interests or even the wages of their employees. They obtain money by selling assets which are bought back during TOM period (Ogden, 1987; Ogden, 1990). Window Dressing Hypothesis considers that TOM effect is linked by the tendency of some investment companies to keep in their portfolios, at the end of a month, where usually their activity is analyzed, only assets with high returns, in order to show favorable results. As the new month starts they will buy back the stocks they sold (Haugen and Lakonishok, 1988; Ritter and Chopra, 1989; Lakonishok et al., 1991). Earning Announcement Hypothesis explains TOM effect by the fact that most of the announcements about the firms' financial results, which have significant effects on the stock prices, are released during the last days of the month (Penman, 1987; Ball and Kothari, 1991). United States Macroeconomic News Announcement Hypothesis is based on the fact that major announcements regarding US economy, which could influence most of the international financial markets, occur around TOM period (Graham et al., 2003; Nikkinen and Sahlstrom, 2004; Nikkinen et al., 2007).

Like other calendar anomalies, TOM effect could be exploited by investment strategies on the stock markets that are not consistent with Fama (1970) Efficient Market Hypothesis. However such strategies are successful only if this seasonality is persistent in time. Empirical researches found that many calendar anomalies are changing in time (Dimson and Marsh, 1999; Szakmary and Kiefer, 2004; Marquering et al., 2006). Sometimes, the passing from quiet to turbulent periods could affect the stock prices seasonality (Holden et al., 2005). There were also found some differences between seasonality from the developed markets and those from the emerging markets (Wong, 1995; Phylaktis and Ravazzolo, 2002; Li et al., 2003).

The seasonality of stock prices refers not only to their returns but also to their volatility which reflects the risk. The General AutoRegressive Conditional Heteroskedasticity (GARCH) models are among the main tools used in the analysis of the financial markets time-varying volatility (Engle, 1982; Bollersev, 1986).

In this paper we investigate the presence of TOM effects on 32 stock markets during two different periods of time. The first one, from January 2000 to December 2006, could be considered as a quiet one, while the second, from January 2007 to October 2013 was marked by some processes (the enlargement of European Union, real estate speculative bubble, the global crisis etc.) which induced some significant turbulences on the financial markets. In our investigation we employ GARCH models to reveal the seasonality not only for the indexes returns but also for their volatility. We use the standard GARCH model and two other variants which allow us to capture the asymmetrical reactions of stocks volatility to good and bad news: Glosten et al. (1993) GJR GARCH and Nelson (1991) EGARCH. We analyze the differences between the two periods of time and also between developed and emerging markets.

The rest of this paper is organized as it follows: the second part describes the data and the methodology employed to investigate TOM Effects, the third part presents the empirical results and the fourth part concludes.

2. Data and Methodology

In this investigation about the presence of TOM effects we employ daily closing values of the indexes from 32 stock markets (Table 1). Half of them are from the developed countries stock exchanges, while the other half from the emerging markets. In order to reveal the differences between quiet and turbulent times we used two sub-samples of data:
- first sub-sample, corresponding to a relative quiet period, from January 2000 to December 2006;
- second sub-sample, corresponding to a turbulent period, from January 2007 to October 2013.

We calculate, for each index, continuous return ($r_{i,t}$) using the formula:

$$r_{i,t} = [\ln(P_{i,t}) - \ln(P_{i,t-1})] \times 100 \qquad (1)$$

where $P_{i,t}$ and $P_{i,t-1}$ are the closing values of index i on the days t and t-1, respectively.

The accuracy of GARCH models could be affected by spurios regressions. In order to avoid them we analyze the stationarity of returns by employing the classic Augmented Dickey – Fuller (ADF) tests (Dickey & Fuller, 1979). For all indexes, the returns graphical representations suggest the use of intercept terms in the ADF regressions. We employ Akaike (1973) Information Criteria to choose the numbers of lags for ADF regressions. We also analyze the autocorrelation and the heteroscedasticity on returns using ARMA (p, q) models, in which the values of p and q are determined by Box-Jenkins methodology (Box et al., 1994). We investigate the ARCH effects on the residuals of these regressions by employing the Ljung - Box test Q and the Engle Lagrange Multiplier (LM) test (Ljung & Box, 1978; Engle, 1982).

We reveal the turn-of-the-month effects using a dummy variable (TOM) which takes value 1 for days from the TOM periods and 0 for the other days. There are many points of view about the range of TOM period. In our investigation we follow Lakonishok and Smidt (1988) approach which include in TOM period the first three days of a month and the last day of the previous month.

A GARCH model is described by two main equations: the conditional mean and the conditional variance. In the first one, we introduce the TOM dummy variable to reveal the seasonality of returns (r_t):

$$r_t = \mu_0 + \mu_1 \times TOM_t + \sum_{k=1}^{n} (\xi_k \times r_{t-k}) + \varepsilon_t \qquad (2)$$

where:
- μ_0 is a constant reflecting the returns of the days not included in TOM period;
- μ_1 is a coefficient which reflects the differences between the returns from the days of TOM period and those from the rest of the month;
- ξ_k is a coefficient of the k-order lagged returns;
- n represents the number of lagged returns, which is calculated by the Akaike Final Prediction Error Criterion (Akaike, 1969);
- ε_t is the error term.

The equation of the returns conditional variance (σ_t^2) has different forms for the three GARCH models. For the (Engle, 1982; Bollersev, 1986) standard form we include the TOM dummy variable to reveal the seasonality of the stock returns volatility:

$$\sigma_t^2 = \omega + \nu \times TOM_t + \sum_{k=1}^{q} \alpha_k \times \varepsilon_{t-k}^2 + \sum_{l=1}^{p} (\beta_l \times \sigma_{t-l}^2) \quad (3)$$

where:

- ω is a constant term reflecting the volatility of the returns from the days not included in TOM period;
- ν is a coefficient which reflects the TOM effects on the stocks volatility;
- α_k (k = 1, 2, ...q) are the coefficients associated to the squared values of the lagged values of error term from the conditional mean equation;
- q is the number of lagged values of the error term, which is calculated by the Akaike Information Criteria (Akaike, 1973);
- β_l (l = 1, 2, ...p) are coefficients associated to the lagged values of the conditional variance;
- p is the number of lagged values of conditional variance, calculated also by the Akaike Information Criteria.

For the (Glosten et al. 1993) GJR GARCH model, the conditional variance of the returns contains the TOM dummy variable to express the turn-of-the-month effects on the volatility:

$$\sigma_t^2 = \omega + \nu \times TOM_t + \sum_{k=1}^{q} [\alpha_k \times \varepsilon_{t-k}^2 + \gamma_k \times \varepsilon_{t-k}^2 \times I(\varepsilon_{t-k} < 0)] + \sum_{l=1}^{p} (\beta_l \times \sigma_{t-l}^2) \quad (3)$$

where:

- $I(\varepsilon_{t-k}<0)$ is a dummy variable, taking the value 1 if the k-lagged error term is strict negative and value zero otherwise;
- γ_k is the coefficient associated to the variable $I(\varepsilon_{t-k}<0)$, expressing the asymmetrical responses of the volatility on the good and bad news.

For the Nelson (1991) EGARCH model, we include the TOM dummy variable in the conditional variance equation which reflects the volatility of returns:

$$\ln(\sigma_t^2) = \varpi + \nu \times TOM_t + \sum_{j=1}^{p} \beta_j \times \ln(\sigma_{t-j}^2) + \sum_{k=1}^{p} \left[\gamma_k \times \frac{\varepsilon_{t-k}}{\sqrt{\sigma_{t-k}^2}} + \alpha_k \times \left(\frac{\varepsilon_{t-k}}{\sqrt{\sigma_{t-k}^2}} - \sqrt{\frac{2}{\pi}} \right) \right] \quad 4)$$

which could be transformed in:

$$\ln(\sigma_t^2) = \omega + \nu \times TOM_t + \sum_{j=1}^{p} \beta_j \times \ln(\sigma_{t-j}^2) + \sum_{k=1}^{p} \left[\gamma_k \times \varepsilon_{t-k} + \alpha_k \times |\varepsilon_{t-k}| \right] \quad (5)$$

where $\omega = \varpi - \sqrt{\frac{2}{\pi}} \times \sum_{k=1}^{p} \alpha_k$ (6)

After performing the regressions of GARCH models we analyze the presence of ARCH effects on their residuals by employing Lagrange Multiplier (LM) tests. A model is validated only if it eliminates ARCH effects. For each return, we choose between the valid models employing as criteria the specific GARCH terms significance.

3. Empirical Results

The results of ADF tests on the indexes returns are presented in the Table 2. For both sub-samples, the null hypothesis of unit root was rejected for all 32 returns. The Table 3 reports the results of Ljung - Box Q and ARCH LM tests on the residuals of ARMA models which indicate, for both sub-samples

and for all 32 returns, that the null hypothesis of autocorrelation and the heteroscedasticity of the residuals cannot be rejected.

The GARCH models with TOM dummy variables applied to the indexes of advanced markets indicate some forms of turn-of-the –month seasonality. For the first sub-sample, the results of the conditional mean equation, which are presented in the Table 4, reveal significant positive TOM effects for the returns of 14 indexes: AEX General, ATX, BEL-20, CAC 40, DAX, FTSE 100, Hang Seng, FTSE MIB, Nikkei 225, OSEAX, S&P TSX Composite, Straits Times, SSMI and TAIEX. The Table 5 reports the results of the conditional variance equation for the same period of time. From all the returns, only those from All Ordinaries index displayed a negative TOM effect on the volatility. For the second sub-sample, the coefficients of the conditional mean equation, which are presented in the Table 6, indicate significant TOM effects for the returns of three indexes: ATX, BEL-20 and TAIEX. For the same period of time, the returns of two indexes, Hang Seng and OSEAX displayed positive TOM effects on the volatility (Table 7).

We continue by performing GARCH models with TOM dummy variables for the indexes of emerging markets. The results of the conditional mean equation for the second sub-sample, which are presented in the Table 8, reveal significant positive TOM effects for the returns of ten indexes: Athex Composite Share, BET-C, Bovespa, BSE 30, BUX, IDX Composite, IPC, KOSPI, SSE Composite and TA 100. For the same period of time, returns of eight indexes displayed TOM effects on the volatility: BET-C, BUX, IDX Composite, IPC, KLSE, OMXT, SEMDEX and SSE Composite (Table 9). For the second sub-sample, the coefficients of the conditional mean equation indicate positive TOM effects for the returns of 13 indexes: Athex Composite Share, BET-C, Bovespa, BSE 30, BUX, CROBEX, IDX Composite, KLSE Composite, IPC, KOSPI, OMXT, PX and TA 100 (Table 10). The results of the conditional variance equation, presented in the Table 11, reveal no TOM effect on volatility for any of the emerging markets indexes.

For all GARCH regressions, we perform ARCH LM tests on their residuals. The results, presented in the Table 12, indicate no remaining ARCH effects.

4. Conclusions

In this paper we approached the persistence in time of TOM effects from advanced and emerging markets. We found, for both categories of markets, that passing from a relative quiet period of time to a turbulent one induced significant changes.

For the indexes from the advanced markets, the turbulences provoked a significant decline of TOM effects in returns. From 2000 to 2006 14 indexed displayed this calendar anomaly on their returns. However, for 11 of them TOM effects in returns disappeared between 2007 and 2013. The changes from TOM effects on volatility were also significant. During the quiet period we found this seasonality for a single index. This TOM effect disappeared during the turbulent period, being replaced by this seasonality of two other indexes.

The changes induced by the turbulences to TOM effects of returns from emerging markets were different to those from developed markets. Between 2000 and 2006 the returns of ten indexes displayed this seasonality. From 2007 to 2013 TOM effect on returns of one from those indexes disappeared, but it was replaced by the other three indexes returns seasonality. Instead, TOM effects on volatility, which was found for eight indexes between 2000 and 2006, disappeared from 2007 to 2013.

We could offer two main explanations for the differences between advanced and emerging markets regarding the persistence in time of TOM effects on returns. The first is that seasonality follows the Dimson and Marsh (1999) Murphy's law for calendar anomalies, but on different stages for the advanced and emerging markets. The advanced markets passed in a stage of TOM effects decline, while the emerging are still in an incipient stage. Other explanation could refer to the different impact of turbulences on the risk perceptions from advanced and emerging markets. For the advanced markets this impact was substantial since they were perceived mainly as having moderate risks. This major change of risk perceptions led to different behaviours of the investors causing the decline of calendar anomalies. Instead, for the emerging markets the impact of turbulence was less consistent since most of them were perceived already as having high risks.

The results of GARCH models suggest that TOM effects on volatility are not persistent in time for both advanced and emerging markets. This investigation could be extended to other advanced and emerging markets.

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Appendix

Table 1 - Indexes from advanced and emerging markets used in TOM effects investigation

Index	Market	Source of data
Panel A: advanced markets		
AEX General	Amsterdam Stock Exchange	http://finance.yahoo.com
All Ordinaries	Australian Securities Exchange	http://finance.yahoo.com
ATX	Vienna Stock Exchange	http://finance.yahoo.com
BEL-20	Brussels Stock Exchange	http://finance.yahoo.com
CAC 40	Paris Bourse	http://finance.yahoo.com
DAX	Frankfurt Stock Exchange	http://finance.yahoo.com
FTSE 100	London Stock Exchange	http://finance.yahoo.com
Hang Seng	Hong Kong Stock Exchange	http://finance.yahoo.com
FTSE MIB	Borsa Milano	http://www.stockrageous.com/
Nikkei 225	Tokyo Stock Exchange	http://finance.yahoo.com

OSEAX	Oslo Stock Exchange	http://finance.yahoo.com
S&P TSX Composite	Toronto Stock Exchange	http://finance.yahoo.com
Standard & Poor's	New York Stock Exchange	http://finance.yahoo.com
Straits Times	Singapore Exchange	http://finance.yahoo.com
SSMI	SIX Swiss Exchange	http://finance.yahoo.com
TAIEX	Taiwan Stock Exchange	http://finance.yahoo.com
Panel B: emerging markets		
Athex Composite Share	Athens Stock Exchange	http://finance.yahoo.com
BET-C	Bucharest Stock Exchange	http://www.bvb.ro
Bovespa	São Paulo Stock, Mercantile & Futures Exchange	http://finance.yahoo.com
BSE 30	Bombay Stock Exchange	http://finance.yahoo.com
BUX	Budapest Stock Exchange	http://bse.hu
CROBEX	Zagreb Stock Exchange	http://www.zse.hr
IDX Composite	Indonesia Stock Exchange	http://finance.yahoo.com
IPC	Mexican Stock Exchange	http://finance.yahoo.com
KLSE Composite	Kuala Lumpur Stock Exchange	http://finance.yahoo.com
KOSPI	Korea Stock Exchange	http://finance.yahoo.com
MerVal	Buenos Aires Stock Exchange	http://finance.yahoo.com
OMXT	Talinn Stock Exchange	http://www.nasdaqomxbaltic.com
PX	Prague Stock Exchange	http://www.pse.cz/
SEMDEX	The Stock Exchange of Mauritius	http://www.stockexchangeofmauritius.com
SSE Composite	Shanghai Stock Exchange	http://finance.yahoo.com
TA 100	Tel Aviv Stock Exchange	http://www.tase.co.il

Table 2 - Results of ADF tests for the returns

Index	First sub-sample		Second sub-sample	
	Number of lags	Test statistics	Number of lags	Test statistics
Panel A: advanced markets				
AEX General	18	-10.7644***	18	-9.07468***
All Ordinaries	20	-9.67463***	23	-8.70532***
ATX	13	-9.88074***	24	-6.70246***
BEL-20	15	-11.0221***	24	-7.61911***
CAC 40	18	-10.2277***	24	-8.21157***
DAX	23	-8.24136***	24	-8.07536***
FTSE 100	21	-9.82347***	17	-10.532***
Hang Seng	16	-9.67231***	18	-8.95955***
FTSE MIB	14	-10.282***	16	-8.79638***
Nikkei 225	23	-8.36668***	20	-9.11076***
OSEAX	24	-7.11064***	16	-8.76572***
S&P TSX Composite	24	-7.89807***	12	-11.8436***
Standard & Poor's	18	-8.96899***	20	-9.35182***
Straits Times	12	-8.41722***	21	-7.72856***
SSMI	19	-9.30069***	14	-11.7669***
TAIEX	21	-8.63978***	19	-7.46551***
Panel B: emerging markets				

Athex Composite Share	20	-9.85546***	16	-8.66939***
BET-C	19	-8.15408***	21	-7.2736***
Bovespa	15	-8.80295***	19	-8.48072***
BSE 30	16	-9.22486***	16	-8.60657***
BUX	21	-8.32031***	24	-6.94695***
CROBEX	21	-9.1649***	20	-7.86167***
IDX Composite	19	-8.0831***	24	-6.7728***
IPC	10	-12.7359***	16	-9.79851***
KLSE Composite	24	-7.67952***	13	-10.4009***
KOSPI	23	-7.46765***	21	-9.14872***
MerVal	24	-8.56384***	24	-7.10717***
OMXT	21	-7.87358***	24	-7.97929***
PX	16	-9.09127***	17	-8.37226***
SEMDEX	23	-6.56819***	18	-7.54523***
SSE Composite	20	-8.21549***	24	-7.7843***
TA 100	14	-0.881075***	23	-6.56284***

Note: *** means significant at 0.01 level.

Table 3 - Results of Ljung-Box Q Tests and ARCH LM Tests on the residuals of ARMA models

Index	First sub-sample		Second sub-sample	
	Ljung-Box Q Test	ARCH LM Test	Ljung-Box Q Test	ARCH LM Test
Panel A: advanced markets				
AEX General	13.448 {0.0041***}	388.302 {0.0001***}	8.974 {0.0307**}	384.611 {0.0001***}
All Ordinaries	6.492 {0.0892*}	89.124 {0.0001***}	5.841 {0.082*}	216.041 {0.0001***}
ATX	28.014 {0.064*}	183.048 {0.0001***}	59.175 {0.0004***}	285.571 {0.0001***}
BEL-20	16.124 {0.0017***}	257.841 {0.0001***}	28.473 {0.0147**}	241.685 {0.0001***}
CAC 40	6.384 {0.0946*}	287.706 {0.0001***}	15.784 {0.0014***}	250.803 {0.0001***}
DAX	28.002 {0.0001***}	374.284 {0.0001***}	16.011 {0.0019***}	205.476 {0.0001***}
FTSE 100	14.519 {0.0028***}	388.663 {0.0001***}	28.249 {0.0001***}	312.741 {0.0001***}
Hang Seng	9.341 {0.0238**}	55.608 {0.0001***}	17.731 {0.0242**}	328.062 {0.0001***}
FTSE MIB	4.287 {0.0884*}	87.028 {0.0001***}	8.609 {0.0461**}	299.15 {0.0001***}
Nikkei 225	3.2055 {0.0847*}	88.2094 {0.0001***}	29.416 {0.0645*}	408.017 {0.0001***}
OSEAX	20.0419 {0.0741*}	242.831 {0.0001***}	23.087 {0.0205**}	382.551 {0.0001***}
S&P TSX Composite	25.841 {0.0898*}	67.037 {0.0001***}	18.105 {0.0004***}	375.016 {0.0001***}
Standard & Poor's	25.0114 {0.0471**}	233.644 {0.0001***}	8.284 {0.0437**}	386.124 {0.0001***}

Straits Times	12.017 {0.0071***}	51.4197 {0.0001***}	31.873 {0.0008***}	251.861 {0.0001***}
SSMI	12.480 {0.0069***}	301.841 {0.0001***}	41.523 {0.0001***}	382.011 {0.0001***}
TAIEX	10.192 {0.0168**}	144.203 {0.0001***}	17.371 {0.0242**}	129.466 {0.0001***}
Panel B: emerging markets				
Athex Composite Share	12.157 {0.0006***}	265.031 {0.0001***}	17.483 {0.079*}	84.017 {0.0001***}
BET-C	7.650 {0.0568*}	171.070 {0.0001***}	7.924 {0.073*}	256.780 {0.0001***}
Bovespa	73.016 {0.0749*}	69.1004 {0.0001***}	41.617 {0.0033***}	386.407 {0.0001***}
BSE 30	14.064 {0.0032***}	337.161 {0.0001***}	24.914 {0.0482**}	115.198 {0.0001***}
BUX	8.002 {0.0416**}	55.8782 {0.0001***}	25.416 {0.0002***}	205.017 {0.0001***}
CROBEX	55.167 {0.0717*}	133.406 {0.0001***}	8.061 {0.0415**}	317.773 {0.0001***}
IDX Composite	4.391 {0.0374**}	60.8274 {0.0001***}	6.731 {0.0428**}	168.257 {0.0001***}
IPC	47.785 {0.0253**}	128.768 {0.0001***}	14.683 {0.0285**}	194.758 {0.0001***}
KLSE Composite	24.011 {0.0628*}	161.740 {0.0001***}	27.061 {0.0283**}	306.937 {0.0001***}
KOSPI	30.014 {0.0284**}	94.374 {0.0001***}	50.164 {0.0906*}	321.684 {0.0001***}
MerVal	38.876 {0.0282**}	265.862 {0.0001***}	11.068 {0.0071***}	248.146 {0.0001***}
OMXT	59.740 {0.0569*}	38.551 {0.0001***}	11.408 {0.0206**}	103.175 {0.0001***}
PX	42.169 {0.0841*}	1323.668 {0.0001***}	6.128 {0.0461**}	321.429 {0.0001***}
SEMDEX	7.374 {0.0622*}	107.301 {0.0001***}	6.288 {0.0874*}	294.705 {0.0001***}
SSE Composite	53.046 {0.0794*}	34.8006 {0.0001***}	9.649 {0.0074*}	62.486 {0.0001***}
TA 100	7.9048 {0.0492**}	62.8041 {0.0001***}	29.714 {0.0943*}	167.518 {0.0001***}

Notes: p-values are within accolades; ***, **, *; mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 4 - Conditional mean equation for the returns of advanced markets indexes from the first sub-sample

Index	Constant term	Coefficient of TOM dummy variable	First order lagged returns
AEX General	-0.0222559 (0.0237487) [-0.9371]	0.116456 (0.0565602) [2.059]**	x
All Ordinaries	0.0417625 (0.0159982) [2.610]***	0.0491725 (0.0485281) [1.013]	x
ATX	0.0545373 (0.021593) [2.526]**	0.175671 (0.0530207) [3.313]***	x
BEL-20	0.0295906	0.128121	0.0439425

	(0.0184115) [1.607]	(0.0503765) [2.543]**	(0.0242438) [1.813]*
CAC 40	-0.0113106 (0.0250143) [-0.4522]	0.140274 (0.0523767) [2.678]***	-0.0487905 (0.0253502) [-1.925]*
DAX	-0.0136522 (0.0263685) [-0.5177]	0.176902 (0.0637447) [2.775]***	-0.0429036 (0.0234809) [-1.827]*
FTSE 100	-0.000012 (0.019761) [-0.0024]	0.185410 (0.0492036) [3.768]***	-0.0891438 (0.0233277) [-3.821]***
Hang Seng	0.00971395 (0.0288676) [0.3365]	0.150271 (0.062548) [2.402]**	x
FTSE MIB	-0.00168589 (0.0218604) [-0.07712]	0.102520 (0.0477724) [2.146]*	x
Nikkei 225	-0.0173986 (0.0252829) [-0.6882]	0.179677 (0.0647276) [2.776]***	x
OSEAX	0.0633505 (0.0273017) [2.320]**	0.205407 (0.0587306) [3.497]***	x
S&P TSX Composite	0.0165995 (0.000011) [919.7]***	0.153008 (0.0003699) [413.6]***	0.0168208 (0.000014) [693.7]***
Standard & Poor's	0.00014403 (0.0225252) [0.0064]	0.0547802 (0.0518975) [1.056]	-0.0567926 (0.0240624) [-2.360]**
Straits Times	-0.00280729 (0.0224764) [-0.1249]	0.226430 (0.0471757) [4.80]***	x
SSMI	-0.00566719 (0.0205401) [-0.2759]	0.128116 (0.0479468) [2.672]***	x
TAIEX	-0.0229975 (0.0413377) [-0.5563]	0.313040 (0.0796324) [3.931]***	x

Notes: Standard errors in round brackets; z-statistics in square brackets; ***, **, * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 5 - Conditional variance equation for the returns of advanced markets indexes from the first sub-sample

Index	Constant term	Coefficient of TOM dummy variable	alpha	gamma	beta
AEX General GJR GARCH (1,1)	0.0110108 (0.0059404) [1.854]*	0.0178953 (0.0254532) [0.7031]	0.0343692 (0.0054637) [6.290]***	0.136416 (0.0216266) [6.308]***	0.919410 (0.0115834) [79.37]***
All Ordinaries GARCH (1,1)	0.0122718 (0.0030896) [3.972]***	-0.0217885 (0.00858916) [-2.537]**	0.0752859 (0.0123626) [6.090]***	x	0.907428 (0.0142595) [63.64]***
ATX EGARCH (1,1)	-0.146360 (0.0295689) [-4.950]***	0.0339447 (0.0383671) [0.8847]	0.161733 (0.0320675) [5.044]***	-0.0740930 (0.0192904) [-3.841]***	0.939804 (0.0187596) [50.10]***
BEL-20	-0.164363	-0.0107943	0.201481	-0.0976767	0.977649

EGARCH (1,1)	(0.0264583) [-6.212]***	(0.0180311) [-0.5986]	(0.033462) [6.021]***	(0.0169808) [5.752]***	(0.00559443) [174.8]***
CAC 40 EGARCH (1,1)	-0.0796203 (0.0156708) [-5.081]***	0.0252850 (0.0362548) [0.6974]	0.0963412 (0.0179016) [5.382]***	-0.113840 (0.0142675) [-7.979]***	0.985805 (0.00273819) [360.0]***
DAX EGARCH (1,1)	-0.0924866 (0.0140718) [-6.572]***	0.0241156 (0.0377292) [0.6392]	0.118154 (0.0156768) [7.537]***	-0.110523 (0.0152848) [-7.231]***	0.983516 (0.00357591) [275.0]***
FTSE 100 GARCH (1,1)	0.00848004 (0.00423610) [2.002]**	0.00802300 (0.0196789) [0.407]	0.0971542 (0.0142747) [6.806]***	x	0.893019 (0.015420) [57.91]***
Hang Seng EGARCH (1,1)	-0.0683421 (0.0146201) [-4.675]***	0.0464948 (0.0444245) [1.047]	0.0806308 (0.014625) [5.513]***	-0.0591354 (0.0146082) [-4.048]***	0.988332 (0.00369394) [267.6]***
FTSE MIB EGARCH (1,1)	-0.0984247 (0.0158588) [-6.206]***	0.0520276 (0.0342290) [1.520]	0.110968 (0.0187955) [5.904]***	-0.106833 (0.0170447) [-6.268]***	0.986487 (0.00371607) [265.5]***
Nikkei 225 EGARCH (1,1)	-0.111609 (0.0165689) [-6.736]***	0.0281719 (0.0326641) [0.8625]	0.151601 (0.0207677) [7.300]***	-0.0698402 (0.0203019) [-3.440]***	0.975052 (0.00799656) [121.9]***
OSEAX GARCH (1,1)	0.0704072 (0.0284268) [2.477]**	0.0402941 (0.0365026) [1.104]	0.107278 (0.0249421) [4.301]***	x	0.829894 (0.0406741) [20.402]***
S&P TSX Composite EGARCH (1,1)	-0.100740 (0.0191964) [-5.248]***	-0.00376700 (0.0397529) [-0.09476]	0.121959 (0.0220408) [5.533]***	-0.0629678 (0.0146888) [-4.287]***	0.983810 (0.00510750) [192.6]***
Standard & Poor's GJR GARCH (1,1)	0.00389552 (0.0045579) [0.8547]	0.0159927 (0.0200660) [0.7970]	0.0264042 (0.0052171) [5.061]***	0.983795 (0.0176236) [55.82]***	0.939482 (0.0115747) [81.17]***
Straits Times GJR GARCH (1,1)	0.00683276 (0.00773663) [0.8832]	0.0381963 (0.025520) [1.497]	0.0460894 (0.0160305) [2.875]***	0.0564102 (0.0225836) [2.498]***	0.913367 (0.0220984) [41.33]***
SSMI GJR GARCH (1,1)	0.0122984 (0.0049636) [2.478]**	0.0226376 (0.0208049) [1.088]	0.0400058 (0.0067224) [5.951]***	0.987979 (0.0438083) [22.55]***	0.903927 (0.0137512) [65.73]***
TAIEX EGARCH (1,1)	-0.0858264 (0.0169583) [-5.061]***	0.0554853 (0.0411640) [1.348]	0.103382 (0.0218031) [4.742]***	-0.0511987 (0.0127985) [-4.000]***	0.991497 (0.00377399) [262.7]***

Notes: Standard errors in round brackets; z-statistics in square brackets; ***, **, * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 6 - Conditional mean equation for the returns of advanced markets indexes from the second sub-sample

Index	Constant term	Coefficient of TOM dummy variable	First order lagged returns
AEX General	-0.0157314 (0.0221046) [-0.7117]	0.0525904 (0.0600496) [0.8758]	x
All Ordinaries	0.0162120 (0.0218783) [0.7410]	0.00784815 (0.0615830) [0.1274]	x
ATX	0.00761101 (0.0355879) [0.2139]	0.136464 (0.0814578) [1.675]*	x
BEL-20	-0.0462466 (0.0280291)	0.111492 (0.0646966)	x

	[-1.650]*	[1.723]*	
CAC 40	-0.0344582 (0.0330332) [-1.043]	0.0887529 (0.0788549) [1.126]	-0.0448172 (0.0225427) [-1.988]**
DAX	0.0122723 (0.0475976) [0.2578]	0.0513080 (0.0661754) [0.7753]	x
FTSE 100	-0.0140183 (0.0278866) [-0.5027]	0.103009 (0.0796944) [1.293]	-0.0461126 (0.0232440) [-1.984]**
Hang Seng	0.0113496 (0.0331520) [0.3424]	0.126788 (0.0812942) [1.560]	x
FTSE MIB	-0.0769714 (0.0979201) [-0.7861]	0.0887786 (0.376346) [0.2359]	x
Nikkei 225	0.00948411 (0.0346326) [0.2738]	-0.0413383 (0.0895086) [-0.4618]	-0.0489348 (0.0237261) [-2.062]**
OSEAX	0.0169618 (0.0176401) [0.9615]	0.0460600 (0.0529289) [0.8702]	x
S&P TSX Composite	0.00343087 (0.00674625) [0.5086]	0.0223866 (0.0790002) [0.2834]	x
Standard & Poor's	0.0209382 (0.0186565) [1.122]	0.0443056 (0.0405277) [1.093]	-0.0804564 (0.0219635) [-3.663]**
Straits Times	0.00311705 (0.00036151) [8.622]***	0.0593810 (0.0454762) [1.306]	x
SSMI	-0.0160259 (0.0207381) [-0.7728]	0.0838886 (0.0537225) [1.562]	x
TAIEX	-0.0124721 (0.000028) [-1103]***	0.159869 (0.0552382) [2.894]***	x

Notes: Standard errors in round brackets; z-statistics in square brackets; ***, **, * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 7 - Conditional variance equation for the returns of advanced markets indexes from the second sub-sample

Index	Constant term	Coefficient of TOM dummy variable	alpha	gamma	beta
AEX General EGARCH (1,1)	-0.0988652 (0.0207209) [-4.771]***	0.0320727 (0.04099) [0.7823]	0.125118 (0.0246505) [5.076]***	-0.151706 (0.0200167) [-7.579]***	0.983943 (0.00537226) [183.2]***
All Ordinaries EGARCH (1,1)	-0.129645 (0.0171387) [-7.564]***	0.0527250 (0.03318) [1.589]	0.152837 (0.0213890) [7.146]***	-0.121653 (0.0179967) [-6.760]***	0.971915 (0.00694945) [139.9]***
ATX GARCH (1,1)	0.0256162 (0.0170105) [1.506]	0.0441676 (0.05839) [0.7564]	0.0904280 (0.0196968) [4.591]***	x	0.899566 (0.021012)8 [42.81]***
BEL-20	-0.117777	0.0019901	0.166299	-0.160937	0.968790

EGARCH (1,1)	(0.0240737) [-4.892]*	(0.03956) [0.05030]	(0.0289074) [5.753]***	(0.0250578) [-6.423]***	(0.00906285) [106.9]***
CAC 40 EGARCH (1,1)	-0.0753279 (0.0188667) [-3.993]***	0.0093966 (0.03939) [0.2386]	0.118802 (0.0207761) [5.718]***	-0.193742 (0.0286075) [-6.772]***	0.968521 (0.00904658) [107.1]***
DAX EGARCH (1,1)	-0.086995 (0.034526) [-2.520]**	-0.020411 (0.09941) [0.2053]	0.133006 (0.022602) [5.884]***	-0.156354 (0.0252676) [-6.188]***	0.977006 (0.00803671) [121.6]***
FTSE 100 EGARCH (1,1)	-0.0990395 (0.0190664) [-5.194]***	-0.011637 (0.0325) [-0.3580]	0.135870 (0.0233632) [5.816]***	-0.138166 (0.0198014) [-6.978]***	0.976717 (0.00697736) [140.0]***
Hang Seng GARCH (1,1)	-0.00394120 (0.0132849) [-0.2967]	0.124840 (0.05948) [2.099]**	0.0750389 (0.012628) [5.942]***	x	0.918502 (0.0129583) [70.88]***
FTSE MIB EGARCH (1,1)	-0.0865575 (0.0706533) [-1.225]	0.0151308 (0.39959) [0.03787]	0.125623 (0.0244258) [5.143]***	-0.103834 (0.0157874) [-6.577]***	0.985366 (0.00543891) [181.2]***
Nikkei 225 EGARCH (1,1)	-0.132996 (0.0208238) [-6.387]***	0.0351508 (0.03842) [0.9148]	0.194626 (0.0280226) [6.945]***	-0.0907503 (0.0220602) [-4.114]***	0.965870 (0.00935738) [103.2]***
OSEAX EGARCH (1,1)	-0.118296 (0.0199315) [-5.935]***	0.0640045 (0.03714) [1.723]*	0.142915 (0.0242996) [5.881]***	-0.100726 (0.0160765) [-6.265]***	0.987014 (0.00403649) [244.5]***
S&P TSX Composite EGARCH (1,1)	-0.109189 (0.0176127) [-6.199]***	0.0528085 (0.05039) [1.048]	0.125513 (0.0196740) [6.380]***	-0.118723 (0.0177372) [-6.693]***	0.986915 (0.00391724) [251.9]***
Standard & Poor's EGARCH (1,1)	-0.133055 (0.020931) [-6.357]***	0.0579041 (0.03756) [1.541]	0.123758 (0.0194174) [6.374]***	-0.176571 (0.0231630) [-7.623]***	0.978478 (0.00574166) [170.4]***
Straits Times EGARCH (1,1)	-0.110242 (0.0194876) [-5.657]***	0.0533691 (0.03698) [1.443]	0.129310 (0.0231160) [5.594]***	-0.0722343 (0.0117771) [-6.133]***	0.992393 0.00315435) [314.6]***
SSMI EGARCH (1,1)	-0.110147 0.0204024) [-5.399]***	-0.033759 (0.03770) [-0.8953]	0.151578 (0.0257497) [5.887]***	-0.154043 (0.0202074) [-7.623]***	0.970687 (0.00698062) [139.1]***
TAIEX EGARCH (1,1)	-0.102730 0.0210484) [-4.881]***	0.0248115 (0.03558) [0.6973	0.136119 (0.0277116) [4.912]***	-0.0740962 (0.0196892) [-3.763]***	0.985772 (0.00679591) [145.1]***

Notes: Standard errors in round brackets; z-statistics in square brackets; ***, **, * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 8 - Conditional mean equation for the returns of emerging markets indexes from the first sub-sample

Index	Constant term	Coefficient of TOM dummy variable	First order lagged returns
Athex Composite Share	0.0108693 (0.0275089) [0.3951]	0.103266 (0.0625302) [1.651]*	0.0982412 (0.0239255) [4.106]***
BET-C	0.0926022 (0.0250375) [3.699]***	0.119873 (0.0596539) [2.009]**	0.151954 (0.0265772) [5.717]***
Bovespa	0.0329743 (0.0400274) [0.8238]	0.386544 (0.101063) [3.825]***	x

BSE 30	0.0263449 (0.0283675) [0.9287]	0.242269 (0.0690618) [3.508]***	0.100178 (0.0272281) [3.679]***
BUX	0.0429649 (0.0326348) [1.317]	0.138534 (0.0729495) [1.899]*	x
CROBEX	0.0692799 (0.0266509) [2.600]***	0.0496981 (0.0563450) [0.8820]	x
IDX Composite	0.0538407 (0.0335790) [1.603]	0.100256 (0.0513968) [1.951]*	0.102552 (0.0262306) [3.910]***
IPC	0.0593891 (0.0272313) [2.181]**	0.199258 (0.0655341) [3.041]***	0.0856522 (0.0235351) [3.639]***
KLSE Composite	0.0109393 (0.0149909) [0.7297]	0.0349013 (0.0368244) [0.9478]	0.145427 (0.0260489) [5.583]***
KOSPI	0.0171869 (0.000041) [1386]***	0.223538 (0.0702143) [3.184]***	0.0144342 (0.000028) [2274]***
MerVal	0.0563620 (0.0472894) [1.192]	0.166789 (0.102677) [1.624]	0.0409841 (0.0231121) [1.773]*
OMXT	0.0500371 (0.0177996) [2.811]***	0.0172080 (0.0341026) [0.5046]	0.179138 (0.0286130) [6.261]***
PX	0.0850995 (0.0285709) [2.979]***	0.0956345 (0.0673557) [1.420]	0.0504818 (0.0250193) [2.018]**
SEMDEX	0.0228857 (0.00892500) [2.564]**	0.00659727 (0.0180554) [0.3654]	0.234309 (0.0226499) [10.34]***
SSE Composite	-0.0111683 (0.0329074) [-0.3394]	0.116634 (0.0481608) [2.422]**	x
TA 100	-0.00149973 (0.000412928) [-3.632]***	0.189240 (0.000016) [4.841]***	x

Notes: Standard errors in round brackets; z-statistics in square brackets; ***, **, * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 9 - Conditional variance equation for the returns of emerging markets indexes from the first sub-sample

Index	Constant term	Coefficient of TOM dummy variable	alpha	gamma	beta
Athex Composite Share GARCH (1,1)	0.0586448 (0.0428926) [1.367]	0.0404459 (0.0618711) [0.6537]	0.112496 (0.0438329) [2.566]**	x	0.850371 (0.067988) [12.51]***
BET-C GARCH (1,1)	0.105236 (0.0472876) [2.225]**	0.161592 (0.0743432) [2.174]**	0.255013 (0.0600202) [4.249]***	x	0.687830 (0.0707877) [9.717]***
Bovespa GARCH (1,1)	0.0359241 (0.0316454)	0.107526 (0.095746)	0.0529704 (0.0119575)	x	0.929732 (0.0169635)

	[1.135]	[1.123]	[4.430]***		[54.81]***
BSE 30 EGARCH (1,1)	-0.175239 (0.0268250) [-6.533]***	-0.0251110 (0.0305464) [-0.8221]	0.285238 (0.0425689) [6.701]***	-0.140163 (0.0319006) [-4.394]***	0.913045 (0.0255883) [35.68]***
BUX EGARCH (1,1)	-0.0945660 (0.0221521) [-4.269]***	0.0664718 (0.0392598) [1.693]*	0.139929 (0.0279247) [5.011]***	-0.0502372 (0.0171774) [-2.925]***	0.955353 (0.0131291) [72.77]***
CROBEX GARCH (1,1)	0.145688 (0.0788154) [1.848]*	0.0838147 (0.0645421) [1.299]	0.198607 (0.0661962) [3.000]***	x	0.726152 (0.0946816) [7.669]***
IDX Composite EGARCH (1,1)	-0.102067 (0.0309236) [-3.301]***	0.100256 (0.0513968) [1.951]*	0.185209 (0.0452181) [4.096]***	-0.101242 (0.0322398) [-3.140]***	0.885044 (0.0464392) [19.06]***
IPC EGARCH (1,1)	-0.116939 (0.0215523) [-5.426]***	0.0618028 (0.0353247) [1.750]*	0.149655 (0.0263205) [5.686]***	-0.104035 (0.0186929) [-5.565]***	0.970080 (0.00853130) [113.7]***
KLSE Composite EGARCH (1,1)	-0.197514 (0.0522791) [-3.778]***	0.0762703 (0.0423468) [1.801]*	0.224710 (0.0596599) [3.767]***	-0.0431858 (0.0185875) [-2.323]**	0.972862 (0.0142098) [68.46]***
KOSPI EGARCH (1,1)	-0.0928303 (0.0193030) [-4.809]***	-0.00823267 0.0433771) [-0.1898]	0.145809 (0.0306315) [4.760]***	-0.0768932 (0.0219416) [-3.504]***	0.981185 (0.00800805) [122.5]***
MerVal GJR GARCH (1,1)	0.0922922 (0.0380726) [2.424]**	0.102929 (0.111867) [0.9201]	0.0898320 (0.0154424) [5.817]***	0.243803 (0.0684059) [3.564]***	0.882846 (0.0187946) [46.97]***
OMXT GARCH (1,1)	0.0176086 (0.00780573) [2.256]**	-0.0261127 (0.0152966) [-1.707]*	0.195381 (0.0398086) [4.908]***	x	0.831060 (0.0281272) [29.55]***
PX GJR GARCH (1,1)	0.0597500 (0.0219326) [2.724]***	-0.00357790 (0.0490258) [-0.07298]	0.0918586 (0.0142770) [6.434]***	0.286176 (0.0945298) [3.027]***	0.860557 (0.0200696) [42.88]***
SEMDEX EGARCH (1,1)	-0.539155 (0.0700498) [-7.697]***	0.139977 (0.0572962) [2.443]**	0.419315 (0.0564841) [7.424]***	0.0899361 (0.0315990) [2.846]***	0.860871 (0.0270596) [31.81]***
SSE Composite GARCH (1,1)	0.298314 (0.119167) [2.503]**	-0.269371 (0.154192) [-1.747]*	0.207648 (0.0680928) [3.049]***	x	0.725401 (0.0661642) [10.96]***
TA 100 EGARCH (1,1)	-0.121981 (0.0271157) [-4.499]***	0.0638609 (0.0531025) [1.203]	0.178918 (0.0368355) [4.857]***	-0.0719682 (0.0262554) [-2.741]***	0.948836 (0.0193486) [49.04]***

Notes: Standard errors in round brackets; z-statistics in square brackets; ***, **, * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 10 - Conditional mean equation for the returns of emerging markets indexes from the second sub-sample

Index	Constant term	Coefficient of TOM dummy variable	First order lagged returns
Athex Composite Share	-0.0564631 (0.0463139) [-1.219]	0.194571 (0.101326) [1.920]*	0.0538544 (0.0227961) [2.362]**
BET-C	-0.00861223 (0.025648) [-0.3358]	0.162227 (0.0647087) [2.507]**	0.0792718 (0.0261177) [3.035]***
Bovespa	-0.0713996 (0.0383472) [-1.862]*	0.249683 (0.0882332) [2.830]***	x

BSE 30	-0.0243808 (0.0325835) [-0.7483]	0.165797 (0.0660482) [2.510]**	0.0525280 (0.0221255) [2.374]**
BUX	-0.0484894 (0.0336533) [-1.441]	0.154997 (0.0730407) [2.122]**	x
CROBEX	-0.0435305 (0.0213535) [-2.039]**	0.111569 (0.0479347 [2.328]**	0.0976693 (0.0247232) [3.951]***
IDX Composite	0.0414456 (0.0295099) [1.404]	0.111204 (0.0670483) [1.659]*	x
IPC	0.000477262 (0.0263725) [0.01810]	0.183240 (0.0599256) [3.058]***	x
KLSE Composite	0.0176274 (0.0162320) [1.086]	0.0797189 (0.0420994) [1.894]*	0.103882 (0.0273801) [3.794]***
KOSPI	0.000479033 (0.0281488) [0.01702]	0.112812 (0.0637529) [1.770]*	x
MerVal	0.0478333 (0.0475773) [1.005]	0.106920 (0.0926417) [1.154]	x
OMXT	0.00356583 (0.0240796) [0.1481]	0.0836532 (0.0479991) [1.743]*	x
PX	-0.0358851 (0.0303009) [-1.184]	0.174214 (0.0632501) [2.754]***	x
SEMDEX	0.0181952 (0.0118623) [1.534]	0.0329361 (0.0229163) [1.437]	0.309609 (0.0271780) [11.39]***
SSE Composite	-0.0655578 (0.0426259) [-1.538]	0.181188 (0.112472) [1.611]	x
TA 100	0.00848683 (0.0287772) [0.2949]	0.106732 (0.0617736) [1.728]*	-0.136644 (0.0259431 [-5.267]***

Notes: Standard errors in round brackets; z-statistics in square brackets; ***, **, * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 11 - Conditional variance equation for the returns of emerging markets indexes from the second sub-sample

Index	Constant term	Coefficient of TOM dummy variable	alpha	gamma	beta
Athex Composite Share EGARCH (1,1)	-0.128186 (0.0219227) [-5.847]***	0.0537454 (0.0377380) [1.424]	0.206473 (0.0305723) [6.754]***	-0.0489078 (0.0173253) [-2.823]***	0.972073 (0.0081858) [118.8]***
BET-C GARCH (1,1)	0.0204426 (0.0149498) [1.367]	0.0621684 (0.0393804) [1.579]	0.151441 (0.0367025) [4.126]***	x	0.844614 (0.0359508) [23.49]***
Bovespa GJR GARCH (1,1)	0.0407206 (0.0311212) [1.308]	0.0758472 (0.0701436) [1.081]	0.0565567 (0.0201379) [2.808]***	0.137681 (0.039990) [3.443]***	0.905886 (0.0293826) [30.83]***

BSE 30 EGARCH (1,1)	-0.113958 (0.0211986) [-5.376]***	-0.0329128 (0.0451324) [-0.7293]	0.172789 (0.0286612) [6.029]***	-0.102715 (0.0204374) [-5.026]***	0.983505 (0.0059445) [165.4]***
BUX EGARCH (1,1)	-0.125241 (0.0218901) [-5.721]***	-0.00827314 (0.0411378) [-0.2011]	0.181461 (0.0295289) [6.145]***	-0.0598784 (0.0151099) [-3.963]***	0.983873 (0.0065571) [150.0]***
CROBEX GJR GARCH (1,1)	0.00594874 (0.00685366) [0.8680]	0.0108875 (0.0269027) [0.4047]	0.0737943 (0.0220162) [3.352]***	0.211292 (0.0695012) [3.040]***	0.920461 (0.0204963) [44.91]***
IDX Composite GJR GARCH (1,1)	0.0713572 (0.0390590) [1.827]*	0.0626008 (0.0590628) [1.060]	0.132421 (0.0357216) [3.707]***	0.312538 (0.0766005) [4.080]***	0.820454 (0.0524580) [15.64]***
IPC GARCH (1,1)	0.0211372 (0.0103768) [2.037]**	-0.0312469 (0.0425291) [-0.7347]	0.0871723 (0.0159793) [5.455]***	x	0.906602 (0.0158493) [57.20]***
KLSE Composite GJR GARCH (1,1)	0.0533215 (0.0222640) [2.395]**	0.0284713 (0.0286321) [0.9944]	0.261608 (0.0564473) [4 .635]***	0.209763 (0.0590137) [3.554]***	0.696763 (0.0617251) [11.29]***
KOSPI GJR GARCH (1,1)	0.0443324 (0.0177432) [2.499]**	-0.00554802 (0.0558465) [-0.09934]	0.0421867 (0.0082559) [5.110]***	1.01996 (0.0444612) [22.94]***	0.887730 (0.0193146) [45.96]***
MerVal GARCH (1,1)	0.0751617 (0.0566648) [1.326]	0.199390 (0.139877) [1.425]	0.0965518 (0.0257012) [3.757]***	x	0.877533 (0.0337679) [25.99]***
OMXT GARCH (1,1)	0.0170777 (0.0141632) [1.206]	0.0637431 (0.0439766) [1.449]	0.158354 (0.0462826) [3.421]***	x	0.844664 (0.0412746) [20.46]***
PX EGARCH (1,1)	-0.179092 (0.0252977) [-7.079]***	0.00547726 (0.0392186) [0.1397]	0.245214 (0.0329646) [7.439]***	-0.0556826 (0.0174221) [-3.196]***	0.975567 (0.0073921) [132.0]***
SEMDEX GARCH (1,1)	0.0236321 (0.00979674) [2.412]**	-0.00637919 (0.0105269) [-0.6060]	0.331147 (0.0932574) [3.551]***	x	0.691324 (0.0747071) [9.254]***
SSE Composite GARCH (1,1)	0.00316801 (0.0107690) [0.2942]	0.00810933 (0.0460545) [0.1761]	0.0268869 (0.0093494) [2.876]***	x	0.971985 (0.0098928) [98.25]***
TA 100 EGARCH (1,1)	-0.0975141 (0.0291778) [-3.342]***	-0.0182498 (0.0598561) [-0.3049]	0.140574 (0.0402330) [3.494]***	-0.0704078 (0.016673) [-4.223]***	0.990158 (0.0059144) [167.4]***

Notes: Standard errors in round brackets; z-statistics in square brackets; ***, **, * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 12 - Results of ARCH LM tests for residuals of GARCH models

Advanced Markets			Emerging Markets		
Index	First sub-sample	Second sub-sample	Index	First sub-sample	Second sub-sample
AEX General	3.8243 {0.5731}	8.6242 {0.2146}	Athex Composite Share	4.716 {0.7308}	8.412 {0.7385}
All Ordinaries	5.1643 {0.8604}	6.8621 {0.5869}	BET-C	6.493 {0.6975}	6.247 {0.5942}
ATX	5.8408 {0.8408}	12.1661 {0.3141}	Bovespa	8.884 {0.6851}	8.741 {0.6475}
BEL-20	4.701 {0.7374}	2.2061 {0.8741}	BSE 30	3.496 {0.7612}	6.478 {0.6861}
CAC 40	4.717 {0.8361}	11.2851 {0.5011}	BUX	10.638 {0.5887}	4.825 {0.758}

DAX	5.062 {0.4906}	7.1241 {0.2873}	CROBEX	3.384 {0.7951}	8.614 {0.6802}
FTSE 100	5.114 {0.6628}	7.4616 {0.5913}	IDX Composite	6.802 {0.7155}	6.705 {0.6940}
Hang Seng	3.735 {0.6874}	11.985 {0.4907}	IPC	4.275 {0.7403}	3.710 {0.7112}
FTSE MIB	3.208 {0.7341}	6.8251 {0.3311}	KLSE Composite	10.769 {0.5751}	7.715 {0.7301}
Nikkei 225	5.347 {0.8258}	8.804 {0.383}	KOSPI	4.841 {0.7116}	10.517 {0.2294}
OSEAX	3.571 {0.5970}	6.482 {0.4216}	MerVal	3.516 {0.6841}	7.161 {0.2115}
S&P TSX Composite	2.884 {0.7168}	8.407 {0.3012}	OMXT	4.340 {0.6853}	8.7514 {0.3501}
Standard & Poor's	5.773 {0.6249}	6.291 {0.2946}	PX	10.164 {0.5738}	8.826 {0.6419}
Straits Times	4.259 {0.7124}	13.196 {0.5197}	SEMDEX	8.714 {0.6428}	8.8731 {0.7943}
SSMI	4.614 {0.6105}	8.867 {0.5160}	SSE Composite	6.217 {0.7510}	7.175 {0.2961}
TAIEX	4.287 {0.8285}	11.503 {0.3821}	TA 100	3.841 {0.7322}	6.617 {0.4612}

Note: p-values are within accolads.