

CHAPTER 5

RESULTS AND DISCUSSION

5.1 Introduction

In this chapter the results and computer analysis output will be discussed in detail. All assumptions used in the study will be presented. Detailed descriptive analysis and specifics analysis will be provided if necessary.

In this study the Bursa Malaysia composite index and sectorial indices were analysed - a total of eleven sets of data were used. The samples for daily indices closing data retrieved from the Bloomberg datastream were FBMKLCI (Kuala Lumpur Composite Index), KLCON (Construction Sector Index), KLCSU (Consumer Sector Index), KLFIN (Financial Sector Index), KLIND (Industrial Sector Index), KLPRO (Industrial Production Sector Index), KLTIN (Mining Sector Index), KLPLN (Plantation Sector Index), KLPRP (Property Sector Index), KLSER (Services Sector Index) and KLTEC (Technology Sector Index).

5.2 Empirical results analysis on stylized facts of volatility

5.2.1 Kuala Lumpur Composite Index – FBMKLCI

Table 5.1: FBMKLCI returns descriptive statistics

DATA	2710
MEAN	0.000221
SKEWNESS	-0.863161
KURTOSIS	12.15231
JARQUE-BERA	9794.961 with P-value = 0.000000

Source: EViews Analysis Output

Table 5.2: Results from the GARCH(1,1) and EGARCH models for FBMKLCI

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	1.06E-06	1.83E-07	0.0000
α	0.1196	0.007	0.0000
β	0.877	0.006	0.0000
$\alpha + \beta$	0.9966	-	-
γ	-0.0584	0.006945	0.0000

Source: EViews Analysis Output

A total of 2710 daily returns were studied for eleven year period between January 2000 and December 2010. The normality of the data was tested with a histogram. The assumption used was that the histogram should

reflect a bell-shaped curve, which would mean that the data was normally distributed. If the returns were normally distributed, then the coefficients of skewness and kurtosis should be equal to zero.

The EViews outputs are shown in Appendices 1, 2 and 3. Observation of the histogram showed that it was not symmetrically bell-shaped. This indicated that the data did not fit into a normal bell-curve. The Jarque-Bera test value of 9794.961 indicated significant departures from normality for the index. The returns statistics and the GARCH (1,1) and the EGARCH outputs are summarised in Tables 5.1 & 5.2. The statistics showed that the index had a positive return of about 0.000221 (0.02%) per day. The skewness coefficient of -0.86 indicated that the distribution was negatively skewed, which was a common feature of equity returns. The kurtosis coefficient which measures of thickness of the tails of the distribution was calculated to be 12.15 and was considered to be very high and implied very extreme deviation from normality. According to Engle and Patton (2001), kurtosis values ranging from 4 to 50 were considered to be very extreme deviation from normality.

The sum of α and β of 0.9966 implied that the volatility half-life was 204.5 days. It could be concluded that although the volatility had a long memory it was persistent and mean-reverting.

The EGARCH analysis showed β value of -0.0584. This implied that the leverage effect existed for FBMKLCI index during the period of study.

The results are highly significant with significance level less than 1%.

The above results concurred with the findings made by Zaharim, Zahid, Zainol, Mohamed and Sopian (2009) in which the KLCI return was not normal, mean-reverting and exhibited volatility clustering. However, the results for leverage effect did not concur with the study done by Wai Mun, Lenan and Sze Yin (2008) in which they concluded that the EGARCH analysis did not confirm the existence of leverage effect. It should be noted that Wai Mun, Lenan and Sze Yin (2008) used KLCI data from January 2004 to June 2007 – a 3 ½ year period whereas this study was for the period between 2000 and 2010. The leverage effect may have been present during the period of their study but may have been significantly muted during the longer period as shown in this study.

5.2.2 Kuala Lumpur Construction Sector Index – KLCON

Table 5.3: KLCON returns descriptive statistics

DATA	2710
MEAN	5.16E-05
SKEWNESS	-0.8385
KURTOSIS	15.23
JARQUE-BERA	17194.51 with P-value = 0.000000

Source: EViews Analysis Output

Table 5.4: Results from the GARCH(1,1) and EGARCH models for KLCON

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	5.45E-06	4.95E-07	0.0000
α	0.1256	0.0089	0.0000
β	0.8547	0.0083	0.0000
$\alpha + \beta$	0.9803	-	-
γ	-0.0538	0.007395	0.0000

Source: EViews Analysis Output

The EViews outputs are shown in Appendices 4, 5 and 6. As observed for the FBMKLCI, the histogram for KLCON showed that it was not symmetrically bell-shaped. The very high value for the Jarque-Bera test i.e. 17194, indicated significant departure from normality for the index. The

returns statistics and the GARCH(1,1) and the EGARCH outputs are shown in Tables 5.3 & 5.4. From the analysis for the index, a daily positive return of about 5.61E-05 (0.005%) per day was calculated. The skewness coefficient had a value of -0.83 and this indicated that the distribution was negatively skewed. The kurtosis coefficient of 15.23 was very high and in this case higher than observed on the FBMKLCI index.

From the sum of α and β , the volatility half-life was calculated. Using the formula described in the previous section, the sum of α and β was 0.9803 and the volatility half-life was calculated to be 35.8 days. This figure implied that the volatility had a long memory and was mean-reverting.

The EGARCH analysis was used to verify the existence of the leverage effect. The value of constant γ was found to be -0.0538. This negative figure implied that the leverage effect existed for the Construction Sector.

Overall, the data analysis for the Construction Sector displayed the same characteristics as the main index, FBMKLCI. The P-values indicated that the statistics had 10% significance level.

5.2.3 Kuala Lumpur Consumer Sector Index – KLCSU

Table 5.5: Consumer Sector returns descriptive statistics

DATA	2710
MEAN	0.000363
SKEWNESS	-0.8652
KURTOSIS	10.23
JARQUE-BERA	6241.8 with P-value = 0.000000

Source: EViews Analysis Output

Table 5.6: Results from the GARCH(1,1) and EGARCH models for KLCSU

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	1.75E-06	1.67E-07	0.0000
α	0.1028	0.0077	0.0000
β	0.8644	0.0082	0.0000
$\alpha + \beta$	0.9672	-	-
γ	-0.0584	0.009040	0.0000

Source: EViews Analysis Output

The EViews outputs are shown in Appendices 7, 8 and 9. As observed for the FBMKLCI and KLCON, the histogram for KLCSU showed that it was also not symmetrically bell-shaped. The high value for the Jarque-Bera test of 6241.8 indicated significant departure from normality for the index. The returns statistics and GARCH(1,1) and EGARCH outputs are shown

in Tables 5.5 & 5.6. The mean figure showed that the index had a positive return of about 0.000363 (0.036%) per day. The skewness coefficient of -0.865 indicated that the distribution was negatively skewed. The kurtosis coefficient of 10.23, which measured of thickness of the tails of the distribution, was considered to be very high as described in section 1.2, values above four were considered very extreme deviation from normality.

The sum of α and β was 0.9672 from which the volatility half-life was calculated to have 21.8 days. This implied that the volatility had a long memory, persistent and mean-reverting.

The γ factor of -0.0584 from the EGARCH analysis implied that the leverage effect existed for this index.

Overall, the data analysis for the Consumer Sector displayed the same characteristics as the main index, FBMKLCI and the Construction Sector indices. All the tests also indicated that this index fitted well into normal financial time series characteristics. Significance level of the statistics was less than 1%.

5.2.4 Kuala Lumpur Finance Sector Index – KLFIN

Table 5.7: Finance Sector returns descriptive statistics

DATA	2711
MEAN	0.000266
SKEWNESS	-0.3630
KURTOSIS	8.32
JARQUE-BERA	3256.793 with P-value = 0.000000

Source: EViews Analysis Output

Table 5.8: Results from the GARCH(1,1) and EGARCH models for KLFIN

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	1.76E-06	2.61E-07	0.0000
α	0.0966	0.0069	0.0000
β	0.8927	0.0063	0.0000
$\alpha + \beta$	0.9959	-	-
γ	-0.0458	0.005991	0.0000

Source: EViews Analysis Output

Reference is made to the EViews outputs for the Finance Sector shown in Appendices 10, 11 and 12. As observed for the other indices in the earlier sections, the histogram for the Finance Sector showed that it was not symmetrically bell-shaped. The high value for the Jarque-Bera test of

3257 indicated significant departure from normality for the index. The returns statistics and GARCH(1,1) and EGARCH outputs are shown in Tables 5.7 & 5.8. The figures showed that the index had a positive return of about 0.000266 (0.026%) per day. The skewness coefficient of -0.363 indicated that the distribution was negatively skewed as for the other indices. The kurtosis coefficient of 8.32 was considered to be very high and this implied that the tail thickness was very high.

The sum of α and β was 0.9959. From this value the volatility half-life was calculated to have been 65.43 days. This meant that although the volatility had a long memory it was persistent and mean-reverting.

From the EGARCH analysis the constant γ had a value -0.0548. This negative value implied that the leverage effect existed for this index

Overall, the data analysis for the Finance Sector displayed the same characteristics as the other indices. The statistics had a high significant level i.e. less than 5%.

5.2.5 Kuala Lumpur Industrial Sector Index – KLIND

Table 5.9: Industrial Sector returns descriptive statistics

DATA	2711
MEAN	0.000251
SKEWNESS	-0.6473
KURTOSIS	13.91
JARQUE-BERA	13645.91 with P-value = 0.000000

Source: EViews Analysis Output

Table 5.10: Results from the GARCH(1,1) and EGARCH models for KLIND

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	2.34E-06	6.21E-08	0.0002
α	0.0385	0.0025	0.0000
β	0.9589	0.0020	0.0000
$\alpha + \beta$	0.9974	-	-
γ	-0.0332	0.006431	0.0000

Source: EViews Analysis Output

The EViews outputs for the Industrial Sector are shown in Appendices 13, 14 and 15. The histogram for this Finance Sector showed that it was not symmetrically bell-shaped. The high value for the Jarque-Bera test of 13646 indicated extreme departure from normality for the index. The returns statistics and the GARCH (1,1) and EGARCH outputs are shown

in Tables 5.9 & 5.10. The figures showed that the index had a positive return of about 0.000251 (0.025%) per day. The skewness coefficient of -0.6473 indicated that the distribution was negatively skewed. The kurtosis coefficient of 13.91, which measured the thickness of the tails of the distribution, implied that the tail was very thick.

The sum of α and β was 0.9974 and this implied that the volatility half-life was 267.25 days. This indicated the volatility had long memory, was persistent and also mean-reverting.

The γ factor from EGARCH analysis had a negative value. The factor of -0.0332 implied that the leverage effect existed for the Industrial index.

Overall, the data analysis for the Industrial Sector displayed the same characteristics as the other indices. The characteristics also showed the normally observed patterns of financial time series. P-values for the statistics showed high significance level i.e. less than 1%.

5.2.6 Kuala Lumpur Industrial Production Sector Index – KLPRO

Table 5.11: Industrial Production Sector returns descriptive statistics

DATA	2711
MEAN	7.28E-05
SKEWNESS	-0.8530
KURTOSIS	12.25
JARQUE-BERA	9984.55 with P-value = 0.000000

Source: EViews Analysis Output

Table 5.12: Results from the GARCH(1,1) and EGARCH models for KLPRO

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	1.35 E-06	2.21E-07	0.0000
α	0.1202	0.0076	0.0000
β	0.8722	0.0071	0.0000
$\alpha + \beta$	0.9924	-	-
γ	-0.0325	0.006946	0.0000

Source: EViews Analysis Output

The EViews outputs for the Industrial Production sector are shown in Appendices 16, 17 and 18. As observed for the other sectors, the histogram for this financial sector also shows that it was not symmetrically bell-shaped. The high value for the Jarque-Bera test of 9984.55 indicated that the index significantly departed from normality. The returns statistics

and the GARCH(1,1) and EGARCH outputs are shown in Tables 5.11 & 5.12 above. The figures showed that the index had a positive return of about $7.28E-05$ (0.007%) per day. The skewness coefficient of -0.853 indicated that the distribution was negatively skewed. The kurtosis coefficient of 12.25 implied that the tail had very high thickness.

The sum of α and β was 0.9924 and this implied that the volatility half-life was 91.86 days. Although the volatility had a long memory, it was persistent and mean-reverting just like other indices.

From the EGARCH analysis the negative value of -0.0325 for γ factor indicated that the leverage effect existed for the Industrial Production sector in the period studied.

Overall, the data analysis for the Industrial Production sector displayed the same characteristics as the main index, FBMKLCI and the other sectors' indices. Significance level of the statistics was less than 10%.

5.2.7 Kuala Lumpur Mining Sector Index – KLTIN

Table 5.13: Mining Sector returns descriptive statistics

DATA	2711
MEAN	0.000364
SKEWNESS	1.4759
KURTOSIS	56.17
JARQUE-BERA	320377.8 with P-value = 0.000000

Source: EViews Analysis Output

Table 5.14: Results from the GARCH(1,1) and EGARCH models KLTIN

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	9.10 E-05	6.56E-06	0.0000
α	0.1732	0.0122	0.0000
β	0.7440	0.0150	0.0000
$\alpha + \beta$	0.9172	-	-
γ	-0.0406	0.007364	0.0000

Source: EViews Analysis Output

The EViews outputs for the Mining Sector are shown in Appendices 19, 20 and 21. As observed for the FBMKLCI and other sectors, the histogram for this Mining Sector showed that it also was not symmetrically bell-shaped. This indicated that the data was not normal. However, the figures implied

that the departure was not as bad as that for the other indices. The high value for the Jarque-Bera test of 320377.8 indicated extensive departure from normality for this index. The returns statistics and the GARCH(1,1) and EGARCH outputs are shown in Tables 5.13 & 5.14. The figures showed that the index had a positive return of about 0.000364 (0.036%) per day. The skewness coefficient of 1.4759 indicated that the distribution was positively skewed, which was not normal for a financial time series. The kurtosis coefficient of 56.17 was also considered to be extremely high, exceeding the range prescribed by Engle and Patton.

The sum of α and β was 0.9172 and this implied that the volatility half-life was 9.02 days. The volatility had a long memory, was persistent and mean-reverting.

From the EGARCH analysis the factor γ was deduced to have the value of -0.0406. This negative value implied that the leverage effect existed for the Mining Sector.

Overall, the data analysis for the Mining Sector displayed the same characteristics as the main index, FBMKLCI and the other sectors' indices in all aspects except the skewness and kurtosis. The most likely reason for this would be that the mining sector index only had one constituent i.e.

Kuchai Bhd. Without having other stocks in the stable, the results actually represented the sole stock. This implied that the particular stock performed relatively poorly during the period studied and since there were no other stocks to moderate the performance of this index, the result was not normal when compared with the other indices. The statistics are reliable with significance level less than 1%.

5.2.8 Kuala Lumpur Plantation Sector Index – KLPLN

Table 5.15: Plantation Sector returns descriptive statistics

DATA	2711
MEAN	0.000574
SKEWNESS	-0.4089
KURTOSIS	15.62
JARQUE-BERA	18068.65 with P-value = 0.000000

Source: EViews Analysis Output

Table 5.16: Results from the GARCH(1,1) and EGARCH models for KLPLN

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	4.55 E-06	4.48E-07	0.0000
α	0.1634	0.0106	0.0000
β	0.8123	0.0110	0.0000
$\alpha + \beta$	0.9757	-	-
γ	-0.0143	0.007181	0.0470

Source: EViews Analysis Output

The EViews outputs for the Plantation Sector are shown in Appendices 22, 23 and 24. As observed on the other sectors, the histogram for Plantation Sector also shows that it was not symmetrically bell-shaped. The high value for the Jarque-Bera test of 18068.65 indicated that the index significantly departed from normality. The returns statistics and the GARCH (1,1) and EGARCH outputs are shown in Tables 15 & 16. The figures showed that the index had a positive return of about 0.000574 (0.06%) per day. The skewness coefficient of -0.41 indicated that the distribution was negatively skewed. The kurtosis coefficient of 15.62 measured high thickness of the tails of the distribution.

The sum of α and β was 0.9757 and this implied that the volatility half-life was 21.18 days. The half-life value implied that it was persistent and mean-reverting.

From the EGARCH analysis the γ factor of -0.0143 was deduced. This negative value confirmed the existence of the leverage effect for this index.

The Plantation Sector displayed the same characteristics as the other indices reviewed and at the same time displayed the normal characteristics of any financial time series. The significance level was less than 5%.

5.2.9 Kuala Lumpur Property Sector Index – KLPRP

Table 5.17: Property Sector returns descriptive statistics

DATA	2711
MEAN	-2.05 E -05
SKEWNESS	-0.6616
KURTOSIS	10.47
JARQUE-BERA	6494.43 with P-value = 0.000000

Source: EViews Analysis Output

Table 5.18: Results from the GARCH(1,1) and EGARCH models for KLPRP

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	3.37 E-06	3.36E-07	0.0000
α	0.1457	0.0079	0.0000
β	0.8417	0.0059	0.0000
$\alpha + \beta$	0.9874	-	-
γ	-0.0116	0.005285	0.0276

Source: EViews Analysis Output

The EViews outputs for the Property Sector are shown in Appendices 25, 26 and 27. As observed for the FBMKLCI and other sectors, the histogram for Property Sector also showed that it was not symmetrically bell-shaped. The high value for the Jarque-Bera test of 6494.43 indicated significant departure from normality for this index. The returns statistics and the GARCH(1,1) and EGARCH outputs are shown in Tables 5.17 & 5.18. The figures showed that the index had a negative return of about 2.05E-05 (-0.002%) per day. The skewness coefficient of -0.66 indicated that the distribution was negatively skewed. The kurtosis coefficient of 10.47 was also considered to be very high.

The sum of α and β was 0.9874 and this implied that the volatility half-life was 55.66 days. The volatility had a long memory and was mean-reverting.

The γ factor from the EGARCH analysis indicated the factor had a negative value of -0.0116. This negative value implied that the leverage effect existed for this index during the period tested.

Overall, the data analysis for the Property Sector displayed the same characteristics as the main index, FBMKLCI and the other sectors' indices except that the return fared poorly when compared with other indices, i.e. investors holding the index during the analysed period would have experienced losses on their investments. The significance level for the statistics can be considered high i.e. less than 5% except for the constant variable which displayed a low significance level i.e. less than 50%.

5.2.10 Kuala Lumpur Services Sector Index – KLSEI

Table 5.19: Services Sector returns descriptive statistics

DATA	2711
MEAN	0.000138
SKEWNESS	-0.6589
KURTOSIS	11.76
JARQUE-BERA	8867.73 with P-value = 0.0000000

Source: EViews Analysis Output

Table 5.20: Results from the GARCH(1,1) and EGARCH models for KLSEI

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	7.36 E-07	1.64E-07	0.0000
α	0.1019	0.0068	0.0000
β	0.8980	0.0063	0.0000
$\alpha + \beta$	0.9999	-	-
γ	-0.0579	0.006836	0.0000

Source: EViews Analysis Output

The EViews outputs for the Services Sector are shown in Appendices 28, 29 and 30. As observed for the other sectors, the histogram for the Services Sector showed that it was also not symmetrically bell-shaped. The high value for the Jarque-Bera test of 8867.73 indicated significant

departure from normality for this index. The returns statistics and the GARCH(1,1) and EGARCH outputs are shown in Tables 5.19 & 5.20. The mean figure showed that the index had a positive return of about 0.000138 (0.014%) per day. The skewness coefficient of -0.659 indicated that the distribution was negatively skewed. The kurtosis coefficient of 11.76 was considered to be high.

The sum of α and β was 0.9999 and this implied that the volatility half-life was 6932 days. Although the volatility had a extremely long memory it eventually reverted to the mean.

From the EGARCH analysis for the factor γ was deduced to have a negative value of -0.0579. This negative value implied that the leverage effect existed for this index during the period studied.

Overall, the data analysis for the Services Sector displayed the same characteristics as the main index, FBMKLCI and the other sector indices. However, it was noted that the volatility half-life value was relatively high for this index. The data statistics had high significance level i.e. less than 1%.

5.2.11 Kuala Lumpur Technology Sector Index – KLTEC

Table 5.21: Technology Sector returns descriptive statistics

DATA	2624
MEAN	-0.000815
SKEWNESS	0.03537
KURTOSIS	10.83
JARQUE-BERA	6698.15 with P-value = 0.000000

Source: EViews Analysis Output

Table 5.22: Results from the GARCH(1,1) and EGARCH models for KLTEC

COEFFICIENT	COEFFICIENT FACTOR	STANDARD ERROR	P-VALUE
ω	3.06 E-06	4.25 E-07	0.0000
α	0.1059	0.0064	0.0000
β	0.8887	0.0052	0.0000
$\alpha + \beta$	0.9946	-	-
γ	-0.0149	0.006203	0.0157

Source: EViews Analysis Output

The EViews outputs for the Technology Sector are shown in Appendices 31, 32 and 33. As observed for the FBMKLCI and other sectors, the histogram for Technology Sector also showed that it was not symmetrically bell-shaped. The high value for the Jarque-Bera test of

6698.15 indicated significant departure from normality for this index. The returns statistics and the GARCH(1,1) and EGARCH outputs are shown in Tables 5.21 & 5.22. The figures showed that the index had a negative return of about 0.000815 (-0.082%) per day. The skewness coefficient of 0.0357 indicated that the distribution was positively skewed which was not a normal case for this time series. The kurtosis coefficient of 10.83 measured very high thickness of the tail's distribution for this index.

The sum of α and β was 0.9946 and this implied that the volatility half-life was 129 days. Although the volatility had a long memory it was persistent and mean-reverting.

From the EGARCH analysis the factor γ was computed to be -0.0149. This negative value indicated that the leverage effect existed for this index during the period studied.

Overall, the data analysis for the Technology Sector displayed the same characteristics as the main index, FBMKLCI and the other sectors indices except that the return fared poorly, i.e. capital investors holding the index during the period analysed would have experienced losses. The positive skewness also supported the notion that it did not perform well relative to other indices. The significance level of the statistics was less than 5%.

5.3 Empirical results analysis on levels of volatility of Indices

Table 5.23: The GARCH(1,1) EViews analysis output 11-year data for covariance coefficients

	INDEX	TICKER	COVARIANCE COEFFICIENTS		
			C	α	β
1	Composite Index	FBMKLCI	1.06E-06	0.119586	0.877081
2	Construction Index	KLCON	5.45E-06	0.125640	0.854725
3	Consumer Index	KLCSU	1.75E-06	0.102756	0.864447
4	Finance Index	KLFIN	1.76E-06	0.096559	0.892701
5	Industrial Index	KLIND	2.34E-07	0.038476	0.958866
6	Industrial Production Index	KLPRO	1.35E-06	0.120266	0.872171
7	Mining Index	KL TIN	9.10E-05	0.173190	0.743999
8	Plantation Index	KLPLN	4.55E-06	0.163364	0.812335
9	Property Index	KLPRP	3.37E-06	0.145739	0.841718
10	Service Index	KL SER	7.36E-07	0.101885	0.898023
11	Technology Index	KLTEC	3.06E-06	0.105896	0.888738

Table 5.24: The ARCH LM test results for 11-year data summary obtained from EViews

	INDEX	TICKER	LM test			
			F-Stat	Prob	Obs-R ²	Prob
1	Composite Index	FBMKLCI	1.075684	0.2998	1.076052	0.2996
2	Construction Index	KLCON	0.024358	0.8760	0.024376	0.8759
3	Consumer Index	KLCSU	3.236260	0.0721	3.234784	0.0721
4	Finance Index	KLFIN	3.046064	0.0810	3.044888	0.0810
5	Industrial Index	KLIND	3.169855	0.0751	3.168487	0.0751
6	Industrial Production Index	KLPRO	1.926632	0.1652	1.926685	0.1651
7	Mining Index	KL TIN	0.002637	0.9590	0.002639	0.9590
8	Plantation Index	KLPLN	2.768689	0.0962	2.767904	0.0962
9	Property Index	KLPRP	0.148397	0.7001	0.148499	0.7000
10	Service Index	KL SER	2.270971	0.1319	2.270744	0.1318
11	Technology Index	KLTEC	2.383564	0.1227	2.383216	0.1226

Table 5.25: The ARCH LM test results yearly-data summary obtained from EViews

TICKER	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	Obs-R ²	Obs-R ²	Obs-R ²	Obs-R ²	Obs-R ²	Obs-R ²	Obs-R ²	Obs-R ²	Obs-R ²	Obs-R ²	Obs-R ²
FBMKL	0.4979	0.0283	0.6591	0.4300	0.4609	0.1001	0.4744	0.3923	0.5215	0.3488	0.0635
CI	34	91	38	25	28	09	80	73	35	26	83
KLCON	0.0265	0.2380	0.3876	0.0688	0.5506	0.0084	0.0367	0.0488	0.1331	0.2035	0.8217
	79	74	59	25	02	83	35	59	10	65	27
KLCSU	0.4014	0.1277	0.0009	0.0187	0.0187	0.0051	0.1455	0.1043	0.0362	0.0088	0.0304
	17	67	47	59	39	89	69	49	88	05	61
KLFIN	0.7275	0.0539	0.0193	0.6869	0.0227	0.2416	0.0949	0.0850	0.8332	0.0006	0.0955
	23	05	77	50	86	10	23	28	88	70	50
KLIND	0.2963	0.0873	0.0100	0.0053	0.4739	0.1381	0.0022	0.0007	0.5796	0.5309	0.9518
	56	81	29	45	65	48	19	26	21	60	49
KLPRO	0.4075	1.0405	0.3169	0.5485	0.0038	0.0014	0.0553	0.5408	0.2252	2.2179	0.2305
	65	64	82	20	93	58	39	87	28	86	99
KL TIN	0.1441	0.0625	0.4500	0.5483	0.0015	3.1855	0.0221	1.24E-	7.91E-	0.1915	0.1088
	40	11	86	07	15	41	15	05	05	53	31
KLPLN	0.2520	1.5812	0.0661	0.7587	2.9184	0.1610	0.2789	0.0060	0.7334	0.4809	0.4741
	33	83	08	43	01	31	39	03	00	59	78
KLPRP	0.1264	0.3045	1.1166	0.0003	0.5392	0.0009	0.1164	0.0161	0.0397	3.0278	1.0341
	33	14	58	84	16	17	61	68	14	21	15
KL SER	1.1858	0.1185	1.0987	0.1670	0.0731	0.0024	0.0079	0.7775	0.0632	1.8647	0.3266
	51	41	40	66	11	26	31	53	12	04	40
KLTEC	0.0025	0.1911	0.0237	5.96E-	1.2641	0.1839	0.9556	0.3135	0.0069	0.9867	2.2389
	02	27	67	06	22	29	36	19	25	18	93

Table 5.23 presents the empirical results of volatility of stock market returns. The LM test statistics analysis presented in Table 5.24 showed that there was evidence of high level conditional heteroscedasticity for six of the indices' returns. These were the Consumer, Industrial, Finance , Plantation, Technology and Service Sectors. The least evidence was shown for Construction and Property Sectors. Furthermore, it could be seen that for those stock prices which had high conditional heteroscedasticity, the GARCH coefficients were statistically significant as their individual prob-values were closer to zero i.e. for the Construction and Property Sectors.

The GARCH(1,1) model equation for indices' conditional variance were rewritten below with the values obtained from analysis:

$$1. \text{FBMKLCI: } \sigma^2 = 0.00000106 + 0.119586\varepsilon_{t-1}^2 + 0.877081\sigma_{t-1}^2$$

$$2. \text{KLCON: } \sigma^2 = 0.00000545 + 0.125640\varepsilon_{t-1}^2 + 0.854725\sigma_{t-1}^2$$

$$3. \text{KLCSU: } \sigma^2 = 0.00000175 + 0.102756\varepsilon_{t-1}^2 + 0.864447\sigma_{t-1}^2$$

$$4. \text{KLFIN: } \sigma^2 = 0.00000176 + 0.096559\varepsilon_{t-1}^2 + 0.892701\sigma_{t-1}^2$$

$$5. \text{KLIND: } \sigma^2 = 0.000000234 + 0.038476\varepsilon_{t-1}^2 + 0.958866\sigma_{t-1}^2$$

$$6. \text{KLPRO: } \sigma^2 = 0.00000135 + 0.120266\varepsilon_{t-1}^2 + 0.872171\sigma_{t-1}^2$$

$$7. \text{KLTIN: } \sigma^2 = 0.0000910 + 0.173190\varepsilon_{t-1}^2 + 0.743999\sigma_{t-1}^2$$

$$8. \text{KLPLN: } \sigma^2 = 0.00000455 + 0.163364\varepsilon_{t-1}^2 + 0.812335\sigma_{t-1}^2$$

$$9. \text{KLPRP: } \sigma^2 = 0.00000337 + 0.145739\varepsilon_{t-1}^2 + 0.841718\sigma_{t-1}^2$$

$$10. \text{KLSER: } \sigma^2 = 0.000000736 + 0.101885\varepsilon_{t-1}^2 + 0.898023\sigma_{t-1}^2$$

$$11. \text{KLTEC: } \sigma^2 = 0.00000306 + 0.105896\varepsilon_{t-1}^2 + 0.888738\sigma_{t-1}^2$$

Table 5.25 presents a summary of the LM test for the main benchmark index and the Sectors' index on Bursa Malaysia for yearly data. For the analysis the eleven-year data was segregated into yearly data. The EViews program was used to test the yearly data. The analysis compared the volatility levels of eleven-year data to

the yearly data and observed if there were similarities. From the results, the following conclusions have been made:

- When Obs-R² values shown in Table 5.24 and Table 5.25 are compared, there seems to be no correlation between the eleven-year and the yearly volatility levels. As an example, based on eleven-year data the Consumer sector was the most volatile however, for yearly data not once during the eleven years the Consumer sector was the most volatile.
- From Obs-R² values shown in Table 5.24 and Table 5.25, the volatility severity levels for the eleven-year data and yearly data do not show any correlation. As an example, based on eleven-year data the Consumer sector had a level of 3.23 however, for yearly data the volatility level ranged from 0.0009 to 0.4.