CHAPTER 6

SHORT-TERM ANALYSIS

6.1 Introduction

In this chapter, the results for short-term analysis are presented. The analysis is referred to as short-term because behaviour of the four sub-periods identified in Chapter 4 is studied individually. Comparisons are then made based on the short-term results. The first section of this chapter discusses the vector autoregression models obtained and the lead-lag relationship between different sectors of the KLSE. Section 6.2.2 presents the results from the variance decomposition analysis. Forecasts are obtained based on the VAR model and the results are presented in Section 6.2.3.

6.2 Results for the Four Sub-Periods

6.2.1 Vector Autoregression Model

As mentioned in Chapter 4, the sectoral relationship is examined for four different sub-periods. The first sub-period represents a growing market that occured in 1993. The second sub-period 1994-1997 is before the Asian financial crisis, with an overall bullish market performance due to the growth in our economy. The third sub-period starts from 1997 to September 1998 and it covers the period of the currency turmoil. The fourth sub-period sees the slight recovery period in the economy up to June 1999.

As the four sub-periods represent a relatively short period of the entire sample period, we conduct a short-run analysis in this chapter. The VAR modeling technique is adopted. The VAR models for the four sub-periods are reported in Table 6.1. As mentioned in Chapter 5, the t-statistics of the individual coefficients in the model allows us to study the intersectoral lead-lag relationship. For the first sub-period, no evidence of causality is apparent among the sectors. A slight causality is only evident in the plantation sector. Besides leading its own sector, the plantation sector was found to lead the financial sector. However, the evidence is only significant at the 10 percent level. This is the same for the mining sector where it led its own sector at the 10 percent level. The market was growing rapidly at that period of time. All the shares of different sectors in the stock market were highly demanded among the investors. Hence, there was no clear dominance in the stock market.

In the second sub-period, the plantation sector led all the other sectors except for mining. As for the industrial and finance sectors, there was a bidirectional causality. Both sectors led each other at the 5 percent level. The mining sector had some impact on all the sectors. It led the industrial and plantation sectors at the 5 percent level and the finance and property sectors at the 10 percent level of significance. Although the plantation sector's share to the gross domestic product (GDP) decline from 18.7% in 1990 to 13.6% in 1995, in absolute terms, the total value added continued to increase significantly from RM14,827 million in 1990 to RM16,406 million in 1995. Thus, the demand for plantation based stocks in the KLSE were still high, which led to its dominance.

The importance of the plantation sector was predominantly due to the growth in the palm oil sector. The yield of crude palm oil increased from 3.5 tonnes per hectare in 1990 to 3.9 tonnes per hectare in 1995. The increase in the output of palm oil has been driven by strong palm oil prices whereby its average price increased from RM 796 per tonne in 1990 to RM 1472 per tonne in 1995. It was also due to higher yield with the maturity of additional 103,000 hectares in 1995 and 85,000 hectares in 1996. Other than that, the increase in production was attributed to the expansion of planted hectarage by 4.1 percent per annum. The increase in hectarage was the result of new land development and conversion of rubber and cocoa plantations into oil palm cultivation.

The growth in the mining sector was led by the impressive output growth in natural gas. The production of natural gas in Malaysia almost doubled from 1865 million standard cubic feet per day (mmscfd) in 1990 to 3476 mmscfd in 1995. The increment in the output was due to a surge in demand for natural gas in Peninsular Malaysia. An increase in the crude oil production also contributed to the growth in the mining sector. The production for crude oil increased from 601,000 barrels per day (bpd) in 1990 to 664,000 bpd in 1995. The higher than average production in 1995 was mainly attributable to the better production performance of existing fields (Sixth and Seventh Malaysia Plan, Government of Malaysia, 1991 and 1996, and Economic Report, Ministry of Finance, Malaysia, 1995/96 and 1996/97).

The third sub-period shows a strong dominance of the finance sector. It led all the other sectors at either 1 percent or 5 percent level of significance. Other than

that, the mining and property sectors seemed to Granger cause each other, but stronger in the direction from the property sector to the mining sector. As mentioned before, this is the period of the financial crisis. At this time, the government tried to implement the International Monetary Fund (IMF) proposed solutions to overcome the country's economy problems. One of the steps taken was to implement a tight monetary policy by imposing high interest rates. Loans were not easily available as the lending guidelines became stricter. This had direct effect on the other sectors particularly the industrial and property sector. As Bank Negara Malaysia monitors closely the development of financial institutions and intervenes when there is a failure, the finance based stocks were relatively safe for investment during this period of economic uncertainty. Hence, the dominance of the finance sector during this sub-period is expected.

The recovery fourth sub-period, showed a lead of the industrial sector. However, the causality is not very strong as it led the finance, plantation and mining sectors at the 10 percent level and the property sector at the 5 percent level. The mining sector led its own sector and also led the finance and plantation sectors at the 10 percent level. Since 1 September 1998, Malaysia imposed certain capital controls. By pegging the ringgit-US dollar exchange rate, businesses could carry on with more certainty. Economic activities grew and lower base lending rates gave more breathing space as credits are more readily available. Thus, the industrial sector began to recover and gain its dominance.

Table 6.1: The Vector Autoregression Models for Four Sub-Periods

(a) Sub-Period 1 (29 March 1993 - 5 January 1994)

Independent Variable	Dependent Variable				
	ΔLnF_t	ΔLnI_t	ΔLnL_t	ΔLnM_t	ΔLnP_t
Constant	0.0043*** (0.0011)	0.0020** (0.0009)	0.0044*** (0.0015)	0.0068*** (0.0021)	0.0048*** (0.0015)
ΔLnF_{t-1}	0.0592 (0.1109)	0.0653 (0.0860)	-0.0367 (0.1520)	0.0118 (0.2130)	-0.1364 (0.1540)
ΔLnI_{t-1}	0.0963 (0.1320)	0.0640 (0.1024)	0.2585 (0.1809)	0.0550 (0.2536)	0.1075 (0.1832)
ΔLnL_{t-1}	0.1250* (0.0755)	0.0396 (0.0585)	0.2000* (0.1034)	-0.0085 (0.1450)	0.0516 (0.1048)
ΔLnM_{t-1}	0.0551 (0.0456)	0.0073 (0.0354)	0.0579 (0.0625)	0.1566* (0.0876)	-0.0367 (0.0633)
ΔLnP_{t-1}	-0.1062 (0.0767)	0.0212 (0.0595)	-0.0981 (0.1052)	-0.0036 (0.1474)	0.0747 (0.1066)

Note F, I, L, M and P represent the Finance, Industrial, Plantation, Mining and Property Index, respectively.
Figures in parentheses are standard errors.
*** Significant at the 1% level.
** Significant at the 5% level.
* Significant at the 10% level.

(b) Sub-Period 2 (6 January 1994 - 28 February 1997)

Independent Variable	Dependent Variable				
	ΔLnF_t	ΔLnI_t	ΔLnL_t	ΔLnM_t	ΔLnP_t
Constant	0.0003 (0.0005)	0.0002 (0.0005)	-0.0003 (0.0007)	-0.0004 (0.0009)	-0.0003 (0.0007)
ΔLnF_{t-1}	-0.0009 (0.0767)	0.1500** (0.0653)	0.1263 (0.1045)	0.1769 (0.1293)	0.1443 (0.1043)
ΔLnI_{t-1}	0.1719** (0.0860)	-0.0607 (0.0732)	0.0206 (0.1172)	0.0540 (0.1450)	0.0339 (0.1170)
ΔLnL_{t-1}	-0.1359** (0.0683)	-0.1555*** (0.0581)	-0.2158** (0.0930)	-0.1110 (0.1151)	-0.2231** (0.0928)
ΔLnM_{t-1}	0.0820* (0.0467)	0.1037** (0.0398)	0.1270** (0.0637)	0.1068 (0.0787)	0.1188* (0.0635)
ΔLnP_{t-1}	0.0037 (0.0704)	-0.0073 (0.0599)	-0.0154 (0.0959)	-0.1493 (0.1186)	-0.0036 (0.0957)

Note: F, I, L, M and P represent the Finance, Industrial, Plantation, Mining and Property Index, respectively.
Figures in parentheses are standard errors.
*** Significant at the 1% level.
** Significant at the 5% level.
* Significant at the 10% level.

Table 6.1 (continued)

(c) Sub-Period 3 (3 March 1997 - 1 September 1998)

Independent Variable	Dependent Variable				
	ΔLnF_t	ΔLnI_t	ΔLnL_t	ΔLnM_t	ΔLnP_t
Constant	-0.0051***	-0.0035***	-0.0030***	-0.0055***	-0.0053***
	(0.0016)	(0.0012)	(0.0011)	(0.0020)	(0.0014)
ΔLnF_{t-1}	0.3803***	0.2139**	0.1693**	0.4329***	0.4276***
	(0.1221)	(0.0882)	(0.0798)	(0.1540)	(0.1077)
ΔLnI_{t-1}	-0.1227	0.0207	0.0410	0.1148	-0.1916
	(0.1465)	(0.1058)	(0.0958)	(0.1848)	(0.1293)
ΔLnL_{t-1}	-0.0391	0.0216	0.0160	0.1570	-0.0599
	(0.1397)	(0.1009)	(0.0913)	(0.1763)	(0.1233)
ΔLnM_{t-1}	-0.0680	0.0057	-0.0526	-0.0366	-0.0814*
	(0.0559)	(0.0404)	(0.0365)	(0.0705)	(0.0493)
ΔLnP_{t-1}	-0.0606	-0.1328	-0.0489	-0.4456***	-0.0658
	(0.1209)	(0.0873)	(0.0790)	(0.1525)	(0.1067)

Note: F, I, L, M and P represent the Finance, Industrial, Plantation, Mining and Property Index, respectively.

Figures in parentheses are standard errors.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

(d) Sub-Period 4 (2 September 1998 - 30 June 1999)

Independent Variable	Dependent Variable				
	ΔLnF_t	ΔLnI_t	ΔLnL_t	ΔLnM_t	ΔLnP_t
Constant	0.0069***	0.0054**	0.0027	0.0083**	0.0050*
	(0.0025)	(0.0022)	(0.0018)	(0.0041)	(0.0027)
ΔLnF_{t-1}	-0.1395	-0.1473	-0.1652	-0.5967	-0.2083
	(0.2231)	(0.2045)	(0.1646)	(0.3749)	(0.2425)
ΔLnI_{t-1}	0.4158*	0.1801	0.3098*	0.6888*	0.5044**
	(0.2147)	(0.1968)	(0.1584)	(0.3608)	(0.2333)
ΔLnL_{t-1}	-0.2182	-0.1361	-0.1056	-0.2361	-0.3398
	(0.2208)	(0.2024)	(0.1628)	(0.3710)	(0.2399)
ΔLnM_{t-1}	-0.1292*	-0.1009	-0.0960*	-0.2933**	-0.1106
	(0.0744)	(0.0682)	(0.0548)	(0.1250)	(0.0808)
ΔLnP_{t-1}	0.0119	0.0644	0.0784	0.2951	0.1420
	(0.1559)	(0.1429)	(0.1150)	(0.2620)	(0.1694)

Note: F, I, L, M and P represent the Finance, Industrial, Plantation, Mining and Property Index, respectively.

Figures in parentheses are standard errors.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

6.2.2 Variance Decomposition (VDC)

The causality test is intepreted as within sample test as any lead-lag relationship found describes the characteristics within the sample period. The VDC is different in the sense that it measures the out of sample causality relationship as discussed in Section 3.2.2.3. The variance decomposition results are given in Table 6.2 for the four different sub-periods. One to five days ahead were used to examine how a change in the returns of a sector is explained by its own movements and movements in the other sectors. In order to compute the VDC, the ordering used was the finance sector, plantation sector, industrial sector, mining sector and lastly the property sector. The ordering of the variables can be important. Unfortunately, there is little guide in the literature as to what constitute the criterion to choose the ordering. The choice is often somewhat arbitrary. When choosing the ordering, the first sector selected affects the results the most. The subsequent sector selected does not really change the result very much. In this study, the returns of the finance sector are chosen as the first variable in the ordering. This is because this sector led the other sectors in the entire sample period, as reported in Chapter 5.

In the first sub-period, all the variables are quite exogenous, in the sense that their own variances are mostly explained by innovations in their own sector. This is particularly true in the finance, plantation and mining sectors. In the finance sector, about 96 percent of the variances are explained by innovations in its own sector. For the plantation sector, the figure is about 61 percent. For the mining sector, it is about 72 percent. Results are quite consistent with Table 6.1,

which shows that the lagged returns of the plantation and mining sectors lead their own current return. Also, the lack of lead-lag relationship (i.e., prevalence of exogeneity) is demonstrated in the VDC results. About 48 percent of the variances in the industrial sector are explained by innovations in the other sectors. About 43 percent of the variances in the property sector are explained by its own variations and another 57 percent is explained by innovations in the other sectors.

Except for the finance sector, we see a remarkable drop in the proportion of variances that are explained by its own sectoral innovations in the second sub-period compared to the first sub-period. This means that the exogeneity early observed no longer holds true. Innovations in the other sectors now play a more important role in explaining variances in the returns of a particular sector. For example, innovation in the industrial sector explains only about 30 percent of its own variances. The corresponding figures are 29 percent, 24 percent and 15 percent for the plantation, mining and property sectors, respectively. These figures are low compared to at least 43 percent of self explained innovations in the first sub-period. The innovation in the finance sector explains most of the variances in the other sectors. Innovations of the plantation sector explain about 12 percent and 10 percent of the variations in the mining and property sectors, respectively. These results do not concur with the pattern found in Table 6.1. This suggests that for bullish market conditions, the in-sample and out-sample inference on causality can be very different.

The innovations in the finance sector explain most of its own variance as well as that of the other sectors for the third sub-period. The relevant proportions are, however lower than those for the second sub-period (except for the property sector) but higher than those for the first sub-period. They explain about 67 percent, 51 percent, 36 percent and 72 percent of the variations in the industrial, plantation, mining and property sectors, respectively. The importance of the finance sector as the leading sector agrees with the results of the Granger causality test reported in Table 6.1. Self-driven innovations are generally stronger than those in the second sub-period but weaker than those in the first sub-period. This suggests that self-driven forces are more dominant in a downward trending market than in a bullish market.

The results for the fourth sub-period show that self-driven forces are weaker than the third sub-period for all the sectors. Again, when the market is recovering, the self driven forces become less dominant and mutual dependence becomes more important. The innovations in the finance sector explain more than half of the shocks in the other sectors. Besides the innovations in the finance sector and self driven innovations, variations in the industrial sector play the third important role in explaining the variances in the other sectors, although the proportions are not very large. This is consistent with the results in Table 6.1 that show the leading role of the industrial sector over a few other sectors.

Table 6.2: Decomposition of Variance of the Sectoral Returns for Different Sub-Periods

(a) Sub-Period 1 (29 March 1993 - 5 January 1994)

Variables Explained	Days	Percentage of forecast variance explained by innovations in				
		ΔLnF	ΔLnI	ΔLnL	ΔLnM	ΔLnP
ΔLnF	1	100.00	0.00	0.00	0.00	0.00
	2	96.81	0.39	1.45	0.47	0.88
	3	96.48	0.45	1.57	0.57	0.92
	4	96.45	0.46	1.58	0.59	0.92
	5	96.45	0.46	1.58	0.59	0.92
ΔLnI	1	46.34	53.66	0.00	0.00	0.00
	2	47.90	51.48	0.52	0.04	0.06
	3	47.91	51.38	0.60	0.05	0.07
	4	47.91	51.37	0.60	0.06	0.07
	5	47.91	51.36	0.60	0.06	0.07
ΔLnL	1	35.22	1.66	63.11	0.00	0.00
	2	35.20	3.03	61.08	0.29	0 39
	3	35.33	3.10	60.81	0.35	0 40
	4	35.34	3.11	60.79	0.36	0.40
	5	35.34	3.11	60.79	0.36	0 41
ΔLnM	1	14.15	2.79	11.36	71.70	0.00
	2	14.33	2.88	11.27	71.52	0 00
	3	14.34	2.88	11.27	71.51	0 00
	4	14.34	2.88	11.27	71.51	0 00
	5	14.34	2.88	11.27	71.51	0.00
ΔLnP	1	40.83	4.18	10.55	1.73	42 71
	2	40.46	4.46	10.68	1.83	42.56
	3	40.45	4.47	10.68	1.84	42 56
	4	40.45	4.47	10.68	1.84	42.56
	5	40.45	4.47	10.68	1.84	42 56

Note: The ordering is ΔLnF (finance), ΔLnL (plantation), ΔLnI (industrial), ΔLnM (mining) and ΔLnP (property).

Table 6.2 (continued)

(b) Sub-Period 2 (6 January 1994 - 28 February 1997)

Variables Explained	Days	Percentage of forecast variance explained by innovations in				
		ΔLnF	ΔLnI	ΔLnL	ΔLnM	ΔLnP
ΔLnF	1	100.00	0.00	0.00	0.00	0.00
	2	98.88	0.42	0.25	0.45	0.00
	3	98.87	0.42	0.25	0.45	0.00
	4	98.86	0.42	0.25	0.45	0.00
	5	98.86	0.42	0.25	0.45	0.00
ΔLnI	1	69.86	30.14	0.00	0.00	0.00
	2	68.86	29.75	0.44	0.94	0.00
	3	68.84	29.77	0.44	0.95	0.01
	4	68.84	29.77	0.44	0.95	0.01
	5	68.84	29.77	0.44	0.95	0.01
ΔLnL	1	64.76	6.34	28.90	0.00	0.00
	2	64.16	6.29	29.00	0.55	0.00
	3	64.15	6.29	29.00	0.55	0.01
	4	64.15	6.29	29.00	0.55	0.01
	5	64.15	6.29	29.00	0.55	0.01
ΔLnM	1	59.76	4.94	11.74	23.56	0.00
	2	59.46	4.91	11.89	23.53	0.21
	3	59.45	4.91	11.89	23.53	0.21
	4	59.45	4.91	11.89	23.53	0.21
	5	59.45	4.91	11.89	23.53	0.21
ΔLnP	1	70.79	3.65	9.52	1.34	14.70
	2	70.17	3.62	9.89	1.82	14.51
	3	70.16	3.62	9.89	1.82	14.51
	4	70.16	3.62	9.89	1.82	14.51
	5	70.16	3.62	9.89	1.82	14.51

Note: The ordering is ΔLnF (finance), ΔLnL (plantation), ΔLnI (industrial), ΔLnM (mining) and ΔLnP (property).

Table 6.2 (continued)

(c) Sub-Period 3 (3 March 1997 - 1 September 1998)

Variables Explained	Days	Percentage of forecast variance explained by innovations in				
		ΔLnF	ΔLnI	ΔLnL	ΔLnM	ΔLnP
ΔLnF	1	100.00	0.00	0.00	0.00	0.00
	2	98.76	0.57	0.14	0.46	0.07
	3	98.64	0.64	0.16	0.47	0.08
	4	98.63	0.65	0.16	0.48	0.08
	5	98.63	0.65	0.16	0.48	0.08
ΔLnI	1	66.50	33.50	0.00	0.00	0.00
	2	67.28	32.10	0.00	0.00	0.61
	3	67.31	32.06	0.00	0.01	0.62
	4	67.31	32.06	0.00	0.01	0.62
	5	67.31	32.06	0.00	0.01	0.62
ΔLnL	1	49.49	13.30	37.21	0.00	0.00
	2	50.85	12.75	35.66	0.64	0.10
	3	50.88	12.75	35.61	0.65	0.11
	4	50.88	12.76	35.61	0.65	0.11
	5	50.88	12.76	35.61	0.65	0.11
ΔLnM	1	35.26	2.32	4.23	58.19	0.00
	2	36.00	2.35	4.02	55.40	2.24
	3	36.03	2.36	4.02	55.35	2.24
	4	36.03	2.36	4.02	55.35	2.24
	5	36.03	2.36	4.02	55.35	2.24
ΔLnP	1	73.61	0.56	1.09	0.47	24.28
	2	72.54	2.09	1.33	1.26	22.79
	3	72.40	2.20	1.34	1.28	22.77
	4	72.38	2.21	1.35	1.28	22.77
	5	72.38	2.21	1.35	1.28	22.77

Note: The ordering is ΔLnF (finance), ΔLnL (plantation), ΔLnI (industrial), ΔLnM (mining) and ΔLnP (property).

Table 6.2 (continued)

(d) Sub-Period 4 (2 September 1998 - 30 June 1999)

Variables Explained	Days	Percentage of forecast variance explained by innovations in ΔLnF	ΔLnI	ΔLnL	ΔLnM	ΔLnP
ΔLnF	1	100.00	0.00	0.00	0.00	0.00
	2	96.79	0.56	1.19	1.46	0.00
	3	96.54	0.69	1.21	1.55	0.02
	4	96.53	0.69	1.21	1.55	0.02
	5	96.53	0.69	1.21	1.55	0.02
ΔLnI	1	85.00	15.00	0.00	0.00	0.00
	2	83.91	14.39	0.59	1.02	0.09
	3	83.71	14.42	0.63	1.15	0.10
	4	83.70	14.43	0.63	1.15	0.10
	5	83.70	14.43	0.63	1.15	0.10
ΔLnL	1	76.98	3.21	19.81	0.00	0.00
	2	74.53	4.05	19.80	1.42	0.21
	3	74.43	4.11	19.78	1.48	0.21
	4	74.43	4.11	19.77	1.48	0.21
	5	74.43	4.11	19.77	1.48	0.21
ΔLnM	1	60.03	4.07	3.49	32.40	0.00
	2	58.24	4.54	4.00	32.68	0.55
	3	58.04	4.64	4.03	32.75	0.55
	4	58.03	4.64	4.03	32.76	0.55
	5	58.03	4.64	4.03	32.76	0.55
ΔLnP	1	82.26	1.21	0.39	0.08	16.05
	2	79.20	2.22	1.90	0.92	15.77
	3	79.11	2.30	1.89	0.96	15.74
	4	79.11	2.30	1.89	0.96	15.74
	5	79.11	2.30	1.89	0.96	15.74

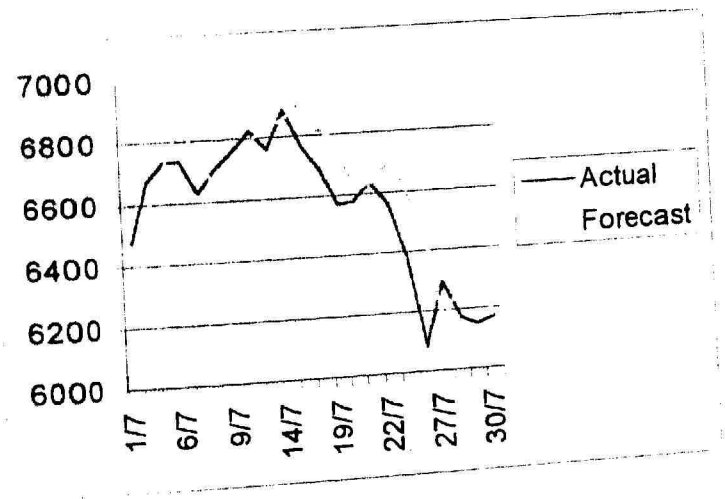
Note: The ordering is ΔLnF (finance), ΔLnL (plantation), ΔLnI (industrial), ΔLnM (mining) and ΔLnP (property).

6.2.3 Forecasting

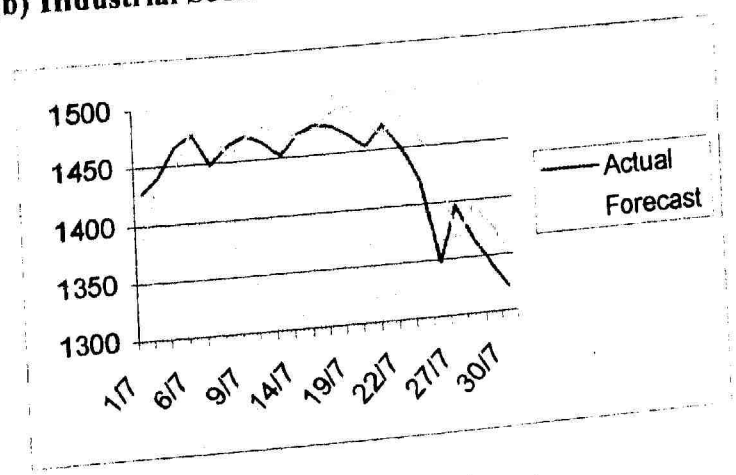
To evaluate the usefulness of the VAR model, its forecasting ability is examined. Here, we use the model fitted for the fourth sub-period to forecast the daily sectoral indices for the month of July 1999. As before, we conducted a one-period ahead forecast. Figure 6.1 plots the actual and the forecast indices for the five sectors. The plots show similar pattern to the forecasts based on the VEC model. The forecast values are rather close to the actual values and certain points are predicted correctly.

Figure 6.1: One-Period Ahead Forecasts for Daily Indices of July 1999 Based on the VAR model

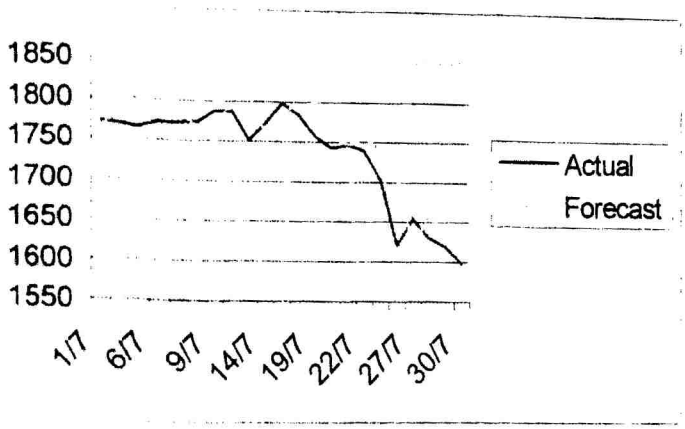
(a) Finance Sector



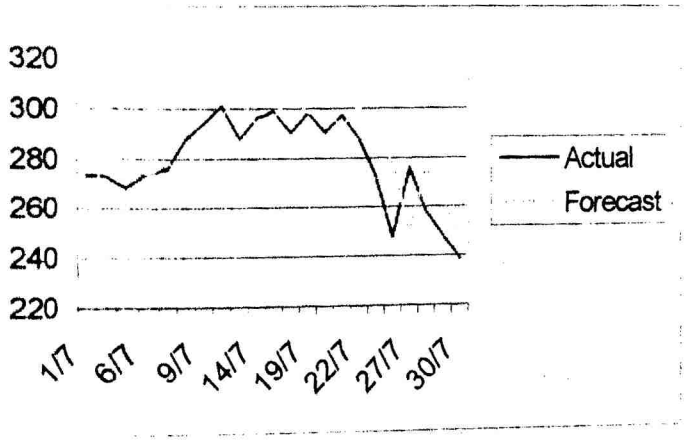
(b) Industrial Sector



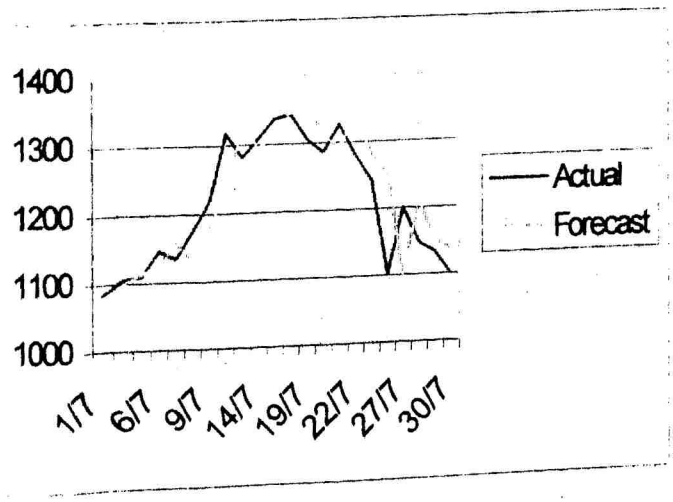
(c) Plantation Sector



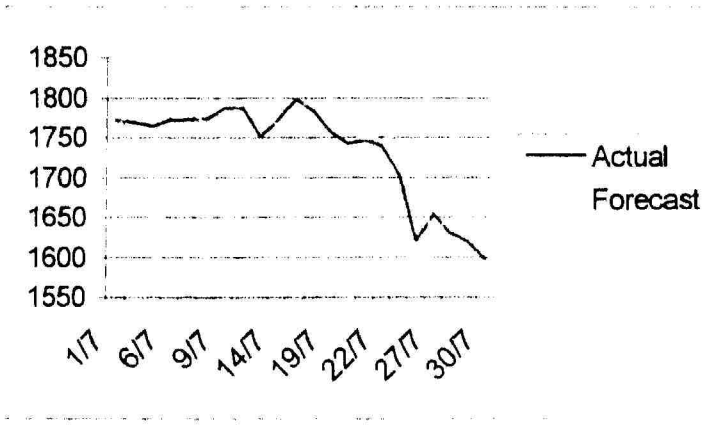
(d) Mining Sector



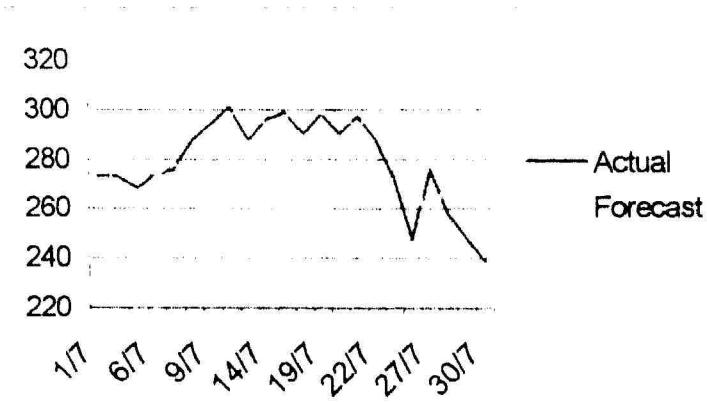
(e) Property Sector



(c) Plantation Sector



(d) Mining Sector



(e) Property Sector

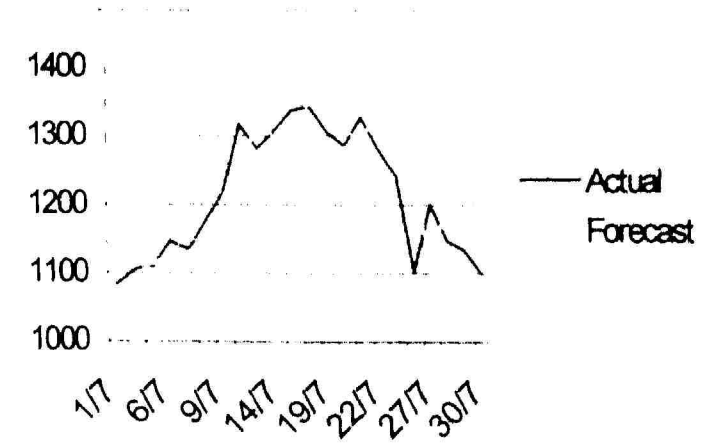


Table 6.3 gives four criteria to evaluate the forecasting performance of the model. The magnitude of all the measures, including of MAD, RMSE, MAPE and Theil's U are slightly more than the corresponding measures for the VEC model. However, the ranking of forecasting accuracy among the sectors does not change. Based on the MAPE, the smallest forecast error is still found for the plantation sector. The second smallest is found for the industrial sector. This is followed by the finance, property and mining sector. A comparison of these results to those in Table 5.5 show that the forecasting based on the VEC model is more accurate than the VAR model. This indicates that the inclusion of the long-run equilibrium relationship through the error-correction mechanism has helped to increase the forecasting performance, rather than to rely on only short-run dynamics as captured in the VAR model.

Table 6.3: Evaluation of Forecasting Errors

Measure	Index				
	Finance	Industrial	Plantation	Mining	Property
Mean Absolute Deviation	108.71	22.96	21.40	10.03	41.95
Root Mean Squared Error	138.44	29.96	28.81	12.91	54.34
Mean Absolute Percent Error (%)	1.68	1.63	1.26	3.70	3.48
Theil's U	1.15	1.20	1.15	1.11	1.05