where R_t is the daily index return; V_t is the closing index on trading day, *t;* and V_{t-1} is the closing index on trading day, *t-1*.

3.1.2 Kuala Lumpur Stock Exchange Composite Index (KLSE CI)

Kuala Lumpur Stock Exchange Composite Index (KLSE CI) was introduced in 1986 with the following objectives: (i) to effectively reflect the performances of companies listed on the KLSE; (ii) to be generally sensitive to investors' expectations; (iii) to be generally indicative of the impact of government policy; and (iv) to be reasonably responsive to structural changes in different sectors of the Malaysian economy.

The KLSE CI comprises a sample of stocks traded on the KLSE. The number of stocks included in the sample varies from time to time; however, the number has been somewhat fixed at 100 since 1995. As of November 6, 2000, the index consists of 100 large capitalisation stocks as shown in Appendix 1.

The KLSE CI is a value-weighted index, which means that it gives more weightage to certain companies whose market capitalisation is greater than others. The method of computation is as follows:

$$\frac{\text{Aggregate Market Value of Component Stock on a given date}}{\text{Aggregate Market Value of Component Stock on base period (i.e. 2/1/1977)}} \times 100$$

The KLSE CI is chosen to be a part of this study on a stand-alone basis. Although no comparison will be made with the other indices, the index is chosen because the share basket that forms the index consists of companies whose major business activities have contributed substantially to the Malaysian economy. Besides, the KLSE CI is the most widely referred to and is considered to be representative of the Malaysian stock performances by the institutional investors and market analysts. With the inception of the Kuala Lumpur Options and Financial Futures Exchange (KLOFFE) which started trading the KLSE CI Futures in 1995 and the KLSE CI Options recently, the KLSE CI is expected to be more significant as an indicator to stock market performance.

3.1.3 Exchange Main Board All-Share Index (KLSE EMI)

Exchange Main Board All-Share Index (KLSE EMI) was launched on October 16, 1991. It incorporates all the stocks listed in the Main Board of the KLSE; thus, the KLSE EMI is used as a proxy for large firm size stocks in this study. A partial list of the pre-requisites for admission to the Main Board for the ordinary shares is as follows:

(1) Minimum issued and paid-up capital of RM60 million comprising ordinary shares of RM1.00 each.

(2) The company should either:

- have an uninterrupted profit record of three (3) full financial years, with an aggregate after-tax profit of not less than RM30 million over the said three (3) financial years and an after-tax profit of not less than RM8 million in respect of the most recent financial year; or

- have an uninterrupted profit record of five (5) full financial years, with an aggregate after-tax profit of not less than RM30 million over the said five (5) financial years and an after-tax profit of not less than RM8 million in respect of the most recent financial year.

The companies in the Main Board are classified into 13 sectors; namely Consumer Products, Industrial Products, Construction, Trading/Services, Infrastructure, Finance, Technology, Hotels, Properties, Plantation, Mining, Trust, and Closed-end Fund. There are 499 companies listed on the Main Board as of December 13, 2000.

The method of computation for the KLSE EMI is the same as the method used for computing the KLSE CI, except that its base year is 1984.

3.1.4 Kuala Lumpur Stock Exchange Second Board Index (KLSE SBI)

The Second Board, which complements the Main Board, was established on November 11, 1988 to enable smaller companies with strong potential to seek a listing on the Exchange. The Kuala Lumpur Stock Exchange Second Board Index (KLSE SBI), on the other hand, was launched on January 2, 1991 and it incorporates all the stocks listed in the Second Board of the KLSE. As a result, the KLSE SBI is used as a proxy for small firm size stocks in this study given its smaller paid-up capital listing requirement. A partial list of the pre-requisites for admission to the Second Board for the ordinary shares is as follows:

(1) Minimum issued and paid-up capital of RM40 million comprising ordinary shares of RM1.00 each.

(2) The company should either:

- have an uninterrupted profit record of three (3) full financial years, with an aggregate after-tax profit of not less than RM12 million over the said three (3) financial years and an after-tax profit of not less than RM4 million in respect of the most recent financial year; or

- have an uninterrupted profit record of five (5) full financial years, with an aggregate after-tax profit of not less than RM12 million over the said five (5) financial years and an after-tax profit of not less than RM4 million in respect of the most recent financial year.

The companies in the Second Board are classified into 7 sectors; namely Consumer Products, Industrial Products, Construction, Trading/Services, Technology, Properties, and Plantation. There are 296 companies listed on the Second Board as of December 13, 2000.

The method of computation for the KLSE SBI is the same as the methods used for computing the KLSE CI and the KLSE EMI, except that its base year is 1990.

Figures 2, 3 and 4 provide a graphical representation of the KLSE CI, KLSE EMI, and KLSE SBI movements for the period under study, respectively.

Figure 2
KLSE Composite Index
(1990 -2000)

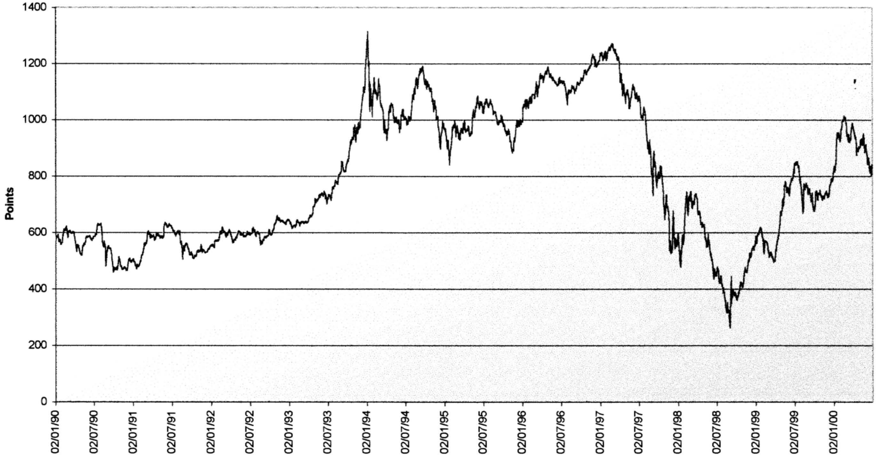

Figure 3
Exchange Main Board All-Share Index
(1991 - 2000)

Figure 4
KLSE Second Board Index
(1991 - 2000)

3.1.5 Holiday

The holidays considered in this study are largely national public holidays which will provoke stock market closings. However, there are also possibilities that some holidays coincidentally fall on Saturday, which is a non-trading day for the KLSE; thus, this will not induce an extra market closing. No distinction has been made in this study between holidays which are accompanied by market closings and those which are not.

The dates of the public holiday for the period of study from 1990 to 2000 are obtained from the University of Malaya's previous Academic Calendars.

Table 2 provides a holiday description for this study which incorporates the frequency distributions of these holidays by the day of the week.

Table 2

Holiday Descriptions

Panel A: Distribution of Exchange-closed Holidays by Day of the Week (January 1990 – June 2000)

Holiday	Mon	Tue	Wed	Thu	Fri	Sat	Total
New Years Day	3	1	2	1	3	1	11
Chinese New Year	4	1	1	2	2	1	11
Hari Raya Puasa	4	2	2	1	2	0	11
Labor Day	3	1	2	1	2	2	11
Wesak	3	1	3	2	1	1	11
Hari Raya Qurban	4	1	1	2	1	2	11
Maal Hijrah	3	1	1	3	0	3	11
National Day	3	2	1	1	1	2	10
Prophet M B'day	4	0	2	2	1	2	11
Deepavali	5	1	2	1	0	1	10
Christmas	2	1	2	1	2	2	10
Election	1	1	0	0	0	1	3
Total	39	13	19	17	15	18	121

Note: For holidays that extend more than a day, only the first day is indicated in the table above (e.g. Chinese New Year and Hari Raya Qurban).

Panel B: Distribution of Holidays by Day of the Week

(January 1990 - June 2000)

Day	Observations	% of Holidays
Monday	39	32
Tuesday	13	11
Wednesday	19	16
Thursday	17	14
Friday	15	12
Saturday	18	15
Total	121	100

To examine the holiday effects in the KLSE, the writer computes and compares the mean pre-holiday return, the mean post-holiday return, and the mean non-holiday return. The pre-holiday return is the difference between the close-to-close prices for the calendar days before the holiday. The post-holiday return is the difference between the closing price of the calendar day prior to the holiday and the trading day immediately following the holiday. The non-holiday return is the return over a one-day period, excluding days surrounding the holidays. The terms "ordinary day", "normal trading days", "all the other days", or "non-holiday" will be used interchangeably to represent trading days that have excluded either pre-holidays or post-holidays, or both, as the case may be. Incidentally, when the day examined falls on the categories of pre-holiday and post-holiday at the same time, this particular day will be classified as a missing value in order to eliminate any overlapping effect between these two types of days.

3.2 RESEARCH METHODOLOGY

The analysis of this research is divided into 5 sections to fulfil the 3 research objectives of this research project as stated earlier in Section 1.6. The statistical program used for data analysis is the Statistical Package for Social Science (SPSS).

The first research objective is to investigate whether the holiday effect exists in the KLSE over the period from 1990 to 2000. Since this question is the central theme of the research, four sections are devoted to address this research objective in order to provide more insights to it.

3.2.1 Means and Variances on Pre- and Post-Holidays

The initial tests of the holiday effect are conducted with the KLSE CI daily returns for the period 1990 to 2000 plus KLSE EMI and KLSE SBI daily returns for the period 1991 to 2000. The trading days in the sample period are divided into three subsets: the *single* trading days immediately before holidays (pre-holidays), the *single* trading days immediately after holidays (post-holidays), and all other ordinary trading days (after excluding pre-holidays and post-holidays).

With the series of daily market returns calculated using Equation (1) from Section 3.1.1, the writer calculates daily mean returns and variances for the pre-holidays and the post-holidays. These mean returns are then compared with the daily mean returns for the ordinary trading days after excluding the trading days before and after holidays. The t-statistic is used to test the equality of daily mean returns between pre-holidays and ordinary days as well as between post-holidays and ordinary days. The hypotheses for the t-tests are as follows:

(a) For Pre-holiday Effect,

H_o: $\mu_1 = \mu_3$ against H_a: $\mu_1 \neq \mu_3$

(b) For Post-holiday Effect

H_o: $\mu_2 = \mu_3$ against H_a: $\mu_2 \neq \mu_3$

where H_o and H_a refer to the null hypothesis and the alternative hypothesis, respectively; μ_1,μ_2, μ_3 are respectively the daily mean returns on the pre-holidays, post-holidays, and ordinary days. If the null hypothesis is rejected, then we will accept the alternative hypothesis that there is pre-holiday or post-holiday effect.

The study also uses a non-parametric test, Chi-square statistic (χ^2-statistic), to reconfirm the result obtained from the parametric test conducted earlier. χ^2-statistic is used to test the null hypothesis that the expected frequency of positive return days among the pre-holidays equals the realised frequency of positive return days among all ordinary trading days in the period. The same test is then repeated for post-holidays. The hypotheses for the χ^2-tests are as follows:

(a) For Pre-holiday Effect,

H_o: $\bar{F}_1 = \bar{F}_3$ against H_a: $\bar{F}_1 \neq \bar{F}_3$

(b) For Post-holiday Effect

H_o: $\bar{F}_2 = \bar{F}_3$ against H_a: $\bar{F}_2 \neq \bar{F}_3$

where $\bar{F}1$, $\bar{F}2$, and $\bar{F}3$ are respectively the expected positive return frequency on pre-holidays, post-holidays, and ordinary days.

3.2.2 Stock Returns on Days Around Holidays

The daily continuous compounding rates of change for the three stock indices in the sample: KLSE CI, KLSE EMI, and KLSE SBI are calculated using Equation (1). The KLSE EMI and the KLSE SBI are used to represent daily stock returns for large and small-sized stocks that are listed on the KLSE, respectively. The stock returns under consideration refer to the returns on the two days immediately prior to the public holidays and the two days immediately after the public holidays.

The Ordinary Least Square (OLS) Multiple Regression Model with the following equation is used to test the effect and timing of stock returns on the days around holidays.

$$R_i = a_i + \alpha_{-2}D_{-2} + \alpha_{-1}D_{-1} + \alpha_1 D_1 + \alpha_2 D_2 + \varepsilon_i \qquad (2)$$

where R_i = daily stock return in period i

a_i = Regression intercept or mean returns on all the other days

$D_{-2}..D_2$ = Dummy variables. E.g. D_{-2} is for second day before holiday, D_{-1} for first day before holiday, D_1 for first day after holiday, and D_2 for second day after holiday. A value of 1 is assigned to that day if it falls in that particular category, otherwise, a value of 0 is assigned.

$\alpha_{-2}...\alpha_2$ = Regression coefficients. E.g. α_{-2} for second day before holiday, α_{-1} for first day before holiday, and so on.

ε_i = Disturbance term

The regression coefficients, $\alpha_{-2}...\alpha_2$, are the difference between the means of the types of day (e.g. first day before holiday, second day after holiday, etc) and all the other days' mean or the extra returns earned in excess of the normal trading days' return. All the other days' mean is represented by the regression intercept, a_i.

The regression model is an analysis-of-variance (ANOVA) model where the F-statistic is used to test the significance of difference among all the regression coefficients. The null hypothesis and alternative hypothesis for the F-statistic are as follow.

$$H_o : \alpha_{-2} = \alpha_{-1} = \alpha_1 = \alpha_2 = 0$$

$$H_a : \alpha_{-2} \neq \alpha_{-1} \neq \alpha_1 \neq \alpha_2 \neq 0$$

In addition to the F-test, individual t-statistic is performed to test for the significance of the regression coefficient separately, more specifically, to test the null hypothesis that the respective coefficient equals to zero. The null hypotheses and alternative hypotheses for the t-statistic are as follow.

$H_o : \alpha_{-2} = 0$	$H_a : \alpha_{-2} \neq 0$
$H_o : \alpha_{-1} = 0$	$H_a : \alpha_{-1} \neq 0$
$H_o : \alpha_1 = 0$	$H_a : \alpha_1 \neq 0$
$H_o : \alpha_2 = 0$	$H_a : \alpha_2 \neq 0$

The rejection of any of the null hypotheses above implies that the mean return of the day examined is significantly different from all the other days' mean return.

3.2.3 Holiday Effect by Individual Holiday

In examining the holiday effect by individual holiday, the writer repeats the OLS multiple regression model and the t-test conducted in Section 3.2.2, with the exception that the dummy variables in the regression model have now been replaced with the individual type of holidays. The purpose here is to study the behaviour of holiday returns segmented by individual holidays. Besides this, the stock returns examined in this section are the returns on the single day immediately before as well as after the respective holiday.

The individual holidays under consideration are those stated in Table 2(A) of Section 3.1.5. An additional variable *Kongsi Raya* which combines the Chinese New Year and Hari Raya Puasa effects is used in the model. The purpose here is to isolate the clashes of these two types of holiday effect, which occurred in 1996, 1997, and 1998, from the model.

The OLS Multiple Regression Model with the following equation is used to test the effect and timing of stock returns on individual holidays.

$$R_i = a_i + \alpha_{-1}D_{NYD-1} + \alpha_1 D_{NYD1} + \alpha_{-1}D_{CNY-1} + \alpha_1 D_{CNY1} + \alpha_{-1}D_{HRP-1} + \alpha_1 D_{HRP1} + \ldots\ldots + \alpha_{-1}D_{ELECTION-1} + \alpha_1 D_{ELECTION1} + \varepsilon_i \quad (3)$$

where R_i	=	daily stock return in period i
a_i	=	Regression intercept which represents mean return on all the other days
$D_{x-1}..D_{x1}$	=	Dummy variables. Sub-script *x* refers to the respective category of holidays, -1 denotes pre-holiday, and 1 denotes post-holiday. A value of 1 is assigned to that day if it falls in that particular category, otherwise, a value of 0 is assigned.
$\alpha_{-1}\ldots\alpha_1$	=	Regression coefficients. E.g. α_{-1} for pre-holiday and α_1 for post-holiday.
ε_i	=	Disturbance term

The regression coefficients, α_{-1} and α_1, are the difference between the means of the respective types of holiday and all the other days' mean or the extra returns earned in excess of the normal trading days' return. All the other days' mean is represented by the regression intercept, a_i.

The null hypothesis and alternative hypothesis for the F-statistic are as follow.

$H_o : \alpha_{-1} = \alpha_1 = 0$

$H_a : \alpha_{-1} \neq \alpha_1 \neq 0$

For the t-statistic, the null hypothesis and alternative hypothesis for the t-statistic are as follow.

$H_o : \alpha_{-1} = 0$ $\quad$ $H_a : \alpha_{-1} \neq 0$

$H_o : \alpha_1 = 0$ $\quad$ $H_a : \alpha_1 \neq 0$

The rejection of any of the null hypotheses above implies that the mean return of the holiday examined is significantly different from all the other days' mean return.

3.2.4 Pre-holiday Returns Are Not A Manifestation of Other Calendar Anomalies

The presence of calendar anomalies is not novel to the KLSE. Among the calendar anomalies studied include the popular January effect whereby stock returns in January are higher than in other months (Annuar and Shamser, 1987b; Yong, 1989; Wong, Neoh, Lee, and Thong, 1990; and Tay, 1991); the day-of-the-week effect whereby the average returns on Monday is abnormally low while the average returns on Friday is significantly high (Wong and Ho, 1986; Annuar and Shamser, 1987a; Kok and Ho, 1997); the monthly effect whereby stocks appear to earn positive returns only around the beginning and during the first half of calendar months, and zero average returns during the second half, and the size effect whereby the average returns of small firm size stocks are substantially higher than large firm size stocks.

First, a regression model in which a pre-holiday dummy variable (represents the single day before holiday) is regressed against the daily index returns is employed.

$$R_i = a_i + \alpha_{ph}D_{ph} + \varepsilon_i \qquad (4)$$

where R_i is the stock return on day i, a_i is the constant which represents the mean return of ordinary days, D_{ph} is the dummy variable for pre-holiday which assumes a value of 1 if the day mentioned is a pre-holiday, or zero otherwise, α_{ph} is the coefficient for pre-holiday dummy which measures the difference between the mean returns of ordinary days and pre-holidays.

The null hypothesis and alternative hypothesis for the t-statistic are as follow.

$$H_o : \alpha_{ph} = 0 \qquad\qquad H_a : \alpha_{ph} \neq 0$$

The rejection of the null hypothesis above implies that the mean return of pre-holiday is significantly different from all the other days' mean return.
In order to ascertain that the pre-holiday effect in the KLSE is not caused by any of the calendar anomalies, the writer repeats the regression in Equation 4 by adding one or more dummy variables in addition to the pre-holiday dummy to control for the different types of calendar anomalies: (1) January effect, (2) Day-of-the-week effect, (3) Monthly effect, and (4) Small firm effect.

(1) Isolation from the January effect

$$R_i = a_i + \alpha_{ph}D_{ph} + \alpha_{jan}D_{jan} + \varepsilon_i \qquad (5)$$

where D_{jan} is the dummy variable for all the days in January. The dummy variables assume a value of 1 if the day is respectively a pre-holiday, in January and zero otherwise. α_{ph} is the regression coefficient for the pre-holiday dummy variable which indicates the additional returns earned on pre-holidays after controlling for the January effect. α_{jan} is the regression coefficient for January's day dummy variable.

The null hypothesis and alternative hypothesis tested are as follow.

$H_o : \alpha_{ph} = 0$ $\qquad\qquad$ $H_a : \alpha_{ph} \neq 0$

The rejection of the null hypothesis above implies that the pre-holiday's mean return is significantly different from all the other days' mean return after isolating from the effects mentioned.

(2) Isolation from the Day-of-the Week effect

$$R_i = a_i + \alpha_{ph}D_{ph} + \alpha_{day}D_{day} + \varepsilon_i \tag{6}$$

where D_{day} is the dummy variable for the respective day in the week to be isolated from the pre-holiday returns. For e.g. D_{mon} is the dummy variable for Monday, D_{wed} is for Wednesday, and so on. α_{day} is the regression coefficient for the respective day's dummy variable.

(3) Isolation from the Monthly effect

$$R_i = a_i + \alpha_{ph}D_{ph} + \alpha_{tom}D_{tom} + \varepsilon_i \tag{7}$$

where D_{tom} is the dummy variable for the turn-of-the-month. It will assume a value of 1 if that day falls on the first half of the month and zero otherwise.

(4) Isolation from the small firm effect

Using the KLSE SBI as a proxy for small firms to regress against one or more dummy variables:

$$R_i = a_i + \alpha_{ph}D_{ph} + \varepsilon_i \tag{8}$$

$$R_i = a_i + \alpha_{ph}D_{ph} + \alpha_{jan}D_{jan} + \varepsilon_i \tag{9}$$

$$R_i = a_i + \alpha_{ph}D_{ph} + \alpha_{tom}D_{tom} + \varepsilon_i \tag{10}$$

$$R_i = a_i + \alpha_{ph}D_{ph} + \alpha_{mon}D_{mon} + \alpha_{fri}D_{fri} + \varepsilon_i \tag{11}$$

All the null hypotheses and alternative hypotheses tested will be the same as the ones stated for isolation from the January effect. The regression models above are essentially the same whereby the sole purpose here is to ascertain that the pre-holidays' mean return is still significantly different from ordinary days' mean return after controlling for these various effects.

The second and third research objectives will be addressed in the following section, which will explore the presence of pre-holiday effect throughout the sample period in relation to the business cycles of the Malaysian economy. This is possible given that the entire sample period encompasses different economic situations whereby we had undergone the expansionary period during early 1990s till mid-1997, the recession period which started in July 1997 when the Asian Financial Crisis hit, and the recovery period in which the Malaysian economy is still undergoing since 1999. Since the statistical tests in the following section will employ the KLSE CI (as a general indicator of the KLSE's performance), the KLSE EMI and the KLSE SBI (as proxies for large to small firm size stocks), the results are deemed sufficient to address both the second and third research objectives of this study simultaneously.

3.2.5 Relationship between Business Cycles and Pre-Holiday Effect for different firm sizes

The trading days in the sample period are divided into 3 sub-periods, namely (1) Expansionary period: January 1990 to June 1997 (KLSE CI); October 1991 to June 1997 (KLSE EMI and KLSE SBI), (2) Recession period: July 1997 to December 1998 (all 3 indices), and (3) Recovery period: January 1999 to June 2000 (all 3 indices) to reflect the business cycles of the Malaysian economy throughout the decade. The business cycles are determined by the real GDP figures published by the Ministry of Finance, Malaysia as reported in Section 1.5.

The following OLS regression model is employed to investigate the effect of business cycles on the pre-holiday effect. The post-holiday has been excluded from the model given its insignificant presence in the KLSE.

$$R_{ijt} = a_{ij1} + \alpha_{ij2}D_{ph} + \varepsilon_{ijt} \qquad (12)$$

where i = the KLSE CI, the KLSE EMI, or the KLSE SBI

j = the entire period, expansion, recession, or recovery

R_{ijt} = the return on the *i*th index during the *j*th business cycle in period *t*

a_{ij1} = the ordinary day returns on the *i*th index during the *j*th business cycle in period *t*

D_{ph} = pre-holiday dummy that assumes a value of 1 for a pre-holiday trading days and zero for ordinary trading days

e_{ijt} = the residual term

The null hypothesis and alternative hypothesis tested is as follow.

$$H_o : \alpha_{ij2} = 0 \qquad\qquad H_a : \alpha_{ij2} \neq 0$$

A significant intercept, a_{ij1}, indicates that the ordinary day returns on the *i*th index during the *j*th business cycle are statistically different from zero. The coefficient, α_{ij2}, measures the difference between the pre-holiday returns and the ordinary day return on the *i*th index during the *j*th business cycle. A positive and significant t-statistic for α_{ij2} implies that the pre-holiday returns are significantly higher than the ordinary day returns, which is an indication that a pre-holiday effect exists in the *i*th index during the *j*th business cycle.

In addition, the writer also employs a nonparametric test, the Kruskal-Wallis (K-W) test, to test for the existence of a pre-holiday effect in all three indices.