# CHAPTER II

# LITERATURE REVIEW

## 2.0 Introduction

Several journals or articles of rational expectations have been published. The following literature review are based on some of the journals published categorized into financial and non-financial sector.

## 2.1 Non- Financial Sector

According to Habibullah (1994), empirical evidence on the testing of rationality of survey data is rather lacking in the developing countries. This is probably due to the unavailability of such expectations survey in a particular country. However, Malaysia is fortunate because both government and the private sector recognize the need for such surveys and have conducted and published reports on expectations survey.

The results from present research (Habibullah, 1994) indicate that the forecasts of gross revenue are unbiased predictors of the actual values for all sectors. Except for Construction sector, similar results are also obtained for employment forecasts. On the other hand, business firms perform badly in forecasting capital expenditure for the period under study. Only Construction, Wholesale and Banking sectors show unbiased predictors of forecasts of capital expenditure to the actual value.

.

13

Levine (1993) research's result said executives' expectations are hard to predict. There are several simple models of expectation formation: rational, adaptive, vector autoregressive, and so forth. While executives do not appear to have rational expectations, neither is their expectations well described by any other simple model. According to Levine, a simple model that executives expect prices to increase by 4.7% plus 0.27 times the average rate price increases of the last 5 years predicts approximately as well as any other simple model-although other information is statistically significant in predicting executives' expectations.

Aggarwal, Mohanty and Song (1995) examined the rationality of the forecasts for 11 macroeconomic variables in the U.S. In contrast to the study by Hafer, Hein and Mac Donald (1992), Aggarwal et. al applied the Dickey-Fuller (DF) test and augmented Dickey-Fuller (ADF) test in evaluating the stationary of the variables to avoid incorrect findings of bias.

The results provide evidence that there are significant deviations from the REH for survey forecasts of a number of macroeconomic series. It is found that survey forecasts for the consumer price index and personal income are stationary and consistent with the REH while the surveys of housing starts, the unemployment rate, and the trade balance are rational forecasts in the sense that the announced values and their survey forecasts are cointegrated with factor one. However, the lack of support for the REH in the case of industrial production, producer price index, money supply (M1), retail sales,

leading indicators, and durable goods suggests that the market participants do not fully exploit private and public information in formulating their forecasts.

Runkle (1991) applied the testing of the REH to the agricultural sector, where he examined whether hog farmers' first and second farrowing intentions announcements are rational forecasts of actual farrowings. The results show that neither the one-quarter-ahead nor the two-quarter-ahead farrowing intentions announcement is a rational forecast of actual farrowings. The implication of this is somewhat surprising in the sense that farmers announce irrational forecasts of their own future actions. However, Runkle argued that because farmers appear to have few economic incentives to report their farrowing intentions accurately, the fact that those intentions are not rational forecasts does not necessarily disprove the REH.

Madsen (1993) investigates the different production expectations formation mechanisms in the manufacturing industry for nine countries. He demonstrates that expectations in most cases are formed regressively and/or follow a combined regressive and adaptive process. The finding that production expectations tend to drift toward the long-run trend in industrial production indicates that expectations are stabilizing to the extent that producers can affect economic activity through orders and investment expenditures.

In addition, it is found that information other than past production and expectations only influence the formation of current expectations weakly. The results

also suggest that the REH is weakly rejected for all countries, except Norway. However, it can be argued that this finding needs to be viewed with caution due to the model specification problems involved.

Baghestani (1992) examines the degree of the rationality of economic agents' inflationary expectations based on differing prevailing rate and volatility of inflation.

The results suggest that economic agents found it cost effective to efficiently utilize primarily the information in the past history of inflation in periods of mild but volatile or high but relatively stable rates of inflation. However, during periods of mild and relatively stable rates of inflation, they did not efficiently utilize such information, perhaps because the loss from misforecasting did not matter too much.

Furthermore, during more uncertain periods of high and volatile rates of inflation, a more accurate forecast was demanded, perhaps due to the realization that the cost of systematic forecasting errors exceeds the cost of enlarging the information set and the utilization of more sophisticated forecasting models. Therefore, it is inferred that the finding of this study is consistent with the notion that the behaviour of economic agents is not invariant to changes in the economic environment.

Baur and Orazen (1994) examined the effect of public information on the orange juice market. They investigated the rationality, information content, and price effects of U.S Department of Agriculture forecasts of the production of oranges. U.S Department of

Agriculture forecasts are found to be unbiased and efficient. While market participants form relatively accurate expectation of USDA estimates, the market does not fully anticipated public information. Nevertheless, their results still corroborate Roll's conclusion that public information cannot account for a majority of the variation.

The explicit examination of expectations is a recent important development in economic theory and policy. The fact that expectations are unobservable often forces economists to rely on survey data as a reasonable proxy for market expectations.

A further feature of the survey data would be to consider seasonal movements within the cointegration framework. The unit roots testing for rationality was applied to Money Market Services (MMS) survey data. The non-rejection of the necessary conditions corroborated with the rationality statistics; nevertheless, the MMS data cannot be regarded as very efficient due to its large forecast variance.

Marais and Conradie (1997) investigated entrepreneurial expectations formation along the lines of the rational expectations hypothesis. It utilizes micro-level business survey data from the Bureau for Economic Research and distinguishes between phases of the business-cycle, consumer and capital goods industries and various degrees of sectoral economic concentration. The South African manufacturing business experience does not appear to provide sufficient evidence that expectations are formed rationality; not even when segments of the total industry, or a variety of business factors are examined separately, it should be emphasized that the unbiasedness and orthogonality tests

17

conducted in this research, only provide evidence to reject the REH in its weak form, that is, although necessary evidence have been found to reject the REH in its strong form, it is not sufficient. This is in accordance with most similar evaluations of business survey data cited in literature.

One of the main consequences of the cointegration revolution on the domain of the direct tests of the rational expectations hypothesis (REH) was the substitution of the restricted cointegration tests (RCT) for the unbiasedness tests (Marais and Conradie, 1997). However, the results of a Monte Carlo study show that a simple t-test can be much more powerful than the RCT. It is argued that the RCT is adequate to investigate the asymptotic rationality but that it is not sufficient to asses the Muthian rationality of expectations.

Lopes (1998) has proposed several criticisms of the restricted cointegration test (RCT), particularly as a determinant test in assessing the rationality of expectations. It was argued that it is as incorrect to base inferences regarding the rationality of expectations on that test as it was, in the past, to let the same job be done by the unbiasedness test. Two main criticisms were made. First, the RCT aims at testing the unbiasedness property of the REH, one of the least interesting properties of that hypothesis. Secondly, at least the popular RCTs may have very low power as rationality tests, particularly when agents do not fully perceive the stochastic trend which is present in the integrated target variable.

Ghosh and Dutt (2000) examined the stability over time in the parameters of the forecasts series of nominal gross domestic product (GDP) and corporate profits (CP), using the Hansen (1992) procedure. This test also examines the cointegration between the present and forecasts series and hence test for consistency and rationality in their expectation formation process. They cannot found any conclusive evidence to show that analysts predictions of corporate profits and GDP have been consistent over the period 1968-1997. This is probably due to the prolonged economic expansion of the 1990s, which had led to a rapidly rising stock market, and thus has led to structural breaks in both the GDP and corporate profit variables.

## 2.2 Financial Sector

According to Hafer; Hein and MacDonald (1992), in terms of the mean squared error (MSE) criterion, the futures rate is found to be a statistically superior projection relative to the other forecasts. At the other extreme, the survey and forward rate forecasts generally have the largest forecast errors but little statistical difference in the forecasts accuracy.

As a result, Hafer; Hein and MacDonald conclude that not all market-determined forecasts are equally useful. As predictors of the future Treasury-bill rate, market-determined futures rates are far superior to market-determined forward rates. This finding is consistent with results indicating that Treasury-bill forward rates include a positive

term premium causing them to be upwardly biased projections of future Treasury-bill rates.

According to Beach, Fernandez-Cornejo and Uri (1995), the use of futures or forward prices, to test the rational expectations hypothesis may be misleading because of the possible presence of risk premia. Besides that, according to them, tests that use aggregate market-level data or aggregate survey data are problematic.

In addition, they also indicate that a number of empirical studies on output price forecasting under rational expectation in agriculture have used the approach of Muth, which is based on a joint test of rational expectations and the underlying specification of the model. In order to overcome the incorrect model specification data from Florida, Michigan and Texas collected on the Agricultural Chemical Usage Survey that is conducted in 1990 have been utilized to examine whether rational expectations underlie the price formation process of vegetable growers.

According Beach, Fernandez-Cornejo and Uri, for the majority of the vegetable/state combinations studied, grower expectations are found to be inefficient and biased. Moreover, the McNemar association test shows that the results of the unbiasedness and orthogonality test are compatible. Besides, the effect of possible errors in the reported price expectations variables on the results are also examined.

The earlier results are reinforced, using Wald's procedure of grouping the observations and performing the tests on the means of the grouped data. Thus, price expectations formed by vegetable growers are found to be inconsistent with the rational expectations hypothesis.

Liu and Maddala (1992), use cointegration methods to achieve the decomposition because exchange rates are found to follow unit root process. They applied the three unit root tests, the ADF, $Z_{\alpha}$ and $Z_t$ tests, to test the proposition and find that none of them reject the unit root hypothesis at the 5 percent significance level. P. C. Liu and G. S. Maddala test the Rational Expectations Hypothesis (REH) by the cointegration tests and they find that the REH is rejected for the monthly data (one-month ahead forecasts), but it is not rejected for the weekly data (one-week ahead forecasts). Thus, the forecasts horizon plays an important role in the rationality tests.

By contrast, the market efficiency hypothesis (MEH) is rejected for both the weekly and monthly data when the same cointegration tests are applied to the forward rate and its corresponding future spot rates. Though the two series may still be cointegarated, the residual is not a white noise process.

According to Liu and Maddala, the results of the hypothesis for this study are rejected for the weekly data. Thus, they conclude that the failure of the MEH for the weekly data is due to risk premium rather than expectational errors. For the monthly data, they reject the "no risk premium" hypothesis for the British Pound (BP), Deutsche Mark

(DM) and Swiss Franc (SF) but not for the Japanese Yen (¥). It is suggested that with the monthly expectations data, the failure of the MEH is probably due entirely to expectational errors in the case of the Japanese Yen but due to both expectational errors and risk premium in the case of British Pound (BP), Deutsche Mark (DM) and Swiss Franc (SF).

In the research by Fisher (1989), the importance of the pretest for unit roots lies in the effect that the roots have on the underlying distributions of the tests, and hence valid inference depends on first establishing which case is relevant to the analysis. The unit roots testing strategy for rationality was applied to Money Market Services (MMS) using survey data.

For the Federal Funds Targeting (FFR) (Sep. 1977-Oct. 1979), and Nonbrrowed Reserves Targeting (NRT) (Oct. 1982-Feb. 1979-Oct. 1982) periods, the rationality properties of unbiasedness and weak form efficiency were not rejected. The non-rejection of the necessary conditions corroborated with the rationality statistics; nevertheless, the MMS data cannot be regarded as very efficient due to its large forecast variance.

With reference to Ito (1990), newly available survey data on the expected exchange rate in the Tokyo market were used to test several hypotheses regarding expectation informations. He found that the Japan Center for International Finance (JCIF) data set is better than the data sets previously used.

From Ito's findings, it was recognized that market participants are heterogeneous, with constant-term biases in their expectation formations. Besides, he also found that exporters (importers) are biased toward yen depreciation (appreciation) relative to others. When the usual rationality tests were applied, among different groups, the unbiasedness of expectation was rejected in a few instances for shorter horizons and unanimously rejected in the sixth-month horizon. Orthogonality was soundly rejected. Hence, he concludes that the findings he received have strong evidence against rational expectation formation in the Tokyo foreign exchange market. Lastly, he found that if the expectation formation is a distributed lag structure with two lags, consistency is overwhelmingly rejected.

Following the study conducted in the U.S. (Aggarwal et. al 1995), another similar research is undertaken in the Japanese economy (Aggarwal and Mohanty 2000) to test whether the REH actually holds in Japanese financial markets. As in their previous work in the U.S., Aggarwal and Mohanty applied a methodology that accounts for non-stationarity and non-normality in the data to examine the REH for five important Japanese macroeconomic variables.

The results indicate that four of the five announced and forecast economic series in Japan; namely, the trade balance, money supply, housing starts, and retail sales are non-stationary and follow unit root processes. The cointegration test suggests that survey forecasts of two of these time series, the trade balance and retail sales, are rational while the other two series, money supply and housing starts, demonstrate significant but only

mild deviations from rational expectations. However, Japanese forecasts of industrial production seem to be significantly biased, do not reflect market expectations, and are inconsistent with the REH.

In comparison to the prior research in the U.S. (Aggarwal et. al 1995), it can be inferred that the results for the rationality of Japanese survey forecasts (Aggarwal and Mohanty 2000) of macroeconomic variables are only somewhat different from the results documented for the U.S. For instance, regarding the trade balances and housing starts, both U.S. and Japanese survey forecasts are non-stationary in levels, are integrated with the announced series, and consistent with the REH. For industrial production, both U.S. and Japanese forecasts are stationary in levels, but are biased and inconsistent with the REH. Only the results for money supply and retail sales are not similar between the U.S. and Japan. These two series are stationary in levels in the U.S. while they are non-stationary in Japan. Furthermore, for the two series mentioned above, the REH is unsupported in the U.S. but supported in Japan.

Cavaglia, Verschoor and Wolff (1994) further extends the analysis of previous work on the sources of forward discount bias by considering a new exchange rate survey database that includes European Monetary System Currencies. In addition, univariate and pooling estimation techniques that impose fewer restrictions than those of prior studies are employed in the testing of hypotheses.

It is found that the bias in the forward discount for the major currencies relative to the U.S. dollar and other currencies is attributable to *both* the failure of rational expectations and the existence of a time-varying risk premium. However, Cavaglia et. al suggest that their results appear to be sensitive to the exchange rate regime and that further investigation on the issue is needed.

Keane and Runkle (1990) examine the rationality of individual price forecasts in a panel of professional forecasters. In contrast to previous studies pertaining to price rationality, this research found that survey respondents' forecasts of the GNP deflator are both unbiased and efficient, and therefore rational. Keane and Runkle argued that the difference in their results is due to improvement in the research design, which seeks to avoid bias besides increasing accuracy and consistency.

However, Keane and Runkle admitted that their results are not conclusive evidence for rational expectations because it is found that while the expert forecasters employed in the study are rational, other people may not be. Thus, their results can only be viewed as salvaging the possibility that the REH is empirically valid, and reopening the debate on this subject.

According to Croushore (1996), the inaccuracy of inflation forecasts estimated from the Livingston Survey from 1956-1979 was largely due to the effect of the oil-price shocks in the 1970s. Adding inflation data since 1980 results in a much-improved performance in the sense that the forecasts no longer show any bias.

Nonetheless, there appears to be some inefficiency in the forecasts with respect to their relationship to monetary policy. This may be because forecasters do not do their jobs well, because the economy is too complicated and changes too frequently, because it takes time to learn about changes in the economy, or because monetary policy isn't fully credible.

Beach, Cornejo, and Uri (1990) utilize data from Florida, Michigan and Texas collected on the Agriculture Chemical Usage Survey conducted in 1990 to examine whether rational expectations underlie the price formation process of vegetable growers. Growers were asked the price they expected for their crop at the time of planting and the price they actually received. For the majority of the vegetable/state combinations studied, grower expectations are found to be inefficient and biased. Moreover, the McNemar association test show that the results of the unbiased and orthogonality test are compatible. Also examined are the effect of possible errors in the reported price expectations variables on the results. Using Wald's procedure of grouping the observations and performing the tests on the means of the grouped data, the earlier results are reinforced. Thus, price expectations formed by vegetable growers are found to be inconsistent with the rational expectations hypothesis.

Dutt and Ghosh (1997) looked at with survey data on exchange rate expectations at multiple forecasts horizons. In both the bivariate and the multivariate cases they found that in the one and four week horizons in the New York Money Market Survey data set

the future and expected spot rates are cointegrated, whereas at the three, six and twelve month horizons in the Economist Financial Report data set the rates are not cointegrated. This implies that market expectations are closer to the actual values at shorter time horizons; as the time horizon lengthen, expected exchange rates and actual values tend to diverge at lot more.

Madsen (1994) embeds survey price expectations of manufacturing into a mark-up model of price determination. The predictive performance, in terms of the mean forecasts error, of the model is compared with an ARIMA forecasts of inflation. He has suggested and estimated a simple forecasts model of producer and consumer price inflation by integrating producer price expectations into a simple model of prices derived under the assumptions of translog technology and profit maximization. The estimates demonstrated that producer's price expectations do not convey much information about future producer prices. This is likely to be a result of the way producer prices are measured. Whereas consumer prices are measured at transaction prices, producer prices are often measured as contract prices.

The consistency property of a select group of macroeconomic variables, representing both the real and the financial sector of the economy, is re-examined. Consistency is a precondition to rationality in the expectation formation process.

Forrest, Gulley and Simmons (2000) used lottery games as an excellent opportunity to test how participants process the information that is available to them.

27

Using data for the first 188 drawings of the UK National Lottery (UKNL), they found that market participants seem to be accurately processing the information that is available to them. This finding implies that individuals understand how the UKNL works in terms of the relationship between sales, rollover and prices. They suggested bettors do not over or under react, on average, to changes in the rollover. They also suggest that bettors reach a rational expectations equilibrium.

Cuthbertson (1996) provide a wide variety of tests of the expectations hypothesis of the term structure of interest rates in the UK interbank market. In his study, different tests give different inferences concerning the validity of expectation hypothesis. The Johansen Cointegration results and spread restrictions are consistent with the expectation hypothesis at shorter maturities but when the spread restrictions on both the 6-month and 12-month rates are imposed, these are usually rejected. The perfect forecast regressions are supportive of the expectation hypothesis for all maturities. However, the Campbell-Shiller approach gives conflicting results. Agents do not appear to process information in a way that is consistent with the expectation hypothesis.

## 2.3 Conclusion

Explicit forecasts are derived directly from survey expectations that are relevant to their decision, for example, on saving behavior, spending, prices, and so on. On the other hand, a ore important is the survey on the expert opinion. This are usually surveys on firm decisions on their likely intentions on sales, capital expenditure, demand for

labour and other resources and so on. The empirical literature of the rational expectations hypothesis is vast and growing. The aim was to determine whether survey data on economic forecasts are accurate, in the Muth (1961) sense, that is, whether participating economic agents used all available information at the time forecasts are made. In general, the studies do not support the rational expectations hypothesis. Thus, the following study is to test the evidence on the rationality of business firm's expectation using survey data where Habibullah (1994) will be the main reference.