



Faculty of Economics and Business

**TESTING RATIONAL EXPECTATIONS HYPOTHESIS ON  
SURVEY DATA IN MALAYSIA**

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SURVEY DATA IN MALAYSIA

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the requirements for the degree of Bachelor of Economics with Honours  
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## Statement of Originality

The work described in this Final Year Project, entitled  
**“Testing Rational Expectations Hypothesis on Survey Data in Malaysia”**  
is to the best of the author’s knowledge that of the author except  
where due to reference is made.

10-5-2010

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Date submitted



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## **ABSTRACT**

### **Testing Rational Expectations Hypothesis on Survey Data in Malaysia**

**By**

**Lucy Chong Lee Yun**

This study examines how firms form their rational expectations based on gross revenue and capital expenditure towards economy trend for the next period. The rational expectations hypothesis (REH) is valid in the condition of the expectations formed on the basis of one possible economy equilibrium. Survey data published by Department of Statistics Malaysia in Business Expectations Survey of Limited Companies from year 1991 until 2006 is utilized in this study and should fulfill the basic requirements of rationality which are unbiasedness, no serially correlated, and efficiency. Nevertheless, the empirical evidence shows that only BGR is an unbiased and rational predictor of forecasts to the actual value. Even though other services sectors did not obtain the same result, the significance of REH is still considerable since the biased, serially correlated and inefficient expectations may be due to unavoidable reasons. Government can utilize some relevant policies to enhance the rationality and assist the economic environment.

## **ABSTRAK**

### **Menguji Hipotesis Jangkaan Rasional dengan Menggunakan Data Tinjauan di Malaysia**

**Oleh**

**Lucy Chong Lee Yun**

Kajian ini mengkaji bagaimana firma membentuk jangkaan rasional terhadap hala ekonomi kelak berdasarkan hasil kasar dan perbelanjaan modal. Kesahihan hipotesis jangkaan rasional akan diperolehi sekiranya jangkaan tersebut mencapai satu keseimbangan ekonomi sahaja. Kajian ini menggunakan data tinjauan yang diterbitkan oleh Jabatan Perangkaan Malaysia melalui Tinjauan Jangkaan Perniagaan Syarikat Berhad Malaysia yang merangkumi tahun 1961 hingga 2006. Ia perlu memenuhi syarat kerasionalan iaitu ketidakbiasan, tidak berkorelasi ralat jangkaan bersiri, dan kecekapan bagi mencapai hipotesis jangkaan rasional. Bukti empirical menunjukkan bahawa hanya BGR adalah peramal yang tidak bias dan rasional. Walaupun sektor perkhidmatan yang lain tidak memperolehi keputusan yang sama, namun ini tidak menunjukkan bahawa hipotesis jangkaan rasional adalah tidak penting. Keputusan yang bias dan berkorelasi ralat jangkaan bersiri serta ketidakcekapan tersebut berkemungkinan berlaku disebabkan oleh faktor-faktor yang boleh dielakkan. Maka, kerajaan harus menggunakan polisi yang bersesuaian bagi mempertingkatkan kerasionalan serta memperbaiki suasana ekonomi.

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# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

Rational expectations utilize all the available information and experimental data to predict the variable in the future market. As a general rule, expectations will affect the current behavior of the firms, households, as well as the government. When people on average are expecting the things to happen with the available information, the outcomes will usually come out as predicted in the end. As noted by Pesaran and Weale (2006), the economy structure and model that are composed through the economy theories will be determined by the influences of the expected futures events on a current behavior which is referred to the rational expectations. In other words, economy model can only be tested if the expectational data is rational.

Besides, rational expectations play an important role in microeconomics and macroeconomics to evade the policy makers from persuading the ineffective policies. The successful and efficiency decisions which avoid the uncertainty of the economy environment could be obtained merely through the rational expectations. Hence, effective business management can be achieved by full allocation of the resources under the rational expectations. It will subsequently maximize the business outcomes and enhancing the social welfare by adjusting the economy planning and policies.

## **1.1 The Process of Forming Expectations**

### **1.1.1 Expectations**

Expectations are the forecast of the uncertainty outcomes in the future. It is a part of decision making process by households, firms and the government. Apart from that, expectations are the predictions by the decision makers on the subject of current economy environment. The public will carry out expectations in their own area to increase their confidence in making decisions which will carry the lowest risk or loss. Based on Sargent (2008), the incentive to use expectations become strong as the potential 'profit' rising. The avoidable errors will be adjusted when the current forecasting takes place during the feedback towards past outcomes to enhance the probability of success.

### **1.1.2 Extrapolative Expectations<sup>1</sup>**

Extrapolative expectations state that the determinant for expectations is the weight average of past realizations. On the other hand, it means that the test by using available survey data will show the sample mean of underlying process that is equal to the average times of the expectations. Above and beyond, extrapolative expectations require the individual's expectations to be heterogeneous and a number of different processes that can be followed. Exogenous expectations and adaptive expectations are the form of extrapolative expectations.

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<sup>1</sup> See Pesaran and Weale (2006) for detailed. As mentioned in their study, this model is the differing degrees of information requirements.

### 1.1.2.1 Exogenous Expectations

Keynes (1936) is the formalizer of the exogenous expectations<sup>2</sup> in economics. However, Keynes only emphasizes on the importance of expectations but did not reveal how the expectations are formed. Keynes proposed that the government needs to use the mathematical control theory to manage the economy since people could not make rational economic decisions due to the unpredictable future. In the incidence of depression, Keynes claims that people are irrational by making the hypothesis that most of the people are not able to outline the price changes (not aware of changes of price) and being reluctant to take a wage cut. As a result, the wages will not fell and unemployment will take place.

However, this idea lost the central tenet of economic rationality. Individuals will not consistently make mistakes in the marketplace as assumed by Keynes. Moreover, Keynesian model ultimately failed to explain the economic world since Keynesian economists believed an idea preserved in Phillips Curve<sup>3</sup> which is not applicable in the real situation at all time. There is some evidence on the rise of the inflation and unemployment rates simultaneously for industrialized countries such as United Kingdom, France, Germany, Japan, and United States around years 1956 until 1975.

Keynes's exogenous expectations consider that people will not realize the dynamic changes of the economy and consequently will not make the forecasting rationally. In a different way, Muth (1961), Lucas (1972) and Sargent (1993) suggested that the

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<sup>2</sup> It was the expectations that fixed by some exogenous forces. The simplest form of extrapolative model by Keynes is static model of expectations that allows any form of adaption to the changing nature of the underlying time series. Besides, the mean-reverting (stationary at level) or the return to normality model had taken into account of the static model's evolution.

<sup>3</sup> The increases in inflation accompany by decreases in unemployment.

existence of rational expectations is valid in the condition that the expectations are formed on the basis of one possible economy equilibrium and is applied to determine the nature of the equilibrium attained. Therefore, the improvement of the idea for exogenous expectations outlying the fulfillment must be taken. Yet, the contributions by Keynes are certainly facilitated in views of the macroeconomics perspective as well as the exertions of forming the expectations. Keynesian approach has benefited the economy as a whole in that particular time.

#### **1.1.2.2 Adaptive Expectations<sup>4</sup>**

As mentioned by Pesaran and Weale (2006), adaptive expectations have been proposed by Koyek to revise the investment in year 1954, by Cagan to discover the money demand in conditions of hyper-inflation in year 1956, and by Nerlove to study the cobweb cycle in 1958. Adaptive expectations are the integration of the current expectations formed by past experiences with the correction made from past errors. The notable thing is that, the current information is not included when the forecasting is being made under the adaptive expectations.

Adaptive expectations have been used widely in Phillips Curve and empirical studies in consumption at early 1970s since the utilizing of the efficient information is not obligatory. Nevertheless, there are indications of arising consistent errors in adaptive forecasting because the adjustment to the forecasting occurs only if there has been a forecast error in the past which will lead to the serially correlated of the expectations errors (Pesaran and Weale, 2006).

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<sup>4</sup> Expectations of the future value of an economic variable are based on past values.

In addition, the adaptive expectations will perform weakly when the core processes are subjected to structural breaks. Hence, the error-learning models proposed by Meiselman in 1962, Mincer and Zarnowitz in 1969, and Frenkel in 1975 which constructed the optimal forecast with the 'restriction' on the revision coefficient to be same across different horizons are extended to facilitate the adaptive expectations (Pesaran and Weale, 2006). Yet, this model is the surpassed models since it needs to accomplish by restricting the coefficients which will convey the biased results.

Subsequently, alternative methodology starts to be explored at the same time as rational expectations are being introduced to make up in the economy. Rational expectations are the most appropriate statistical method to examine economic relationships. It has been employed wisely since the economists alert for the continuous revolutionize in economy environment and it is one of the most appropriate methodologies that employed all information during forecasting.

### 1.1.3 Rational Expectations

John F. Muth is the pioneer that formed the rational expectations in 1961. Even so, Robert E. Lucas is the one that popularized rational expectations by testing it empirically in 1976. This idea has been strengthened by Herbert A. Simon in 1978, Marjorie A. Flavin in 1981 and Thomas J. Sargent in 1986 afterward. Rational expectations are to assume that on average, the agents' expectations<sup>5</sup> are correct. Muth pointed out that:

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<sup>5</sup> Zarnowitz (1992) define it as expectations by those who act in economy, not those study economy.



*In order to explain fairly how expectations are formed, we advance the hypothesis that they are essentially the same as the predictions of the relevant economic theory. In particular, the hypothesis asserts that the economy generally does not waste information, and that expectations depend specifically on the structure of the entire system.*

(Muth, 1961, pp. 315)

In other form, rational expectations implied that agents formed their expectations with current information which do not rely purely on the past experience.

Even if the future is not fully predictable, the systematic error can be assumed not to happen because all the relevant information and economic fundamental relationships will be used in forming economy expectations. Therefore, although the economic variables (nominal variables) are created by systematic process, which is represented by the expectations<sup>6</sup>, the outcomes will be same as predicted theory<sup>7</sup> under rational expectations hypothesis. However, the expectations errors can still be non systematic since there are real variables which will let people realize and adjust their expectations from time to time.

Under the rational expectations hypothesis, the government is not able to manipulate public expectation with misleading policies. Public viewed these policies as one of the resources to form the expectations and not fully rely on it. Muth used the example of a commodity that cannot be stored in an isolated market by setting the short period price and fixing production lag. The commodities price is expected to rise in the future. He outlined that the speculation will spread the effect of market disturbance over several time periods and reducing the variance of prices in the condition of the

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<sup>6</sup> Refer to the subjective probability distribution of outcomes.

<sup>7</sup> Refer to the objective probability distribution of outcomes.

well informed price expectations. In other words, the public will adjust their price expectations until it is equal to actual price, which is revealed in the reduction of the variation of prices.

At first, the public followed the government policies which are the evidence for the stable nominal prices. Nevertheless, when they realized that real prices will rise as the speculation did, they will start purchasing commodities in the present for the purpose of: [1] consumers trying to stay away from purchasing at higher prices in the future, while [2] the producers trying to store in order to sell in the succeeding period in the future. Therefore, as delineated by Muth, the ‘insider’<sup>8</sup> has opportunities to gain a profit with the conditions of the prediction of theory (equilibrium price for the inventory) are better than the expectations of the firms (expected price for the inventory). This also means that, when the equilibrium price for the inventory is still lower than the expected price for the inventory, speculators will gain the profit through the above actions.

For that reason, consumers’ expenditure and producers’ revenue both increased in the condition that the consumers’ expenditure is a little faster than producers’ revenue at the beginning. However, these ‘profit opportunities’ will no longer exist. When public keep on purchasing, the equilibrium price (aggregate expectations on the firms) will increase until it reaches the same as the predicted price (prediction of the theory). In sum, the standard deviations of the expected prices will first increase<sup>9</sup> due to the nominal variables (prices) being manipulated by government actions, and then

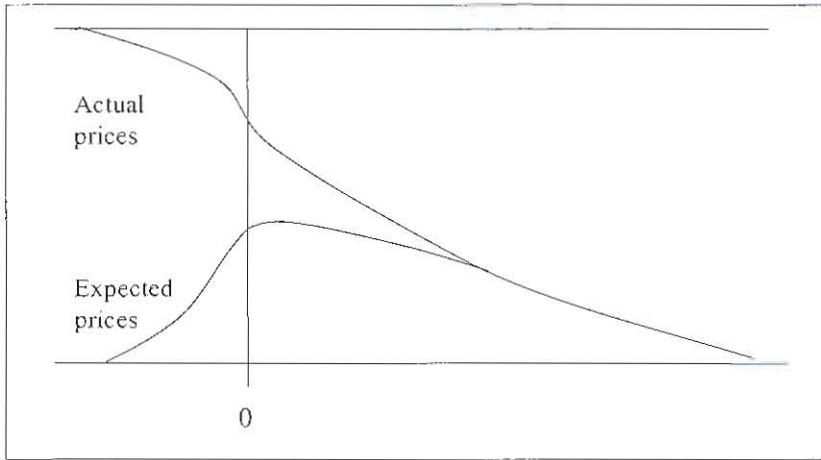
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<sup>8</sup> Also called as speculators.

<sup>9</sup> This happens because the time series are more predictable due to speculation.

decrease<sup>10</sup> due to the public realization of the real variables as illustrate in Figure 1 as shown below.

**Figure 1: Standard Deviations of Prices and Expected Prices**



Sources: Muth, 1961.

Muth's rational expectations can neither establish well nor widely spread in that point of time. McCloskey (1982) argued that this is because Muth's paper is difficult to read. Besides, Muth combined the unusual ideas and mathematical sophistication that is too far ahead of the profession; hence his ideas cannot reach the people as what he expected. Despite this, the main reason of Muth's idea failure is due to the bad timing when Muth proposed his idea. In that particular time, nobody inquired the Keynesian model that seemed to be working well. As a result, Muth's rational expectations are deserted until Lucas proposed it by providing evidence with empirical test.

Lucas is one of the contributors to macroeconomic analysis transformed. As suggested by Muth, Lucas restated that the government notification to be less optimistic of their ability to adjust economies since the people will take actions that may revise the

<sup>10</sup> The variability of actual prices is small.

expected results of government policies after making rational decisions. He argued that under the rational expectations, government cannot systematically bring effects towards employment in the long run through the stabilization policy which will accordingly increase the inflation as revealed in Phillips Curve<sup>11</sup>.

Thus, *anticipated changes*<sup>12</sup> in money supply made the producers realize that inflation (raise in aggregate price) does not mean their relative price are increased, it in fact indicated that the consumers purchasing power are reduced (Lucas, 1972). As a result, there will be no increases for productions and employment as expected by the government. Lucas critique is influential since he encouraged the economists to build their micro foundation in the macroeconomics model. Moreover, he drew out the evidence of positive correlation between inflation and unemployment which is due to rational expectations and not price adjustment.

## 1.2 Rational Expectations Hypothesis

Generally, an individuals or economic agents are considered *rational* when they have self interest and avoid making costly mistake by using all the available information efficiency as well as not making the systematic errors. Muth stated that rational expectations hypothesis (REH) is the expectations that are reflected by an adequately large number of private agents that knew 'how the economy works' which will lead to

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<sup>11</sup> There is a negative relationship between inflation and unemployment. When economy is growing (inflation), employment is increased.

<sup>12</sup> It is the changes when announcement precedes the implementations (Zamowitz, 1992). For example, the *exogenous* price level starts to change at the time of announcement of the changes in nominal money and before the actual changes are occur. Hence, the adjustments are faster and the actual implementation affects short-term interest rate but is has little effect on output. It only affected the prices and made the real output equal to potential.

the equilibrium of endogenous variables. Again, REH is built on the basis of natural rate hypothesis<sup>13</sup> and suggested that government policies may not be able to produce the systematic expectation errors (Grossman, 1980).

To be more precise, policies tend to be a game theory as the strategic interaction between the players in economics such as individuals, firms and policy makers under rational expectations. It does not act as a tool to control but is more likely to act as the sources for individuals and firms in forming their expectations as well as the resolution for the government to cope with the current economy condition. Therefore, individuals that used all their available information to form rational expectations in systematic process will realize the real variables and will not be manipulated by government's actions. They started to adjust their expectations since the systematic monetary actions only affect the nominal variables such as prices (Grossman, 1980). So, the government knows that the policies launched may not result in the effect as much as they have predicted. The average performances of the economy will be worse than before if they try to mislead private agents about the nature of the economy disturbances.

According to Muth (1961), the assertions of REH are scarce in information, hence the individuals or firms will not waste it and uses it efficiently. Besides, REH entailed that parameter must be unbiased, serially uncorrelated, and efficient. However, it is worth mentioning that the rational expectations do not entail the perfect foresight since it is hard for the individual to employ all possible relevant information particularly which is subjected to a certain degree of uncertainty.

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<sup>13</sup> Imply the limitations on what government policy can accomplish and argue that no tenable monetary or fiscal policy can permanently keep the output above and unemployment below their natural rate.

REH assumed that 'public prediction' will have no substantial effect on the operation of the economy system unless the expectations are based on inside information that will give the opportunities to economist to make profit of speculation. For this reason, the public at most of the time will enhance their expectations through agents' expectations. The characteristic of unbiasedness requiring the expectation variables should be unbiased predicted for the actual variables. For the serially uncorrelated characteristic, the current forecast error should not be correlated with past forecast errors.

Additionally, the efficiency required all information about the variables to be fully utilized including the previous realized outcomes. Orthogonality<sup>14</sup> implied that the expectations errors are serially uncorrelated and have zero means, algebraically:

$$E(\varepsilon_{t+1}/S_t) = 0$$

where the term of  $\varepsilon_{t+1}$  is the error of expectations (Pesaran and Weale, 2006). Hence, one of the essential requirements of REH is orthogonal of the expectations error which represent the fully and no cost information that are uncorrelated with error so that expectations outcome's equal to the actual outcomes. REH does not impose any restrictions on conditional or unconditional volatilities of the expectations errors as applied in adaptive expectations to obtain more reliable results.

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<sup>14</sup> The unbiased mean which was due to offsetting by different forecasting. The mean of these biases will being zero or some value at significantly different from zero (Pesaran and Weale, 2006).

REH can be tested by using [1] quantitative expectational data that gives direct information and [2] qualitative survey data<sup>15</sup> that gives indirect information (Pesaran and Weale, 2006). The observations of quantitative data are obvious while the qualitative data required transformation of data into quantitative data by using econometric method for examination. Survey data acts as a panel of respondents and provides the information about subjective uncertainty. It is more accurate than most of the corresponding sets of individual predictions since it reflects the performance of average of participants' responses (Zarnowitz, 1992).

Ordinarily, market rationality is still on hold even if there are individual expectations errors of being biased or serially correlated, as well as high degree of heterogeneity of the expectations since these have been captured into characteristic of orthogonality. Based on Mishkin (1983), not all the market participants need to be rational to display rational expectations as well as the behavior of the average individual not necessarily being the same as behavior of a market. The market will behave as if those expectations are rational rather than irrational as long as the unexploited profit opportunities are eliminated by rational participants in the market.

Survey data can act as independent variables or dependent variables (Friedman, 1980). Independent variables are used to investigate the influence of expectations (unobservable) on economic behavior (observable) whilst the dependent variables are used to investigate expectations formation process. Nonetheless, there are some criticisms of consequences by using survey data such as cross-sectional differences and biased expectations.

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<sup>15</sup> Is the timely information that collected from professional analysts to serve the compilation of economic indicators; commercial and business community, academicians and researchers; and for estimate of quarterly national accounts (Department of Statistics Malaysia, 2009).

In this regard, Muth (1961) declared that although there are considerable cross-sectional differences when using survey data, the accordingly aggregate effect is negligible as long as the deviation from the rational forecast for an individual firm is not strongly correlated. Furthermore, Zarnowitz (1992) stated that biased expectations in survey yield should not be generalized for the reason that it is likely due to careless, poor information, or other failings of particular respondents which can be avoided. As a result, REH using survey data is not as problematic as addressed in some of the criticisms.

REH is principally applied in the business cycle theory, stock prices evidence, consumption behavior, dynamic inflation, and policy implementation. These situations strongly emphasized on how the rational expectations take place to affect the actual future outcomes. As noted before, firms or individuals rational expectations can manipulate the equilibrium in future outcomes rather than the government. Therefore, in order to move together with private agents, governments need to identify the aggregate expectations.

### **1.3 Applications of the Rational Expectations Hypothesis**

#### **1.3.1 The Business Cycle Theory**

According to Sargent (2008), business cycle theory outlines that business fluctuations are due to forecasting error through the rational expectations. This theory is employed in Philips Curve to show the forecast error of prediction when the public is referring to the nominal price level to form the expectations. At first, firms will raise their