INTRODUCTION AND OVERVIEW

In recent times the new classical concepts of rational expectations and optimisation have come to dominate the manner in which economists model expectations formation and economic decision making. This thesis examines both of these concepts in the context of the non-durable consumption expenditure decision making process. The purpose of this chapter is to introduce the reader to the reasoning behind this thesis, its aims and the manner in which they are to be achieved.

1.1 An Introduction

Rational economic man was reintroduced into economic debate (within the context of expectations formation) by Muth (1961). It was not until the works of Lucas (1972), Sargent (1973), Sargent and Wallace (1973a, 1973b, 1975) and Barro (1976) however, that rational expectations and the concept of rationality became an issue of central concern in mainstream macroeconomics. By definition, rational expectations propounds that the expectations formed by economic agents are equivalent to those produced by the relevant economic model and any errors that occur are of a random nature, resulting from unavailable information (see Muth 1961). This definition represents the rational expectations hypothesis in its strongest form.
Over time the rational expectation hypothesis has undergone modification, producing a weak form version (see Fischer 1980), which has come to be known as constrained maximisation, where "...each person's behaviour can be described as the outcomes of maximising an objective function subject to perceived constraints" (Sargent 1993 p6). This version of rationality is also referred to as optimality and it is in this general form that the rational expectation hypothesis will be critically examined in this thesis.

Following Tolar's (1993) review of the rational expectation hypothesis and expectations formation from a historical and philosophical perspective, this thesis attempts to add empirical substance to Tolar's conclusion that the concept of rational expectations portrays economic agents in an unrealistic manner devoid of human qualities. In contrast to Tolar's analysis that dealt with the rational expectations hypothesis in its strongest form, this dissertation recognises the aforementioned relaxation in the new classical school's position. Consequently we examine the concept of optimisation or constrained maximisation within the specific context of the non-durable consumption expenditure decision making process. In turn, this thesis recognises that cognitive constraints are only one of the many constraints faced by individuals in the expenditure decision making process and suggests that economic agents undertake satisficing behaviour within these constraints1. Thus we examine if the bounded rationality hypothesis and the related concept of satisficing provide a greater insight into how individuals determine the amount of total income that will be allocated towards expenditure upon non-durable goods and services2.

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1 Section 2.1 provides a brief discussion of these additional constraints.
2 In other words, the non-durable consumption expenditure decision making process.
Simon (1957) introduces the bounded rationality hypothesis, which is based upon the recognition that individuals face a number of internal constraints (in addition to the external constraints recognised by new classical economists) that prevent them from making optimal decisions. Simon argues that these cognitive constraints force agents to behave in a satisficing manner. That is, unlike optimisation, where individuals are said to choose the best available alternative given a number of constraints, individuals choose the first alternative found that meets or exceeds their pre-determined criteria. Simon proposes that the internal constraints in addition to those already faced externally by individuals, will allow economic agents to behave in a manner that is rational, in a bounded sense. The rationally bound individual will generate rules of thumb that permit the formation of decisions that are satisficing in nature.

In investigating the concepts of rational expectations, optimisation, satisficing and bounded rationality, this thesis employs a behavioural methodology. The employment of such a methodology is in keeping with recent calls for the construction of economic models that represent a truer reflection of the functioning of our economic systems and the people and institutions that operate within these systems. A majority of these calls have been made by individuals that have become disenchanted with the increasingly inaccurate forecasts produced by our current econometric models (see Ormerod 1994 and Toohey 1994). A brief discussion of these shortcomings follows.

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3 Simon introduces the bounded rationality hypothesis in 1957, however, he does not make this distinction between optimisation and bounded rationality until 1976.

4 It is important to note that once we recognise the cognitive constraints faced by individuals, then only satisficing behaviour is possible, as the attainment of maximum solutions requires a higher degree of information processing ability.

5 Simon (1987) defines behavioural economics as an approach to the manner in which economics is researched, rather than a school of economic thought (see section 2.2.3).
In an examination of economics, its foundations and present research techniques, Ormerod (1994) notes that our first economists were philosophers attempting to provide an understanding of how economics and the economy worked. This approach has been lost in the rush to develop mathematical models that will provide ‘accurate’ forecasts of our economic future. Of particular interest is Ormerod’s comparison of the research methodologies pursued by both social and physical scientists. Ormerod concludes that perhaps the true research methodology that should be followed by economists is one somewhere between that advocated by historians and physicists. One akin to palaeontology, astronomy and climatology, given that “...much of the work in these disciplines consists of careful collection and sifting of the data, building theories around the facts from the outset, rather than pursuing abstract theories on how a rational world ought to operate.” (Ormerod 1994 p210).

*The Economist* (1994) has made calls for economists to adopt methodologies that may provide a deeper understanding of how people make decisions. One article reports upon the behavioural experiments that have been undertaken by MIT economist Peter Diamond, who is examining the concept of money illusion. This concept has been removed from present econometric consideration with the embracement of the rational expectations hypothesis. Yet Diamond (1994) finds empirical support for the existence of the money illusion. In short, the journal advocates the employment of more subtle definitions of economic rationality, as they “…have the potential to improve both the usefulness and the credibility of economics” (The Economist 1994 p94).
The bounded rationality hypothesis is not foreign to new classical economics. Sargent (1993) attempts to present an understanding of the hypothesis that delves in ‘irrational thought’. Yet in attempting to extend to mainstream economists the appeal of Simon’s (1957) proposition, Sargent misinterprets the concept of bounded rationality. Sargent states that “As I have interpreted it, the bounded rationality program wants to make the agents in our models more like the econometricians who estimate and use them.” (Sargent 1993 p4). In a sense he is correct in that individuals are searching for a satisfactory econometric model (as opposed to the correct model). This interpretation is misguided however, in that Sargent assumes that economic agents face the same cognitive constraints as those faced by econometricians. Individuals are not aware of the existence of unit roots and the spurious regression results their existence can cause. On a more fundamental level, considerable knowledge differentials exist between econometricians and economic agents with respect to primary economic concepts. Sargent’s elucidation distorts Simon’s original hypothesis. This current study attempts to reinterpret the bounded rationality hypothesis as intended by Simon.

Finally it should be noted that the distinction between optimising and satisficing models of consumer behaviour can be made clearer by remembering that optimal or rational behaviour “...is a normative (prescriptive) theory rather than a positive (descriptive) theory. At least formally and explicitly it deals with the question of how each player should act in order to promote his own interests most effectively...and not with the question of how he (or persons like him) will actually act...” (Harsanyi 1977 p16). In contrast satisficing models attempt to describe how individuals actually behave in forming economic decisions.

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6 This misinterpretation is stated in at least two places in his book.
1.2 An Overview

This thesis sets out to examine two inter-related propositions. That consumers form decisions of a satisficing nature when expending upon non-durable goods and services and that this satisficing behaviour can be explained in terms of the cognitive limitations these consumers face.

In investigating these propositions our research design encompasses two distinct stages; one micro and one macro. The first stage is centred around determining whether the sample of consumers under investigation make decisions in accordance with the concept of optimisation, at a microeconomic level. Employing a one-way analysis of variance on primary data obtained from a telephone administered questionnaire, we are unable to provide any evidence in support of the optimisation process. The survey data is then analysed further in an attempt to determine if optimisation has been prevented as a consequence of cognitive constraints faced by the respondents. We conclude that the formation of sub-optimal decisions by our respondents appears to be a consequence of their limited cognitive capacities. Thus we provide empirical support for Simon’s bounded rationality hypothesis (see Simon 1957) and satisficing behaviour.

The macroeconomic stage of our research design entails an econometric comparison between Mankiw’s (1981) re-estimation of Hall’s (1978) rational expectation hypothesis and our behavioural consumption function, which we produce from a sample of consumers. Here we employ both a two stage least squares and an ordinary least squares
regression analysis of time series data for the period 1976(1) to 1994(2). This data set includes: non-durable consumption expenditure, the real rate of interest, disposable household income, a measure of Neo-Ricardian income (see Johnson 1983), credit availability and an index of consumer sentiment (see Acemoglu and Scott 1994). The results obtained reject the rational expectations permanent income hypothesis as stated by Mankiw, which in turn questions the hypothesis as it is usually applied. In contrast we find encouraging support for our behavioural consumption function.

This thesis concludes that the empirical evidence obtained at a micro level appears to lend support to the notion that consumers engage in decision making that is of a satisficing nature. On a theoretical level the concepts of satisficing and bounded rationality hold great appeal in that they recognise the cognitive limitations faced by individuals in economic decision making. We also note that the theoretical arguments and empirical results presented in this thesis reflect favourably upon the recently developed behavioural elements of the Post-Keynesian model of the consumption expenditure decision. Finally this thesis concludes that based upon this limited study, econometric models that employ behavioural methodologies in their development, may at best improve their forecasting ability and at least improve their theoretical appeal, as a consequence of the adoption of this research technique.

The remainder of this thesis is set out as follows: Chapter 2 provides a review of the rational expectations permanent income hypothesis, the bounded rationality hypothesis, satisficing and behavioural economics. Chapter 3 presents an outline of the methodology
and data employed in this thesis. We present the results of our empirical analysis in Chapters 4 and 5 and then draw together our conclusions in Chapter 6.
Chapter 2

A REVIEW OF RELATED RESEARCH

The purpose of this chapter is to provide a review of the theoretical and empirical literature pertaining to our two distinct models of economic behaviour. Time will be spent investigating the Rational Expectations Permanent Income Hypothesis (REPIH) and the Bounded Rationality Hypothesis (BRH). This review will concentrate upon these two alternate approaches within the context of the non-durable consumption expenditure decision making process.

2.1 The Rational Expectations Permanent Income Hypothesis

Friedman's (1957) Permanent Income Hypothesis (PIH) has been adopted by the new classical school as their model of optimising behaviour within the context of the non-durable consumption expenditure decision making\(^1\). The PIH follows Fisher's (1930) model of intertemporal optimisation\(^2\) and Modigliani's (1949) Life Cycle Hypothesis. Initially the PIH was developed by Friedman as a forward looking model of consumption expenditure within an adaptive expectations framework. Following Muth's (1961) development of the rational expectations hypothesis, Hall (1978)

\(^1\) It is imperative that we remember that the PIH only sets out to explain consumption expenditure by individuals on non-durable items as, "...expenditures on durable consumer goods can be regarded as capital expenditures." (Friedman 1957 p20) and hence be seen to be an addition to the individual's total household wealth.

\(^2\) Unlike Friedman and Hall, Fisher does not impose an assumed uniformity of expectations formation in his approach.
reinvestigates the PIH, replacing Friedman’s assumption of adaptively formed expectations with that of rationally formed expectations. This review rejoins the debate with Hall’s (1978) paper.

Friedman’s estimate of total consumption expenditure ($C$) can be represented as follows;

$$C_t = C^p_t + C'_t$$

(2.1).

Where $C^p$ denotes permanent consumption and $C'$ depicts transitory consumption. More specifically, permanent consumption can be shown as such;

$$C^p_t = k(1-g)Y_{t-1} + gC^p_{t-1} \quad \text{given that} \quad 0 < g < 1$$

(2.2).

Where; $k$ is a present value coefficient, $g$ is a fraction of last period’s error used in forming estimates of permanent income or consumption from actual income or consumption, while $Y$ represents measured income.

We now substitute equation 2.2 back into equation 2.1 to obtain;

$$C_t = k(1-g)Y_{t-1} + gC^p_{t-1} + C'_t$$

(2.3).

The inclusion of a lagged value of measured income represents Friedman’s employment of the adaptive rather than the rational expectations approach. To place equation 2.3
within the context of the rational expectations hypothesis, we remove the lag producing:

\[ C_t = k(1 - g)Y_t + gC_{t-1}^p + C_t^r \]  \hspace{1cm} (2.4).

The placement of the PIH into a rational expectations framework also removes the existence of systematic error formation by economic agents, hence \( g = 1 \). Therefore,

\[ C_t = C_{t-1}^p + C_t^r \]  \hspace{1cm} (2.5).

This in turn produces Hall's (1978) empirically testable equation,

\[ C_t = \alpha + \beta C_{t-1} + u_t \]  \hspace{1cm} (2.6).

where \( \alpha \) is the fixed coefficient, \( \beta \) is a regression coefficient and \( u = C_t^r \) which is equivalent to the random error coefficient.

Applying equation 2.6 to US quarterly data over the period 1948 to 1977 (in 1972 dollar terms) Hall attempts to demonstrate that actual consumption provides an unbiased estimate of future consumption. Thus expectations can be interpreted as rational in the Muthian sense, while transitory consumption can be considered stochastic in nature. Hall’s results reveal two important phenomena; first that the residuals obtained from the estimated equation and actual consumption data are stochastic (hence all known information is already represented in current consumption).
and thus economic agents can be said to be rational. Secondly, the lagged level of disposable income has essentially no predictive power beyond that of lagged consumption (see Hall 1978). This provides further support for the REPIH, as it can be argued that all the available information is already contained in the previous periods level of non-durable consumption. Hall concludes that the REPIH cannot be rejected, despite his admittance that the addition of extra lagged values of disposable income provide "...only weak evidence against the pure life cycle-permanent income hypothesis" (Hall 1978 p982).

Hall’s approach presents some difficulties in that his examination is a test of a joint hypothesis; that of the method in which consumers expend on non-durables and the manner in which they form their expectations about the future. The proposition that current consumption is an unbiased predictor of future consumption, thus consumption expenditure behaves as a random walk, appears to place more emphasis on the second of the joint hypotheses. Consequently, rejection of Hall’s methodology may not be a result of a rejection of the PIH, but rather the Rational Expectations Hypothesis (REH).

As a consequence of Hall’s unification of the PIH with the REH, a number of theoretical problems arise, most of which are inherited from the REH. For the purposes of this thesis we will only concentrate upon the two major criticisms that are most pertinent to our line of inquiry.

Our first concern with this approach to expectations formation stems from the notion that economic agents are assumed to have a complete understanding of the workings
of the economy. This assumption is then coupled with proposition that information is perfect, in the sense that everybody has equal access to the same informational set. It is then argued that within this perfect set of information and given the aforementioned assumptions about human behaviour, economic units are able to form rational expectations of future values of economic variables and expend upon non-durables accordingly. Some may view this as an unrealistic assumption about the capabilities of the average economic actor (see Shackle 1976, Kirzner 1992 and Toohey 1994).

This concern has been partially addressed by the new classical school’s adoption of what may be deemed as the weak form version of the REH. This interpretation takes into consideration the informational constraints faced by individual economic actors and suggests that within these constraints, economic actors will form their expectations optimally and hence rationally (see Fischer 1980). The problem this approach now faces no longer lies with the determination of how much information will be essential for actors to behave in a manner that is both optimal and rational, but rather in the assumption of individuals’ possessing a perfect understanding of the information they hold\(^3\). The new classical approach to decision making does not recognise the cognitive ability required by individuals to process this set of available information. Here lies our concern with the weak form REH. To obtain an understanding of this information set necessitates the incurrence of an opportunity cost (see Lilly 1994), which if too large, may prevent individuals from acquiring the level of understanding necessary to employ this information optimally when expending upon non-durables. Hence our

\(^3\) Such an approach also ignores the numerous other constraints placed upon an individual, which prevents them from operating in an optimising manner. See section 2.2 for a fuller discussion.
concentration upon establishing the level of awareness individuals have of economic information and their appreciation of this information (see section 4.2.).

The second major criticism of the assumption of rational economic actors in the Muthian sense, stems from the Post-Keynesian school's advocacy of an uncertain and unknowable future. Following Keynes (1921 and 1936), the Post-Keynesian school disputes Muth's (1961) REH (and consequent new classical adoption), on the grounds of fundamental or incalculable uncertainty⁴. As a consequence of living in a world with an uncertain and unknowable future, the provision of models capable of calculating predictions of future economic occurrences proves to be a difficult task (see Colander and Guthrie 1980).

Keynes (1921) raises doubts as to the ability of economic units to assign numerical probabilities to uncertain future events, hence placing them in a position that does not allow them to maximise their utility (see Rutherford 1984). It is from this explanation of uncertainty that the Post-Keynesian school approaches its critique of the REH. The problem for Keynes and Post-Keynesian economists is not that long term predictions have low probabilities, but that "...there is no scientific basis on which to form any calculable probability whatever. We simply do not know." (Keynes 1937 p214). It is from the uncertain nature of the future and the associated lack of available knowledge, that Post-Keynesians attack the REH, that is, "...if rational action requires true or

⁴ See section 2.2.1. for a fuller discussion of the impact fundamental uncertainty has upon decision making.
probable knowledge and true or probable knowledge eludes us, then so does rational action itself." (Rutherford 1984 p 384).5

Hall’s REPIH makes some very strong assumptions about the nature of human behaviour and the certainty of our economic environment. First, the REPIH assumes that economic actors have the cognitive capability and information to calculate their permanent income, thus being in a position to balance current and future consumption expenditure accordingly. Such an assumption ignores the intellectual, informational, time and opportunity cost constraints placed upon an individual, in their attempt to calculate their permanent income.

Secondly, the theoretical framework in which Hall develops his model of the REPIH, is based upon the assumption "...that consumers face a known, constant, real interest rate." (Hall 1978 p977). Such a proposition has two shortcomings. In the first instance, this supposition makes a strong cognitive assumption about the level of understanding possessed by economic agents in respect to not only economics, but more specifically interest rates and supposes that economic units are capable of making distinctions between economic variables in both nominal and real terms. Secondly real interest rates appear to be highly variable in the Australian experience over time (see Appendix A).

Finally, the adoption of rational expectations by Hall suggests that economic agents do not make systematic errors when forming non-durable expenditure decisions. The

5 Here rational refers to behaviour in a new classical sense as satisficing behaviour can still be deemed as rational action.
formation of systematic errors on behalf of individuals is an indication of one or two occurrences; that they are not learning from their mistakes, or they are ignoring some information (see Rogers and Neal 1994). If we can show that information is being ignored, then economic agents are employing satisficing behaviour and systematic errors are being made. Thus g does not equal one and we can reject Hall's REPIH as a model of non-durable consumption expenditure.

Sargent (1978) also attempts to place the PIH into a REH context, however, Sargent's treatment not only differs with Hall's in respect to its approach, but also in regards to the model presented and the data employed. Based upon Tobin's (1955) dynamic aggregative model, Sargent adopts a consumption function that treats income as an exogenous variable and applies it to data which covers the period from 1948(2) to 1972(4). Unlike Hall, Sargent's study includes data pertaining to the consumption of durables, non-durables and services. Contrary to Hall, Sargent concludes that the results presented are discouraging for the simple permanent income model of aggregate consumption (see Sargent 1978).

Following Hall and Sargent, Flavin (1981) produces a structural model of the REPIH designed to test whether the Marginal Propensity to Consume (MPC) out of current income is significantly different from zero (see Flavin 1981). Prior to the development of this model, Flavin reconciles Hall's model with that of Sargent's, by demonstrating that Sargent's model is based upon an incorrect definition of permanent income. Once

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6 Sargent defines permanent income as average discounted expected future income. When employed in producing a value of permanent consumption, consumption becomes a random walk with drift as opposed to a simple random walk (see Flavin 1981).
this problem is rectified, both models represent a reduced form of Flavin's structural model, the parameter restrictions are equivalent and the tests produce "...numerically identical results." (Flavin 1981 p976).

Flavin's structural model is developed by employing an autoregressive moving average of income, in an attempt to identify the extent of re-evaluations in permanent income as a consequence of observed changes in current income (see Flavin 1981). When applied to non-durable expenditure data, for the period 1949(3) to 1979(1), the empirical results indicate that current consumption is overly sensitive to current income. As a consequence the REPIH is rejected at the 0.05 level of significance, which when coupled with the result that the MPC out of current income is quite large, Flavin concludes that the "...failure of the permanent income hypothesis is quantitatively, as well as statistically significant." (Flavin 1981 p977).

Above we have criticised Hall’s REPIH on the basis that it assumes a known and constant real interest rate. Mankiw (1981) notes that despite the many examinations of the REPIH that have been employed and reject the hypothesis, economists continue to accept the model and expose it to empirical examination. Hence for the majority of economists, the cause of this rejection is not the REPIH itself, but the underlying assumption of known and constant real interest rates. Mankiw relaxes this assumption by examining the following model and employing a standard instrumental variables procedure\(^7\).

\(^7\) See Chapter 3 for a fuller discussion of this approach.
\[ G_{t+1} = a_0 + a_1 r_t + b X_t + u_{t+1} \] (2.7).

Where \( G \) is the growth rate of non-durable consumption expenditure\(^8\), \( a_0 \) is the fixed coefficient, \( a_1 = 1 / A \) where \( A \) is the Arrow-Pratt measure of relative risk. \( r \) is the real interest rate\(^9\), \( b \) is a regression coefficient, \( X \) is the variable used to encompass all additional independent variables employed in the model and \( u \) is the random error term.

For Mankiw’s model of the REPIH to hold, no other variable other than the real rate of interest should be a significant predictor of the growth in real non-durable consumption expenditure (or any \( X_t \) known at time \( t \) must not be significant)\(^10\). Employing real per capita data for the period 1948(1) to 1980(4), Mankiw rejects the REPIH at the 10% level (as lagged non-durable consumption expenditure data proves to be significant) and at the 1% level (as the growth rate of real disposable income proves to be significant). Thus, despite relaxing the questionable assumption of constant real interest rates, Mankiw queries the REPIH as it is usually applied.

Following Helliwell and Boxal’s (1978) and Anstie, Gray and Pagan’s (1981) applications of Hall’s Euler equation to Australian data, Johnson (1983) produces results that are in accordance with these earlier Australian studies for the period

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8 Which is produced using the following equation; \( (C_{t+1} / C_t) - 1 \).

9 The real interest rate is produced as follows; \( r_t = (1 - \theta)i_t - [ (P_{t+1} / P_t) - 1 ] \). Where \( \theta \) is the marginal tax rate, \( i \) is the nominal interest rate and \( P \) is a price deflator.

10 Consequently \( b = 0 \).
1964(4) to 1981(1). Unlike these earlier studies however, Johnson demonstrates that when lagged values of Neo-Ricardian income are used as regressors, they enhance the predictability of future non-durable consumption expenditure. This condition violates the REPIH, thus leading Johnson to conclude that the strong form REPIH can only be rejected given the inclusion of the aforementioned variables.

Like Hall, Johnson employs time series data that is in levels and is non-stationary. Dickey and Fuller (1981) and Nelson and Plosser (1982) warn that the employment of non-stationary data in ordinary least squares analysis will produce spurious results, hence invalidating any conclusions drawn from the analysis\footnote{The presence of non-stationary data may be removed via first or higher order differentiation.}. This would appear to explain some of the unusual t-statistics obtained by Johnson. Regression equation A1 (which represents consumption regressed upon a value of consumption lagged by one period) produces a t-statistic of 944.40, while equation A15 (which represents consumption regressed upon a lagged value of consumption and the change in the unemployment rate) produces a t-statistic for the lagged value of consumption of 993.62. We concede that these two values represent the upper extremes of the values obtained, however, for the fifteen regressions reported, the average t-statistic produced for the lagged value of consumption is 192.962. We avoid these econometric misspecifications in our examination of the REPIH by employing the growth rate of all variables under consideration (see Mankiw 1981).

Flavin (1981) demonstrates that current non-durable consumption is excessively sensitive to current income, hence leading to her rejection of the REPIH. Numerous
studies follow Flavin's model, with the majority rejecting the REPIH on similar grounds. Flavin (1985) examines why these rejections occur, by investigating the underlying assumption, that financial markets are perfect, in the sense that "...agents can lend or borrow against expected future income at the same interest rate." (Flavin 1985 p117-18). This approach is taken on the basis that the rejection of the REPIH may be attributed to the financial constraints placed upon economic actors, as opposed to a rejection of the hypothesis on the grounds of rationally formed expectations.

Employing a model that nests an extreme form of the Keynesian consumption function (in which consumption simply responds to current income) with that of a permanent income consumption function, on US annual data for the period 1929 to 1985, Flavin implicitly explores whether economic agents behave in a myopic manner (whether the MPC out of transitory income is non zero). This coupled with the introduction of the unemployment rate as a variable in the information set (the inclusion of which is designed to represent the liquidity constraints faced by individuals, particularly in terms of transitory income) produces two interesting results. The first being that the MPC out of transitory income is different from zero (see Flavin 1985). This can indicate that either agents are not rational or that the intertemporal model of consumption does not hold. Secondly, the inclusion of a liquidity constraint results in the expected excess sensitivity of consumption to the unemployment rate being negative (see Flavin 1985). Flavin concludes that if consumers behave in a myopic manner (hence placing the REPIH hypothesis in question), the influence of extraneous variables, such as liquidity constraints may provide an explanation.
Following Dickey and Fuller (1981) and Nelson and Plosser (1982), Mankiw and Shapiro (1985) also examine rejections of the REPIH as a consequence of excess sensitivity of current consumption expenditure to current income. Mankiw and Shapiro argue that examinations of the REPIH that fail to take into consideration the existence of unit roots or non-stationary data are biased in favour of finding the existence of excess sensitivity (see Flavin 1981 and Cuddington 1982). Mankiw and Shapiro remove the non-stationarity of their data set (1960-1985) by differencing it in the first instance. The results indicate that income is a random walk or non-stationary process. Consequently Mankiw and Shapiro conclude that ‘conventional tests’ of the REPIH aimed at examining excess sensitivity of current non-durable consumption expenditure to current income will provide results that are spurious, which incorrectly lead to rejection of the REPIH on the basis of excess sensitivity.

As discussed in Chapter 1, this thesis employs a behavioural methodology in an attempt to obtain a greater understanding of the non-durable consumption expenditure decision making process, than is currently available through the employment of conventional econometric analysis techniques. Although this approach is novel, we cannot lay claim to being its first exponents in the context of the REPIH. Following Flavin (1985), Fissel and Jappelli (1990) explore the degree to which liquidity constraints empirically hamper the REPIH. By manipulating both the Survey of Consumer Finances and the Michigan Panel Study of Income Dynamics for the period 1969 to 1982, Fissel and Jappelli determine estimates for the number of consumers that are liquidity constrained. The employment of panel data by Fissel and Jappelli is designed to test the REPIH on

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12 A panel study is "...a longitudinal study that involves collecting data from the same sample of individuals over time." (Zikmund 1994 p745).
an individual basis, thus identifying if the rejection of the REPIH stems from liquidity constraints or time series aggregation bias. Following the application of standard sensitivity tests, Fissel and Jappelli (1990) conclude that the fraction of total income which is controlled by constrained consumers should be treated as endogenous and thus cannot be treated as a constant overtime. Thus the failure to recognise the endogenous nature of income constrained consumers may bias examinations of the REPIH, causing researchers to reject it incorrectly on the grounds of excess sensitivity.

Following Fissel and Jappelli, Batchelor and Dua (1992) employ survey data in an attempt to improve the empirical testability of the REPIH. Batchelor and Dua note, that contrary to the REPIH, previous studies have identified past expectations of current income and past inflation rates appearing as significant predictors. In an attempt to examine the PIH theory independently of any assumptions about the REH, Batchelor and Dua investigate survey data designed to quantitatively measure expectations and uncertainty variables. Utilising the same time series data set as Blinder and Deaton (1985) and survey data covering the period 1969(1) to 1987(2), the results provide three interesting insights. First, survey expectations provide additional information pertaining to the explication of changes in consumption, other than provided by standard variables, thus providing encouragement for our employment of survey data. Secondly Hall's model is rejected as an explanation of short run movements in consumption. Finally long run consumption is consistent with the REPIH, in that “...planned consumption depends on current and expected interest rate” (Batchelor and Dua 1992 p605).
Pickering (1981) and Earl (1986b) suggest measures of consumer confidence should be employed as predictors of consumer expenditure. Following this suggestion, Acemoglu and Scott (1994) examine if indices of consumer confidence contain additional information (pertaining to non-durable consumption expenditure) to that already contained within lagged values of non-durable consumption expenditure. The existence of which violates the REPIH. Analysing the data set 1974 to 1994\(^{13}\), Acemoglu and Scott reveal that in contradiction with the REPIH, consumer confidence indices predict consumption growth rates, as opposed to the majority of studies that dismiss the REPIH on the basis of current income. Acemoglu and Scott also remove the assumptions of perfect capital markets (see Flavin 1985) and certainty equivalence in an attempt to explain whether shifts in the consumption function (as a consequence of fluctuations in the business cycle) can be accounted for in terms of animal spirits (see Blanchard 1993). Employing both \textit{ad hoc} parametric and non parametric formulations and an extension of Hansen and Singleton's (1983) consumption Capital Assets Pricing Model, Acemoglu and Scott demonstrate that with or without allowances for time aggregation the results indicate that "...consumer confidence signals both higher consumption growth and higher forecast variance." (Acemoglu and Scott 1994 p2)\(^{14}\). Thus Acemoglu and Scott are able to conclude that the UK data rejects the REPIH and this rejection can be explained in terms of the inclusion of non-certainty equivalence. We investigate this proposition in Chapter 5 when we include the Westpac index of Consumer Sentiment as an additional independent variable in our estimation of Mankiw's variable interest rate model of the REPIH. Our interest in this approach lies

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\(^{13}\) The survey of consumer expectations is commissioned by the EEC and undertaken by Gallup. The survey comprises of interviews with 2,000 adults over the age of 16 and is conducted on a quarterly basis.

\(^{14}\) The existence of higher forecast variance presents itself in the form of higher consumption growth resultant upon precautionary saving.
in the possibility that indices of consumer sentiment may act as a proxy of human behaviour.

In this section we have presented an overview of the development of the REPIH, from Hall’s original proposition to Acemoglu and Scott’s inclusion of a behavioural index as a predictive variable. Despite the different methodologies that have been employed in the examination of the REPIH, our two major criticisms remain. These being the failure of the new classical school to recognise the cognitive limitations of human behaviour and the uncertainty surrounding the occurrence of future economic events. This thesis addresses the first criticism and the methodology employed in doing so is presented in our next chapter.

2.2 The Bounded Rationality Hypothesis, Satisficing and Behavioural Economics

In recent times the new classical school’s interpretation of economics has come to dominate the way in which economists approach, teach and research the discipline. Despite its current wide appeal and acceptance, this school of thought is by no means the only interpretation. In fact many of the assumptions that underpin this school of thought’s explication (see section 2.1) are founded upon perceptions of human behaviour that do not truly represent the reality of the human creature or the environment in which they function. It is from these misgivings that we approach both this section and the remainder of this thesis.
The purpose of this section is two fold. First, to explore the concept of satisficing as it pertains to the Bounded Rationality Hypothesis (BRH) and to differentiate both concepts from the new classical model of constrained maximisation or optimisation. In doing so we will discuss three inter-related issues that both individually and in unison result in the formation of cognitive constraints which prevent optimal or 'rational' decision making. Secondly, we attempt to provide the reader with a greater understanding as to what is meant by the behavioural approach to economics.

It should also be noted that in comparison to the REPIH and the related concept of optimisation, the BRH, satisficing and behavioural economics have not been investigated to the same extent within the context of the non-durable consumption expenditure decision making process. Consequently the literature in this area is comparatively sparse.

2.2.1. The Limits Of Rationality\textsuperscript{15}

Simon (1972) presents three limits to rational behaviour; incomplete information about alternatives\textsuperscript{16}, uncertainty and complexity of calculation. These three limits to rational behaviour in turn act both in combination and in isolation to produce cognitive constraints upon the decision making abilities of economic actors. Maximisation of the search for additional alternatives (in an allocatively efficient manner) conforms with the new classical model of decision making. The notion that the existence of uncertain outcomes prevents the attainment of optimal solutions is consistent with Post-Keynesian thinking, while recognition of computational constraints is encompassed

\textsuperscript{15} This section heading is taken from Simon (1972).
\textsuperscript{16} It should be noted that incomplete information in itself represents a form of uncertainty.
within the related concepts of bounded rationality and satisficing. In this section time
will be spent discussing the first two of Simon's limits to rational behaviour, while in
the next section we will discuss the third of these limitations\textsuperscript{17}.

The new classical approach to decision making within the context of incomplete
information about available alternatives is best explained by examining the seminal
work of Stigler (1961)\textsuperscript{18}. This approach to human behaviour assumes that consumers
search for additional information or alternatives up until the point where the marginal
utility derived from the search process is greater than or equal to the marginal cost
incurred from searching\textsuperscript{19}.

Stigler (1961) presents a model where consumers undertake the search process to
discover the most favourable price available to them. In this scenario “If the dispersion
of price quotations of sellers is at all large (relative to the cost of the search), it will
pay, on average to canvass several sellers.” (Stigler 1961 p214) \textsuperscript{20}. As consumers
dedicate more time to the search process, then the probability of them obtaining the
lowest minimum price available for the desired product also increases. It must be
remembered however, that “Whatever the precise distribution of prices, it is certain
that increased search will yield diminishing returns as measured by the expected
reduction in the minimum asking price.” (Stigler 1961 p215).

\textsuperscript{17} Given that it is the intent of this thesis to determine if consumers employ satisficing decision
making as a consequence of internal information processing ability, we provide a more in-depth
discussion of satisficing and the BRH in the next section.
\textsuperscript{18} Other authors to pursue this line of inquiry include; Becker (1976), Hirshliefer (1980), Henderson
and Quandt (1980) and Campbell (1987).
\textsuperscript{19} Theories that concentrate upon the allocation of resources in order to discover additional
information or options can be generally classified as sequential sampling theory.
\textsuperscript{20} Given that the existence of price dispersion is a measure of market ignorance.
The problem confronted by any individual within this context is to calculate the expected savings that will result from an additional unit of search. This is approximated by multiplying the expected reduction in price (as a consequence of undertaking the search process) by the quantity of goods that will be purchased. As the dispersion of prices increases, so will the expected savings that result from searching (see Stigler 1961). This process will result in the formation of optimal decisions “If the cost of the search process is equated to its expected marginal return...” (Stigler 1961 p216).

Stigler’s model makes the underlying assumptions that consumers are not only capable of providing a solution to this maximisation problem, but that they also know the dispersion of prices. Another area of concern with this approach is that in discussing expected savings and expected prices, the concept of risk or uncertainty is ignored. Hence Stigler presents a model that is either static in nature or assumes the formation of expectations in a Muthian sense.

Stigler proceeds to explain that the efficiency associated with the proposed search function is extremely low as “…the cost of the search must be divided by the fraction of potential…sellers in the population which is being searched” (Stigler 1961 p216). In order to reduce this cost and improve the efficiency of the search process, Stigler suggests that consumers make the decision to reduce the number of alternatives searched by limiting their search to local sellers. This form of decision making

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21 This can be represented mathematically as follows: $q \left| \frac{\partial P_{\text{min}}}{\partial n} \right|$ where $q$ is the quantity purchased, $P_{\text{min}}$ the minimum price, $n$ the number of searches and $\partial$ is the partial derivative coefficient.
suggests that the opportunity costs are so high that it is impossible to evaluate all of the possible alternatives\textsuperscript{22}.

What Stigler does not explain under his proposal is how consumers can make a conscious decision to reduce the number of alternatives that are investigated while still forming optimal decisions. In deciding to reduce the number of alternatives investigated, individuals are establishing the rule of thumb\textsuperscript{23}, that purchases will only be made from local sellers, which in turn results in the formation of sub-optimal decisions and the exhibition of satisficing behaviour. Despite Stigler’s argument that optimal behaviour is being employed within the context of the local market place, within the wider context of the total population of potential sellers, the decisions that are being formed are sub-optimal in nature.

It is also important to note that in this model, consumers only embark upon new search strategies when wishing to purchase ‘unique’ goods, such as a house or a particular used book (see Stigler 1961). Yet as purchases become more repetitive in nature (the purchase of non-durable goods for example), then the volume of purchases that are based upon the initial search increases. This is interesting in that Stigler appears to be suggesting that consumers rely upon past behaviours for some of their decision making (see Veblen 1972), a behavioural pattern which is roughly akin to the Post-Keynesian concept of habit (see Keynes 1936, Hodgson 1988 and Drakopoulos 1992).

\textsuperscript{22} Stigler only explains opportunity cost in a time sense, however, opportunity costs also arise as a consequence of cognitive constraints (see Lilly 1994). Also see Nicolaides (1988) and Hodgson (1988) for a discussion on how time and cognitive constraints prevent the formation of optimal decisions.

Consequently, in the first instance an optimal decision may be made, but over time as new alternatives are introduced into the market place, which may go unexamined for reasons of habit, the initial decision becomes sub-optimal over the longer term.

Upon entering a market for the first time, Stigler argues that consumers “…will have no idea of the dispersion of prices and hence no idea of the rational amount of search he should make. In such cases the dispersion will presumably be estimated by some sort of sequential process…” (Stigler 1961 p219). This argument re-enforces our earlier comments, that if individuals are relying upon previous behaviours and experiences, they are behaving in a satisficing manner and are most likely forming sub-optimal decisions. Given that new consumers face a cognitive constraint resulting from lack of experience\(^{24}\), they must rely upon past experiences and knowledge in attempting to solve the current problem before them. In doing so they establish a rule of thumb based upon the principle, ‘what has worked for me in the past will continue to do so in the future’. This rule of thumb will continue to be employed until it can be shown that it results in the formation of ‘unsatisfactory’ decisions.

Stigler explains further that even in established market places “…there is a component of ignorance due to the changing identity of buyers and sellers.” (Stigler 1961 p220). Thus even in markets that consumers have had some experience searching and making decisions in, they will still face cognitive constraints that will prevent optimisation from occurring.

\(^{24}\) This in itself represents a form of uncertainty.
Finally Stigler discusses the uncertainty surrounding the quality that can be attributed to particular purchase or product. In order to overcome such uncertainties, consumers may rely upon reputations of quality in their decision to purchase a product. These reputations in turn command a premium. Relying upon premium products when making expenditure decisions reduces the marginal cost of the search process and increases the likelihood of making an optimal decision. Despite Stigler’s assertion that this line of thought is consistent with optimisation, it can be strongly argued that this approach is more consistent with satisficing behaviour and the establishment of rules of thumb. Although this method may produce an optimum outcome, other alternatives might exist in the market place that have not been investigated, which if purchased, may have the potential to deliver a greater level of utility\textsuperscript{25}.

It should be noted that the large cognitive burden placed upon individuals in Stigler’s model is increased once we recognise the existence of transaction costs (see Speight 1990). Within this environment, consumers not only have to form an optimal decision by purchasing a product where the marginal benefit derived from the item is equal to the marginal cost of obtaining that item, but this optimising problem must be solved in dollar terms. The cost side of the equation is relatively easy to assess. Opportunity costs can be measured in terms of forgone income and search or information costs can be measured in terms of phone calls made, newspapers bought or kilometres driven in evaluating all alternatives. This can all be added onto the purchase price of the product chosen. In addition to these costs, this model also requires the individual to place a

\textsuperscript{25} It is important to note that satisficing behaviour only requires that predetermined utility levels are achieved, while optimising behaviour requires that the highest level of utility obtainable from each decision will be obtained.
dollar value upon the marginal benefit or utility derived from the product purchased. This in turn assumes that consumers not only have the ability to measure the expected utility derived from the item purchased in a cardinal sense, but are also capable of converting the estimated utility derived from that purchase into dollar terms. Once we recognise the existence of transaction costs, we also need to consider the liquidity constraints confronted by the decision maker. Under these conditions, individuals are faced with the added cognitive burden of forming optimal decisions within the financial constraints that bind them. In short, economic agents are now confronted with the problem of not only having to equate the marginal benefit derived from a purchase to the marginal cost of the good, but they are also required to determine how many items can be purchased and more importantly how much money can be spent in obtaining the optimal alternative.

Another of the major shortcomings of the approach described by Stigler is that he appears to look at the decision making process in a static manner. Once we attempt to observe the non-durable consumption expenditure decision making process in a more dynamic fashion, we introduce the added complexity of unknown future outcomes or uncertainty. It is from this point of view that both Keynes and the Post-Keynesian school question an individual’s ability to form optimal decisions.

From the outset it is important to identify what is meant by the term uncertainty. Lavoie (1992) states that “There is uncertainty when the probability of an outcome is

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26 Attempts have been made to address this issue by a number of subsequent new classical authors (see Savage 1962, Radner 1968, Stoohs 1980), however, these papers employ the use of risk and certainty equivalence in an attempt to make the utility maximisation process more dynamic in nature.
unknown, when the value of an outcome is unknown, when the outcomes that can
possibly result from a choice are unknown, or when the spectrum of possible choices is
unknown." (Lavoie 1992 p44)27. More specifically, uncertainty can take one of three
forms; the uncertainty of probability, the uncertainty of value and fundamental
uncertainty28 (see Lavoie 1992). It is this last form of uncertainty which is viewed by
Keynes and Post-Keynesians as being critical in preventing individuals from
maximising utility.

Keynes does not explicitly set out to illustrate a microeconomic model of consumer
behaviour in any of his writings, however, Drakopoulos (1992) demonstrates that
Keynes’ writings are at odds with the new classical notion of utility maximisation.
Keynes makes the distinction between his work and that of new classical economics by
rejecting the concept of Benthamite hedonism29 and his writings on probability and
uncertainty present a world in which optimisation is unobtainable (see Drakopoulos

The manner in which uncertainty can influence the non-durable consumption
expenditure decision making process and prevent the attainment of optimal outcomes
can be clearly demonstrated by investigating four areas within the external30 decision

27 In contrast, risk or certainty equivalence is defined as knowing that "...each choice leads to a set of
possible specific outcomes, the value of which is known, each outcome being associated with a
specific probability." (Lavoie 1992 p43).
28 Fundamental uncertainty is "...where the individual is ignorant of the available courses of action
or of the extent of future states of the world" (Lavoie 1992 p44).
29 This line of thought follows from Bentham’s (1823) introduction of calculus in the modelling of
human behaviour, which in turn laid the foundations to the marginalist approach to economics (see
Jevons, Walras and Edgeworth) and later new classical economics.
30 Both Simon (1982) and Drakopoulos (1990) make the distinction between the internal and
external environment of an individual.
making environment of the individual, the presentation of alternatives, the nature of
commodities, the stability of incomes and prices and the non-parametric nature of
agents.

As was briefly discussed above, new classical economists assume that in attempting to
maximise their utility individuals will choose the best alternative available. Not only
does this approach assume that individuals are capable of evaluating all of the available
alternatives (see Lilly 1994), it also assumes that all of the available alternatives are
known. McNally (1980) argues that as a consequence of living in a world with an
uncertain future, there will be limitations placed upon the number of alternatives that
will be known at any point time\textsuperscript{31}. The existence of uncertainty places a constraint
upon the number of options an individual may choose from, which in turn places a
limitation upon the level of utility that may be derived from any one decision. We can
place this argument within the context of the non-durable consumption decision
making process, in that as a consumer is deciding to expend upon a product, there may
not only be additional products that enter the market that may perform the same
function better, but alternate locations from where the same product(s) may be
purchased at a lesser price may also arise. If these new alternatives remain unknown to
the consumer at the time of purchase, then what at first may have appeared to be an
optimal decision may in fact turn out to be a sub-optimal decision.

Drakopoulos (1990) questions the underlying new classical assumption that by nature
commodities are stable. The new classical approach argues that consumers choose

\textsuperscript{31} This constrains the cognitive ability of the individual.
amongst goods that have characteristics that are both known to the individual and will not change over time\textsuperscript{32}. In assuming that the nature of commodities is given, the new classical approach also assumes that expected utility is equal to actual utility. This assumption ignores the fact that there is some uncertainty surrounding the utility derived from the good purchased, both in the present and in the future (if the item is purchased again). When a consumer purchases a product they do so with an expectation as to how much utility will be derived from its consumption. Once the product is actually consumed, these expectations will either be met, exceeded or leave the consumer with a feeling of disappointment. There is no guarantee that what is perceived to be the alternative that will provide the greatest level of utility will actually fulfil this expectation.

Let us briefly examine a situation where a consumer has established (over some time) that Brand X is the consumer’s favourite brand. Upon the consumer’s next trip to the supermarket they notice on Brand X’s label the words ‘New and Improved’. The problem that now confronts the consumer is, do they still purchase the product? This product has served them well in the past, however, will these changes to the product be to the consumer’s liking? Will the consumer’s satisfaction increase, decrease or remain unchanged as a result of the re-formulation? These are questions that remain unanswered in assuming that commodities are stable in nature. This assumption also does not recognise the use of research and development by manufacturers in attempting to differentiate their product from the remainder of the market place. In

\textsuperscript{32} Earl (1986a) also challenges this notion suggesting that consumers act as scientists, buying products in order to expand their knowledge and understanding of the product they just purchased.
short, the changing nature of products over time (and the uncertainty surrounding these changes) can also result in less than the optimum level of utility being obtained.

Uncertainty also impacts upon future wage and price levels and what consumer’s expectations of these increases will be (see Drakopoulos 1990). This in turn impacts upon their expected real purchasing power. Under such circumstances individuals not only have to anticipate future price and wage increases in a relative sense, but they also need to be able to estimate which will occur first and hence how will this affect their real purchasing power? If their real purchasing power is expected to fall (rise) in the next period then their utility will be maximised by increasing (postponing) their spending in this (to the next) period. In either instance, the impact uncertainty has upon wages and prices places a large cognitive burden upon individuals, which in turn jeopardises the attainment of optimal outcomes.

Finally the new classical model of constrained maximisation also assumes that individuals are parametric agents. By definition “Parametric agents treat their environment and the behaviour of other agents as constant.” (Drakopoulos 1990 p188). Not only is the existence of uncertainty removed from the individual’s external environment by this assertion, but individuals are also assumed to behave in a like manner, that is known to all and free from impulsive actions. Elster (1979) argues that once this assumption is removed and individuals are aware that both themselves and other individuals behave in a non-parametric manner “...the very idea of constrained optimisation might be non existent...” (Drakopoulos 1990 p188). Therefore in recognising that individuals are non-parametric actors we are creating an environment
where Simon’s theories of bounded rationality and satisficing are much more relevant than complete rationality (see Drakopoulos 1990).

The underlying difficulty that arises from the introduction of uncertainty into the non-durable consumption expenditure decision making process is that constraints are now placed upon an individual’s ability to not only estimate all of the options open to them, but the consequences of choosing one option over another are also unknown. In short the introduction of fundamental uncertainty places an additional constraint upon an individual’s decision making ability; a cognitive constraint, which results in individuals developing rules of thumb that permit the formation of satisfactory decisions.

2.2.2. Bounded Rationality and Satisficing: An explication

In the previous section we discussed two limits to the formation of optimal decision making; incomplete information about alternatives and uncertainty. In this section we will discuss the third of these limitations to optimal behaviour, complexity of calculation. This will be undertaken by discussing the related concepts of the Bounded Rationality Hypothesis (BRH) and satisficing.

The BRH was first proposed by Simon (1957) via the introduction of his two axioms of bounded rationality. The first being; that the "...intended rationality of an actor requires him to construct a simplified model of the real situation in order to deal with it. He behaves rationally with respect to this model." (Simon 1957 p199). While the second axiom states that; "Human beings are limited in knowledge, foresight, skill and time." (Simon 1957 p199). We will discuss each axiom in turn.
The suggestion by Simon that economic agents simplify the model or decision at hand in order to deal with it rationally is not a concept unique to Simon's hypothesis. The process of optimisation involves the production of a simpler model than that denoted by the actual situation. This is achieved by making certain assumptions and imposing constraints to allow maximisation to occur. Nevertheless Simon believes that "The optimal decision [made] in the approximated world is not necessarily even a good decision in the real world." (Simon 1972 p167). By reducing the real world model in an over simplistic form and then solving it optimally, the resulting optimal solution (and related decision), may in fact only be satisfactory in nature once returned to the real world situation (see Simon 1987). In contrast, the action of satisficing prefers to simplify the process by interpreting real world situations and developing rules of thumb capable of coping with the complexities at hand\textsuperscript{33}.

Boland (1981) attempts to address this argument by suggesting that "True knowledge is not necessary for maximisation to occur" (Boland 1981 p1032). All that is required is for economic agents to develop a theory as to the correct shape of their utility curve, which permits them to 'pick' the 'best' option. What Boland appears not to recognise is that the consumer's own theory of utility will be determined by their knowledge and understanding of the (economic) environment and the nature of the decision that confronts them. Thus the cognitive limitations faced by the individual will be paramount in determining the level of abstraction of their theory of utility. As the individual's cognitive constraints increase, then so will the abstraction of the utility

\textsuperscript{33} Such as accepting the first satisfactory alternative that is found or purchasing the same product previously purchased.
theory developed. Then once the individual employs this theory within the context of real world decision making, they can only at best be forming satisfactory decisions.

The recognition of limitations to human computational ability in Simon’s second axiom allows us to draw an even clearer distinction between optimisation and bounded rationality. Here Simon suggests that when individuals are confronted with the need to make a decision (thus required to process information) and are faced with a number of constraints, these constraints can be described as being of two basic types; those that exist externally in the individual’s environment and those that exist within the individual. Leaving aside the external constraints that face the individual\textsuperscript{34}; once we recognise the existence of internal constraints on the information processing capacities of the actor, we are then concerned with “...theories of bounded rationality.” (Simon 1972 p162).

Employing these two axioms of bounded rationality and Figure 2.1 we can interpret the BRH diagrammatically. Here matrix A depicts the entire body of economic knowledge that exists at any particular point in time. This knowledge results from a combination of the total information available and the complete assemblage of theoretical economic understanding. Unless one spends a lifetime studying and has unlimited access to information and the capacity to absorb it in its entirety, matrix A is unobtainable. Thus all economic actors are in a position to possess only some portion of this economic knowledge matrix.

\textsuperscript{34} Such as uncertainty (see Section 2.2.1), liquidity, time and information constraints.
In order for individuals to process the information available in matrix A and employ it in the decision making process, they need to produce a simplified model. By imposing constraints such as, information availability, opportunity costs (see Lilly 1994), time constraints (see Simon 1957) and income or budget constraints (Gossen, Jevons, Menger and Walras) we produce matrix B. Within matrix B economic agents can then find the maximum solution to the problem at hand and thus exhibit optimising behaviour. By including the additional internal constraints of intellectual capacity and theoretical economic knowledge to those presented above (see Simon 1972), we produce matrix C. Matrix C now represents the BRH as we have recognised the existence of individuals’ cognitive limitations with relation to economic decision making. Unlike matrix B where individuals form optimal decisions within perceived constraints, Simon argues that these additional internal or cognitive constraints force agents to behave in a satisficing manner.

Figure 2.1. The Bounded Rationality Hypothesis.
The satisficing behaviour that will be exhibited within matrix C is a consequence of individuals setting a minimum expected aspiration level that must be met prior to the decision being made. This does not suggest that economic agents will always choose the least best alternative as long as it meets these predetermined aspiration levels. What it does imply is, that if a better option can be found prior to the alternative that meets the minimum requirements is found, then it will be chosen. The extra satisfaction derived from choosing this option by the agent is a bonus. What is important for the satisficing individual is that all minimum expected criteria are met. Any additional satisfaction obtained in addition to the pre-determined minimum criteria acts as a premium. Placing this discussion within the context of this thesis; each economic agent will expend upon non-durable consumption in a manner that will result in the attainment of utility between the expected minimum required level and the maximum obtainable level.

Lilly (1994) further demonstrates that satisficing and constrained maximisation are two very different concepts. Following Simon’s (1989) model of computational ability, Lilly develops and extends the conjunctive rule\(^{35}\) developed by Bettman, Johnson and Payne (1990) to illustrate that human decision making is akin to that of serial symbol processing.\(^{36}\) Lilly argues that a major oversight of the new classical approach is its ignorance of the opportunity cost associated with the evaluation of all possible alternatives in the constrained maximisation model. As humans are only capable of

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\(^{35}\) The application of the conjunctive rule to economics can be attributed to Simon (1955) and is "conducive to satisficing." (Lilly 1994 p206). The conjunctive rule or strategy suggests that individuals set minimum acceptable criteria that must be met when any activity or purchase is undertaken (see Crooks and Stien 1988). The conjunctive rule represents only one of a number of satisficing rules. For a survey of satisficing rules see Earl (1986).

\(^{36}\) This concept is based upon the premise that individuals can only process one set of information at a time. A proposition that is not recognised in the new classical approach.
processing one information set at a time, the opportunity cost associated with examining all possible alternatives (as denoted by new classical theory) is far greater than the opportunity cost associated with the search process attributed to Simon’s satisficing hypothesis. Applying this methodology to data obtained from Bettman, Johnson and Payne, Lilly’s empirical results indicate that as the complexity of the decision at hand increases, then so does the cost of new classical rationality.

Satisficing behaviour can always revert to optimising behaviour by taking into consideration the cost associated with the search for a satisfactory alternative. If the individual only searches up until the point where the perceived utility derived from the alternative chosen is equal to the opportunity cost associated with the search process, then they can be said to be behaving in an optimal or allocatively efficient manner (see Stigler 1961). Yet this process adds an additional burden on the individual’s informational and computational ability. A burden more complex than the initial problem, where the individual is required to estimate the expected marginal return received from the search and the opportunity cost associated with the search process.

What we have discussed thus far, may be best illustrated through the use of an example. Milton and Martin are two individuals who wish to purchase a new shirt. Both have the same amount of money to spend, both have limited time so they decide to shop at the local shopping complex and both have a preferred colour, blue. Milton is an optimising individual and thus operates within matrix B, while Martin makes satisficing decisions and operates within matrix C. On arrival at the shopping complex both individuals go their separate ways. Martin heads off to a store where he has bought his shirts in the past. Upon entering this store Martin discovers that they have
just sold their last blue shirt in his size. He then heads towards the local department store contained within the shopping complex. On the way he notices that a new tailor has just opened. He enters the premises, sees a shirt that he had expected to purchase at the previous store that is within his budget, so he decides to buy it.

In contrast, Milton finds the shopping complex’s directory and notes that there are five possible stores that can sell him the shirt he requires. Milton then proceeds to visit every store, evaluating all the blue shirts that are in his size. After evaluating all of the shirts within all of the stores, Milton purchases what he perceives to be the best blue shirt amongst all the alternatives that is equal to his allocated budget\textsuperscript{37}.

We can also employ Figure 2.1 to demonstrate that as economic actors become more 'knowledgeable' on specific aspects of economics, their matrices increase in size from the lower left hand side of matrix A (depicted by 0, representing zero knowledge and information) to the upper right hand side of matrix A (which represents total knowledge and information). When comparing the existing knowledge of two individuals, individual B (as depicted by matrix B) has a superior knowledge of the workings of the economy then individual D (as denoted by matrix D). As individuals obtain a greater theoretical understanding of the economy, the amount of information that becomes relevant also increases in size, hence reducing the internal constraints they face and increasing the size of their respective matrix. It is important to note, that despite this acquisition of additional knowledge and hence understanding of the

\textsuperscript{37} Note that the only manner by which an optimal or maximum decision can be made is if all the available alternatives are evaluated. In contrast the satisficing individual will choose the first alternative that meets his or her predetermined selection criteria.
economy, it does not imply that this newly acquired knowledge or understanding will be utilised in its entirety in all future economic decisions and in particular non-durable consumption expenditure decisions.

We have argued that some individuals will possess a greater knowledge of economics than others (hence matrices B and D) as is represented by larger shaded areas in Figure 2.1. In not recognising the internal constraint of cognitive ability, new classical economists argue that all individuals possess the same level of knowledge; that is, once individual B is aware of an opportunity to profit, or a piece of information that will aid in their decision making, then individual D will also become aware of this same opportunity, or piece of information. This in fact may not be the case, as we are dealing with a real world economy that is dynamic in nature and inhabited by individuals with different cognitive abilities. By the time individual D has learned of the information, individual B has earlier obtained, the opportunity may have past, or the information will become historical in nature and thus of less consequence and value in the decision making process of individual D. Hence the only manner in which individual D is to benefit from the knowledge of individual B is to study under his or her guidance and even then there will be some form of lag present, (assuming individual B continues to study the workings of the economy)\textsuperscript{38}.

Following Simon (1955 and 1976), Earl (1986a) suggests another manner in which economic agents may increase the size of their economic knowledge matrix. In contrast to new classical economists that suggest individuals expend on consumption

\textsuperscript{38} It is also possible to explain satisficing behaviour as a consequence of an overabundance of information (see Arestis 1992).
to maximise their utility, Earl argues that consumers expend on consumption in an attempt to extend their boundaries of economic knowledge. Earl borrows from psychology a branch of thought known as personal construct theory. Here individuals are treated as scientists that undertake activities in an attempt to have their beliefs either proven or disproven. Hence when individuals undertake the non-durable expenditure decision making process and choose amongst the alternatives available to them, they face a number of opportunity costs that prevent them from evaluating each alternative. They may be fortunate enough to make a decision early in the process that permits the attainment of the pre-determined minimum satisfactory level required to continue forming that expenditure decision. If this is not the case however, then the individual must undergo this form of experimentation until an alternative is found that meets the minimum specified level of satisfaction. Whatever the number of alternatives evaluated, economic actors will have achieved two accomplishments as a consequence of undertaking this process. First, they will have extended their economic knowledge matrix as they now know a little more about one small aspect of the economy. Secondly, they will have made a decision that meets their minimum satisfaction requirements and be in a position to continually meet these requirements.

Placing the BRH within the context of the REH debate, we find that the advocates of the REH (Muth, Sargent, Thomas, Lucas and Barro) suggest that all economic actors (consumers) posses knowledge akin to matrix A, that is, the entire body of economic knowledge at a particular point in time. Some may argue that this only represents the strong form of the REH, where as the weaker form suggests that “...each person’s behaviour can be described as the outcome of maximising an objective function subject to perceived constraints” (Sargent 1993 p6). As discussed in section 2.1, the
relaxation of the amount of information required by individuals in forming optimal decisions still does not overcome the problem the new classical approach faces in its failure to recognise cognitive ability as a constraint faced by individuals in expectations formation.

Another feature of the REH is Muth’s concept of *homo economicus*, which is represented by the random error term (u) and suggests that any deviations from the expected results and the actual results are serially uncorrelated and not a consequence of systematic forecasting errors (see section 2.1). Thus REH advocates suggest that exogenous shocks such as the OPEC oil price shocks of the 1970s can fully explain any errors ‘rational’ consumers make in their expectations formation. In contrast our examination of the BRH suggests that differences that occur from actual outcomes and expected outcomes may not only be explained in terms of information unavailability, but also in terms of the incomprehension of all available information.

In section 2.2.1 we discussed how the Post-Keynesian concept of fundamental uncertainty (and the related concept of incomplete information) led to the introduction of cognitive constraints which in turn prevent the formation of optimal decision making. In this section we have discussed how the existence of cognitive constraints prevent individuals from processing all of the available information and knowing all of the available alternatives. This in turn results in decision making in an uncertain environment where optimisation is not possible. Irrespective of which line of thought is pursued, the final outcome is the formation of sub-optimal decisions by consumers and the development of rules of thumb which permit satisficing behaviour. Although the difference between these two approaches appears to be minimal and akin to the
‘chicken and egg’ argument, it is a subtle difference worthy of further consideration and study at another time. Nevertheless, for the purposes of this thesis, we will concentrate upon the computational limitations faced by individuals when attempting to determine how much of their income to expend upon non-durables. Thus in referring to the cognitive constraints faced by our respondents, we are in fact referring to their ability to process economic information and apply it to the decision at hand.

Prior to presenting our concluding remarks, it is worth answering the question, why endeavour to determine if individuals form decisions that are consistent with satisficing and the BRH? As discussed above, the orthodox approach of assuming that individuals behave in an optimal manner ignores the cognitive constraints that arise as a consequence of computational inability and fundamental uncertainty. In addition Conlisk (1996) argues that the BRH is important to economics because of the vast amount of empirical evidence that suggests individuals make decisions in a rationally bound manner; that the addition of bounded rationality improves the ability of economic models to explain economic behaviour beyond standard approaches; bounded rationality is methodologically appealing and that models of bounded rationality adhere to the fundamental economic premise of scarcity\(^{39}\). To these advantages Argyrous and Sethi (1996) add that models of bounded rationality remove the underlying assumption in new classical economics of a world inhabited by individuals who make economic decisions in accordance with fixed rules. Models of bounded rationality make allowances for individuals, who for example, “...buy more than they know they can pay for.” (Argyrous and Sethi 1996 p479). It is from these

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\(^{39}\) In that cognitive ability is treated as a scarce resource.
perspectives that we approach the question, do individuals employ satisficing or optimising behaviour when expending upon non-durable goods?

Overall, we have attempted to demonstrate that satisficing can be represented as rational behaviour in the bounded sense, while optimisation represents rational behaviour in the new classical sense. Both decision making processes require agents to form rational decisions. The former however, requires the establishment of rules of thumb to permit rational decision making, while the latter requires the maximisation of an objective function subject to perceived constraints.

2.2.3. The Behaviouralist Methodology

Simon (1987) defines behavioural economics as an approach to the manner in which economics is researched rather than a school of economic thought. Behaviouralists do not view economics as an independent social science, but rather just one of a combination of many social sciences that can be drawn from to enable a better understanding of man's nature, actions and decisions. While the economy represents the immediate environment in which most humans function, new classical economists have generally failed to understand the nature of human beings, concentrating rather on the externalities they face, as opposed to the internalities. This represents the starting point of the behavioural approach. Behavioural economics looks at individuals, in an attempt to understand what influences the decisions and actions they undertake, using techniques that have been developed in other disciplines, such as psychology and sociology. As a result, within the behavioural approach one can identify a number of different foci and directions of inquiry, that employ a wide variety of research techniques.
At present it is possible to identify two related yet distinct lines of inquiry in behavioural economics. There are those economists who are concerned with questioning the assumptions of utility and profit maximisation, with a view to replacing these assumptions with alternate explanations of the motivating forces behind individuals operating within a market environment (see Baumol 1959). Secondly, there are those economists who are interested in determining how individuals make decisions under conditions of uncertainty (see Simon 1987). These economists are attempting to determine whether economic agents behave and make decisions in an optimal manner, as in accordance with the new classical theory of constrained maximisation. Within this latter research agenda, the interest lays less in the motivational forces behind human decision making, as opposed to ascertaining whether economic actors have the ability to carry out the calculations required to make optimal decisions under uncertain conditions.

Within the wide variety of studies undertaken in behavioural research, many varied research techniques have been employed in an attempt to gain a fuller understanding of human nature. These techniques include the utilisation of, case studies (see Clarkson 1962, Cyert and March 1963, Soelberg 1966, Bouwman 1982 and Courvisanos 1994), surveys (see Dunkelberg 1969 and Katona 1975), computer modelling (see Bonini 1963, Eliasson 1984, Winter 1984 and Arthur 1991, 1994) and economic experimentation (see Selten 1987 and Uhlich 1990). In particular, the implementation of surveys as a research technique in economic modelling has proven to be both appropriate and useful. Unlike the case study approach which suffers from a lack of generalisability and computer modelling which has aggregation problems, no such difficulties exist in relating the data obtained from surveys to macroeconomic models
of the economy, or general economic principles. Simon suggests that the major limiting factor in the employment of surveys in economic research appears to be; "...the small number of economists who are trained to produce and interpret survey data and the limited resources that have been applied to generating such data." (Simon 1987 p225)40.

Pickering (1981) proposes a behavioural model of the demand for consumer durables based upon data obtained from a UK survey of behavioural information. This model, unlike traditional approaches that represent expenditure on consumer durables as a function of current or permanent income, relative prices, credit conditions, and financial market adjustments (for example), is developed upon the premise that the "...demand for consumer durables [is] a function, not only of the ability to buy an item but also of the willingness of consumers to do so." (Pickering 1981 p63). Hence this model encompasses such variables as; consumer expectations and consumer confidence, relating not only to the economy but also to the durable good in question. Earl (1986b) also takes up this argument, explaining that the level of a consumer's confidence represents a personal construct that can be depicted in the form of a budget constraint. From this we can deduce that as the time frame of a durable purchase is increased (in terms of repayments), then the level of a consumer's confidence will be reduced as a result of a greater exposure to the level of uncertainty surrounding future repayments and a greater reliance upon one's expectations formation. Thus consumers will be more reluctant to make purchases of this nature, or in doing so, shall exhibit greater caution than represented in purchases that are of a shorter time frame, or are

40 See Chapter 6 for a discussion of some of the problems faced in employing survey data in this thesis.
more non-durable in nature. Hence one would expect the inclusion of indices of consumer sentiment in econometric models of non-durable consumption expenditure, to not greatly improve the model’s explanatory power in comparison to models of durable consumption expenditure. An argument that contradicts the findings of Acemoglu and Scott\textsuperscript{41}.

As evident from the review in this section, we note that the BRH and satisficing suffer both as a consequence of an absence of general empirical examination and more specifically a lack of application to the non-durable consumption expenditure decision making process. This deficiency inhibits the promotion of the BRH and satisficing as alternate models of economic decision making and expectations formations. This thesis attempts to rectify this situation and the methodology employed in doing so is presented in the next chapter.

\textsuperscript{41} See pages 21 and 22 for a discussion of the results obtained by Acemoglu and Scott.
Chapter 3

EMPIRICAL ANALYSIS: Testing Methodology and Data

In this chapter we will present the methodology that will be employed in our empirical investigation of the optimising and satisficing approaches to human economic behaviour, within the context of the non-durable expenditure decision. It is also the intent of this chapter to outline details of the data sets that will be employed in this investigation.

Prior to discussing our intended methodology, it is imperative that we clarify what we mean by the term non-durable. By definition, a good is non-durable “…if its life is less than one year.” (Jackson, McIver & McConnell 1994 p111). In practice however, the distinction between a durable and non-durable good is not so apparent. In particular clothing and footwear present a problem in that clothing is durable enough to be worn for more than one season\(^1\) and hence more than one year. If consumers allow fashion to dictate, then clothing and footwear can be rendered obsolete prior to the arrival of the next season, thus depicting them as non-durable in nature. The reality of the situation may lie somewhere between the two extremes.

This dilemma lays at the heart of a study undertaken by Dow (1993) which is developed following Jaeger’s (1992) conclusion that rejection of the REPIH may be attributed to the durable nature of some goods traditionally classified as non-durable.

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\(^1\) That is for more than one summer or winter.
Dow's results indicate that clothing represents the most durable of the goods traditionally classified as non-durable and hence may be one of the goods responsible for rejection of the REPIH. Nonetheless Gan and Soon (1994) suggest (following Bernanke 1985) that the exclusion of goods that are durable in nature from examinations of the REPIH may bias the results in favour of rejecting the hypothesis. This thesis takes the approach of classifying consumption expenditure on clothing and footwear as a non-durable purchase.

3.1 Testing Methodology

The methodology employed within this thesis contains two distinct sections. The first analyses primary data in an attempt to determine if individuals employ optimising or satisficing behaviour on a microeconomic basis. While the second utilises time series data in the estimation of two alternate macroeconomic models of non-durable consumption expenditure.

3.3.1. Determining whether Consumers Optimise - The micro perspective

Our initial objective is to determine whether consumers make non-durable expenditure decisions in an optimising manner. In order to undertake this analysis we present a number of respondents with a telephone administered questionnaire (see section 3.2.1). If we are unable to provide any evidence that optimal decisions are being made by the respondents, we then extend our investigation in an attempt to determine if sub-optimal decisions are a consequence of cognitive limitations. If this is so, then our
results lend support to the notion that individual’s behave in a satisficing manner that is in consistent with the BRH.

To achieve this task we employ the use of a one-way Analysis Of Variance (ANOVA). Briefly, the ANOVA technique is employed to determine if the means of two or more groups of data are significantly different from each other. The utilisation of ANOVA is appropriate on data that is obtained using a random sampling technique and has an interval or ratio scaled dependent variable. When the data is analysed it is placed into a grid which highlights the number of treatments each group of data is exposed to. The ANOVA technique is then employed to determine if the means of these groups differ as a consequence of their exposure to the different treatments. This allows the researcher to conclude whether the treatments have a significant effect on the different groups of data.

In Chapter 2 we stated that optimisation involves the maximisation of an objective function within known or perceived constraints, while satisficing behaviour involves the development of simple decision rules (as a consequence of cognitive limitations) that permit satisfactory decisions to be made. Following Kreps (1990) and Sargent (1993) we relax these definitions and treat computational ability as just an additional constraint faced by the optimising individual in their attempt to obtain maximum outcomes\(^2\). Therefore the amount of information processed by the optimising

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\(^2\) In introducing cognitive ability as an additional constraint faced by individuals when attempting to form optimal decisions, we are endeavoring to ascertain if the amount of economic information employed by our respondents is a function of their cognitive ability. If this is found to be the case then our respondents form optimal decisions within the constraints that bind them (including cognitive constraints). If our results indicate that sub-optimal behaviour is being employed then we will need to analyse the responses obtained in order to determine the form of decision making techniques the respondents are employing.
consumer in the decision making process becomes a function of their cognitive ability.

Given this relaxation we employ a one-way ANOVA to determine if the respondents behaviour is akin to constrained maximisation (optimising). To achieve this we examine if the difference in the number of variables considered by respondents in the non-durable consumption expenditure decision making process is a function of the different degrees of information they are aware of or of their appreciation of that information\(^3\).

In order to accomplish this task we assign each respondent to one of three groups, based upon the number of variables they have chosen as important considerations in the non-durable expenditure decision. These three groups are then titled Low, Moderate and High with respect to the aforementioned relaxed definition of optimising behaviour. That is, those respondents who chose the most number of variables should have a larger degree of knowledge (High) relative to those respondents who chose a lesser number of variables (Moderate) and to those respondents that chose the least number of variables (Low)\(^4\). Referring back to Figure 2.1 these three groups can also be seen as matrices B, C and D respectively. The four treatments these three groups are exposed to are the Consumer Price Index (CPI), the unemployment rate, Gross Domestic Product (GDP) and the level of interest rates. This data is applied twice to the one-way ANOVA, first to the four treatments as they pertain to information

\(^3\) That is, the respondents form sub-optimal decisions.

\(^4\) The constrained maximisation approach would suggest that those economic units that have chosen more economic variables must possess a greater level of economic knowledge. Hence we have assigned titles to these groups in accordance with this assumption.
awareness and secondly to the four treatments as they relate to an appreciation of that information.

Consequently we test the following null hypothesis: The mean number of respondents in each group is not significantly different with respect to their knowledge or appreciation of the four economic variables presented to them. This can be written mathematically as follows:

$$H_0: \overline{X}_B = \overline{X}_C = \overline{X}_D$$  \hspace{1cm} (3.1)

Where $\overline{X}_B$ is the mean of the high knowledge group (matrix B), $\overline{X}_C$ is the mean of the moderate knowledge group (matrix C) and $\overline{X}_D$ is the mean of the low knowledge group (matrix D).

An inability to reject the null hypothesis indicates that the number of variables chosen by respondents as important considerations in expending upon non-durables, is not a function of the level of awareness or appreciation of the economic information possessed by the respondents. This in turn suggests that the respondents do not adhere to the concept of optimisation\(^5\). Alternatively, rejection of the null hypothesis indicates that the number of variables chosen by respondents is a function of the level of awareness and appreciation of the economic information possessed by the

\(^5\) This does not imply that all respondents must possess the same amount of economic information and appreciation of this information. As all respondents are contemplating the same decision (whether to and how much to expend on non durables), then they should approximately use the same set of information.
respondents. This implies that the respondents adhere to the concept of optimisation or constrained maximisation, as each individual will have been evaluating as much economic information as their cognitive capabilities would permit them in forming non-durable expenditure decisions.

In determining if a respondent was aware of the above four variables, all that was required from them when answering the survey, was the provision of a positive response when asked, ‘had they heard of ...’ the variables in question. In employing this approach, a slight response bias exists in that respondents may answer in the affirmative despite not having heard of the variable in question previously, for fear of appearing to be uninformed. When attempting to measure the respondent’s awareness of these same four variables, awareness was said to exist when the respondent provided an even remotely correct explanation as to the variables’ meaning or determination. If anything, we have erred on the side of caution in our acceptance of what was deemed to be a correct response (see below for a further discussion).

It is also important to note that when the four variables were presented as potential considerations in Question 2 of the survey (see Appendix B) they have been worded in a more general form to promote ease of understanding, than when presented in Section 3 of the questionnaire (see Appendix B). This was also done as we were concerned that if the variables were discussed in Question 2 and then respondents were asked if they were aware of these same variables in Section 3, then we would bias our results in favour of all respondents saying that they were aware of the four variables. Despite

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6 See Chapter 6 for a fuller discussion.
7 See Chapter 6 for a fuller discussion.
the superficial difference in the form in which the variables are presented in Sections 1 and 3 of the questionnaire, for all intents and purposes they remain the same four variables under investigation in both instances.

Keynes (1923) explains that expected changes in prices will affect the timing of purchasing decisions. Following this it can be said in a more general sense, that expected changes in all relevant economic information at time \( t + 1 \) will impact upon the decision to expend on goods and services at time \( t \). This raises a very important question, if expected economic outcomes influence current decision making and if understanding of how these outcomes occur is limited, then what impact does the possession of limited knowledge have upon the formation of optimal expenditure decisions at time \( t \) ?

In an attempt to answer this question, we have concentrated our analysis around four economic variables that should affect the non-durable consumption expenditure decision making process via their impact upon real disposable household income. As stated above these variables are; GDP, the level of interest rates, the unemployment rate and the CPI. It is our belief that the cognitively unconstrained, economically literate individual should have little difficulty in determining the relationships that exist between these four macro variables and their own set of micro data.

Changes in GDP should act as a predicator of future changes in nominal income and changing interest rates impact upon disposable household income (given most Australians have mortgages), both of which in turn influence the level of consumer expenditure. The unemployment rate should act as a measure of the certainty of
maintaining current employment and hence current income and consumption expenditure\textsuperscript{8}. While the rate of inflation will impact upon individuals’ real income, the price of non-durables and hence their real purchasing power\textsuperscript{9}. Thus in varying degrees, all four variables we have chosen to concentrate our analysis upon should affect non-durable consumption expenditure.

If after employing the one-way ANOVA we can not reject the null hypothesis, then we are also unable to provide any evidence to support the notion that the respondents make optimal non-durable consumption expenditure decisions. In the event of such an outcome we will then further examine the responses obtained using descriptive statistical techniques\textsuperscript{10}, in an attempt to provide some explanation as to why our respondents exhibited sub-optimal behaviour in forming their non-durable expenditure decisions.

3.1.2. Estimation of Alternate Consumption Functions - The macro perspective

The second objective of this thesis (as we outlined in Chapter 1) is to produce a consumption function that is behavioural in nature. We utilise the variables chosen as important considerations by the respondents in the non-durable expenditure decision\textsuperscript{11} to produce a behavioural consumption function that will be employed as an alternative

\textsuperscript{8} It is important to note that some individuals may be insulated from the increased chance of employment loss associated with economic downturns, thus the unemployment rate may not be used as a measure of current and future income certainty. The unemployment rate however, may be used as an indicator as to when it may be a good time to change employment by these individuals, which then should act as a predictor of changes in income and hence consumption.

\textsuperscript{9} One would also expect that this would effect the timing of when purchases are made, as optimising economic agents would want to maximise their real purchasing power. Note that this is more likely to come into play for those non-durable items that exhibit durable characteristics.

\textsuperscript{10} Descriptive statistics include the calculation of the mean, mode, median and standard deviation.

\textsuperscript{11} These variables are obtained from section one of the questionnaire (section 1 in Appendix B) as outlined in section 3.2.1. of this chapter.
to the REPIH. Even if consumers do not adhere to the concepts of satisficing or bounded rationality, the consumption function we produce remains behavioural in nature (thus consistent with our intended methodology) and may still provide a more satisfactory explanation of non-durable consumption expenditure than the REPIH, as it is designed to capture the behaviour employed by individuals in the decision making process, as opposed to assuming how expenditure decisions are made. This alternate behavioural consumption function is estimated using an ordinary least squares regression analysis and will be presented in Chapter 5.

We compare our behavioural consumption function (BCF) with Mankiw’s (1981) re-estimation of the REPIH\textsuperscript{12}. In Chapter 2 we recognised that one of the limitations of Hall’s model is his underlying assumption of known, constant real interest rates. Mankiw removes this underlying assumption by making allowances for uncertain real rates of return. Employing equation 2.7\textsuperscript{13}, Mankiw rejects the REPIH as he finds that the lagged growth rate of non-durable consumption expenditure and the lagged growth rate of disposable income are significant predictors of the growth rate in non-durable consumption expenditure. This occurrence violates the hypothesis that only the ex post real interest rate should be a significant predictor of the growth rate of non-durable consumption expenditure\textsuperscript{14}. We reproduce this study on Australian data\textsuperscript{15}.

In producing equation 2.7 Mankiw assumes that consumers maximise the expected

\textsuperscript{12} In order to provide a stricter comparison between the BCF and the REPIH we estimate the BCF within the REPIH framework developed by Hall (1978), (see Chapter 5).
\textsuperscript{13} See Chapter 2.
\textsuperscript{14} Therefore b \neq 0.
\textsuperscript{15} We test Mankiw’s model in the following form; \( G_t = \alpha_0 + \alpha_1 r_{t-1} + b X_{t-1} + u_t \).
value of an additively separable utility function at time $t$,

$$
\sum_{s=0}^{\infty} (1+\gamma)^{-s} U(C_{t+s})
$$

(3.2).

Where $\gamma$ is the rate of subjective time preference, $U(\cdot)$ is the one period utility function, $C_{t+s}$ is the level of non-durable consumption expenditure in period $t+s$ and $s$ denotes subsequent periods of time.

Mankiw maintains the assumption that capital markets are perfect\(^{16}\), thus producing the following condition that must be met if optimal intertemporal non-durable consumption expenditure is to occur\(^{17}\),

$$
E \left[ \frac{(1+r_t)U'(C_{t+1})}{(1+\gamma)U'(C_t)} | I_t \right] = 1
$$

(3.3).

Where $E$ denotes the expected utility value, $r_t$ is the real interest rate and $I_t$ is the set of information known at time $t$. In estimating equation 2.7 and testing the null hypothesis that $b = 0$, Mankiw is examining if equation 3.3 holds.

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\(^{16}\) This assumption contradicts the findings of Flavin (1985), however, as a consequence of the results produced by Shea (1995) and the recent deregulation of Australia’s financial markets, we maintain this underlying assumption.

\(^{17}\) Equation 3.3 is comparable to Hall’s expected value of optimal non-durable consumption expenditure; $u'(C_{t+1}) = \left( \frac{1+f}{1+r} \right) u'(C_t)$, where $f$ is a given discount rate.
In order to estimate equation 2.7 Mankiw employs a standard Instrumental Variables (IV) procedure. The IV procedure is utilised if it is believed that some of the independent variables are correlated with the models error term (or disturbance). This is particularly the case when lagged or endogenous variables are employed as predictors. The process involves employing a Two Stage Least Squares (TSLS) regression analysis, where variables that are uncorrelated with the disturbance (instruments) are estimated upon the lagged or endogenous variables (first stage). The second stage of the process involves estimating the model in its original form, with the first stage estimations used to replace the original lagged or endogenous variables. The coefficients produced using this technique are the standard TSLS estimates (see Berndt 1991).

In our application of Mankiw’s methodology to Australian data, we employ all of our independent variables in a lagged form, hence there is some concern that these variables may be correlated with $u_t$. Therefore we utilise the IV procedure in our estimation of Mankiw’s model (see equation 2.7), where $Z_{t-1}$ is employed as the set of instruments known at time $t - 1$ and uncorrelated with $u_t$.

By re-examining Mankiw’s model we are testing the null hypothesis that: No variable in addition to the lagged real interest rate will be a significant predictor of the growth in non-durable consumption expenditure ($b = 0$)\textsuperscript{18}. While our alternate hypothesis is that: Variables other than the lagged real interest rate will be significant predictors of the growth in non-durable consumption expenditure ($b \neq 0$). Rejection of the null

\textsuperscript{18} Note that $X$ encompasses any independent variables in addition to the lagged real interest rate.
hypothesis is a rejection of equation 2.7 and casts doubt upon the validity of equation 3.3 and consequently the REPIH.

In addition to Mankiw's employment of the lagged value of the growth in disposable household income, the lagged value of the growth in non-durable consumption expenditure and a lagged measure of real interest rates, we employ the following additional independent variables (in growth form); Neo-Ricardian income (Nry) (see Johnson 1983), an index of Consumer Sentiment (Cs) (see Acemoglu and Scott) and a measure of available credit (Cr).

Our inclusion of the index of consumer sentiment holds particular theoretical appeal as the index is constructed using survey data, which is consistent with the behavioural approach to economics. By employing survey data, indices of consumer sentiment have the capacity to clarify consumer intentions through their simplicity of construction and thus have the ability to provide economic researchers with additional information not available through traditional macroeconomic variables. It should also be noted that consumer expectations data has a shorter publication lag than non-durable consumption and income data, hence it may serve as a good proxy for current unobserved data (see Acemoglu & Scott 1994).

All of the equations produced from implementing the REPIH and the BCF in our examination of Australian non-durable consumption expenditure, will be exposed to tests for heteroscedasticity, structural stability and autocorrelation. We employ the Auto-Regressive Conditional Heteroscedasticity (ARCH) test (see Engle 1982), the
Chow (1960) test of structural stability\textsuperscript{19} and the Ljung-Box (1978) test for autocorrelation.

In an attempt to detect the presence or absence of autocorrelation the Ljung-Box (LB) test is employed\textsuperscript{20}. We employ the LB test, as standard tests for detecting serial correlation (such as the Durbin-Watson test) have a built-in bias when applied to autoregressive models\textsuperscript{21}. The LB statistic produced by the Ljung-Box test follows a chi-square distribution. The critical value is produced by combining the number of lags that autocorrelation will be examined for over the series\textsuperscript{22} with the corresponding level of significance.

We also employ the ARCH test for heteroscedasticity in addition to plotting the residuals obtained from all of the equations estimated (see Appendix F). Following this simplistic approach of analysing the residual plots the ARCH test is employed in an attempt to provide a more robust analysis\textsuperscript{23}. The ARCH test involves the regression of subsequent squared lagged residuals upon the square of the residuals at time $t - l$. This approach tests the null hypothesis; That the coefficient of the lagged squared residuals are all zero. Thus the residuals are homoscedastic in nature. This test produces a F-statistic with a Chi-square distribution where the degrees of freedom are equal to the

\textsuperscript{19} For a full discussion of these tests see Gujarati (1995).

\textsuperscript{20} The LB statistic is produced using the following formula; $Q_{LB} = n(n+2)\sum_{j=1}^{p} \frac{r_j^2}{n-j}$

\textsuperscript{21} That is models containing lagged dependant variables as explanatory variables.

\textsuperscript{22} We utilised four lagged periods. Given the nature of the investigation, it is highly unlikely that any of the variables investigated would influence the value of the dependent variable beyond a period of a year.

\textsuperscript{23} The results of this analysis are denoted by ‘ARCH’ when reported in tabular form.
number of lagged, squared residuals\(^{24}\). We employ this approach as it is applicable in both ordinary least squares and two-stage least squares regression analysis.

The final diagnostic test we subject our two models of non-durable consumption expenditure to is the Chow Test\(^{25}\). This test produces an F-statistic that follows a normal F distribution and is based upon the underlying assumptions that the residuals are normally distributed and homoscedastic in nature. The test requires the total sample over which the model is estimated be divided into two periods\(^{26}\). The model is then re-estimated for the first data period, which then produces a forecast for the second data period. This forecast is compared to the actual values of the second data period. If the variance between the forecasted values and the actual values is significantly different, then the null hypothesis that the structure of the model is stable is rejected.

### 3.2 Data

Our investigation involves the collection and analysis of both primary and secondary data. In this section we provide a discussion of both sources of data.

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\(^{24}\) Once again we employ the use of four lagged periods.

\(^{25}\) The F-statistic is produced using the following formula: \( F = \frac{(e^t - e^*_t)}{n_2} / \frac{e^t - e^*_t}{n_1 - k} \)

\(^{26}\) Specific rules do not exist in determining how the data sample is to be split. We have divided our observations into two periods; pre and post October 1987 - representing the stock market crash.
3.2.1. Primary Data

Our primary data is obtained from the administration of a telephone questionnaire\textsuperscript{27}. This questionnaire has been developed to achieve three objectives. First to determine how much knowledge and information the consumers questioned possessed, secondly to ascertain how much of this knowledge is utilised in the decision to expend on non-durable goods and services and finally to establish what are the principal sources of information for consumers\textsuperscript{28}. The questionnaire comprised of three sections; section 1 asked respondents what pieces of information influence their decision to expend on non-durables, section 2 ascertained the sources of this information, while section 3 examined the respondents’ awareness and appreciation of four major economic variables.

In producing our behavioural consumption function (see section 3.1.2) we need to determine which variables are important in the respondents’ non-durable expenditure decision. To achieve this, respondents were presented with twelve alternatives that had been derived from the general economic literature as variables that should influence the level of non-durable consumption expenditure\textsuperscript{29} (section 1 of the questionnaire). Respondents were then asked if any of these variables influenced their non-durable expenditure decisions. Provisions were also made for other influences to be nominated by the respondents that we did not present.

\textsuperscript{27} See Appendix B for a copy of the survey and Appendix C for the results obtained from each question.

\textsuperscript{28} These three objectives were not pursued in this order in our survey, as questions designed to seek information about a respondent’s knowledge of a particular economic variable may bias the response given when questioned about what information is utilised in your expenditure decision.

\textsuperscript{29} These were primarily related to income, credit conditions, economic activity and human behaviour.
To ascertain if the respondents made optimal non-durable expenditure decisions, we needed to obtain an insight into their cognitive abilities in an economic context. Section three of the questionnaire was designed to achieve this task. Here respondents were asked if they were aware of four particular economic variables and then asked to explain their meaning or how they are calculated. These four variables were chosen on the basis that they represent different degrees of complexity, receive varying degrees of media coverage and the general economic literature suggests they should influence the level of non-durable consumption expenditure (via their impact upon disposable household income). These variables were; the CPI, the rate of unemployment, GDP and the level of interest rates\textsuperscript{30}.

Prior to its implementation, the questionnaire was pilot-tested on a sample one tenth of our final sample size. The pilot study was based upon a number of informal interviews that allowed respondents to have any difficulties explained, while simultaneously suggesting improvements that would allow for easier administration of the survey. For instance, the cash on hand or net income less financial obligations variable was included as a consequence of the interview sessions.

Following Zikmund (1994) a sample size of 100 respondents was chosen. The questionnaire was then administered over a three week period commencing on the 31st of April 1994 until we achieved 100 responses. These respondents were chosen using a systematic sampling technique. That is, on every 75th page of the Sydney

\textsuperscript{30} It is important to note that these four variables are also presented within section 1 of the questionnaire in a more general form to minimise any testing effects (see Chapter 6).
Satisficing Versus Optimising: Empirical Analysis: Testing Methodology and Data

metropolitan telephone directory\textsuperscript{31}, calls were made until we obtained a respondent prepared to answer the questionnaire. Once a survey was completed, we then proceeded to obtain a respondent on the next corresponding page of the telephone directory.

3.2.2. Secondary Data

The secondary data employed in this thesis is obtained from the Australian Bureau of Statistics (ABS), the Reserve Bank of Australia (RBA) and The Westpac / Melbourne Institute, Centre for Business Cycle Analysis. This data set is quarterly and seasonally adjusted\textsuperscript{32} in real terms (base year 1989/1990) and covers the period 1976(1) to 1994(2)\textsuperscript{33}.

In our investigation we utilise two measures of income; Disposable Household Income (Dhy) and Neo-Ricardian Income (Nry). Dhy is calculated by the ABS\textsuperscript{34} and reports on the total amount of disposable income available for all Australian households as an industry sector. Nry is obtained by subtracting government final consumption expenditure and government gross fixed capital expenditure from gross domestic product\textsuperscript{35}.

To obtain the available credit (Cr) data, we calculated the difference between the previous period’s total credit limits outstanding and the previous period’s total credit

\textsuperscript{31} The number 75 is purely arbitrary.
\textsuperscript{32} With the exception of the Westpac index of consumer sentiment, as this series did not display a seasonal trend.
\textsuperscript{33} Appendix D presents all the data sets employed in this thesis graphically.
\textsuperscript{34} Appears in the Australian National Accounts catalogue No: 5204.0.
\textsuperscript{35} This information is contained in the Australian National Accounts, catalogue No: 5204.0.
advances outstanding. Therefore only the unused credit from the previous period is available for use in the current periods expenditure\textsuperscript{36}. This data is produced on a monthly basis by the RBA (Monthly Bulletins) and represents all credit card lending undertaken by all banks. Strictly speaking this is not the most accurate measure of credit available to Australian households as it ignores other credit facilities such as overdrafts, credit cards supplied by non-bank financial institutions and store credit accounts. It is however, the only data available that covers the period 1976(1) to 1994(2).

As discussed above the available credit data is presented in a monthly format. Therefore in order to convert the data into a quarterly series we average out the data on a three monthly basis. Likewise, Westpac's index of consumer sentiment is calculated on a monthly basis (Newspoll Market Research) and requires identical manipulation to produce a quarterly series.

It is important to note that all of the variables utilised have been employed as rates of growth (with the exception of the real interest rate)\textsuperscript{37}. For example, the rate of growth of real disposable income is calculated as follows,

\[
X_{t-1} = \left( \frac{Dh_{t-1}}{Dh_{t-2}} \right) - 1
\]  

\textsuperscript{36} Difficulties do arise in terms of when is the previous periods used credit paid back in the current period, thus increasing the amount of credit available in the current period. The literature does not provide any helpful information in dealing with available credit.

\textsuperscript{37} See Mankiw (1981).
Where $X_{t-1}$ denotes variables other than $r_t$ at time $t-1$. Consequently potential non-stationarity problems have been avoided.

Like Mankiw, we obtain a value for the real interest rate as follows;

$$r_{t-1} = (1 - \theta) i_{t-1} - \left( \left( \frac{P_t}{P_{t-1}} \right) - 1 \right)$$

(3.5)

Where $\theta$ is the marginal rate of tax, $i$ is the nominal interest rate and $P$ is a price deflator. Mankiw employs a marginal tax rate of 0.4 while we utilise a marginal tax rate of 0.33\(^{38}\). We also employ the 90 day bank bill rate as the nominal rate of interest\(^{39}\) while we use the CPI as our price deflator. Unlike Mankiw however, this measure of real interest is non-stationary (see Appendix E) and requires differencing in the first instance to return it to a stationary process\(^{40}\).

Unlike the data set employed by Mankiw, the data we employ in this thesis is at an aggregate level (as opposed to per capita data). In terms of non-durable consumption expenditure data, the conversion from aggregate data to per capita data is a simple process of dividing the aggregate data by total population data. Yet if we employ this process in the calculation of per capita income data we encounter some difficulties. If one refers back to fundamental Keynesian economics, one will note that as income increases, the Average Propensity to Consume (APC) decreases or becomes flatter. By calculating per capita income in the manner described above, this important

\(^{38}\) See (The) Tax Payers Association of New South Wales (1996).

\(^{39}\) 90 day bank bill data (RBA) is published on a monthly basis, therefore we utilise a three month average in converting the data to a quarterly format.

\(^{40}\) We assume Mankiw did not have this problem as it is not discussed.
occurrence is ignored (see Johnson 1983 and Acemoglu and Scott 1994). Consequently we follow Campbell and Mankiw (1989, 1990 and 1991) and MacDonald and Kearney (1990) in the employment of aggregate data.

The results from the manipulation of the aforementioned primary and secondary data as in accordance with the methodology outlined in section 3.1 is reported in the following two chapters. In Chapter 4 we present the results obtained from our ANOVA and descriptive statistical analysis of the primary data, while in Chapter 5 we present the results produced from our estimation of the REPIH and BCF upon Australian time series data. Following the presentation of these results, we will draw together our arguments in Chapter 6 and highlight any shortcomings and possible avenues of future research that may eventuate as a consequence of our investigations.
Chapter 4

EMPIRICAL RESULTS: Analysis of Primary Data

The results obtained from our empirical examinations are presented in the following two chapters. In this chapter we analyse the data obtained from our survey, with the intent of determining whether the respondents make non-durable expenditure decisions that are optimal in nature. If this is shown not to be the case, then attempts will also be made to determine if the exhibition of sub-optimal behaviour by the respondents is a consequence of their cognitive abilities, which in turn provides an empirical examination of the BRH and the related concept of satisficing.

4.1 A Test of Optimality

As outlined in Chapter 3, we employ the primary data obtained from the responses to our questionnaire to determine if the difference in the number of variables considered by respondents in the non-durable consumption expenditure decision making process is a function of the respondents’ awareness and appreciation of different economic information. The absence of such a relationship would lead us to conclude that the respondents do not form optimal non-durable consumption expenditure decisions. As noted in Chapter 3 there are two sections of our survey that are of primary concern in undertaking this analysis. Questions contained within Section 1 (see Questions 1-5 in Appendix B) of the survey were designed to obtain an insight into the amount of

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¹ For a breakdown of all the responses given in the questionnaire, see Appendix C.
information and knowledge utilised by the respondents in the non-durable expenditure decision (via the number of variables considered). While in Section 3 of the survey (see Questions 12-15 in Appendix B) we asked questions that attempted to establish how much economic knowledge and information each respondent possessed.

Examination of Figures 4.1 and 4.2 illustrates that despite the inclusion of a wide range of economic variables (13 and 27) in the survey, the respondents nominated only a small proportion of the total variables presented as important considerations when deciding to expend upon non-durables. This would appear to suggest that only a diminutive proportion of the total amount of information and knowledge available is utilised in the non-durable expenditure decision.\(^2\)

![Figure 4.1: Respondents Grouped by Number of Variables Chosen (limited alternatives)](image)

\(^2\) This may explain the formation of systematic errors in decision and expectations formation. See Chapter 2.
Figure 4.2:
Respondents Grouped by Number of Variables Chosen (unlimited alternatives)

Figure 4.1 depicts the number of variables chosen as important considerations in the non-durable expenditure decision when respondents were presented with thirteen options (see questions 1-4 of the questionnaire in Appendix B). On average, respondents chose two variables in comparison to the four variables\(^3\) that were chosen once respondents were allowed unrestricted choice in what variables they considered when making their non-durable expenditure decision\(^4\). These results raise two interesting questions. First, given our inclusion of cognitive ability as an additional constraint faced by optimising individuals (see Chapter 3), are the small number of variables considered as important a function of the respondents' awareness and appreciation of the economic information presented? Secondly, why have the respondents chosen so few of the possible economic variables available (on average 16% [restricted] and 14% [unrestricted])? If the first question can be answered in the affirmative, then the answer to our second question is because the respondents adhere

---

\(^3\) The actual means were 2.09 and 3.69 respectively.

\(^4\) These unlimited responses were obtained via question 5 of the questionnaire (see Appendix B).
to the new classical concept of optimisation. Alternatively, if the answer to our first question is negative, then the answer to our second question is that the respondents form sub-optimal decisions. If we can show that the respondents make sub-optimal decisions using only a fraction of the available information and knowledge set, as a consequence of their failure to understand this bundle of economic information, then we find evidence in support of the BRH. This in turn may suggest that the respondents maybe employing rules of thumb that permit satisficing decisions to be made (see section 4.2).

In employing the ANOVA technique to determine if respondents adhered to the concept of optimisation, each respondent was placed into one of three groups based upon the number of variables they considered as important pieces of information when deciding to expend upon non-durables. These groupings were as follows; those respondents who chose zero or one variable (Low), those who chose two variables

<table>
<thead>
<tr>
<th>Table 4.1: Level of Information⁵</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPI</strong></td>
</tr>
<tr>
<td>Aware</td>
</tr>
<tr>
<td>LOW</td>
</tr>
<tr>
<td>MODERATE</td>
</tr>
<tr>
<td>HIGH</td>
</tr>
</tbody>
</table>

⁵ The Unaware term includes those respondents for questions 12 to 15 (see Appendix B) that answered no or unsure.
Table 4.2: Appreciation of Economic Variables

<table>
<thead>
<tr>
<th></th>
<th>CPI</th>
<th>UNEMPLOYMENT</th>
<th>GDP</th>
<th>INTEREST RATES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Have</td>
<td>Haven't</td>
<td>Have</td>
<td>Haven't</td>
</tr>
<tr>
<td>LOW</td>
<td>9</td>
<td>28</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>MODERATE</td>
<td>7</td>
<td>25</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>HIGH</td>
<td>4</td>
<td>27</td>
<td>7</td>
<td>24</td>
</tr>
</tbody>
</table>

(Moderate) and those who chose more than two (High). The three groups (Low, Moderate and High) contained 37, 32 and 31 respondents respectively. Thus we assigned each of our 100 respondents to one of these three groupings. These groupings are summarised above in Tables 4.1 and 4.2.

Briefly examining the low group in terms of the CPI, one can see that of the 37 respondents classified within this group, 35 of these respondents were aware of the CPI and two were not. In terms of possessing an appreciation of the CPI, of those respondents classified in the low group, only nine possessed such an appreciation and twenty eight did not. The remainder of Tables 4.1 and 4.2 are set out in a similar fashion.

Tables 4.3 and 4.4 illustrate the results obtained from our employment of the one-way ANOVA technique in testing the null hypothesis: The mean number of respondents in each group is not significantly different with respect to their knowledge or appreciation.

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6 The Have term includes those respondents for questions 12 to 15 (see Appendix B) that gave a response deemed correct or partially correct (see Chapters 3 and 6 for further discussion).
of the four economic variables presented to them \( \bar{X}_B = \bar{X}_C = \bar{X}_D \).

In inspecting Tables 4.3 and 4.4 we note that; SS depicts the Sum of Squares error, df the degrees of freedom, MS the Mean Square error, F the F distribution and the P-value signifies the probability associated with our statistical hypothesis test. Given that the P-value obtained is greater than our level of significance (in this instance 0.01), our results suggest an inability to reject the null hypothesis (see Daniel and Terrell 1992).

Table 4.3: ANOVA of Respondents in Terms of Information Awareness

<table>
<thead>
<tr>
<th>Group</th>
<th>Count</th>
<th>Sum</th>
<th>Mean</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>8</td>
<td>148</td>
<td>18.5</td>
<td>283.71</td>
</tr>
<tr>
<td>Moderate</td>
<td>8</td>
<td>128</td>
<td>16</td>
<td>194.57</td>
</tr>
<tr>
<td>High</td>
<td>8</td>
<td>124</td>
<td>15.5</td>
<td>128.86</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>41.3333</td>
<td>2</td>
<td>20.6667</td>
<td>0.10212</td>
<td>0.903369</td>
</tr>
<tr>
<td>Within Groups</td>
<td>4250</td>
<td>21</td>
<td>202.381</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4291.33</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.4: ANOVA of Respondents in Terms of Appreciation of Variables

<table>
<thead>
<tr>
<th>Group</th>
<th>Count</th>
<th>Sum</th>
<th>Mean</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>8</td>
<td>148</td>
<td>18.5</td>
<td>123.71</td>
</tr>
<tr>
<td>Moderate</td>
<td>8</td>
<td>128</td>
<td>16</td>
<td>78.86</td>
</tr>
<tr>
<td>High</td>
<td>8</td>
<td>124</td>
<td>15.5</td>
<td>155.14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>41.3333</td>
<td>2</td>
<td>20.6667</td>
<td>0.173323</td>
<td>0.642057</td>
</tr>
<tr>
<td>Within Groups</td>
<td>2504</td>
<td>21</td>
<td>119.238</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2545.33</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Implementing the one-way ANOVA test produces an F-statistic of 0.10212 for the three groups in terms of information awareness and an F-statistic of 0.173323 for the three groups in terms of information appreciation. Consequently we are unable to reject the null hypothesis at the 0.01 significance level. It would therefore appear that the decision by respondents to choose differing numbers of the economic variables presented to them, is independent of their awareness and appreciation of economics. This seems to suggest that the respondents do not form optimal non-durable expenditure decisions, given our treatment of cognitive ability as an additional constraint faced by the optimising individual.\textsuperscript{7}

\textbf{4.2 Are Consumers Cognitively Constrained?}

The above results do not appear to provide any evidence in support of the formation of optimal decisions on the behalf of our respondents. This then raises the question as to whether the exhibition of sub-optimal behaviour is a consequence of their cognitive abilities. Returning our attention to the four economic variables we considered in our ANOVA analysis, we see in Figure 4.3 that these four variables are largely ignored by the respondents when deciding to expend upon non-durables. The absence of these four economic indicators as considerations by the respondents, may be a consequence of a lack of appreciation as to what these variables represent and how they impact upon the respondents’ set of micro data. If this is the case and it can be demonstrated that as the variables increase in economic complexity, the respondents’ awareness and

\textsuperscript{7} It is important to note that our inclusion of cognitive ability as an additional constraint faced by the optimising individual is only applicable for Section 4.1.
understanding decreases, then we can interpret this as evidence of the respondents’ cognitive limitations.

Figure 4.3:

Number of Respondents that Considered Inflation, Unemployment, Interest Rates and the level of Economic Activity when Purchasing Non-durables

Of the four purely economic variables presented to our respondents, our results suggest that GDP (or the level of economic activity) appears to be the most economically abstract. Figure 4.4 indicates that only 61% of respondents were aware of the term GDP, while in comparison, the other remaining variables presented scored well above the 90% rate in terms of recognition by the respondents. These remaining three variables could be classified as somewhat common knowledge in today’s age of high economic information. Nevertheless some respondents may have been confused by the use of the term CPI as opposed to the rate of inflation. This was a deliberate

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8 It should also be noted that we received 17 responses indicating that respondents did not know how to find out the level of economic activity in the economy. In contrast we received 2 responses indicating that respondents were unable to find out the unemployment rate, 5 responses indicating that respondents were unable to find out the level of interest rates and 12 responses indicating that respondents were unable to find out the inflation rate (see Questions 8 to 11 in Appendices B and C).
attempt to discover how many of the respondents were unaware that the CPI was the economic instrument employed in the calculation of the rate of inflation. In turn this represents a small examination of the respondents’ cognitive limitations.

![Bar chart showing awareness of economic variables]

**Figure 4.4:**

**Number of Respondents Aware of the Economic Variable in Question**

In terms of the respondents’ appreciation of these four economic variables, as a whole, the results suggest that the respondents did not exhibit a high level of understanding of the economic variables they were aware of. Figure 4.5 presents a summary of the percentage of respondents who provided a correct explanation of the economic variables in question. Despite the respondents’ high level of awareness of the four economic variables presented, this did not transpose to a high appreciation of these variables. A surprising occurrence is that 97% of respondents were aware of the concept of interest rates (presumably via their dealings in home mortgages and savings accounts), however, only 3% of those respondents were able to explain how the rate of
interest was calculated in its simplest form\textsuperscript{9}. Rather, a large majority of the respondents either did not know or informally suggested that the rate of interest was determined ‘by the bank’. This is interesting in two respects. First it appears to suggest the presence of a cognitive limitation by the respondents (in relation to economics and the interest rate determination process) and secondly the behaviour exhibited here by the respondents appears to be satisficing in nature. This lack of concern may appear to suggest that the respondents are not interested in the interest rate determination process, but rather in the end result; the interest repayments that must be made on their loans or the payments they receive on their savings.

\begin{center}
\includegraphics[width=\textwidth]{figure4.5.png}
\end{center}

\textbf{Figure 4.5:}

\textbf{Percentage of Respondents that Provided a Correct Explanation of the Economic Variable in Question}\textsuperscript{10}

\textsuperscript{9} Any reference made by the respondents to changes in the supply or demand for money or changes in the inflation rate were categorised as correct responses for the purposes of recognising the interest rate determination process.

\textsuperscript{10} This represents a percentage of those respondents that were aware of the economic variable in question.
In order to validate the aforementioned argument, we need to establish the importance of the link between knowledge of the interest rate determination process and the formation of optimal non-durable expenditure decisions. If economic agents are to behave in a forward looking manner then some form of understanding as to how the level of interest rates are determined will be required.

As we have noted in Chapter 3, most individuals will have purchased their homes with a mortgage obtained from a bank or some other form of financial institution. If interest rates were to increase for example, then there is a strong likelihood that the repayments on these mortgages will also increase, reducing disposable household income, which in turn impacts upon non-durable consumption expenditure. If individuals are truly forward looking, they will need to be able to recognise the factors that will lead to a change in interest rates before they actually effect the rate of interest. If they do not recognise these factors and only react once interest rates change, the decision making process becomes sub-optimal, as purchases should have been made prior to the fall in disposable household income. If however, individuals were able to increase their expenditure prior to interest rates rising then they would maximise their utility by ensuring that their purchasing power is maintained for as long as possible.

It should also be noted that if individuals are unable to form a reasonable expectation as to whether interest rates are likely to increase or decrease in the future (as this knowledge eludes them), then the uncertainty surrounding their future expenditure decisions is increased, as they must wait until these changes in interest rates occur and impact directly upon their disposable household income. The presence of even crude subjective expectations reduces the uncertainty surrounding the value of disposable
household income in the next period, which consequently should influence the timing of expenditure decisions (see Keynes 1923). Therefore, it can be argued that in not understanding how interest rates are determined, fundamental uncertainty is introduced into the individual's decision making environment, which in turn prevents the formation of optimal non-durable expenditure decisions (see Chapter 2).

Further examination of Figure 4.3 reveals that the CPI and the unemployment rate (respectively) were the two economic variables that were chosen most often by the respondents as important when forming non-durable expenditure decisions. This occurrence may simply be a reflection of the high levels of awareness exhibited by respondents in respect to these two variables (see Figure 4.4)\textsuperscript{11}. Other possible explanations for this occurrence include: That some respondents' recognised a link between the inflation rate (CPI) and their real purchasing power (see Keynes 1923); that employment uncertainty was still fresh in the mind's of some respondents in light of Australia's recent recession, hence its impact upon disposable income was recognised\textsuperscript{12}; that the CPI and the unemployment rate are technically less difficult in their construction in comparison to GDP and the level of interest rates, or that a small proportion of the respondents were more economically literate (or cognitively unconstrained) than others.

\textsuperscript{11} It should be noted that higher levels of appreciation can be attributed to these two variables in comparison to the level of interest rates, which was less appreciated but more highly recognised by respondents.

\textsuperscript{12} This is hard to determine without demographic information on each respondent detailing occupation. This information may have provided an insight into how cyclical factors may impact upon each respondent's employment prospects.
Examining the responses obtained with respect to GDP, we see that despite it representing the least known of the four variables presented (in terms of awareness), it represented the variable that was understood most by respondents that were aware of it. Perhaps this occurrence can be explained in terms of an awareness and appreciation of GDP being limited to those respondents that have had some form of academic training in economics, or are employed in a capacity that involves the use of economic data. Despite 28% of respondents possessing an understanding of the GDP variable, we only received 4 responses deeming the variable to be important to the non-durable expenditure decision making process\(^\text{13}\).

The decision to exclude GDP as a consideration in the non-durable expenditure decision making process, cannot be attributed alone to a lack of understanding of the variable and contradicts the findings of Jaeger (1992). Jaeger suggests that the of level of economic activity is an important determinant of expenditure on non-durable consumption as GDP represents income on an aggregate level. Thus as the economy experiences growth and national income increases (GDP) on an aggregate level, one would expect the economically literate individual (say 28% of our respondents) to realise that this should also bring about a rise in their individual income, which should in turn impact upon their level of non-durable consumption expenditure. The overall suggestion by respondents that GDP is not an important consideration in their non-durable consumption expenditure decision, indicates that either the respondents are unable to recognise the connection between changes in aggregate income and individual income, or for those that recognise this connection, a conscious decision is

\(^{13}\) The level of GDP will have implications for consumers in terms of inflationary and employment effects (see Chapter 3).
made to exclude it from their information set. Either way this outcome questions Muth’s concept of *homo economicus*.

Another possible indication of the respondents’ cognitive limitations has been alluded to in our earlier discussion. We demonstrated that as the respondents information set increased (from 13 variables to 27 variables), the proportion of variables chosen (as represented by the means) decreased from 16% to 14%\(^{14}\). Hence as the information set relevant to the decision at hand increases, the amount of that information utilised decreases as a percentage of the total information set. This occurrence appears to suggest that in not processing the entire information set, the respondents employ some rule of thumb that allows rational decisions to be made (in a satisficing sense) based upon what each of them have determined to be the most relevant information. This occurrence also appears to be consistent with Lavoie’s (1992) suggestion that substantive or new classical rationality is not possible when there is either too little or too much information available; irrespective of the cost associated in obtaining that information.

When the presence of cognitive limitations are coupled with time constraints faced by an individual in the decision making process\(^{15}\), as a consequence of living in a dynamic economy, the opportunity cost associated with making economic decisions increases (see Chapter 2 and Lilly 1994). As a result of these time constraints and high opportunity costs, individual economic agents (in this instance our respondents) may

\(^{14}\) It should be noted that the information set increased as a consequence of the additional 14 variables chosen by the respondents when asked to nominate further information that was considered (and had not been presented) in deciding to expend upon non-durable goods or services.

\(^{15}\) This restriction is based upon the dynamic nature of the economy in which economic agents inhabit.
not be in a position to allocate the time required that would permit them to obtain a fuller understanding of the significance of these four economic variables and the impact they have upon disposable household income and hence non-durable consumption expenditure\textsuperscript{16}. It can be argued that these variables are then simply removed from the decision making process, as long as their exclusion still permits the individual to form a satisfactory decision. Thus we conclude that the four economic variables that we have concentrated our analysis upon, appear to be excluded from the non-durable expenditure decision making process as a result of the cognitive difficulties that arise once these variables are included in the decision making set.

Previously we have suggested that as the relevant set of information increases in size, the respondents may employ rules of thumb in their decision to include less information than more and to exclude those variables that are economically complex in nature. Figure 4.6 highlights what pieces of economic information respondents consider important in the non-durable expenditure decision.

The variable that was considered most by respondents was that of previous purchases. Such an occurrence has two possible explanations; the first being that the respondents take stock of what non-durables they have currently in their possession prior to purchasing more\textsuperscript{17} and secondly they follow established patterns of habit when making non-durable purchases (see Veblen 1972 and Lavoie 1992 and 1994). Our results

\textsuperscript{16} This is somewhat verified by the large number of respondents that chose none of the four economic variables presented in question 2 of the survey (see Appendix C).

\textsuperscript{17} This form of behaviour would be consistent with an optimising approach to decision making, where the respondents would be employing what could be described as a 'standard inventory model'.
Most Frequently Chosen Considerations When Purchasing Non-durables

suggest that the respondents continue to employ the same methodology that has produced satisfactory results for them in the past, in their attempt to contend with the uncertainties of the future. This behaviour appears to be consistent with the alternate model of non-durable consumption expenditure developed by the Post-Keynesian school (see Lavoie 1992 and 1994).

Because of the nature of non-durable goods and services the variable ‘need’ has also arisen as an important consideration. This occurrence adds some weight to our interpretation of why previous purchases figured so highly in the expenditure decision making process. After taking into consideration what has been previously purchased

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18 Net Inc-Fin Ob denotes net income less financial obligations, while Avail Credit represents available credit.
19 Habit, like cognitive ability, is within the individual’s internal environment. Consequently it too is not recognised by new classical models of optimisation.
20 This result adds empirical evidence to Drakopoulos’ (1990) and Lavoie’s (1992 and 1994) ascertaining that need is an important determinant in the non-durable consumption expenditure decision making process.
(and consumed over the subsequent period), the respondents are then in a position to determine what non-durables are required to be replaced, or are needed and they expend upon these items accordingly\textsuperscript{21}. In basing expenditure decisions upon this form of behaviour, doubt is placed on the new classical assumption of forward looking economic agents, especially when rules of thumb have been developed that centre around past or habitual behaviour.

Our results appear to suggest that at best the respondents are concerned with the present, as indicated by the second and third two most frequently chosen variables. The respondents indicated that the amount of money they currently possess (Net Inc - Fin Ob)\textsuperscript{22} and the amount of available credit are also important considerations in the decision to expend upon non-durables. The inclusion of these two variables implies that the respondents expend on non-durables in a manner that is determined by past behaviour given a number of constraints imposed by current factors.

The remaining variables of note are quality and price, which seem to be included to allow the respondents to make differentiations between the number of available non-durables. With respect to the variable ‘price’, it is important to note that we interpret this variable to represent relative price as opposed to absolute price\textsuperscript{23}. That is, when choosing between non-durable goods or services, the respondents take into consideration relative prices amongst these goods or services. Like ‘price’, ‘quality’

\textsuperscript{21} The variable ‘need’ represents not only what variables are required to be purchased (on a stock flow basis) but also appears to acts as a source of information in the decision making process.
\textsuperscript{22} The variable Net Income less Financial Obligations has been designed to represent cash on hand. That is the amount of income individuals have left over once all their financial obligations or bills are deducted from their net household income.
\textsuperscript{23} Given that the respondents chose price as a consideration and not the inflation rate.
also appears to be a determining factor when choosing between non-durables, as opposed to deciding to expend on non-durables.

It is interesting to note that the third most considered variable was that of net income less financial obligations or Disposable Household Income (Dhy) (see Chapter 5). As we have discussed previously, the four macroeconomic variables we have concentrated our analysis upon, should all have an indirect impact upon the level of non-durable consumption expenditure through the effect they have upon disposable household income\(^{24}\). Even though the respondents have nominated Dhy as an important consideration in their expenditure decision making process, they appear to be unable to relate the effect these four variables may have upon their level of Dhy. This occurrence may be explained in one of two ways. First, the respondents are so cognitively constrained that they are unable to recognise the impact the macroeconomy can have upon their own micro data\(^{25}\). Secondly, respondents recognise the link between the macro economy and their micro economy and have determined that it is too complicated (or irrelevant). In the second instance, the macro information is consciously removed from the respondents information set. Therefore they form decisions on the basis of the micro data available to them. Consequently establishing the rule of thumb that only immediate (micro) data will be employed in the non-durable expenditure making process. In either instance the removal of the macro information from an individual’s information set on a conscience or sub-conscience basis results in the formation of sub-optimal decisions.

\(^{24}\) Our discussion only concentrates upon the impact these variables have upon income and hence non-durable consumption expenditure.

\(^{25}\) In this instance the respondents would be forming what appeared to be optimal decisions, however, once these decisions were placed within the context of the total information set or the broader economy, these decisions would return to being sub-optimal or satisficing in nature (see Chapter 2).
We can take this analysis a step further by examining Figure 4.7. In choosing Dhy over the other three measures of income presented, the respondents have demonstrated their ability to distinguish between total income and the amount of income available for non-durable consumption expenditure. They are aware of the impact taxation and other financial obligations have upon their purchasing power, however, they are unable to make the connection between other macroeconomic variables and the effect they can have upon their purchasing power and consequently non-durable consumption expenditure. This may suggest that the respondents' employ a rule of thumb, where they are not concerned as to how Dhy is determined or influenced, just as to how much it is.

![Figure 4.7: Different Measures of Income Considered When Purchasing Non-Durables](image)

Further evidence as to the existence of such rules of thumb may be found by examining the results obtained from question six (see Appendix B) as presented in Figure 4.8.

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26 See Question 1, Appendices B and C.
When asked ‘how their expectations of their future personal economic situation were determined?’, the alternative that received the highest number of responses was that of personal observations. This occurrence questions Fischer’s weak form explanation of expectation formation in which he states that, ‘...individuals form expectations optimally on the basis of the information available to them and the cost of using that information’ (Fischer 1980 p212). In today’s high information age, the monetary cost associated with obtaining economic information is almost zero and as a consequence of the increased media coverage the economy now receives, economic agents have at their disposal a multitude of costless economic information. Contrary to Fischer’s explication of expectations formations, our respondents have largely ignored such information in their expectations formation, relying on a rule of thumb entitled ‘personal observations’.

Our results do not provide an insight into what the respondents understood by term personal observations. One interpretation may be that personal observations encompasses only those pieces of information that the respondents find interpretable and relevant to their particular situation, as a result of the lower opportunity cost associated with obtaining a workable understanding of them. Therefore in choosing this alternative as most important in their expectations formation, it can be argued that the respondents once again appear to be employing a rule of thumb that has eliminated a vast majority of the available information in the formation of these expectations. As suggested previously, the exclusion of information, may have been made purely on the basis of cognitive limitations and time constraints\(^{27}\). Such an occurrence implies that

\(^{27}\) Both of which when coupled together increase the opportunity cost associated with the decision making process.
the respondents undertake expectations formation in a satisficing manner. This occurrence would appear to contradict the new classical notion of rationally formed expectations, even in its weakest form.\(^{28}\)

![Bar chart showing response distribution]

**Figure 4.8:**

**How Respondents Form Expectations About Their Future Economic Well Being**

In summary, the first section of this chapter attempts to demonstrate that the number of variables considered in the non-durable consumption expenditure decision making process is not a function of the respondents’ cognitive ability. Given our treatment of cognitive ability as just one of a number of constraints faced by economic agents (see Chapter 3), we conclude that the respondents do not form optimal non-durable expenditure decisions. Following this outcome, the second section of this chapter was spent examining the responses obtained from our questionnaire in further detail. This additional analysis finds some evidence that appears to suggest that the respondents are

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\(^{28}\) It is important to note that Fischer (1980) measures opportunity cost only in monetary terms. Following Lilly (1994), our approach also recognises the opportunity cost associated in obtaining an understanding of the information processed in solving the decision at hand.
cognitively constrained and consequently develop rules of thumb that permit decisions of a satisfying nature to be made. Thus we also conclude that our results provide general evidence in support of the BRH.
Chapter 5

EMPIRICAL RESULTS: Analysis of Secondary Data

In this chapter we employ Australian time series data in our examination of two alternate macroeconomic models of non-durable consumption expenditure. The first model we investigate is Mankiw's (1981) variable real interest rate model of the REPIH. This model assumes that individuals form optimal non-durable consumption expenditure decisions. Our second model is the behavioural consumption function, which is produced by utilising the primary data obtained from our questionnaire (see section 3.2.1). The behavioural consumption function is designed to capture the behaviour exhibited by our respondents in the non-durable consumption decision making process. Unlike the model produced by Mankiw, the behavioural consumption function does not make any assumptions as to the behaviour employed by economic agents in the non-durable expenditure decision making process.

5.1 Estimation of the Rational Expectations Permanent Income

Hypothesis on Australian data

Our general review of the REPIH (see Chapter 2) suggests that in recent times little empirical examination of the REPIH has been undertaken within the Australian context. Milbourne and Otto (1992) utilise the theory of intertemporal consumption in an attempt to explain Australia's current account imbalance, while MacDonald and Kearney (1990) examine the REPIH in the light of recent developments in
cointegration techniques. Prior to these examinations little else has been reported after Johnson's (1983) application of Hall's (1978) hypothesis. All of these examinations of the REPIH employ Hall's underlying assumption of constant real interest rates. We relax this assumption in our estimation of Mankiw's model of the REPIH on Australian data for the period 1976 (1st quarter) to 1994 (2nd quarter).

In Chapter 2 we discussed a number of criticisms related to the REPIH as a consequence of Hall's adoption of the rational expectations hypothesis and the underlying assumption of known, constant real interest rates. These criticisms centred around the strong assumptions this approach to the modelling of non-durable consumption expenditure makes about human cognitive ability and human behaviour. By employing Mankiw's interpretation of the REPIH we address one of these concerns, namely the assumption of known, constant real interest rates.

In applying Mankiw's methodology to Australian data we estimate the following model:

\[ G_t = a_0 + a_1 r_{t-1} + b X_{t-1} + Z_{t-1} + u_t \]  \hspace{1cm} (5.1).

Where $G$ is the growth rate of non-durable consumption expenditure, $a_0$ is the fixed coefficient, $a_1$ is the coefficient of relative risk aversion, $r$ is the real interest rate, $b$ is a regression coefficient, $X$ is the variable used to encompass all additional independent variables employed in the model, $Z$ is the set of instruments and $u$ is the
random error term. The results produced from our estimation of this model are presented in Table 5.1.

Prior to discussing the results we have obtained in our estimation of Mankiw's REPIH, it is important to note that our examination differs with one respect to that of Mankiw's. After calculating the real interest rate we find it to be non-stationary (see Appendix E). In order to avoid the spurious results that can occur in regression analysis as a consequence of utilising non-stationary data (see Dickey and Fuller 1981, Nelson and Plosser 1982 and Mankiw and Shapiro 1985), we employ the real interest rate in its first difference.

In estimating equation 1 (see Table 5.1), we utilise the lagged value of the change in the real interest rate as the independent variable and the change in the real interest rate lagged two and three times as our set of instruments. Here \(a_1\) is equal to 0.00, which results in an incalculable implied coefficient of relative risk aversion. This outcome differs to the coefficients produced by Mankiw and Hanson and Singleton (1983).

Further examination of Table 5.1 reveals that not only does the change in the lagged value of real interest fail to be a significant predictor of variations in the growth of non-durable consumption expenditure at the 0.10 level, but only one other independent

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1 The t-statistics are presented in parentheses and all independent variables employed in addition to the change in the lagged value of real interest is represented by \(X_{it}\).

2 It should also be noted that the employment of non-stationary data in examinations of the REPIH can bias the results in favour of rejecting the hypothesis (see Mankiw and Shapiro 1985).

3 The coefficient of relative risk aversion is equal to \(\frac{1}{a_1}\).
<table>
<thead>
<tr>
<th>Equ. No.</th>
<th>Depn. Var.</th>
<th>( a_0 ) (7.32)</th>
<th>( a_1 \Delta r_{t-1} )</th>
<th>( b X_{t-1} )</th>
<th>( \Delta r_{t-2}, \Delta r_{t-3} )</th>
<th>( R^2 )</th>
<th>Adj ( R^2 )</th>
<th>LB Stat.</th>
<th>C Stat.</th>
<th>ARCH Stat.</th>
<th>F Stat.</th>
<th>P-value (F Stat)</th>
<th>Stand. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( G_t )</td>
<td>0.008</td>
<td>0.000136 (0.03228)</td>
<td>( \Delta r_{t-2}, \Delta r_{t-3} )</td>
<td>0.0023</td>
<td>-0.0124</td>
<td>2.2919</td>
<td>0.7538</td>
<td>1.543</td>
<td>0.0010</td>
<td>0.9743</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>( G_t )</td>
<td>0.008</td>
<td>0.000697 (0.1515)</td>
<td>( \Delta r_{t-2}, \Delta r_{t-3}, \Delta r_{t-3} )</td>
<td>0.0187</td>
<td>-0.0105</td>
<td>2.577</td>
<td>0.7498</td>
<td>2.162</td>
<td>0.3231</td>
<td>0.725</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>( G_t )</td>
<td>0.008</td>
<td>0.000434 (0.10028)</td>
<td>( \Delta r_{t-2}, \Delta r_{t-3}, \Delta r_{t-3} )</td>
<td>0.0205</td>
<td>-0.0087</td>
<td>2.48</td>
<td>0.7282</td>
<td>1.9621</td>
<td>0.4663</td>
<td>0.6316</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>( G_t )</td>
<td>0.007</td>
<td>0.000092 (0.02156)</td>
<td>( \Delta r_{t-2}, \Delta r_{t-3}, \Delta r_{t-3} )</td>
<td>0.0102</td>
<td>-0.0194</td>
<td>1.5914</td>
<td>0.8618</td>
<td>0.337</td>
<td>0.2842</td>
<td>0.7535</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>( G_t )</td>
<td>0.008</td>
<td>0.000164 (0.0385)</td>
<td>( \Delta r_{t-2}, \Delta r_{t-3}, \Delta r_{t-3}, \Delta r_{t-3} )</td>
<td>0.0071</td>
<td>-0.0225</td>
<td>2.438</td>
<td>0.7257</td>
<td>1.54</td>
<td>0.1478</td>
<td>0.8629</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>( G_t )</td>
<td>0.008</td>
<td>0.000193 (0.0457)</td>
<td>( \Delta r_{t-2}, \Delta r_{t-3}, \Delta r_{t-3}, \Delta r_{t-3} )</td>
<td>0.0040</td>
<td>-0.0256</td>
<td>3.220</td>
<td>0.7406</td>
<td>1.458</td>
<td>0.0328</td>
<td>0.9677</td>
<td>0.0087</td>
<td></td>
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<tr>
<td>7</td>
<td>( G_t )</td>
<td>0.007</td>
<td>0.000185 (0.04935)</td>
<td>( \Delta r_{t-2}, \Delta r_{t-3}, \Delta r_{t-3}, \Delta r_{t-3} )</td>
<td>0.0178</td>
<td>-0.0116</td>
<td>2.036</td>
<td>0.7584</td>
<td>1.637</td>
<td>0.5145</td>
<td>0.6002</td>
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<td></td>
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<tr>
<td>8</td>
<td>( G_t )</td>
<td>0.008</td>
<td>0.000190 (0.0436)</td>
<td>( \Delta r_{t-2}, \Delta r_{t-3}, \Delta r_{t-3}, \Delta r_{t-3} )</td>
<td>0.0194</td>
<td>-0.0103</td>
<td>2.494</td>
<td>0.6917</td>
<td>1.154</td>
<td>0.5084</td>
<td>0.6038</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>( G_t )</td>
<td>0.008</td>
<td>-0.00069 (-0.1618)</td>
<td>( \Delta r_{t-2}, \Delta r_{t-3}, \Delta r_{t-3}, \Delta r_{t-3} )</td>
<td>0.007</td>
<td>-0.0227</td>
<td>3.127</td>
<td>0.8100</td>
<td>0.573</td>
<td>0.8418</td>
<td>0.4354</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>( G_t )</td>
<td>0.008</td>
<td>0.000128 (0.0301)</td>
<td>( \Delta r_{t-2}, \Delta r_{t-3}, \Delta r_{t-3}, \Delta r_{t-3} )</td>
<td>0.0023</td>
<td>-0.0274</td>
<td>3.108</td>
<td>0.7393</td>
<td>1.439</td>
<td>0.0064</td>
<td>0.9936</td>
<td>0.0087</td>
<td></td>
</tr>
</tbody>
</table>

* G denotes the growth rate in non-durable consumption expenditure, Dhy the growth rate in disposable household income, Nry the growth rate in neo-Ricardian income, and \( \Delta R \) is the change in the real interest rate.

# Significant at the 1% level, * Significant at the 5% level and + Significant at the 10% level.
Table 5.1. (cont.) Results Obtained From the Re-examination of Mankiw’s Re-estimation of the REPIH

<table>
<thead>
<tr>
<th>Equ. No.</th>
<th>Depn. Var.</th>
<th>$\alpha$</th>
<th>$a_1 \Delta r_{t-1}$</th>
<th>$b \times \Delta y_{t-1}$</th>
<th>$Z_{t-1}$</th>
<th>$R^2$</th>
<th>Adj $R^2$</th>
<th>LB Stat.</th>
<th>C Stat.</th>
<th>ARCH Stat.</th>
<th>F Stat.</th>
<th>P-value (F Stat)</th>
<th>Stand. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 G_t</td>
<td>0.008</td>
<td>0.000164</td>
<td>0.053266</td>
<td>$N_{t-2}$, $N_{t-3}$, $N_{t-4}$</td>
<td>0.0132</td>
<td>-0.0163</td>
<td>2.393</td>
<td>0.8218</td>
<td>1.263</td>
<td>0.3678</td>
<td>0.6937</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>12 G_t</td>
<td>0.008</td>
<td>0.000058</td>
<td>-0.005882</td>
<td>$N_{t-2}$, $N_{t-3}$, $N_{t-4}$</td>
<td>0.0012</td>
<td>-0.0291</td>
<td>2.752</td>
<td>0.7204</td>
<td>1.579</td>
<td>0.0028</td>
<td>0.9972</td>
<td>0.0088</td>
<td></td>
</tr>
<tr>
<td>13 G_t</td>
<td>0.008</td>
<td>-0.00014</td>
<td>0.009909</td>
<td>$C_{t-1}$, $C_{t-3}$, $C_{t-4}$</td>
<td>0.0029</td>
<td>-0.0269</td>
<td>3.048</td>
<td>0.7207</td>
<td>1.28</td>
<td>0.2043</td>
<td>0.8157</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>14 G_t</td>
<td>0.008</td>
<td>0.000549</td>
<td>0.026989</td>
<td>$C_{t-1}$, $C_{t-3}$, $C_{t-4}$</td>
<td>0.0470</td>
<td>0.0186</td>
<td>6.140</td>
<td>0.7461</td>
<td>1.081</td>
<td>1.3933</td>
<td>0.2535</td>
<td>0.0085</td>
<td></td>
</tr>
<tr>
<td>15 G_t</td>
<td>0.008</td>
<td>-0.00004</td>
<td>0.028132</td>
<td>$C_{t-1}$, $C_{t-3}$, $C_{t-4}$</td>
<td>0.0334</td>
<td>0.0045</td>
<td>4.804</td>
<td>0.8143</td>
<td>0.940</td>
<td>1.5014</td>
<td>0.2302</td>
<td>0.0086</td>
<td></td>
</tr>
<tr>
<td>16 G_t</td>
<td>0.008</td>
<td>0.00005</td>
<td>0.022019</td>
<td>$C_{t-1}$, $C_{t-3}$, $C_{t-4}$</td>
<td>0.0252</td>
<td>-0.0043</td>
<td>3.356</td>
<td>0.7743</td>
<td>1.166</td>
<td>0.883</td>
<td>0.4184</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>17 G_t</td>
<td>0.007</td>
<td>-0.00039</td>
<td>0.016673</td>
<td>$C_{t-1}$, $C_{t-3}$, $C_{t-4}$</td>
<td>0.0012</td>
<td>-0.0297</td>
<td>2.5564</td>
<td>0.7272</td>
<td>1.430</td>
<td>0.2178</td>
<td>0.8048</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>18 G_t</td>
<td>0.01</td>
<td>0.000349</td>
<td>0.000000</td>
<td>$C_{t-1}$, $C_{t-3}$, $C_{t-4}$</td>
<td>0.0167</td>
<td>-0.0127</td>
<td>3.4955</td>
<td>0.4717</td>
<td>2.2304</td>
<td>0.4481</td>
<td>0.6407</td>
<td>0.0087</td>
<td></td>
</tr>
<tr>
<td>19 G_t</td>
<td>0.01</td>
<td>0.000368</td>
<td>0.000000</td>
<td>$C_{t-1}$, $C_{t-3}$, $C_{t-4}$</td>
<td>0.0163</td>
<td>-0.0131</td>
<td>3.4965</td>
<td>0.7455</td>
<td>2.2418</td>
<td>0.4331</td>
<td>0.6503</td>
<td>0.0087</td>
<td></td>
</tr>
</tbody>
</table>

* G denotes the growth rate in non-durable consumption expenditure, CS is the growth rate in the consumer sentiment index, CR represents the growth rate in the amount of available credit, and $\Delta R$ is the change in the real interest rate.

# Significant at the 1% level, * Significant at the 5% level and + Significant at the 10% level.
variable proves to be significant. This being the rate of growth in the index of consumer sentiment.

Our finding that the Westpac Index of Consumer Sentiment (Cs) is a significant predictor of variations in the growth of non-durable consumption expenditure violates Mankiw's null hypothesis (see Chapter 3). For equation 5.1 to hold any $X_{t-1}$ known at time $t-1$ must be insignificant. The index fails to be significant when lagged once (equation 13). Yet when Cs is lagged for two and three periods (equations 14 and 15) it proves to be significant at the 0.10 level$^4$. This outcome suggests that the index is a 6 to 9 month lead indicator of variations in the growth rate of non-durable consumption expenditure$^5$.

These results are consistent with Pickering's (1981) suggestion that changes in consumer attitudes tend to lead changes in demand by 6 to 9 months. Consequently we can also extend Boehm and McDonnell's (1993) finding that the Westpac index of consumer sentiment is a 6 to 12 month leading indicator of durable consumption expenditure to include non-durable consumption expenditure. Our results however, differ slightly from those produced by Acemoglu and Scott (1994). Acemoglu and Scott find the EEC's index of consumer sentiment to be a significant predictor of changes in non-durable consumption expenditure when the index is lagged for one or two quarters, thus acting as only a 3 to 6 month leading indicator.

$^4$ It should be noted that when the index is lagged for four periods it proves to be significant at the 0.20 level.

$^5$ Note the index is produced on a monthly basis.
Both our results (see Table 5.1) and the results produced in the studies cited above suggest that indices of consumer sentiment act as leading indicators of future economic outcomes. Acemoglu and Scott produce results that suggest consumer sentiment indices are a good measure of future non-durable consumption expenditure because they prove to be a good estimate of future income. In our examination of Mankiw’s REPIH, the only variable that proves to be a significant predictor of variations in the growth of non-durable consumption expenditure is the consumer sentiment variable. This occurrence appears to suggest that the index has a predictive power over and above the other standard macroeconomic variables we have employed in this analysis. There appears to be three possible explanations for this occurrence.

First, the index is published on a monthly basis which represents a shorter publication lag than non-durable expenditure data. Hence the index may be capable of adjusting a lot quicker to underlying changes in the economy than other macroeconomic variables that are published on a quarterly basis. Secondly, survey data is employed in the construction of the index. In utilising survey data in the development of this variable, the researchers may be obtaining additional information about the future state of the economy than can not be encompassed within standard macroeconomic variables. Finally, monthly movements in the index now receive wider media coverage. Therefore it could be argued that this index is now a part of each economic agent’s information set⁶. As a consequence, individuals have the opportunity to gain an insight into the direction other individuals believe the economy is headed, rather than relying exclusively upon their own perceptions.
Despite the Westpac Index of Consumer Sentiment’s ability to explain variations in the growth of non-durable consumption expenditure, further examinations of the data will be required before a conclusive explanation as to the predictive nature of the index is possible.

Unlike Mankiw, who rejects the null hypothesis that $b = 0$, as a result of the significance of the lagged value of the growth in real non-durable consumption expenditure (G) and the lagged value of the growth in real disposable household income (Dhy). Our employment of these two variables in the estimation of the REPIH on Australian data, do not provide any evidence to support rejection of this null hypothesis at the 0.10 level. Our finding that the lagged value of the growth in Dhy is insignificant in explaining deviations in the growth of G is consistent with Johnson (1983) (equations 5, 6, 7 and 8). In contrast to our results however, Johnson does find that Dhy possess some small explanatory power when lagged for three periods at the 0.20 level.

Equations 2 to 4 demonstrate that the utilisation of the lagged dependent variable (G) as an additional regressor proves to be insignificant. Once again we can draw comparisons between these results and those of Johnson’s. Like Johnson, we find the explanatory power of lagged non-durable consumption expenditure insignificant when lagged over one, two and three periods.

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6 It could also be argued that the index is included in the individual’s information set because it is relatively easy to understand. In other words its use does not place a large cognitive constraint upon the individual.
Our employment of Neo-Ricardian income (Nry) as an additional independent variable fails to provide any evidence in favour of rejecting the REPIH at the 0.10 level. Though it is a significant predictor of variations in the growth of non-durable consumption expenditure at the 0.20 level (equation 9). This occurrence is consistent with the results produced by Johnson. Yet unlike Johnson who finds Nry significant at the 0.02 and 0.05 levels when lagged three and four times, our employment of additional lagged values of Nry fail to produce similar results (equations 10, 11 and 12).

Following Flavin (1985), Davies and Weber (1991) observe that consumers face liquidity constraints, thus calling into question the REPIH. We employ a measure of available credit (Cr) in an attempt to determine if liquidity constrained individuals utilise credit cards in an attempt to overcome these constraints. Our finding that Cr is not significant in explaining non-durable consumption expenditure at the 0.10 level has two possible explanations. First, individuals do not face liquidity constraints (see Shea 1995) or secondly, individuals do face liquidity constraints, however, they do not use credit card lending as a means to overcome these constraints. Clearly more analysis in this area is required if conclusive results are to be produced.

Within Chapter 3 we outlined three diagnostic tests that would be employed upon our estimations of Mankiw’s REPIH in an attempt to detect the existence of any econometric mis-specifications. These being the Ljung-Box test for autocorrelation

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7 Consequently, current non-durable consumption expenditure will be overly sensitive to current income.
8 Shea examines the Permanent Income Hypothesis as opposed to the REPIH.
(LB Stat), the Chow test for structural stability (C Stat) and the ARCH test for
heteroscedasticity (ARCH Stat). The results of these tests are presented in Table 5.1.

The Q-statistics produced in the application of the Ljung-Box test for autocorrelation,
are unable to reject the null hypothesis that all of the autocorrelation coefficients are
simultaneously equal to zero at the 0.01 level of significance. Therefore we are able to
conclude that the time series was generated by a white noise process. These results are
reconfirmed by the lack of significance of the lagged value of the dependent variable as
a predictor variable.

Turning our attention to the results produced from conducting the Chow test on our
estimations of the REPIH we can see that the results obtained are insignificant at the
0.01 level. This occurrence does not permit us to reject the null hypothesis that the
model is structurally stable.

Examination of the plots of the residuals produced from our estimations of equations 1
to 19 indicate an absence of heteroscedasticity (see Appendix F). We then employ the
ARCH test for heteroscedasticity. The statistics produced from this analysis indicate an
absence of heteroscedasticity at the 0.01 significance level. Consequently we are unable
to reject the null hypothesis that the residuals are both homoscedastic and independent
of the regressors and that the linear specification of all the equations estimated in our
examination of the REPIH are correct.

Further examination of Table 5.1 reveals that our estimation of Mankiw's model of the
REPIH produces extremely low $R^2$ and adjusted $R^2$ values. This occurrence can be
explained in terms of the approach taken in this analysis. In estimating the REPIH, we have concentrated upon determining which variables (if any) violate Mankiw’s null hypothesis. Consequently we have employed five other independent variables in addition to the change in the lagged value of real interest, on an individual basis, in an attempt to determine which variables are significant and which are not. Our analysis has not been an exercise in the maximisation of the $R^2$ value.

Rather than attempting to maximise the $R^2$ values obtained, some of the more relevant issues in our estimation of the REPIH are; the acquisition of dependable estimates of the true population, that the estimated coefficients are equivalent with a priori expectations and the attainment of the knowledge that the independent variables are either significant or insignificant in explaining the dependent variable (see Gujarati 1995). In relation to the first and second issues, the results produced do not appear to be unusual in nature (contrary to some results produced by Johnson)\(^9\) and do not violate any of the diagnostic tests applied to them to examine econometric irregularities (as reported above). With respect to the third and most significant issue, the results indicate that variables other than the lagged value of the change in the real interest rate add to the regression equation's predictability. This is in strict contradiction of Mankiw’s null hypothesis and represents one of the more valuable findings of this thesis.

The results produced from our estimation of Mankiw’s variable real interest rate model.

\(^9\) These include the production of a t-statistic of 944.40 for the lagged value of non-durable consumption expenditure and a t-statistic of 993.62 for the lagged value of the change in the unemployment rate.
of the REPIH reject equation 5.1 and consequently the null hypothesis that \( b = 0 \).

Following the rejection of Mankiw's null hypothesis our results also call into question the REPIH as it is usually applied (see equation 3.3). This rejection of the REPIH is consistent with Johnson's (1983), MacDonald and Kearney's (1990) and Milbourne and Otto's (1992) rejection of the hypothesis on Australian data.

### 5.2 The Behavioural Consumption Function

As outlined in Chapter 1, one of the objectives of this thesis is to produce an empirically testable consumption function that is behavioural in nature - the Behavioural Consumption Function (BCF)\(^{10}\). Respondents were questioned as to what economic variables they considered important when making the decision to expend on non-durable goods and services\(^{11}\). These responses have in turn been employed to produce our BCF. In this section we present the BCF and report the results obtained from its estimation on Australian data for the period 1976 (1st quarter) to 1994 (2nd quarter).

Returning our attention to Figure 4.6, we note that the individuals surveyed indicated that their decision to expend on non-durables is very much centred around: (i) their previous purchases; (ii) their need for the product or service; (iii) the amount of available money; (iv) price; (v) the quality of the non-durable good or service and (vi) the level of available credit. In the construction of the model, restrictions were

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\(^{10}\) With exception to two paragraphs that discuss our analysis of the BCF within an REPIH framework, the term BCF refers to the consumption function we have derived from our survey data.

\(^{11}\) See Questions 1-5 in Appendix B.
placed upon the variables that could be utilised as all were not available in a time series format. Only three variables chosen by respondents are conducive to an analysis that employs time series data, these are (i), (iii) and (vi) above. Thus the BCF denotes non-durable consumption expenditure \((C)\) to be a function of net income less financial obligations \((Y_{n-fin})\), the amount of credit available \((Cr)\) and a lagged value of the dependent variable (depicting previous purchases) \((C_{t-1})\). Consequently the BCF takes the following form;

\[
C_t = f(Y_{n-fin} + Cr_t + C_{t-1})
\]  

(5.2)

When attempting to produce a numerical aggregate value for the variable net income less financial obligations, it was noted that the disposable measure of household income produced by the ABS in the national accounts satisfied this notion. This measure of income includes; earnings from wages and salaries plus government supplements, net income from dwellings\(^{12}\), income earned in the form of profits, farm income, personal benefit payments, grants and unrequitited transfers from overseas. From this measure of household income the ABS deduct the following disbursements; income tax, government fees, fines, utility payments, consumer debt interest and unrequitited transfers overseas. This produces at a macro level, a measure of disposable household income akin to the variable net income less financial obligations. Data for

\(^{12}\) Net income earned from dwellings refers to the difference between money received as rental income and interest and the amount that is paid out as rent or home loan interest repayments (see ABS cat. no. 5204.0).
the other two variables in the BCF (Cr and $C_{t-1}$), are identical to that data employed in our re-examination of the REPIH above\(^{13}\).

In order to make the BCF comparable with Mankiw's model of the REPIH, we employ the growth rates of the three variables that constitute the BCF. Consequently the BCF is estimated in the following form;

$$G_t = \alpha + \beta \ D_{hy_t} + \lambda \ Cr_t + \sigma \ G_{t-1} + u_t \quad (5.3).$$

Where $G$ is the rate of growth in real non-durable consumption expenditure, $D_{hy}$ depicts the growth in real disposable income, $Cr$ represents the growth of available credit in real terms, $\alpha$ denotes the fixed coefficient, $\beta$, $\lambda$, $\sigma$ the variable coefficients and $u$ is a random error term.

The econometric results obtained from the estimation of the BCF (see equation 20) are reported in Table 5.2\(^{14}\). One of the more pleasing aspects of these results, is the significance of the majority of the independent variables contained within the BCF. $D_{hy}$ is significant at the 0.01 level and $Cr$ is significant at the 0.05 level, however, the lagged value of $G$ fails to be significant at the 0.10 level and is only significant at the 0.20 level\(^{15}\).

\(^{13}\) The methodology employed in obtaining this data is outlined in Chapter 3.

\(^{14}\) The t-statistics are presented in parentheses.

\(^{15}\) Caution must be used when interpreting the significance of the lagged value of $G$, as it provides an extremely weak explanation of the variation in the growth of $G$. 
Table 5.2. Results Obtained from the Analysis of the Behavioural Consumption Function

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<tbody>
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<td>20</td>
<td>G₁</td>
<td>0.005</td>
<td>0.291970</td>
<td>0.040312</td>
<td>-0.147492</td>
<td>0.33732</td>
<td>0.30809</td>
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<td>1.8146</td>
<td>11.5381</td>
<td>0.000003</td>
<td>0.008</td>
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<td></td>
<td></td>
<td></td>
<td>5.56658</td>
<td>2.1629</td>
<td>-1.46801</td>
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<tr>
<td>21</td>
<td>G₁</td>
<td>0.007</td>
<td>-0.0402</td>
<td>0.0212</td>
<td>-0.0657</td>
<td>0.02715</td>
<td>-0.0164</td>
<td>1.5268</td>
<td>0.57099</td>
<td>1.7125</td>
<td>0.62315</td>
<td>0.060251</td>
<td>0.0194</td>
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<td></td>
<td>-0.05292</td>
<td>0.0915</td>
<td>0.44486</td>
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* G denotes the rate of growth in non durable consumption expenditure, Dhy the rate of growth in disposable household income and Cr the rate of growth in available credit.

# Significant at the 1% level, * Significant at the 5% level and + Significant at the 10% level.
Further examination of Table 5.2 indicates that the regression intercept reported is positive, conforming our a priori expectation that the level of autonomous consumption is positive. The coefficients obtained for the independent variables Dhy and Cr, are also positive, denoting a positive relationship between the growth in non-durable consumption expenditure and the growth in Dhy and Cr. The only negative regression coefficient obtained is the lagged value of non-durable consumption expenditure\textsuperscript{16}.

Strictly speaking the BCF (as presented in equation 20) is not directly comparable with the REPIH. In order to make a direct comparison between these two alternate models of non-durable consumption expenditure possible, we employ two of the independent variables identified by our respondents as important considerations (Dhy and Cr) in a lagged form (see equation 21). This produces a model that is comparable with Hall’s (1978) REPIH. It is important to note that in doing this we are in a sense compromising the behavioural nature of the BCF.

In examining the results produced from equation 21 we find that none of the independent variables employed in this form are significant. Thus we are unable to reject the REPIH. Alternatively, given that the lagged value of non-durable consumption expenditure is also not significant our results are unable to provide any support for Hall’s REPIH. Consequently the results produced from our examination of the BCF within a strict REPIH framework prove to be inconclusive.

\textsuperscript{16} This occurrence is in keeping with the results produced by Zuehlke and Payne (1989), Haug (1991) and Khayum and Baffoe-Bonnie (1994).
In Chapter 3 we outlined three diagnostic tests that would be employed to discover any econometric mis-specifications in our time series analysis. The results of these tests as conducted on the BCF are presented in Table 5.2.

The results obtained from conducting the Ljung-Box test were 2.54 and 1.53, which are not significant at the 0.01 level. Consequently we are unable to reject the null hypothesis that the autocorrelation function is zero, which once again leads us to conclude that the time series was generated by a white noise process. Turning our attention to the results produced from conducting the Chow test, we see values of 1.15 and 0.57 are obtained. These values are also not significant (at the 0.01 level). Therefore we are unable to reject the null hypothesis that the model is structurally stable.

An examination of the plots of the residuals produced from our estimation of equations 20 and 21, indicate an absence of heteroscedasticity (see Appendix F). We then employ the ARCH test for heteroscedasticity. The statistics produced from this analysis are 1.81 and 1.71 which indicate an absence of heteroscedasticity at the 0.01 significance level. Thus we are unable to reject the null hypothesis that the coefficient of the lagged squared residuals are all zero. Consequently the residuals are both homoscedastic and independent of the regressors and that the linear specification of the BCF is correct.

The results produced from the three diagnostic tests applied to the BCF allow us to conclude that the BCF does not contain any econometric mis-specifications. This occurrence while comforting, is secondary to our finding that the majority of the variables nominated by the respondents, are significant (as denoted by the t-statistic)
predictors of variations in the growth of non-durable consumption expenditure. Consequently, it may appear that the methodology we have employed in the construction of our BCF may prove to be superior to the positivist approach currently pursued by many of the economists that adhere to the new classical school of economics (see Friedman 1953). In the very least, these results indicate that economic research that employs a behavioural methodology is a justifiable and worthwhile line of inquiry.

Despite the significance of most of the variables contained within the BCF, our estimations produce relatively low $R^2$ values. This occurrence would appear to suggest that the BCF provides a relatively poor explanation of variations in the growth of non-durable consumption expenditure. As we have discussed above, in the production of the BCF we have been unable to include all of the variables chosen by respondents as considerations in the non-durable expenditure decision making process, as they were either unavailable in a time series format or not conducive to time series analysis. The attainment of a low $R^2$ value also indicates an absence of explanatory information. It is our belief that by including those variables that were not available in a time series format when estimating the BCF, the $R^2$ value produced would have improved\(^\text{17}\).

In spite of the low $R^2$ value produced, the BCF performs as well as the REPIH in explaining variations in non-durable consumption expenditure\(^\text{18}\). Looking at the results

\(^{17}\) It is important to note that econometric analysis is not just about maximising the $R^2$ statistic (see Gujarati 1995).

\(^{18}\) A discussion of the results produced by the BCF and our re-estimation of the REPIH will be presented in section 5.3.
obtained by two of the more recent examination of the REPIH, we note that
MacDonald and Kearney produce an $R^2$ value of 0.29 when employing the change in
the sum of disposable income as the additional independent variable. In comparison
Acemoglu and Scott utilise a one and two period lagged consumer confidence index as
additional variables in their examination of the REPIH, producing $R^2$ values of 0.440
and 0.292 respectively.

Although the $R^2$ values obtained by Acemoglu and Scott are considerably higher than
those produced by MacDonald and Kearney and the BCF, it should be noted that
Acemoglu and Scott examine the REPIH on UK data in comparison to MacDonald
and Kearney’s and our employment of Australian data. Secondly, the higher $R^2$ value
obtained by Acemoglu and Scott can also be explained in terms of the high t-statistic
produced by the consumer confidence index in explaining changes in non-durable
consumption expenditure$^{19}$.

The results presented in Table 5.2 indicate that the BCF produces a Marginal
Propensity Consume (MPC) of 0.29. In comparison to other MPC’s produced with
Australian data, the BCF’s MPC approximates those of Bladen-Hovell and Richards
(1983) and Dixon and Rimmer (1995)$^{20}$. Yet we are unable to make direct
comparisons between our MPC and that of Johnson’s (1983), as Johnson only employs
lagged values of income and consequently the MPC’s produced are significantly
smaller.

$^{19}$ The t-statistic is 7.869.
$^{20}$ Dixon and Rimmer produce a MPC for total consumption. Following the Lewis et al. (1994)
suggestion that non-durable consumption constitutes 27% of total consumption, the MPC’s are
comparable.
As alluded to earlier our attempts to produce a BCF have been impaired by the availability of time series data. A discussion of some of the difficulties associated with four of these variables is presented below (i.e. need, quality, price and previous purchases).

Figure 4.6 indicates that the variable ‘need’ is an important consideration by respondents when expending upon non-durables. The emergence of this variable as a leading consideration by the respondents is not a surprising result given the nature of most non-durables. It is our belief that in nominating this variable, respondents were attempting to explain the motivating force behind purchasing basic items such as food and clothing. Items that are fundamental to survival. Nevertheless, irrespective of the high proportion of respondents who nominated ‘need’ as an important consideration, it is almost impossible to quantify this variable in terms of time series data. If we had however, chosen to produce the BCF using cross sectional data, the variable ‘need’ could have been encompassed within the model via the inclusion of a dummy variable\textsuperscript{21}.

The respondents have also nominated the variables ‘price’ and ‘quality’ as important considerations when deciding to purchase non-durable items. With respect to the variable ‘price’, we interpret this variable to represent the relative price amongst different non-durable items as opposed to the absolute price of a particular non-durable good or service\textsuperscript{22}. That is, when the respondents are choosing between non-durable goods or services, they take into consideration the relative prices amongst these goods

\textsuperscript{21} This does not imply that dummy variables cannot be employed with time series data.

\textsuperscript{22} Given that the respondents chose price as a consideration and not the inflation rate.
or services. Therefore ‘price’ would only have an impact upon the distribution of expenditure on non-durable items as opposed to being an influence upon aggregate expenditure.

Like ‘price’, ‘quality’ also appears to be a determining factor when choosing between non-durables, as opposed to deciding to expend income on non-durables. Having said this however, if a range of non-durable items were of a relatively poor quality, this may then limit (or prevent in extreme circumstances) the amount of money spent on these products\(^{23}\). Nevertheless, these two variables appear to be important determinants of the distribution of expenditure upon non-durables as opposed to influencing the aggregate level of non-durable expenditure. Consequently we have decided not to include them within the BCF, as the BCF is designed to be a model aggregate expenditure on non-durable goods and services.

The selection of the variable, previous purchases by the respondents is an interesting inclusion, as it not only improves the econometric model by making it more dynamic in nature, but it also provides some anecdotal support for the REPIH as depicted by Hall’s (1978) hypothesis\(^{24}\). While conducting the questionnaire, indications were that previous purchases referred to how much was expended over the previous week or fortnight (see Q4(b) in Appendix C) and hence revealed a close relationship between the variable net income less financial obligations, or how much money was still available. Consequently we are dealing with a much reduced time frame for previous purchases than available in the current time series format, as non-durable expenditure

\(^{23}\) The same could be said for ‘price’ with respect to the overall cost of a category of goods.
\(^{24}\) The results presented in Table 5.1 subsequently reject this casual observation.
decisions are made more frequently than they are currently reported. Hence there may be valuable information that is being obscured as a consequence of the collection of quarterly data as opposed to the collection of data on a more frequent basis (see Haug 1991 and Aitken and Ironmonger 1995). Fluctuations and behavioural patterns that may exist in the data, might have been removed through the current practice of collecting data on a three monthly basis (which cannot be returned by simply converting this data back to a weekly or fortnightly format). This approach to data collection may also explicate the relatively poor performance of the variable in explaining variations in expenditure upon non-durables.

5.3 Overview and Comparison of Consumption Functions

In undertaking our analysis of Australian non-durable expenditure (time series) data we have estimated two distinct models of consumer behaviour. The first was our estimation of Mankiw's variable real interest rate model of the REPIH. This approach assumes that economic agents form their expenditure decisions in an optimal manner. Our second model makes no such assumptions, but rather attempts to capture the behaviour exhibited by individuals in the expenditure decision making process.

The results obtained in the estimation of the REPIH leads us to reject the null hypothesis as stated by Mankiw, which in turn calls into question the REPIH as it is usually applied. This occurrence (when coupled with the results presented in Chapter 4) not only casts doubt upon the REPIH as a model capable of explaining non-durable consumption expenditure, but also questions the assumption that economic agents
behave in a manner in accordance with the concept of optimisation. Our results appear to suggest that the underlying assumption of optimising behaviour, when captured within an econometric model of non-durable consumption expenditure, does not produce satisfactory results.

In contrast (despite the difficulties associated in the production of the BCF) our alternate model of non-durable consumption expenditure performs very well. Unlike the REPIH, the BCF makes no assumptions as to the behaviour exhibited by the respondents used in its construction. Its main objective is to capture the behaviour employed in the non-durable expenditure decision making process, which appears to be satisficing in nature (see Chapter 4). Consequently the BCF can be viewed as a macro model of satisficing behaviour.

In light of the significance of the majority of the variables contained within the BCF we find the methodology employed in the BCF’s formation to be useful. Yet despite this initial success, improvements to the BCF (and other behavioural models of economic decision making) can still be made by employing larger sample sizes, refining the information gathering process and developing more appropriate measures of time series data.
Chapter 6

LIMITATIONS, FUTURE RESEARCH, AND CONCLUSIONS

The investigations undertaken in this thesis have set out to examine the proposition that consumers form decisions of a satisficing nature when expending upon non-durable goods and services and that this satisficing behaviour can be explained in terms of the cognitive limitations these consumers face. We investigate this proposition on both a microeconomic (see Chapter 4) and macroeconomic (see Chapter 5) basis.

From a micro perspective we employ a one-way ANOVA analysis in an attempt to determine if our respondents form optimising non-durable expenditure decisions. These results are unable to provide evidence in support of optimal decision making by the respondents. Further analysis suggests that the formation of sub-optimal decisions on the behalf of the respondents appears to be a consequence of cognitive constraints. In order to make decisions within these cognitive constraints, it seems the respondents' generate rules of thumb, that permit the formation of satisficing decisions and the exhibition of rational behaviour in a bounded sense (see Simon 1957).

On a macro level we produce a consumption function that has been derived by employing a behavioural methodology. In applying this approach, the consumption function encapsulates the behaviour demonstrated in the expenditure decision making process by our respondents. As the respondents analysed in the construction of the behavioural consumption function appear to exhibit satisficing behaviour, the
behavioural consumption function becomes a macroeconomic model of satisficing behaviour. This model is then estimated upon Australian time series data. The results obtained from the behavioural consumption function are compared with our estimation of Mankiw’s (1981) variable interest rate model of the rational expectations permanent income hypothesis. As Mankiw’s approach assumes individuals to be optimising in nature, we are able to make a comparison between the satisficing and optimising theories of decision making on a macroeconomic level. The results produced from this comparison appear to support the employment of behavioural methodologies in the construction of macroeconomic consumption functions. The results however, prove to be inconclusive when attempting to determine which model produces a better explanation of variations in the growth rate of non-durable consumption expenditure.

In the remainder of this chapter we present some of the limitations this research has encountered, avenues of possible future study and our conclusions.

6.1 Limitations and Future Research

In preparing this thesis we have faced a number of constraints that have placed limitations upon the research conducted. These limitations however, may in turn provide avenues of future research. In this section we will present a brief discussion of these limitations and the resultant areas of possible future inquiry.

One of the more evident limitations of this thesis is that the primary data employed in our micro analysis and in the construction of the behavioural consumption function is
obtained from a sample of 100 Sydney residents. Consequently broad generalisations from our results have to be treated with caution, due to the relatively small sample size utilised. Yet having said this, survey work will always suffer as a consequence of not examining the entire population. The skill lies in limiting the negative impact working with survey data (as opposed to census data) can have upon the research design. We have attempted to minimise this impact by selecting a random sampling technique that permits the attainment of a sample that encompasses the broader characteristics of the total population. If the behavioural methodology employed within this thesis is to make a significant contribution to the field of economics, then further analysis of larger and more diverse sample sizes is required.

In employing a survey as one of our major information gathering tools, we have also encountered a number of more general problems that occur when collecting primary data. Namely two forms of response bias (interviewer bias and social desirability bias), along with systematic sampling error and testing effects.

In relation to the responses biases encountered, the bias that appears to be most prevalent in our collection of primary data is that of interviewer bias\(^1\). Interviewer bias may have affected the responses we have obtained in two ways. First, by asking respondents which of the following pieces of information do they consider when expending upon non-durables (See Appendix B, section 1), we may have been attempting to access a thought process that takes place unconsciously, if at all. Secondly, when attempting to ascertain the respondents understanding of the four

\(^1\) "Bias in the responses of subjects due to the influence of the interviewer." (Zikmund 1994 p178).
macroeconomic variables presented to them (see Appendix B, section 3), some prompting did occur in an attempt to interpret the explanations provided and ensure that if the respondent vaguely understood the variable in question, we could record this understanding, no matter how limited it was\(^2\). In either instance, the interviewer did (unavoidably) impact upon the responses obtained.

There is also a chance that some of the responses we obtained may have contained an element of social desirability bias\(^3\). In asking respondents if they were aware of the four macroeconomic variables in question (see Appendix B, section 3), the respondents may have felt that by answering in the negative they would have appeared uninformed. Consequently this may have influenced some of our respondents to answer in the affirmative despite having no recollection of the variable(s) in question.

By employing the Sydney metropolitan telephone directory as our source of respondents, there exists a small systematic sampling error, in that this approach excludes those Sydney residents that have unlisted telephone numbers. Nevertheless as the majority of Sydney’s population is listed within this directory, this occurrence should not have effected the representative nature of the sample. As discussed above, our major concern here lies in the size of the sample employed.

As explained in Chapter 3, when we designed the questionnaire, we were concerned about alerting the respondents to the four macroeconomic variables presented to them

\(^2\) This occurrence would have biased the results in favour of finding that the respondents’ formed optimal decisions (see Section 3.1.1).

\(^3\) “Bias in the responses of subjects caused by respondents’ desire, either consciously or unconsciously, to gain prestige or to appear in a different social role.” (Zikmund 1994 p179),
in section 3 of the questionnaire, through questions contained within section 1 of the survey. Hence our decision to present the four variables under consideration (the CPI, GDP, the unemployment rate and the level of interest rates) in a more general form in section 1 before their formal presentation in section 3. By doing so, we have attempted to minimise the impact any testing effect\(^4\) may have had upon the results obtained within section 3 of the questionnaire.

In utilising this primary data in our microeconomic examination of the non-durable consumption expenditure decision making process, we have examined what are the important variables considered by the respondents, as opposed to how these variables have been employed by the respondents. Consequently our analysis attempts to interpret how we believe the respondents use economic information in their non-durable consumption expenditure decision making (see section 4.2). This is one of the shortcomings of employing primary data obtained via a telephone administered questionnaire\(^5\). To make the results presented in Chapter 4 of the thesis conclusive would require the development and implementation of further questionnaires, in-depth interviews and experiments. Consequently we can view the results presented in Chapter 4 of the thesis as preliminary in nature.

We have discussed in Chapter 5 that the construction of the behavioural consumption function has been inhibited by both the types of time series data available and the intervals in which the available data is collected. If behavioural methodologies are to

\(^4\) The testing effect is the impact a pre-test or other part of a questionnaire may have in sensitising the respondents to the actual experiment or the remainder of the questionnaire (see Zikmund 1994).

\(^5\) In that, in-depth analysis is difficult to undertake.
be employed in the production of large scale econometric models, then statisticians will be required to rethink the manner in which statistics are collected and the types of statistics that are produced. The adoption of a behavioural methodology will only produce econometric models as good as the data available. This may prove to be a costly exercise, however, it is our belief that valuable information is being ignored as a consequence of the collection of data over extended periods of time (see Haug 1991 and Aitken and Ironmonger 1995). This missing information cannot be retrieved by simply dividing the available time series data into shorter time frames. Particularly in the case of non-durable consumption expenditure, where the decision making process is made on a frequent basis. Consequently the behaviour exhibited in this high frequency decision making process may be obscured by the collection and presentation of quarterly data.

From the results obtained in Chapter 4, we suggest that the small number of variables chosen as important considerations in the non-durable expenditure decision making process is a consequence of the respondents’ cognitive ability. These cognitive constraints result in the establishment of rules of thumb that permit the respondents to make satisficing decisions. We identify the possible existence of a number of such rules of thumb (see section 4.1). These explanations may suffice for now, but it is our belief that further research is required to determine the range of rules of thumb that may exist and in which economic contexts they are employed. Unless behavioural and Post-Keynesian economists can identify the existence of such rules of thumb, they risk being dismissed by critics as economists who are presenting an unsatisfactory explanation for occurrences they simply do not understand and are unable to quantify.
In section 2.2.1 we presented three limits to rational behaviour. One of these limits was the uncertain nature of the future and the impact fundamental uncertainty has upon the decision making process. In our analysis we have concentrated on attempting to determine if constraints exist on the internal information processing abilities of individuals and if so, do these constraints prevent the formation of optimal decision making. As discussed in section 2.2.1, the presence of fundamental uncertainty presents itself as an additional external cognitive constraint which also results in the formation of sub-optimal decisions by individuals. Although both these limits to rational behaviour result in individuals forming rules of thumb and decisions in a satisficing sense, this thesis would have benefited from an attempt to address the presence of fundamental uncertainty in the decision making process. Clearly this represents an opportunity for future research.

Finally, this thesis sets out to examine if the computational abilities of economic agents influence the information employed in the non-durable consumption expenditure decision making process. As we have discussed in Chapters 2 and 4, computational ability is just one of the many constraints that individuals face in their economic decision making and expenditure upon non-durables is just one of the many economic activities undertaken by individuals. Thus we recommend that the concepts of optimising, bounded rationality and hence satisficing, be re-examined within the context of different economic decision making processes, while simultaneously examining how different constraints impact upon the decisions made. It is only once we have examined these alternate models of decision making within all of the economic decisions that individuals undertake, that we can be certain that they form satisficing
decisions in accordance with the bounded rationality hypothesis, or make optimal decisions and adhere to the concept of constrained maximisation.

6.2 Conclusions

In summary, this thesis attempts to provide an empirical answer to a largely theoretical question. That is, do economic agents make decisions that are satisficing in nature when expending upon non-durable goods and services and can this satisficing behaviour be explained in terms of their cognitive abilities? In attempting to provide an answer to this question we have produced a number of findings. These findings are as follows.

On a micro level, we find that the respondents surveyed form non-durable consumption expenditure decisions that appear to be sub-optimal in nature. Examination of our results (see Chapter 4) illustrate that the respondents employ only a small proportion of the economic information available to them. In an attempt to determine if this occurrence is a consequence of optimal or satisficing decision making, respondents are grouped on the basis of the number of variables they have chosen as important considerations when expending upon non-durables and are questioned as to their awareness and appreciation of four key economic variables. Following Kreps (1990) and Sargent (1993) we relax our aforementioned definitions of optimisation and satisficing\(^6\), consequently treating cognitive ability as an additional constraint faced by the optimising individual. In this form, if the respondents behave in an optimal manner,

\(^6\) See Chapter 2 for a discussion of optimising and satisficing behaviour.
the number of variables they choose as important considerations in the non-durable expenditure decision making process, should be a function of their awareness and appreciation of economics\(^7\). The results from our one-way ANOVA analysis indicate that the number of variables chosen by respondents is not a function of their relative economic abilities. This outcome appears to suggest that the respondents make sub-optimal decisions.

Further analysis of the primary data we obtained from the respondents, also appears to suggest that the formation of sub-optimal decisions is a consequence of the cognitive limitations faced by the respondents. We also identify what appear to be a number of rules of thumb, that have been established to permit the formation of satisficing decisions. In all, it would appear that our results are amongst the first Australian studies to provide empirical support for Simon’s (1957) bounded rationality hypothesis, within the context of the non-durable consumption expenditure decision making process.

One of the rules of thumb we identify is that of habit or previous behaviour\(^8\). This observation is not only consistent with Simon’s bounded rationality hypothesis, but also provides support for the Post-Keynesian view, that consumption expenditure is largely based upon habit (see Drakopolous 1992 and Lavoie 1992 and 1994). Post-Keynesian’s explain that in an attempt to compensate for their cognitive limitations (while functioning in an economy that is dynamic in nature and contains a

---

\(^7\) As measured by the four variables presented to them.

\(^8\) Like cognitive ability, habit appears to be an additional internal constraint that prevents optimising behaviour from occurring.
fundamentally uncertain future), economic agents undertake expenditure decisions that contain a significant element of habit. In short, Post-Keynesian's suggest that the items economic actors have previously purchased will stand them in good stead again (in terms of providing satisfaction) when confronted with a similar expenditure decision in the future. Our results appear to add empirical weight to what has been until now a theoretical model of consumer behaviour.

The alternate consumption model developed by the Post-Keynesian school\(^9\), makes the distinction between durable and non-durable consumption expenditure on the basis of needs and wants (see Drakopoulos 1990 and Lavoie 1992 and 1994)\(^{10}\). In this model those goods or services that are more critical for survival are classified as needs and tend to be non-durable in nature\(^{11}\). While items that are not as critical to the survival of individuals are seen to be wants and consequently more durable in nature. The Post-Keynesian analysis places a large emphasis upon consumption expenditure behaviour that can be attributed to need. This portion of the Post-Keynesian theory is once more supported by our results. If one returns their attention to the results obtained from questions 1-5 (see Appendix B), one should note that a large majority of the respondents indicated that need was an important determinant of their non-durable consumption expenditure\(^{12}\).

\(^9\) This alternate model of consumer behaviour is based upon six principles (see Lavoie 1992). In producing evidence that suggests individuals face cognitive constraints, we provide empirical support for the first of these principles, the principle of procedural rationality.

\(^{10}\) This line of thought is also consistent with ideas presented by Karl Menger and Alfred Marshall.

\(^{11}\) It is important to note that within this category, some goods and services will be deemed more critical for survival than others.

\(^{12}\) Need received 56 responses as an important consideration. This represents the second most popular alternative chosen.
Although our analysis has not concentrated upon establishing how uncertainty impacts upon the decision to expend upon non-durables, we provide some evidence to support the existence of fundamental uncertainty. In identifying the presence of cognitive constraints we also identify the presence of uncertainty. Cognitive constraints not only result in the existence of unknown alternatives that the individual may choose from (see McNally 1980), it also results in the existence of non-parametric agents. Because of the cognitive constraints agents face, they develop rules of thumb based upon psychological traits (such as habit or need) in order to form satisficing decisions. As each individual has a different psychological profile, both the rules of thumb that are developed and the behaviour exhibited will be diverse. Therefore agents will not know how all other individuals behave and consequently they will be unable to reasonably assume that this behaviour is constant (see Drakopoulos 1990). The existence of unknown alternatives and non-parametric agents introduces the presence of fundamental uncertainty into the cognitively constrained individual’s decision making environment.

The final parallel we can draw from our results and that of the Post-Keynesian model of consumption expenditure, comes from the Post-Keynesian school’s emphasis on the income effect, while downplaying the substitution effect (see Lavoie 1992 and 1994). Consequently, changes in the relative prices of goods have little effect upon the combination of goods and services purchased, while changes in income have a greater impact upon the total amount expended on goods and services. Our results indicate

---

13 See section 2.2.1 for a discussion of the relationship between unknown outcomes, non-parametric agents and fundamental uncertainty.

14 This occurrence is a consequence of the existence of hierarchical needs and sub-needs (see Lavoie 1992 and 1994 for a full discussion).
that price is the fourth most popular consideration chosen by respondents when
deciding to expend upon non-durables. As discussed earlier, we interpreted ‘price’ to
represent relative price as opposed to absolute price\textsuperscript{15}. When this outcome is placed
within the context of the third most popular alternative chosen by respondents
(available money or disposable income) as an important consideration, our results
provide some weak empirical support for the greater emphasis Post-Keynesian’s place
upon the income effect as an important influence in the consumption expenditure
decision. Hence we can conclude that this thesis has added empirical support to both
Simon’s bounded rationality hypothesis and to the Post-Keynesian model of consumer
behaviour.

In addition to our analysis of primary data, this thesis also investigates Australian non-
durable consumption expenditure time series data for the period 1976(1)-1994(2). We
employ this data to examine two alternate macroeconomic models of non-durable
consumption expenditure. Mankiw’s (1981) variable real interest rate model of the
rational expectations permanent income hypothesis and a consumption function we
produce using a behavioural methodology.

This econometric analysis produces two interesting results. First, we reject Mankiw’s
null hypothesis that no other independent variable other than the lagged value of real
interest will be a significant predictor of variations in the growth of non-durable
consumption expenditure. This rejection occurs as a result of the significance of
lagged values of the growth in the Westpac Index of Consumer Sentiment in explaining

\textsuperscript{15} Absolute price is represented by the CPI.
the rate of growth in non-durable consumption expenditure\textsuperscript{16}. Following our rejection of Mankiw's null hypothesis, our results cast doubt upon the rational expectations permanent income hypothesis as it is usually applied.

Secondly, one of the most encouraging outcomes obtained from our econometric analysis is the significance (as denoted by the t-statistics) of the majority of the independent variables included within the behavioural consumption function. In producing the behavioural consumption function, we have employed those variables nominated most frequently by the respondents as important considerations in the non-durable expenditure decision making process. This occurrence appears to suggest that the methodology we have employed in the construction of our behavioural consumption function may prove to be superior to the positivist approach currently pursued by the majority of economists who subscribe to the new classical school of economics (see Friedman 1953). At the very least our results indicate that economic research that employs a behavioural methodology is a justifiable line of inquiry.

Despite the initial success of the behavioural consumption function, we are unable to supply conclusive evidence that it provides a better explanation of variations in the growth of non-durable consumption expenditure than the rational expectations permanent income hypothesis. In Chapter 5 we placed the behavioural consumption function into a rational expectation permanent income hypothesis framework (see Hall 1978). The results obtained from this analysis were unable to provide any evidence to support or reject the hypothesis. Consequently we are unable to state with any

\textsuperscript{16} This finding is consistent with Pickering (1981).
confidence that one model provides a better explanation of non-durable consumption expenditure than the other.

Finally, there are three general economic implications that arise from our analysis. Before presenting them however, it should be noted that as a consequence of the relatively small sample size employed and the preliminary nature of our findings, caution must be taken when attempting to generalise the results obtained here to the broader economic literature.

We have shown (on a micro level) that economic agents appear to form sub-optimal decisions as a consequence of the cognitive constraints they face. Our results also demonstrate that economic agents appear to be creatures of habit, employing previous behaviour within current constraints. These occurrences question both the strong and weak form versions of the rational expectations hypothesis. If further analysis of the behaviour employed by individuals within the context of economic decision making can show conclusively that economic agents adhere to the bounded rationality hypothesis and behave in a satisficing manner, economists will need to rethink the method in which they model human behaviour. Nowhere would this remodelling of human behaviour be more important than within the context of macroeconomic forecasting. Particularly as the majority of the current models employed assume the rational expectations hypothesis holds and individuals act in a rational manner.\(^\text{17}\)

In a more general sense, the identification of sub-optimal behaviour on the part of

\(^{17}\) That is rational in a Muthian sense.
some economic agents has been shown to result in changes to an economy's equilibrium (see Akerlof and Yellen 1985). These changes can be represented in the form of a kinked aggregate demand curve (see Drakopoulos 1992). The existence of a kinked aggregate demand curve implies that the new classical assumption of continuous market clearing does not hold. This in turn means that governments have an active role to play (through the use of discretionary fiscal and monetary policy) in the attainment of economic objectives.

Following from the relative success of the behavioural consumption function, we feel it may be time to rethink the way we as economists approach the science of economics, both on a theoretical level and a practical level. Current practice sees many economists pursuing a positivist approach (see Friedman 1953), where assumptions are made about both human and market behaviour. These assumptions then permit the development of economic theory and models that perform well within the classroom and under computer simulation, but fail to be very useful when applied to the actual economy (see Economic Planning and Advisory Commission 1994). Although there is still much work to be done in this area, it is our belief that the results produced within this thesis provide scope for the pursuit of economic theories and models that are developed within an understanding of how the economy actually works, as opposed to how it is assumed to work. What we are prescribing is a return to the days of Smith, Marshall and Keynes, when economists attempted to gain an insight into how the economy actually functioned (see Omerod 1994).

We conclude that the micro results obtained in this thesis add some empirical weight to the notion that consumers form satisficing decisions when expending upon non-durable
goods and services and that this satisficing behaviour can be explained in terms of the
cognitive limitations these consumers face. On a micro level, our results suggest that
the respondents questioned appear to behave in a rationally bounded manner, which
generates the development of rules of thumb and permit decisions to be made that are
satisficing in nature. From a macro perspective, we find evidence to question the
rational expectations permanent income hypothesis as formulated by Mankiw (1981).
Secondly, the results obtained from our construction of a behavioural model of non-
durable consumption expenditure suggest that the production of econometric models
that employ a behavioural methodology in their development is a justifiable line of
inquiry. In short, this thesis finds more evidence to suggest that individuals behave in a
satisficing manner than an optimising manner, within the context of the non-durable
consumption expenditure decision making process.
APPENDICES
APPENDIX A

Figure 1.1a. Real Interest Rates (1958-1992).

The above graph depicts the real rate of Australian 90 day Treasury Notes (Short term interest rates) and 10 year Government Bonds (prior to 1960), 20 year Government Bonds (1960-1980), and 15 year Government Bonds (1981-1992) (Long term interest rates). The calculation of the real value of Australian interest rates ($Ri$) was derived from the Fisher Effect which can be represented as follows;

$$Ri = \frac{(1 + M_i)}{(1 + P)} - 1 \quad (1.1a).$$
Where $M_i$ equates to the market rate of interest, and $P$ the general rate of inflation. As evident in Figure 1.1a, the real rate of interest appears to be far from constant, a finding in accordance with that of Mankiw (1981) and Michener (1984). One must note however, that there are difficulties associated with the calculation of real rates of interest (see Kolb 1986).
Good Morning/Afternoon/Evening,
I am from the University of Western Sydney and I am studying the decision making process undertaken by consumers. As a consumer, your input would be beneficial to this study. Would you like to participate in a short questionnaire.
SECTION 1

Q.1) When purchasing goods such as;
    Groceries,  
    Clothing,  
    Petrol,  
    Alcohol & Tobacco,  
    Medical care,  
    Recreation & Entertainment

which factors do you consider?

☐ Total income.  
☐ After tax income.  
☐ Expected after tax income.  
☐ After tax income less financial obligations.  
☐ None of the above.

Q.2) When purchasing goods such as;
    Groceries,  
    Clothing,  
    Petrol,  
    Alcohol & Tobacco,  
    Medical care,  
    Recreation & Entertainment

which factors do you consider?

☐ Inflation.  
☐ Unemployment.  
☐ Interest Rates.  
☐ The level of economic activity.  
☐ None of the above.

Q.3) When purchasing goods such as;
    Groceries,  
    Clothing,  
    Petrol,  
    Alcohol & Tobacco,  
    Medical care,  
    Recreation & Entertainment

which factors do you consider?

☐ My expectations of future economic conditions.  
☐ The amount of credit available.  
☐ The availability of jobs.  
☐ Expected salary bonuses, tax refunds, or other winnings.  
☐ None of the above.
Q.4a) When purchasing goods such as;
    Groceries,
    Clothing,
    Petrol,
    Alcohol & Tobacco,
    Medical care,
    Recreation & Entertainment
The amount I have previously purchased is an important consideration.
    □ Yes.
    □ No.

Q.4b) If yes, I consider the amount purchased over the last
    □ Week.
    □ Fortnight.
    □ Month.
    □ Year.

Q.5) Please list any others you consider important when purchasing these types of goods,


SECTION 2

Q.6) My expectations of my future economic situation is based upon (you may choose more than one);
    □ Media reports.
    □ Government announcements.
    □ Personal observations.
    □ Other, Specify


Q.7) My expectations of Australia’s future economic situation is based upon (you may choose more than one);
    □ Media reports.
    □ Government announcements.
    □ Personal observations.
    □ Other, Specify
Q.8) How do you know the level of inflation in the economy? (you may choose more than one).

☐ Don't know
☐ Personal observation
☐ Media reports
☐ Government announcement
☐ Other, Specify ______________________________

Q.9) How would you find out about the level of unemployment? (you may choose more than one).

☐ Don't know
☐ Personal observation
☐ Media reports
☐ Government announcement
☐ Other, Specify ______________________________

Q.10) How do you know how high the level of interest rates are? (you may choose more than one).

☐ Don't know
☐ Personal observation
☐ Media reports
☐ Government announcement
☐ Other, Specify ______________________________

Q.11) How do you know the level of economic activity that is occurring in the economy? (you may choose more than one).

☐ Don't know
☐ Personal observation
☐ Media reports
☐ Government announcement
☐ Other, Specify ______________________________
SECTION 3

Q.12a) Have you heard of the Consumer Price Index (CPI)?
   □ Yes
   □ No
   □ Unsure

Q.12b) If yes, what does it measure?

Q.13a) Have you heard of the Unemployment Rate?
   □ Yes
   □ No
   □ Unsure

Q.13b) If yes, what does it measure?

Q.14a) Have you heard of Gross Domestic Product (GDP)?
   □ Yes
   □ No
   □ Unsure

Q.14b) If yes, what does it measure?

Q.15a) Have you heard of Interest rates?
   □ Yes
   □ No
   □ Unsure

Q.15b) If yes, how are they calculated?
APPENDIX C

Q1 Which of these factors do you consider when purchasing non-durable goods?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tot. Inc.</td>
<td>3</td>
</tr>
<tr>
<td>Net Inc.</td>
<td>8</td>
</tr>
<tr>
<td>Exp. Net Inc.</td>
<td>2</td>
</tr>
<tr>
<td>Net Inc.-Fin Ob</td>
<td>45</td>
</tr>
<tr>
<td>NOTA</td>
<td>44</td>
</tr>
</tbody>
</table>

Key:

Q2 Which of the following factors do you consider when purchasing non-durable goods?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>12</td>
</tr>
<tr>
<td>Unemp</td>
<td>9</td>
</tr>
<tr>
<td>Int Rts</td>
<td>8</td>
</tr>
<tr>
<td>Ec Activity</td>
<td>4</td>
</tr>
<tr>
<td>NOTA</td>
<td>74</td>
</tr>
</tbody>
</table>

Key:
Inflation = Inflation rate, Unemp = Unemployment Rate, Int Rts = Level of interest Rates, Ec Activity = Level of Economic Activity, NOTA = None Of The Above.
Q3 Which of these factors do you consider when purchasing non-durable goods?

<table>
<thead>
<tr>
<th></th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future Exp</td>
<td>12</td>
</tr>
<tr>
<td>Avail Credit</td>
<td>25</td>
</tr>
<tr>
<td>Avail Jobs</td>
<td>9</td>
</tr>
<tr>
<td>F'tre w/falls</td>
<td>6</td>
</tr>
<tr>
<td>NOTA</td>
<td>53</td>
</tr>
</tbody>
</table>

Key:
Future Exp = Expectations of the Future, Avail Credit = Amount of Credit Available, Avail Jobs = Availability of Jobs, F'tre W/falls = Expected winnings or Salary Bonuses, NOTA = None Of The Above.

Q4(a) When purchasing non-durable goods do you consider the amount previously purchased?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>65</td>
</tr>
<tr>
<td>No</td>
<td>35</td>
</tr>
</tbody>
</table>

Q4(b) If yes, I consider the amount purchased over the last...

<table>
<thead>
<tr>
<th>Response</th>
<th>Percentage of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week</td>
<td>40.58%</td>
</tr>
<tr>
<td>Fortnight</td>
<td>30.43%</td>
</tr>
<tr>
<td>Month</td>
<td>11.59%</td>
</tr>
<tr>
<td>Year</td>
<td>17.39%</td>
</tr>
</tbody>
</table>
Q5 Other factors considered when purchasing non-durable goods

Key:

Q6 My expectations of my future economic situation is based upon
Other responses given in Q6

Key:
Person = Person Beliefs, Sent = Sentiment, J Sec'ty = Job Security, D Peers = Discussion with Peers, Imed F'tre = Immediate Future, Ec Vbles = Economic Variables, Present = the Present, Fin Sit = Financial Situation, D’nt Know = Don’t Know.

Q7 My expectations of Australia's future economic situation is based upon...

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media Reports</td>
<td>44</td>
</tr>
<tr>
<td>Government Announcements</td>
<td>47</td>
</tr>
<tr>
<td>Personal Observations</td>
<td>55</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
</tr>
</tbody>
</table>
Key:
Fin adv = Financial Advisor, D Peers = Discussions with Peers, No Imports = Level of Imports, Politicians = Politicians, Ec Grth = Economic Growth, Bel Info = Believable Sources, D’nt Know = Don’t Know
Q9 How would you find out about the level of unemployment?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don't Know</td>
<td>2</td>
</tr>
<tr>
<td>Personal Observations</td>
<td>9</td>
</tr>
<tr>
<td>Media Reports</td>
<td>77</td>
</tr>
<tr>
<td>Govt. Announcements</td>
<td>27</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
</tr>
</tbody>
</table>

Other responses given in Q9

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Govt. Dept.</td>
<td>2</td>
</tr>
<tr>
<td>Occupation</td>
<td>2</td>
</tr>
<tr>
<td>ABS</td>
<td>2</td>
</tr>
</tbody>
</table>

Q10 How do you know how high interest rates are?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don't Know</td>
<td>5</td>
</tr>
<tr>
<td>Personal Observation</td>
<td>23</td>
</tr>
<tr>
<td>Media Reports</td>
<td>63</td>
</tr>
<tr>
<td>Govt. Announcements</td>
<td>15</td>
</tr>
<tr>
<td>Other</td>
<td>21</td>
</tr>
</tbody>
</table>
Other responses given in Q10

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money Market</td>
<td>1</td>
</tr>
<tr>
<td>Occupation</td>
<td>2</td>
</tr>
<tr>
<td>Bank</td>
<td>17</td>
</tr>
<tr>
<td>Disc. with Peers</td>
<td>1</td>
</tr>
</tbody>
</table>

Q11 How do you know the level of economic activity that is occurring in the economy?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don't Know</td>
<td>17</td>
</tr>
<tr>
<td>Personal Observations</td>
<td>15</td>
</tr>
<tr>
<td>Media Reports</td>
<td>65</td>
</tr>
<tr>
<td>Govt Announcements</td>
<td>23</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
</tr>
</tbody>
</table>

Other responses given in Q11

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
<td>1</td>
</tr>
<tr>
<td>ABS</td>
<td>1</td>
</tr>
<tr>
<td>Disc. with Peers</td>
<td>2</td>
</tr>
<tr>
<td>New Bus. and New Construction</td>
<td>1</td>
</tr>
</tbody>
</table>
Q12(a) Have you heard of the CPI?

Number of Respondents

- Yes: 92
- No: 7
- Unsure: 1

Q12(b) If yes, what does the CPI measure?

Percentage of responses

- Correct: 7.61%
- Incorrect: 70.63%
- Partially Correct: 21.74%

Q13(a) Have you heard of the unemployment rate?

Number of Respondents

- Yes: 95
- No: 5
- Unsure: 0
Q13(b) If yes, what does it measure?

- Correct: 7.53%
- Incorrect: 44.09%
- Partially Correct: 48.09%

Q14(a) Have you heard of GDP?

- Yes: 61 respondents
- No: 32 respondents
- Unsure: 7 respondents

Q14(b) If yes, what does it measure?

- Correct: 27.89%
- Incorrect: 62.30%
- Partially Correct: 9.84%
Q15(a) Have you heard of interest rates?

- Yes: 97
- No: 3
- Unsure: 0

Q15(b) If yes, what do they measure?

- Correct: 3.09%
- Incorrect: 87.63%
- Partially Correct: 8.25%
APPENDIX D

Data Employed in Regression Analysis

- Growth Rate of Non-Durable Consumption Expenditure (1976:1 - 1994:2)
- Growth Rate in the Westpac Index of Consumer Confidence (1976:1 - 1994:2)
- Growth Rate of Disposable Household Income (1976:1 - 1994:2)
- Growth Rate of Available Credit (1976:1 - 1994:2)
- Growth Rate of Neo-Ricardian Income (1976:1 - 1994:2)
- The Level of Real Interest Rates (first difference) (1976:1 - 1994:2)
APPENDIX E

Unit Root Tests of Data Employed.

<table>
<thead>
<tr>
<th>Variable</th>
<th>MacKinnon Critical Value 1%</th>
<th>MacKinnon Critical Value 5%</th>
<th>MacKinnon Critical Value 10%</th>
<th>Dickey-Fuller test statistic</th>
<th>Unit Root Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>G growth rate</td>
<td>-3.5226</td>
<td>-2.9017</td>
<td>-2.5879</td>
<td>-9.031879</td>
<td>No</td>
</tr>
<tr>
<td>Dhy growth rate</td>
<td>-3.5239</td>
<td>-2.9023</td>
<td>-2.5882</td>
<td>-11.64319</td>
<td>No</td>
</tr>
<tr>
<td>Nry growth rate</td>
<td>-3.5239</td>
<td>-2.9023</td>
<td>-2.5882</td>
<td>-4.754613</td>
<td>No</td>
</tr>
<tr>
<td>Cs growth rate</td>
<td>-3.5239</td>
<td>-2.9023</td>
<td>-2.5882</td>
<td>-6.707107</td>
<td>No</td>
</tr>
<tr>
<td>Cr growth rate</td>
<td>-3.5239</td>
<td>-2.9023</td>
<td>-2.5882</td>
<td>-5.504586</td>
<td>No</td>
</tr>
<tr>
<td>r</td>
<td>-3.5226</td>
<td>-2.9017</td>
<td>-2.5879</td>
<td>-1.189498</td>
<td>Yes</td>
</tr>
<tr>
<td>Δr</td>
<td>-3.5239</td>
<td>-2.9023</td>
<td>-2.5882</td>
<td>-7.076349</td>
<td>No</td>
</tr>
</tbody>
</table>
APPENDIX F

Plot of Residuals From Econometric Examinations of Australian Time Series Data
ADDENDUM
In Chapter 4 of the thesis, we divided our respondents into three groups (Low, Moderate and High), based upon the number of variables they had chosen as important considerations in the non-durable consumption expenditure decision making process. The variance in the means of these three groups was then analysed using a one-way ANOVA. Concern was raised during the examination process that this may not have been the most appropriate statistical technique given the small number of respondents surveyed. Consequently, we re-examine this portion of the thesis employing the Kruskal-Wallis one-way analysis of variance (see Daniel and Terrell 1992 and Argyrous 1996).

The Kruskal-Wallis H statistic is calculated as follows,

$$H = \frac{12}{n(n+1)} \sum_{j=1}^{k} \frac{R_j^2}{n_j} - 3(n+1)$$  \hspace{1cm} (1)

Where $k$ is the number of samples, $n_j$ represents the number of observations in the $j$th sample, $n = \sum n_j$ or the total number of observations in all samples and $R_j$ depicts the sum of the ranks in the $j$th sample.

As in Chapter 4, we wish to determine if a significant difference exists between the three groups under consideration with respect to their awareness of the four economic variables presented to them (CPI, Unemployment, GDP and Interest Rates) and their appreciation of these four variables.
In an attempt to determine if all of the respondents are equally aware of the four economic variables presented to them, irrespective of which group they were placed in, we test the following null hypothesis: The mean number of respondents that are aware of the four economic variables in each group is not significantly different. The results obtained from this analysis are presented in Table 1.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>9.25</td>
</tr>
<tr>
<td>Moderate</td>
<td>6.50</td>
</tr>
<tr>
<td>High</td>
<td>3.75</td>
</tr>
<tr>
<td><strong>Kruskal-Wallis H Stat</strong></td>
<td><strong>4.654</strong></td>
</tr>
<tr>
<td><strong>df</strong></td>
<td><strong>2</strong></td>
</tr>
<tr>
<td><strong>P-value</strong></td>
<td><strong>0.098</strong></td>
</tr>
</tbody>
</table>

Implementing the Kruskal-Wallis one-way analysis of variance produces a H-statistic of 4.654 which prevents us from rejecting the null hypothesis at the 0.05 level of significance.

Secondly, we wish to determine if the mean appreciation of the four economic variables was the same for all three groups. Consequently we test the null hypothesis: The mean number of respondents that have an appreciation of the four economic
variables in each group is not significantly different. The results from this examination are presented in Table 2.

Table 2: Kruskal-Wallis Analysis of Respondents in terms of Information Appreciation

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>8.25</td>
</tr>
<tr>
<td>Moderate</td>
<td>7.75</td>
</tr>
<tr>
<td>High</td>
<td>3.50</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kruskal-Wallis H Stat</td>
<td>4.237</td>
</tr>
<tr>
<td>df</td>
<td>2</td>
</tr>
<tr>
<td>P-value</td>
<td>0.120</td>
</tr>
</tbody>
</table>

Once again we are unable to reject the null hypothesis as our analysis produces a H-statistic of 4.237, which fails to be significant at the 0.05 level.

As a consequence of our inability to reject either of the null hypotheses tested above using the Kruskal-Wallis one-way analysis of variance, we reconfirm the results produced by the one-way ANOVA analysis presented in Chapter 4. Therefore the discussion presented in the remainder of Chapter 4 and the conclusions drawn in Chapter 6 remain unchanged.
LIST OF REFERENCES


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SATISFICING VERSUS OPTIMISING BEHAVIOUR IN THE NON-DURABLE CONSUMPTION EXPENDITURE DECISION MAKING PROCESS:

AN EMPIRICAL EXAMINATION OF AUSTRALIAN DATA FOR THE PERIOD 1976(1) - 1994(2)

By

MARTIN TOLAR

A DISSERTATION SUBMITTED IN FULFILMENT OF THE REQUIREMENT OF THE MASTERS OF COMMERCE (HONOURS) PROGRAM OF THE UNIVERSITY OF WESTERN SYDNEY, MACARTHUR

FACULTY OF BUSINESS AND TECHNOLOGY
UNIVERSITY OF WESTERN SYDNEY
MACARTHUR, NSW 2256

November 1995
PLEASE NOTE

The greatest amount of care has been taken while scanning this thesis,

and the best possible result has been obtained.
For my dearest Sarah.
DECLARATION

I certify that the substance of this dissertation has not already been submitted for any degree and is not being submitted for any other degree.

I certify that to the extent of my knowledge any help received in preparing this thesis and all sources used, have been acknowledged.

[Signature]

Martin Tolar.
Preface

It has been suggested to me on many occasions during the preparation of this dissertation that ‘...your research is pointless. Everybody knows that no one takes into consideration any of this information when buying non-durables. When I walk down the aisle of a supermarket, I don’t care what the levels of interest rates, unemployment, gross domestic product or inflation are. All I care about is what I purchased last week and how much money I have this week. And I’m a trained economist.’

On each occasion that I have received such a comment I have been in total agreement with these people. The levels of interest rates, unemployment, gross domestic product and inflation are not important considerations when expending upon non-durables. On each occasion my response has been ‘...then why do economist devise economic models that suggest they are?’

This thesis embraces this casual presupposition and applies it to the rigours of both theoretical and empirical analysis.
Acknowledgements

In completing this thesis I have been generously assisted by many people. First and foremost, I wish to thank my principal supervisor Dr Jerry Courvisanos and co-supervisors Dr Steve Keen and Professor Colm Kearney for their guidance on the topic, substance, and editing effort throughout this thesis. Thanks are also due to Dr Anis Chowdury, Mr Kevin Daly and Mr Paul Hyland for their assistance in terms of both their time and access to their library.

I am also indebted to my wife Sarah, who not only provided encouragement and support throughout the research process, but also assisted in the administration of the surveys that were employed in this thesis.

I am particularly grateful to Mr Mark Tapley for both his friendship and his many thoughtful insights that have aided in the preparation of this thesis.

Finally I would also like to thank my employers at both the University of Western Sydney Macarthur’s faculty of Business and Technology and the University of Western Sydney Nepean’s Centre for International Management And Commerce. For without their financial support this thesis would not have been possible.

Ultimately, all remaining errors and omissions, however, are my responsibility alone.
Abstract

The new classical school's dominance of mainstream economic thought in recent years has brought with it the associated adoption of rational economic agents (in the Muthian sense) by mainstream economists. This thesis challenges this underlying assumption of human behaviour in the context of the non-durable consumption expenditure decision making process. In doing so, our attention will be placed upon the weak or more general form of the hypothesis, which has come to be known as optimisation. We employ a behavioural methodology in an attempt to ascertain if individuals adhere to the optimising or satisficing model of human behaviour. In doing so time will be spent examining the bounded rationality hypothesis. We also employ a behavioural methodology in producing a non-durable consumption function that is econometrically comparable with an optimising model of non-durable consumption expenditure (namely the permanent income rational expectations hypothesis).

The micro results produced in this thesis suggest that the respondents surveyed form non-durable consumption expenditure decisions that are sub-optimal in nature. The formation of these sub-optimal expenditure decisions appear to be a consequence of the cognitive constraints faced by our respondents, which in turn provides empirical support for the bounded rationality hypothesis. On a macro level, our behavioural consumption function generates results that are comparable with those produced by the optimising model employed in this thesis. Our results also question the rational expectations permanent income hypothesis (as it is usually applied), despite making adjustments to the model which remove the underlying assumption of known, constant real interest rate.
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“Moreover, the term ‘rational’ has long had in economics a much more specific meaning than its general dictionary significance of ‘agreeable to reason; not absurd, preposterous, extravagant, foolish, fanciful or the like; intelligent, sensible.’ As is well known, the rational man of economics is a maximizer, who will settle for nothing less than the best. Even his expectations, we have learned, in the past few years, are rational. And his rationality extends as far as the bedroom for, as Gary Becker tells us, ‘he would read in bed at night only if the value of reading exceeded the value (to him) of the loss in sleep suffered by his wife’.”

Herbert A. Simon

(1977, p59).