An Evaluation of Consumption Function for Pakistan Based on Time Series Analysis

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Acknowledgments

First of all, I would like to thank all the faculty members and staff at department of econometrics, Pakistan Institute of Development Economics, for their cooperation and encouragement. I am extremely indebted to my supervisor, Dr Abdul Qayyum, for his patience help and critical insights provided to me from time to time in developing my proposal and then in the completion of the final report. I would also like to take this opportunity to thank my co-supervisor, Dr Hafsa Hina, for her endeavoring suggestions which made this thesis report interesting for me. At the end, I, myself, am responsible for any weakness in this work.

Akbar Jan

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List of Abbreviations

Abbreviation	Words
AIH	Absolute Income Hypothesis
LCH	Life Cycle Income Hypothesis
PIH	Permanent Income Hypothesis
ECM	Error Correction methodology
GDP	Gross Domestic Product
OLS	Ordinary Least Square
SNA	United Nations System of National Accounts
NFS	Non Factor Services
RIH	Relative Income Hypothesis
MPS	Marginal Propensity to Save
GNP	Gross National Product
DHSY	Davidson, Hendry, Srba and Yeo
ADF	Augmented Dickey-Fuller
PP	Phillips and Perron
LR	Likelihood Ratio
LM	Lagrange Multiplier
ARCH	Autoregressive Conditional Heteroskedasticity
CUSUM	*Cumulative Sum*
VECM	Vector Error Correction Model

FPE	Final Prediction Error
AIC	Akaike Information Criteria
SC	Schwarz Information Criterion
HQ	Hannan-Quinn Information Criterion
JJ	Johansen and Juselius
MPC	Marginal Propensity to Consume
VEC	Vector Error Correction

ABSTRACT

Besides gross domestic product, aggregate consumption is the single most important macroeconomic variable which affects various sectors of the economy, directly or indirectly. For example, consumption is said to be the biggest component of aggregate demand and hence is a major determinant of economic fluctuations in an economy. Besides these well known effects of consumption, it also has a number of other effects which are very relevant from the policy perspective. For instance, variations in consumption are strongly associated with variations in government tax revenues (in particular where bulk of tax revenue is collected through consumption taxes), variations in the balance of trade, inflation and so on.

Keeping this immense importance of aggregate consumption in mind, it is important to know the sources that cause variations in aggregate consumption. This very topic is under serious scrutiny since the times of Keynes (1936) but no single answer has been reached as yet. In particular, there are still debates on the differences of short run and long run consumption functions and on the relevance of current income as a source of variation in consumption. This study has been designed to seek answers for some of the debated issues in the area.

The study utilizes time series data from 1971 to 2012 and most of the variables mentioned relevant in the literature. As is the routine in contemporary time series based econometric analysis, we have checked all the variables for their order of integration. Since most of the variables under consideration were found to be non stationary, the use of conventional ordinary least square was ruled out and we searched for our answers using the relatively new cointegration analysis. The relevant technique, in our case, was the Johansen and Juselius (1992) conintegration (JJ hereafter) technique which has a number of advantages over the Engle-Granger cointegration technique.

The JJ test confirms the long run equilibrium relationship between consumption and the set of explanatory variables (income, wealth, rate of interest, relative prices, liquidity constraints as proxied by unemployment, government expenditure, uncertainty and exchange rate) and then we moved to estimate the VECM model to get the long run and short run coefficients of the variables explaining consumption. The resulting ECM term turned out to be negative and statistically significant, meaning that the set of explanatory variables, listed above, causes variations in long run consumption behavior of Pakistan. After arriving at a parsimonious ECM model, we then carried out the short run causality analysis.

The major conclusions of the study, based on the estimated long run consumption function are that current income, real exchange rate and interest rate have no explanatory power for explaining consumption. On the other hand, variables such as government expenditure, and liquidity constraints effects long run consumption negatively and the wealth effects on consumption are positive. From the long run consumption function, we failed to found any evidence of the price confusion effect.

Similarly, the short run consumption function, based on the error correction mechanism, reveals that personal disposable income effects consumption positively while rate of interest and uncertainty affects it negatively. The short run consumption function shows that Pakistani consumers do suffer from the price confusion effects in the short run. However, wealth and liquidity constraints both turned out to be insignificant factors in the short run.

Chapter 1

INTRODUCTION

1.1 Introduction

Given the factors that determine households' economic opportunities, consumption at the national level is defined as "the total quantity of goods and services that households want to consume" (Bernanke, 2008). Consumption is usually divided into three subcategories: consumption on nondurable goods such as food and clothing, consumption of durable goods such as cars and computers, and consumption of services such as haircuts and doctor visits (Mankiw, 2004).

Since consumption expenditure by the households is the principal element of demand for goods and services, changes in the consumer's propensity to consume have key implications for the behavior of the economy. Beside size, household's choice about how much to consume is closely related to the decision about how much to save and invest. For a given level of disposable income, the choice about how much to spend and save the reminder is the same decisions (Bernanke, 2008). Consumption and saving are important to both growth and fluctuations. With regard to growth, the society's resources that are saved and invested in physical capital, human capital and research and development are central to standards of living in the long run (Romer, 2006). Fluctuations are mainly caused by changes in aggregate demand and, as already mentioned, aggregate consumption is by far the major component of aggregate demand. Thus understanding the consumption behavior at the aggregate level is crucial for multiple reasons.

The issue of what determines variation in consumption was first systematically analyzed by J. M. Keynes (1936) in his *"General Theory of Employment, Interest and Money"*. His theory of

consumption is commonly known as the Absolute Income Hypothesis (AIH) in the literature. According to Absolute income hypothesis, consumption is a linear and increasing function of current disposable income with a positive intercept called as autonomous consumption. The "average propensity to consume", i.e. the ratio of consumption to income, decreases as income increases and the "marginal propensity to consume", i.e. rate of change in consumption, lies between zero and one.

The AIH received good empirical support earlier on but sooner the theoretical and observed inadequacies of the simple Keynesian function have led economists to build up new hypothesis about consumer behavior. The most important of those alternative hypotheses are the "life cycle income hypothesis (LCH)" of Modigliani and Ando (1950) and the "Permanent Income Hypothesis (PIH)" by Friedman (1957). Modigliani's LCH suggests that consumption depends on consumer's life time resources, where lifetime resources are a sum of initial wealth and life time earnings. According to the Friedman's PIH, consumption is a function of permanent income. Both the theories conclude that individuals consume a fraction of their lifetime resources in such a way as to smooth consumption over their life time.

The two hypotheses share the same view that consumption is related to some measure of long-term income. This is an important departure from the Keynesian consumption function because, in addition to current income, the whole lifetime stream of income enters into the calculation of lifetime consumption. The two hypotheses differ in that while LCH pays more attention to the motives for savings, the PIH pays more careful attention to the expectations formation. Moreover, the LCH provides convincing reasons to include the wealth as one of the explanatory variables in consumption function (Fisher *et al*. 2010).

The subsequent research in the area, most notably Hall (1978) and Flavin (1981), focused on the combined implications of the "life cycle permanent income hypothesis and rational expectation (RE-PIH)". Hall (1978) concludes that if the RE-PIH is correct and consumers have rational expectation, then changes in consumption over time should be unpredictable, i.e. consumption follows a random walk. The random walk prediction was tested by Campbell and Mankiv (1989) and suggested that both the adequacy of the Keynesian absolute income hypothesis and Hall's random walk hypothesis are relevant to understand the aggregate consumption pattern. Hence, they have presented a consumption function based on the combination of both.

Flavin (1981), in contrast to Hall, found that consumption systematically responds too much to current income, a phenomenon that is known as excess sensitivity of consumption in the literature. This finding posed a new challenge for the PIH, i.e. if the PIH is correct, there must be some plausible explanations for the excess sensitivity of consumption. There are two possible explanations for that. One is based on the shortsightedness, i.e. Myopia hypothesis, of the individuals (Dornbusch *et al*., 2010) and the other one on the liquidity constraints (Carroll, 2001).

The year 1978 was also important for consumption theory because of Davidson *et al*. (1978) paper which started a new way of investigating consumption function. The author introduced, for the first time, the Error Correction Methodology (ECM) which requires dynamic econometric modeling. This methodology, also known as the equation based approach as opposed to the Euler approach of Hall (1978), was initially criticized as being ad hoc but later on Molana (1991) derived the ECM representation of consumption function from the intertemporal optimizing behavior of individuals. Thus research on consumption function follows either the Euler equation approach or the equation based approach since then. The biggest advantage

claimed for the error correction approach is its flexibility of incorporating many relevant variables.

1.2 Problem Statement

Consumption, to a large extent, explains the economic conditions, from boom to bust, of an economy (Dejuan *et al.* 1997). Thus understanding consumption has both theoretical, as well as, policy importance. But since there is no single theory explaining consumption behavior and that various theories leads to different policy prescriptions, one needs to verify which theory closely explains consumption behavior in their own economy (Fernandez-Corugedo, 2004).

Consumption function in Pakistan has been estimated both from cross sectional data and time series data, using various specification. The time series data based studies related to Pakistan have some common limitations. Some of them having problems in their theoretical underpinnings, others have methodological issues. There are still others whose interpretations of results are questionable. For example, the study of Khan and Siddique (1989) and Khan *et al.* (2011) has theoretical problems as discussed in the literature review. Similarly, studies by Khan and Siddique (1989), Khalid (1994), Khan *et al.* (2011), and Khan and Nishat (2011) have problems with their econometric methodologies. That is, these studies do not provide stationarity checks, and use OLS in the presence of lagged dependent variables which may lead to biased results (Keele and Kelly, 2005). Studies that are having problems in their interpretations include Khan *et al.* (2011) and Khan and Nishat (2011). Moreover, the time series research conducted in Pakistan on consumption function has mainly focused on the implications of PIH, ignoring the LCH as proposed by Muellbauer and Lattimore (1995). Moreover, there is not a single study which utilizes the Davidson, Hendry, Srba and Yeo (DHSY) (1978) approach for investigating consumption behavior.

Cross sectional data based studies which estimated various forms of consumption functions, directly or indirectly, include Siddiqui (1982), Ali (1985), Malik *et al.* (1987), Malik and Sarwar (1993) and Jamal (2005) but since our purpose is to investigate aggregate consumption so that relevant policy prescriptions are outlined, the cross sectional based studies are not very relevant for our purpose.

Overall, judged from the contemporary advances in economic theory and econometric techniques, one cannot put trust on the results obtained from the previous studies, which leaves a huge gap in the area. Thus the current study has been designed to incorporate most of the relevant variables explaining consumption behavior and employ modern techniques of dynamic econometric modeling.

1.3 Objectives of the Study

The major objective of the study is to identify the main covariates of aggregate consumption in Pakistan and to outline, based on the findings, the policy options available to the government to influence the economy in a desirable way. These objectives can de disaggregated as;

- To empirically analyze the consumption theory which explains consumption behavior in Pakistan
- Based on the results, recommend which policy instruments are effective in achieving desirable consumption variations and which are ineffective.

1.4 Organization of the Study

The final scientific research is organized in a total of six chapters. Chapter 1 includes introduction, problem statement, objectives and hypothesis of the study. Chapter 2 highlights some of the stylized facts regarding aggregate consumption function in Pakistan. Various

economic and econometric mythologies utilized by the past researchers to investigate consumption behavior are reviewed in chapter 3. Chapter 4 is entirely devoted to explaining data and methodology that are used in this study. Chapter 5 presents empirical results with subsequent discussion and the final chapter concludes the scientific research with some policy recommendations and suggestions for future research.

Chapter 2

CONSUMPTION PATTERN IN PAKISTAN

In this chapter, two important things regarding consumption in Pakistan are studied and analyzed. First, the overall trend of private consumption expenditure is explored using time series data from 1971 to 2012. Next, an attempt would be made to analyze consumption pattern in Pakistan using cross sectional as well as time series data. Cross sectional data would be utilized to know various important components of consumption in Pakistan and then time series data would be used to study the trend of these important components. In all of the aforementioned analysis, data would be arranged as rural, urban and overall so that a comparison is also made between rural-urban, rural-overall and urban-overall consumption pattern and important similarities/differences are highlighted.

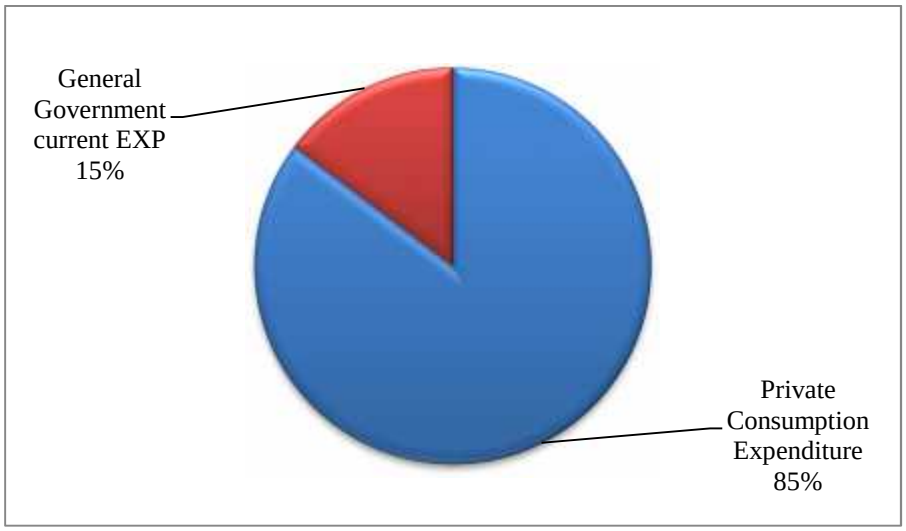
This final output of goods and services is then either consumed by households, government or is exported. Although private and government consumption also include an imported content, however, the bulk of private and government expenditure is out of GDP. Thus it would be a good exercise to begin with an idea of how much of the GDP is consumed by the private household and how much by the government sector.

It is worth noting at this point of time to mention that Pakistan is using "United Nations System of National Accounts (UNSNA)" for its national accounts, so we will mostly used definitions of terms that are used by UNSNA. Thus according to UNSNA, private consumption expenditure stands for "household and not for profit institutions serving households final consumption expenditure". Similarly, "general government (current) consumption expenditure includes all government current expenditure for purchases of goods and services, including

compensation of employees and most expenditure on national defense and security (excluding military expenditure)".

The following pie chart gives the relative share of private consumption expenditure and government current consumption expenditure out of GDP for the financial year 2011-12.

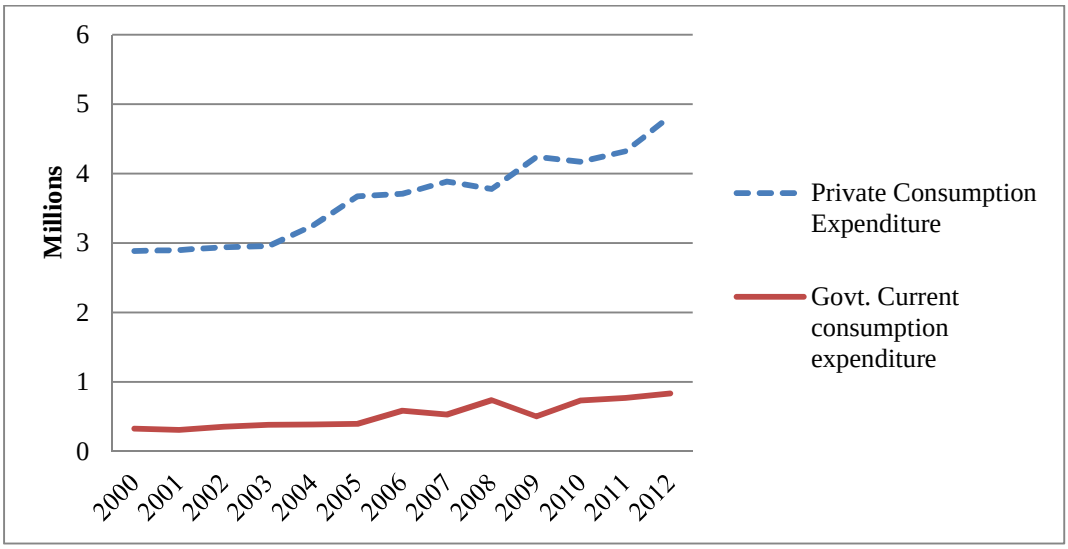
Figure 2:1 Relative Shares of Private and Government Consumption Expenditure out of GDP (2011_12)



Source: Statistical Bulletin, State Bank of Pakistan

The figure shows that private consumption expenditure is a giant share of GDP in the financial year 2011-12, which usually is the case around the world. The next figure shows the trend of private and government consumption expenditure which should give us an idea of whether or not the two components move together.

Figure 2:2 Private Consumption and Government Expenditure in Rs. Millions (1999-2012)

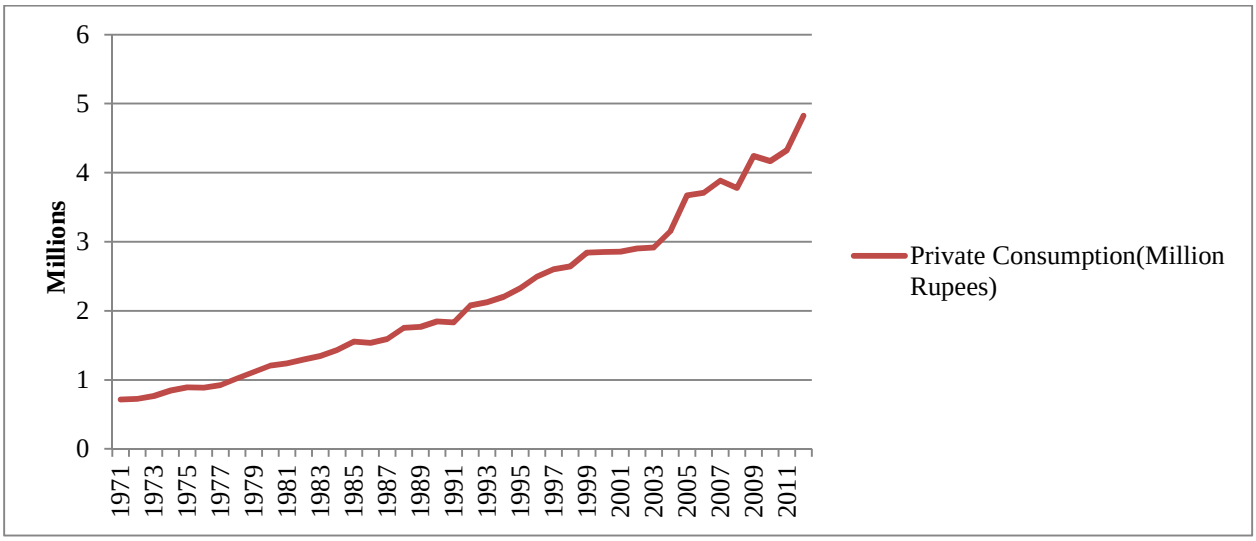


Source: Statistical Bulletin, State Bank of Pakistan

Figure 2.2 gives us a number of important information. First, the trend of both private consumption expenditure and government consumption expenditure is upward, with occasional drops. Second, while government consumption expenditure looks relatively stable, the private consumption expenditure component is relatively more volatile. This, in turn, implies that if one is interested to investigate volatility in consumption, private consumption expenditure is the best option to do so (since it is a giant share of GDP and since it is more volatile).

Having said that, the following figure shows private consumption expenditure in Pakistan, for an extended period of time so that we can get an idea of the trend in that variable.

Figure 2:3 Private Consumption Expenditure in Rs. Millions (1971-2012)

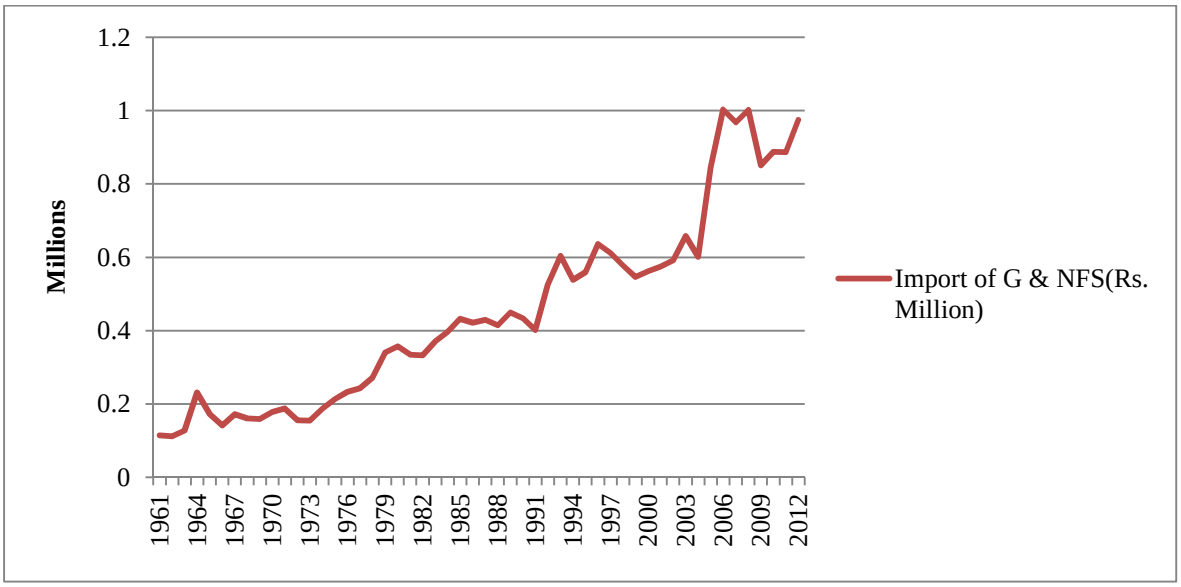


Source: Handbook of Statistics on Pakistan Economy, State Bank of Pakistan

Considering 1999-00 as base, the figure shows that private consumption expenditure in continuously increasing year after year. There are occasional drops in private consumption expenditure, but at this point in time, we can only guess the reasons behind the upward trend and occasional drops. The very purpose of the study is to systematically diagnose what causes private consumption to move up and down, and we can conclude only after empirical investigation in this regard.

The next important thing that we would like to know is the imported content of consumption expenditure in Pakistan. This is essential because there is every reason to believe that private consumption expenditure on domestically produced goods and services are governed by one set of factors while that on imported goods and services by another, with some commonalities. Data on private consumption on imported goods and services is not available. However, we do have data on imports of goods and non factor services which could serve as a rough guide for the purpose.

Figure 2:4 Imports of Goods and Non-factor Services in Rs. Millions (1961-2012)



Source: Statistical Bulletin, State Bank of Pakistan

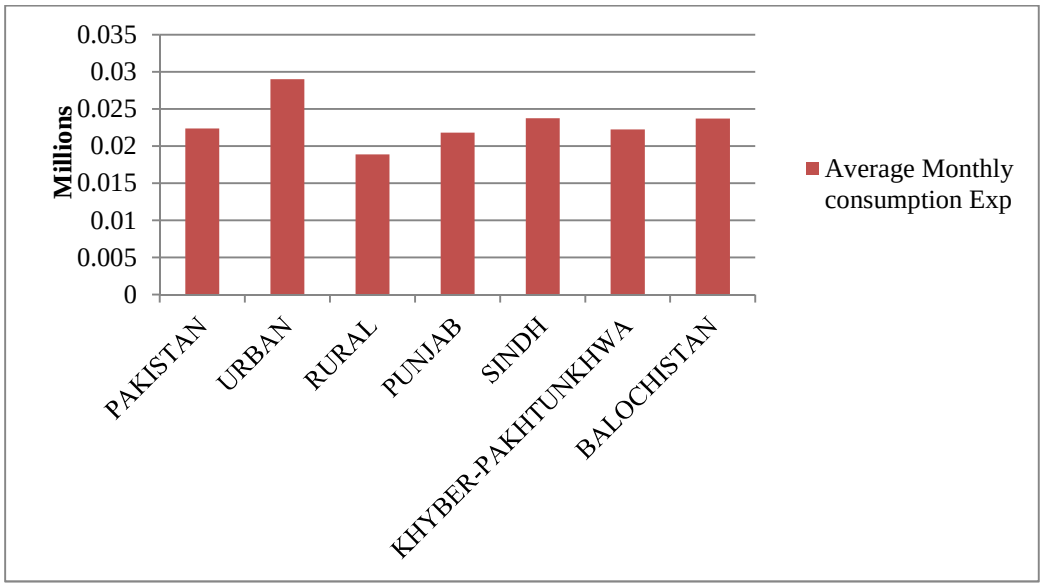
The graph shows that there is considerable volatility in the imports of goods and non factor services but the overall trend is upward. This means that private consumption expenditure on both domestic output, as well as, imported goods increased in Pakistan overtime.

Imports of goods and NFS is not a control variable in our estimation (since the only variable measuring consumption in our model is private consumption expenditure) but has been included in this chapter for discussion mainly due to its importance in the overall consumption expenditure. Many researchers takes increasing consumption as a sign of growing domestic economy but one has to take care of whether consumption takes place on domestically produced goods or imported. Thus the inclusion of this variable will only serve this purpose, i.e. whether the imported component of private consumption expenditure is decreasing over time (which would be a sign of growing domestic economy or import substitution) or is increasing overtime. In the initial periods of development, one would expect growing import demands because raw materials, machinery and technical expertise are needed which are scarcely available in such

economies. But if the reliance on such imports extends for more than half a century, this seems an issue of grave concern (as the data shows continuous growth in imports from 1960s onward).

Next we turn to average monthly consumption across Pakistan. The following figure shows average monthly consumption for Pakistan, Pakistan rural, Pakistan urban and also for the four provinces.

Figure 2:5 Average Monthly Consumption in Rs. Millions (2011-2012)

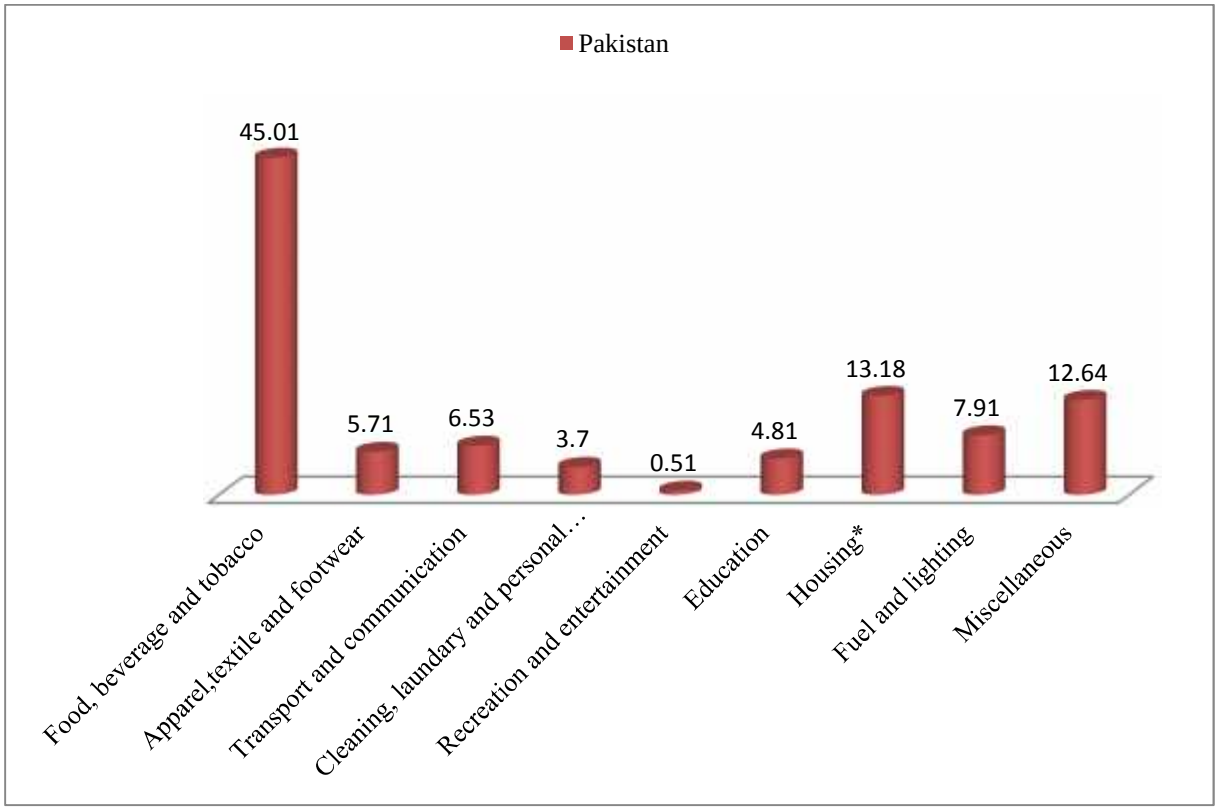


Source: Statistical Bulletin, State Bank of Pakistan

The figure shows that average monthly consumption is higher in urban areas than rural areas of Pakistan. Amongst the provinces, the highest average monthly consumption takes place in Sindh, followed by Balochistan, Khyber Pakhtunkhwa and Punjab respectively. Now this is very interesting as one would expect the highest average monthly consumption in Punjab, the richest province of the country, and the lowest in Balochistan, the poorest among provinces. But the situation in completely opposite. This result is interesting because most consumption theories place affluence at the top of the list in explaining consumption behavior, which apparently, looks not to be the case in Pakistan.

Broadly speaking, Engel's law states a direct relationship between income and consumption for normal goods and a negative relation for inferior goods (Pindyk, 2007). That is, as income increases, consumption on inferior goods such as food decreases. Thus at first look, the above phenomenon might look like an application of Engel's law, but since our consumption variable is an aggregate, including consumption on all commodities and services (some may be normal, other inferior), hence we cannot conclude that the above phenomenon is an application of Engel's law. Thus the issue of poor provinces spending more than the rich needs separate research endeavor and may be treated as a gap which cannot be answered by this research effort.

Figure 2:6 Percentage Distribution of Average Monthly Consumption Across Various Commodity Groups in Million of Rupees (2011-2012)



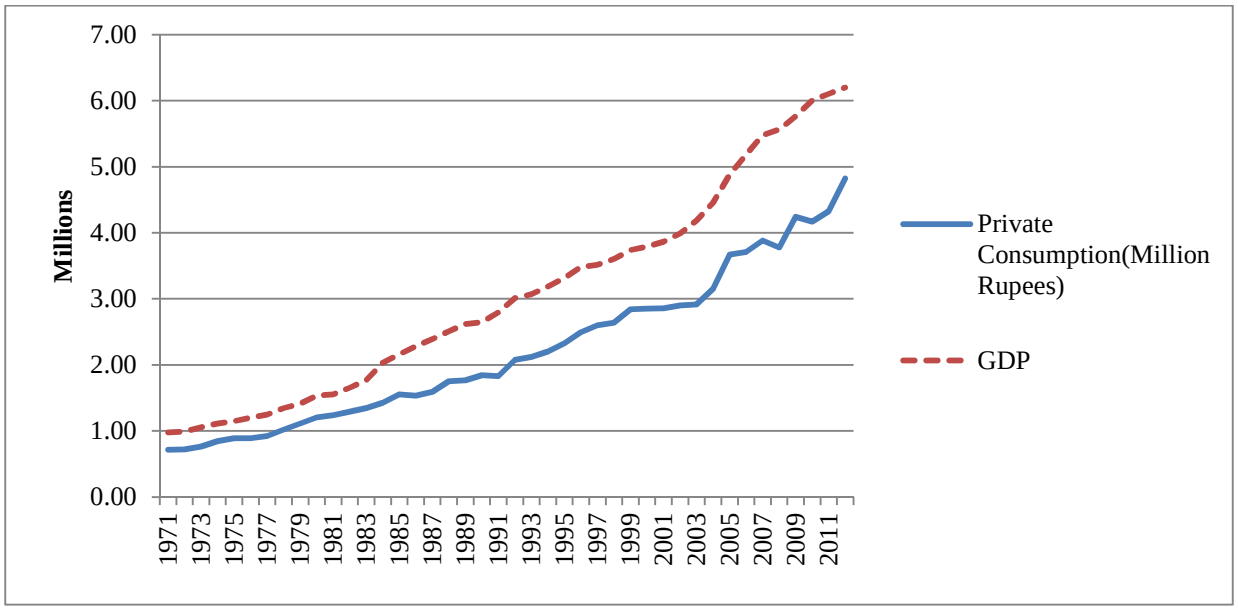
Source: Statistical Bulletin, State Bank of Pakistan

At the end, the percentage distribution of monthly consumption on various commodity groups in Pakistan is given by Figure 2.6. Clearly, the largest category is food, beverages and tobacco followed by housing, fuel and lighting, transport and communication, apparel, textile and footwear, education, cleaning, laundry and personal appearance, and recreation and entertainment respectively. Expenditure on health is included in the miscellaneous category and hence cannot be ascertained.

One startling feature of the information contained in Figure 2.6 is that the highest monthly expenditure in Pakistan is done on food and related products while the lowest category is recreation and entertainment. This definitely shows the level of development of the country. That is, this is the future of a low income country to spend more on necessities and very less on other attractions of life.

As the objective of this research is, we are seeking to explain various covariates of consumption expenditure, both in the long and short run. As the literature review rightly points out, the most important variable that explains private consumption is the personal income, both at the individual level and aggregate level. The following figure shows the co-movement of private consumption and personal income (proxies by Gross Domestic Product) from 1971 to 2011.

Figure2:7 Co-movement of Private Consumption and GDP (1971-2011) in Rs. Millions

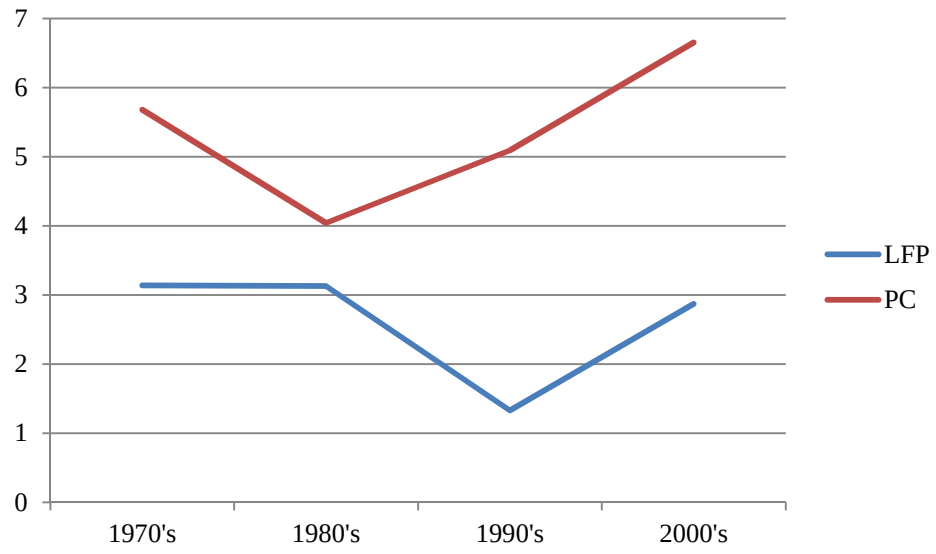


Source: Handbook of Statistics on Pakistan Economy, State Bank of Pakistan

From the figure, one can see that private consumption expenditure follows GDP, i.e. an increase in GDP is translated into an increase in consumption and vice versa. During the entire period under consideration (i.e. 1971-2011), there is only one instance (i.e. 2008-09) where apparently GDP recorded significant growth but consumption declines during that period. This may be attributed to the global financial crises, soaring international prices, political instability in Pakistan and other natural calamities (Economic survey of Pakistan, 2008-09). Although private consumption is growing continuously, one can note that the share of private consumption out of GDP is declining continuously as well. That is, the gap between the dotted line and solid line is increasing during the analysis period. This could mean a number of things such as increasing general government expenditure or increasing saving rate out of personal income. Whatever, the data shows that personal income is one of the strongest predictor of private consumption expenditure in Pakistan.

Another variable closely associated with income is the expected income which has been stressed by most theoreticians except Keynes as the most important factor explaining consumption behavior. Unfortunately, measuring expected income is an impossible task and one has to use either crude proxies or estimate expected income using various econometric techniques. For the purpose of this description, we follow Mei (2012) who proxies increase in expected labor income through increase in labor force productivity (as have strong correlation). Consider the following figure which plots average growth in consumption against average growth rate in labor force productivity.

Figure 2:8 Private Consumption (PC) and Labor Force Participation (LFP)



Source: Handbook of Statistics on Pakistan Economy, State Bank of Pakistan

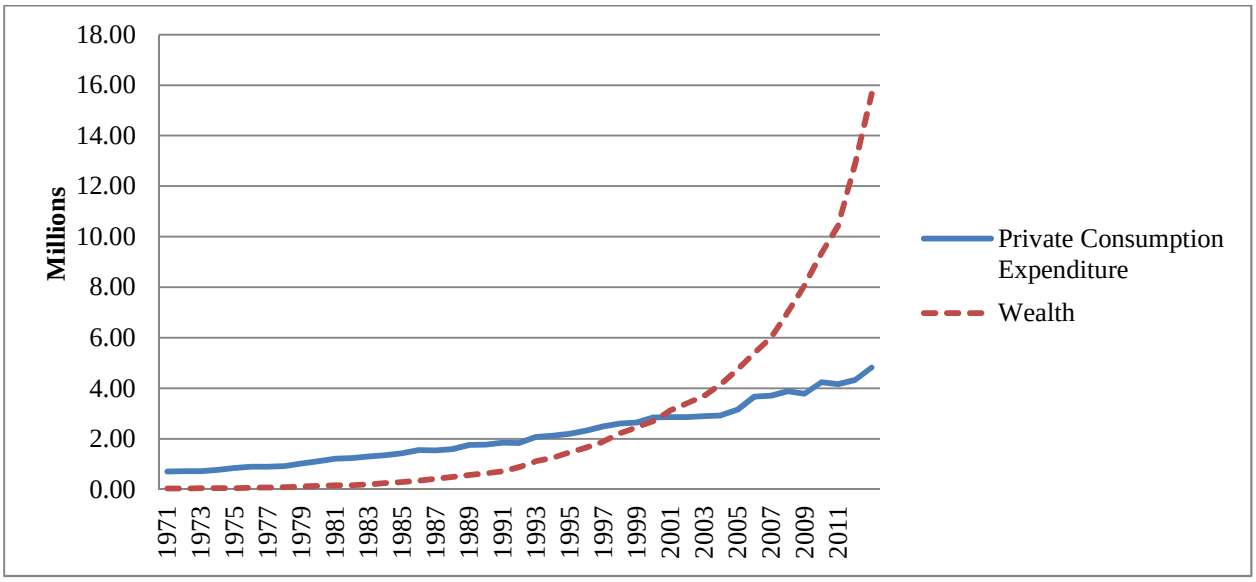
One can see that no clear cut picture emerges from the above figure. That is, the two variables moves in the opposite direction during the decade of 1990's but move in the same upward direction afterwards. Thus, the expected income growth may or may not be an important variable explaining consumption growth.

Just like personal income, wealth is also considered to be one of the important variables explaining private consumption behavior. Wealth can be defined as the value of all of the assets of worth owned by a person, community, company or country. Total Wealth is measured by taking the total market value of all the physical and intangible assets of a country and then subtracting all debts. But, in practice, doing so is a herculean task. Thus one is left with the option to use a proxy variable in place of the original wealth variable.

A good proxy is suggested by Garcia and Ramajo (2005) who measures total wealth as the sum of private wealth and government debt. There are two opinions of whether the public consider government debt as net wealth or not. If the Ricardian equivalence prevails, then consumers don't consider government debt as net wealth, but if it does not, as the dominant Keynesian view suggests, then public do consider government debt as net wealth and hence should be included in total wealth. Thus we approximate the amount of liquid assets held by the public by M2, as suggested by the aforementioned researchers, and also include government debt in the definition of total wealth. However, due to the non availability of data on private productive resources, our measure of wealth (composed of M2 and government debt) is still an under approximation of the total domestic wealth (this proxy is used by Waqas and Awan, 2011).

Consider the following figure which describes the trend of private consumption expenditure and total wealth overtime.

Figure 2:9 Private Consumption and Wealth (1971-2011) in Rs. Millions



Source: Handbook of Statistics on Pakistan Economy, State Bank of Pakistan

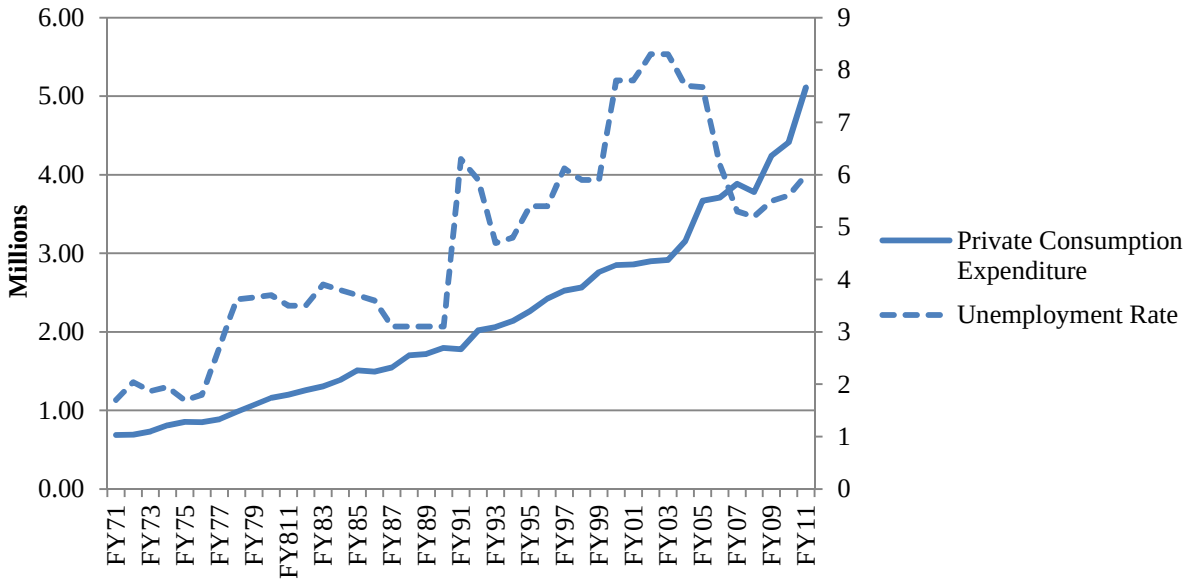
The figure shows that private consumption follows wealth up to the early 1990's, the period when the volume of private consumption expenditure is greater than the volume of wealth. Then both the variables crosses and wealth is getting much larger in its volume than private consumption expenditure afterwards. Since the gap between the two curves in widening, thus from a simple description as above, one cannot conclude that private consumption expenditure is explained by the wealth level. We might get some reasonable insights from our empirical analysis later in the thesis.

One of the implications of the Life Cycle income hypothesis is that people in the working age saves more than those nearing retirement (Modigliani, 1986). Thus viewed this way, the above phenomenon (widening gap between private consumption expenditure and total wealth) may be due to the fact that the percentage of youth in the population of Pakistan is increasing since the early nineties which will continue to reach its peak in 2030 (approximately 60% of the population would be in the working age).

Another way to check whether wealth is a good explanatory variable for consumption is proposed by Mei (2012). According to the author, if one wants to check whether consumption growth is explained by growth in wealth, one has to distribute population according to their wealth level and then check whether consumption is increasing for the whole population or only for the wealthy class. Such a test would have added taste to the study but, unfortunately, such data is not available in Pakistan.

The next variable that is considered in this research is the impact of unemployment on private consumption behavior. Unemployment is in fact a proxy variable that has been suggested by Flavin (1985) to capture the influence of liquidity constraints on private consumption behavior. Individuals try to smooth the consumption path by savings (during times of unexpectedly higher income) and dis-saving (during times of low income). However, given that borrowing and lending rates differ and that all individuals are not likely to get load during times of emergency, consumption smoothening may not be possible. If this is the case, then during periods of high unemployment (low income), private consumption should be less than the optimum and vice versa. Figure 09 shows whether variations in consumption in Pakistan are associated with variations in unemployment of not.

Figure 2:10 Private Consumption Expenditure and Unemployment Rate (1971-2011)

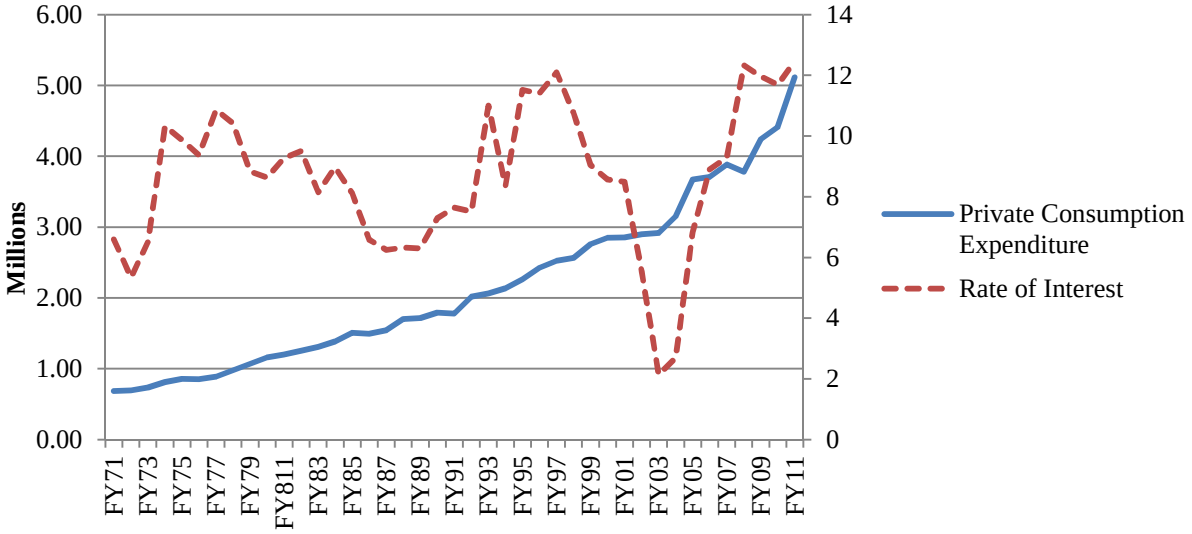


Source: Handbook of Statistics on Pakistan Economy, State Bank of Pakistan

There seems to be no clear cut association between private consumption expenditure and unemployment from the figure given above. There are considerable variations in the unemployment rate during the period under consideration but private consumption expenditure follows a smooth upward trend, suggesting that private consumption expenditure is not very sensitive to unemployment rate. However, as is the case with the previous graphs, this one also gives us only a rough idea and may further be explored in the analysis section.

The last figure shows movements in private consumption expenditure and rate of interest since 1971 to 2011.

Figure 2:11 Private Consumption Expenditure and Interest Rate (1971-2011)



Source: Handbook of Statistics on Pakistan Economy, State Bank of Pakistan

As is the case with unemployment, we do not see any considerable variations in private consumption expenditure but the rate of interest shows volatility during the period. However, unemployment and rate of interest may not be very relevant variables in explaining long run consumption behavior, but may be very relevant in the short run. Since the empirical analysis will look for short run, s well as, long run relationships, this may become clear in the analysis section.

Chapter 3

LITERATURE REVIEW

The most fundamental part in any scientific study is the literature review which provides the critical knowledge about the focus of the study. A detailed and refined literature review is the foundation and motivation for significant and useful research (Boote and Beile, 2005). Thus, this chapter has been devoted to the previous research conducted in this area. We consider Keynes's General theory as a starting point and trace the subsequent developments in the area in a chronological order. For ease of reference, the literature review is subdivided into various heading, first explaining the theory, and then the empirical validity is judged through the lenses of empirical studies. To this end, we first start with Keynes famous Absolute Income Hypothesis (AIH).

3.1 Absolute Income Hypothesis

3.1.1 Theory

The modern theory on consumption functions could be traced back to J. M. Keynes (1936). Keynes has realized that consumption is determined by a multiplicity of factors but he concluded that real income is the main variable upon which the consumption component of the aggregate demand function will depend [Curran, 2007]. Mathematically, the AIH, in its primitive form can be stated as;

$$C = c(Y) \qquad (3.1)$$

Where C stands for consumption, Y for disposable (after tax) income and small c stands for Marginal Propensity to Consume (MPC).

Later on, the Keynesian economists have made various modifications to the original consumption function proposed by Keynes. One such modification, which assumes consumption to be a linear function of disposable income is given in equation (3.2) below;

$$C = \beta_0 + \beta_1 Y \qquad (3.2)$$

In this specification, the coefficient of Y, represent MPC while the constant β_0 represent autonomous consumption, or the level of consumption that is independent of the level of income. This specification, initially, has rarely been criticized since individual needs to consume something for their survival even if their current income is zero.

Yet another modification of the AIH separates current income into labor income (Y_1) and property income (Y_2) and its advocates (Ando and Modigliani, 1963) asserts that the marginal propensities associated with Y_1 and Y_2 are different. This more complicated version of the AIH can be specified as;

$$C = \beta_0 + \beta_1 Y_1 + \beta_2 Y_2 \qquad (3.3)$$

The proponents of this specification believe that the MPC out of labor income is greater than that of property income. Thus, if true, then β_1 should be greater than β_2.

3.1.2 Empirical Validity of the AIH

Soon after the advent of the AIH, empirical research, mostly based on cross sectional data verified the validity of the AIH (Friedman 1957, Branson 1972). It was found that current consumption is highly correlated with current income and that the MPC of the poor class is much higher than that of the wealthy class. These findings confirm Keynes assertions that current consumption is explained by current income and that the MPC decreases with the increase in income (and hence marginal propensity to save, defined as 1-MPC, increases with income).

However, the AIH received a blow when researchers started to evaluate its validity with time series data. Kuznet (1946) empirical findings from the time series data showed that Keynes prediction of falling MPC with increasing income is wrong. Instead, his findings revealed that the real income of the US citizens has increased since 1860 but the long run share of consumption in income is more or less constant (Kuznet, 1952). In other words, the short run consumption function does have an autonomous component but disappears in the long run as long run consumption is proportional to income.

Moreover, Kuznets (1952) also scientific researched that "despite of the increase in income, the proportion of savings in income had decreased at the individual level which means that households had not saved a bigger proportion of their earnings as they had become more affluent over time". Subsequent research also proved the lack of association between increased income and consumption in some years (Dadkhan, 2009).

3.2 Relative Income Hypothesis

3.2.1 Theory

The next in order but less known theory of consumption is the so called "Relative Income Hypothesis (RIH)" forwarded by Duesenberry (1949) in his book "Income, Saving and the Theory of Consumer Behavior". According to RIH, consumption decisions depend on psychological factors linked with habit formation and societal interdependencies based on relative income concerns rather than current income (Palley, 2008). Duesenberry argues that individuals decides how much to consume and saves and once such a decision is made, then habit formation protects individuals from altering their saving consumption plans unless they are introduced to superior quality goods. In other words, assuming that individuals saving behavior

do not change, an individual's consumption expenditure will change only when the individual observes consumption of higher quality goods in his social reference group [Mei, 2012].

The RIH of consumption received little attention because of the introduction of the more mechanical PIH and the LCH. But the theory is regaining focus after Akerlof and Kranton' s (2000) pioneering work on the application of identity into economic study. By including identity into the utility function, they show that identity can alter preferences and thus is an influential factor during the decision-making course.

Cynamon and Fazzari (2008) analysis provided a new life to the RIH. Accordingly the authors criticize Modigliani and Brumberg's assumption that consumers have full information and are completely aware of the uncertainties they face. Alternatively, they assert that, in a continuously changing environment, consumers learn their consumption patterns from the social reference group. And once consumption patterns are learnt, individuals built their habits which cannot be forgotten easily. Cynamon and Fazzari define a consumption norm as "the standard of consumption an individual considers normal based on his/her group identity" and argues that "a consumption norm is a powerful force that should not be ignored while modeling consumer expenditure (Cynamon and Fazzari, 2008)".

3.2.2 Empirics

Empirical literature on RIH is very rare since the theory was not widely accepted within the academia. The theory does have an intuitive appeal but the reason behind its little acceptability may be because data availability is issue to test the theory empirically. Duesenberry (1949) was the first one to present data in the United States to support his theory but systematic econometric studies are very rare. The resurgence is recent and various researchers are trying to construct data to test the empirical validity of the theory (Mei, 2012).

3.3 Permanent Income Hypothesis

3.3.1 Theory

After Kuznets (1957) puzzling results about the Keynesian consumption function, Friedman (1957) used it as strong evidence against absolute income hypothesis and proposed the Permanent Income Hypothesis. According to PIH, the long run income status of an individual is a more proper determinant of consumption than absolute/current income. Since current income do not represent permanent income, hence empirical studies based on current income could not explain the different propensities among different consumer groups.

Friedman (1957) divides current/measured income (Y_t) into permanent income (Y^P) and transitory income (Y^T). The permanent element of income includes "nonhuman wealth that the consumer owns and his personal characteristics that enhances a consumer's earning capabilities". This in turn implies that the present value of a person's lifetime income is included in Y^P (Branson, 1989). The transitory component, Y^T, represent income that a consumer is not able to predict before time. By assumption, there is no connection between transitory and permanent income, so that Y^T is just an accidental deviation around Y^P.

Similarly, measured consumption expenditures have also two components; the permanent component (C^P), and transitory component (C^T). Friedman refers to permanent consumption as that consumption which has been chosen by the consumers optimally so that lifetime utility is maximized. If there is no uncertainty, then permanent consumption and actual consumption coincides. The transitory component of consumption is defined in the similar way as transitory income which captures the influence of all other factors. Friedman assumes that there is no relationship between permanent and transitory consumption and transitory income and transitory consumption.

Friedman (1957) defined permanent income variously. According to the broader definition, "the permanent component of income is the result of any elements whose influence lasts for more than a period". The narrower definition identifies the permanent part with predictable lifetime income. On the basis of his empirical studies on time series data, Friedman (1957) suggested that "the suitable estimate for permanent income is given by a weighted average of current and past actual incomes with weights declining geometrically" (Kankaanranta, 2006).

Thus, the PIH can be summarized as;

$$C_t = k(r, w, u)(Y^P) \qquad (3.4)$$

$$Y_t = Y^P + Y^T \qquad (3.5)$$

$$C_t = C^P + C^T \qquad (3.6)$$

According to equation (3.4), current consumption depends on permanent income while equation (3.5) and (3.6) defines the permanent and transitory components of measured income and consumption respectively. Note that the MPC (k) in this specification is independent of the permanent income but would vary with varying rate of interest (r), the ratio of income to wealth (w) and with consumer's tastes (u).

3.3.2 Empirics

The modern concept of cointegration and its synergy with the PIH made it the most attractive theory for empirical research on consumption in recent times. Under the PIH, a long run correlation exists between the level of permanent income and consumption. That is, in econometric terminology, there is cointegration between permanent income and consumption. Moreover, the PIH suggests that the cointegrating coefficient between these series is unity [Williams, 1999].

The permanent income model is found to give a much better explanation of the year-to-year variations in household saving than does the simple current income model. According to Friedman's permanent income hypothesis, the whole of transitory income or the departure of actual income from expected income is saved, i.e. $MPS^T = 1$. This is an extreme case which implies an extraordinarily heavy dependence of consumer spending on past experience. Although a majority of empirical studies of the permanent income model have shown that $MPS^T > MPS^P$, the hypothesis of unitary MPS^T has found little support.

For example, Qureshi (1981) tried two measures of permanent income, namely, (i) a simple average of the current year's and past two years' measured income, and (ii) income levels estimated from the relation $LnY = a + bt$. In both cases, transitory income was defined as the difference between actual disposable income and the corresponding estimate of permanent income. Their results shows that when permanent income is defined as an average of current year's and last two years' measured income, the estimated MPS out of transitory income is much higher than that of permanent income, though much short of unity. Both the estimates are highly significant and there is a significant improvement in R^2 over that for the absolute income model. However, when permanent income is estimated from the relation $LnY = a + bt$, the difference between the two marginal propensities disappears almost completely [Qureshi, 1981]. However, there are other studies in Pakistan which scientific researchs very small disparity between MPC out of current income and MPC out of permanent income [Khan et *al*. 2011].

Another empirical test is provided by Khan and Che (2012), using time series data from Pakistan. Their empirical results show that the basic PIH don't explain consumption behavior in Pakistan as consumption has been found to be responsive to current income rather than

permanent income. They also carried out the Campbell and Mankiw (1990) type test and concluded that the proportion of consumers following the rule of thumb behavior is much greater than those following PIH [Khan and Che, 2012].

Most of these studies concluded that consumption is excessively responsive to current income. One possible explanation for this sensitivity of consumption to current income may be the lack of perfect capital markets. If consumers are liquidity constrained, then current income becomes a major determinant of current consumption. If this is the case in developed countries, then the validity of RE/PIH for developing countries is very unlikely, as most of these countries do not have well-established financial and capital markets. Thus if one controls for the fact of imperfect capital markets, then the basic PIH explains the consumption behavior in Pakistan [Khalid, 1994].

But as is being observed by Carroll (2001), most of the models developed to check the empirical validity of the PIH differed from Friedman's original conception, at least in four important areas. First, Friedman severally mentioned the importance of precautionary savings which results from uncertainty about the future level of labor income. However, the later researchers had either assumed that labor income uncertainty has no impact on consumption or it was assumed absent altogether (perfect foresight models).

Second, according to Friedman's permanent income hypothesis, the MPC out of transitory income was about a third. However, the perfect foresight and certainty equivalent models usually disguised an MPC of 5% or less.

Third, Friedman (1957) stressed that permanent income, which determines current spending is "the mean of the expected level of income in the very near term", as households planning

horizon is relatively shorter than the rest of their lives. According to Friedman (1963), people discount future income at a subjective discount rate of say 33(1/3) percent. But the assumed discount rate is the perfect foresight models is the market rate of interest.

Finally, as an interface between all of the previous points, according to Friedman, the distant future labor income would not influence current consumption because capital markets are imperfect. This implies that individuals would not be able to smooth their consumption by borrowing based on their future (but uncertain) labor income (Carroll, 2001).

3.4 Life Cycle Income Hypothesis

3.4.1 Theory

Another contemporary of Friedman named Modigliani and his student Brumberg came up with their life cycle income hypothesis (LCH). According to Modigliani and Brumberg's (1954) life cycle income hypothesis, households pursue maximum utility of its life cycle by arranging savings and consumptions across different periods of life. Under this hypothesis, they derive a function set to describe the relationship between consumption and its determinants.

The LCH implies that individuals/households plan their consumption/savings decisions in such a way as to get a smooth marginal utility out of their life time income. In particular, the theory implies that savings are done for retirement (Romer, 2006). Moreover, they point out that the presence of uncertainty also gives rise to motives of saving (Brumberg and Modigliani, 1954) so that it influences consumption. Unlike PIH, which assumes life is infinite and each life period is uniform, LCH regards life as finite and structured. Therefore, LCH allows systematic variance in the patterns of saving and consumption during different life periods, which makes it possible to derive implications of aggregate consumption and saving. According to this model, people

saves in their working age but dissaves when they retires and hence the saving rate should be hump- shaped (Modigliani, 1986).

The later research of Modigliani (1990) points a number of other factors that can effect consumption saving decisions. These include the interest rate, liquidity constraints, and strength of the bequest motives, availability of public and private insurance and socio-demographic variables. In addition, he also mentioned the role of uncertainty but did not provide formal proof of how uncertainties affect consumption. It was Leland (1968) who first analyzed the role of uncertainty in a two period model and concluded that uncertainties boost the precautionary demand for savings and hence has a negative impact on current consumption.

Note that there are a number of similarities between the PIH by Friedman and the LCH by Modigliani. Both the theories assume that consumption is nothing but rational planning. Both the theories starts from the micro foundations of utility maximization and both believe that only the long term changes in income could change consumption. Since windfall changes in income are saved, not consumed, hence the proportion of income saved is independent of income. This contradicts Keynes who asserts that people saves a greater proportion of their income as their income increases. The only considerable difference between the two theories is that Friedman consider an infinite planning horizon, as to him people not only saves for themselves but for children as well, while the planning horizon of the LCH is finite, as it claims that people saves for their retirement (Kankaanranta, 2006). Another key difference between the two, claimed by some economists, is the explicit inclusion of wealth by the LCH (Williams, 1999). However, the truth remains that many economists use both the theories interchangeably (Mei, 2012).

3.4.2 Empirics

The key proposition of the standard LCH is that economic agent smooth consumption over the life cycle. But Hall's (1978) showed that under the PIH, and assuming that expectations are formed rationally, consumption should follow a random walk. This implies that any past or otherwise expected information should have no power to explain changes in consumption. Particularly, past and current income should have no predictable power. However, empirical studies on time-series data have rendered this inference suspect. It has become an empirical regularity that consumption has been excessively sensitive to income and also exhibit excessive smoothness.

As mentioned above, the basic life cycle hypothesis predicts that household accumulates wealth during their working life in order to consume during retirement. And since individuals smoothens their consumption over their life time, there should be no noticeable change in consumption after retirement. This is exactly what forward looking rational behavior implies. But the observed phenomenon is entirely a different story. Old age people do reduce their consumption and they are either not ready to de-cumulate their wealth or to do so at a very slow rate (Kankaanranta, 2006).

Another worrying trait of the standard LCH framework is the assumed representative agent. In Deaton's (1992) words, the assumed individual has more knowledge than reality. Hence, one doubts if the behavior of the assumed agents portray the actual consumer or not. The financial crises of 2008, triggered by the collapse of the mortgage market in the US, put more doubt on the rationality of the consumers. Since rational expectation is one of the building blocks of the LCH, this shed doubts on the efficacy of the LCH (Mei, 2012). Finally, in empirical

studies, aggregate consumption is often treated as the summation of the decisions of the single representative agent, which clearly is an invalid simplification (Kankaanranta, 2006).

3.5 RE- Permanent Income Hypothesis

3.5.1 Theory

Hall (1978), in an attempt to derive the implications of the life cycle permanent income hypothesis under rational expectations came up with his random walk hypothesis. Hall (1978) claims that most of the empirically consumption functions treats income as an exogenous variables and ignores its endogenous nature. By doing so, all such studies seriously effects the estimated consumption function. The alternative approach suggested by Hall (1978) treats consumption as a Random Walk which means that known information has no explanatory power for consumption and current consumption is all one needs to predict consumption in the future. In other words, consumption is unpredictable. In particular, there is no information available at time period t which can predict consumption in time period t+1. If this really is the case, then all the traditional theories explaining consumption behavior were just an exercise in futile (Kankaanranta, 2006).

However, Hall argues that this is precisely what happens under the skeleton of the LCH. The objective of the consumers is to maximize expected future utility but the expectations of future marginal utility is a function of only present consumption. This implies that all other factors, except current consumption, do not have any influence on future marginal utility. In other words, marginal utility of consumption follows a random walk. Additionally, since marginal utility is linearly associated with present consumption, it is logical to infer that consumption also follows a random walk. In addition, since one period lagged consumption includes all related information of consumers' past behavior, hence including more variable

other than lagged consumption or including more than one period lagged consumption would add nothing to the function. Therefore, there is no need to include lagged income in the presence of lagged consumption in the consumption function.

The random walk hypothesis of Hall can also be analyzed from a different perspective. If we consider the main equation of the random walk hypothesis and eliminate the error component of it, then it would imply than current consumption exactly equals previous period's consumption. In other words, consumption in successive time periods equals which means that it has been smoothed against fluctuations in income. This is, again, exactly what the life cycle hypothesis assumes. That is, according to Modigliani, consumers arrange their lifetime consumption in such a way that there are no predictable fluctuations during their lifetime (Mei, 2012).

3.5.2 Empirics

Empirical tests of Hall's prediction can be divided into three categories (Khalid, 1994). The first category of research, known as Hall's own approach, tests the RE-PIH by incorporating variables in the consumption function that could potentially influence consumption. If any of the variables other than lagged consumption is found to have statistical significance, this would be considered as evidence against the RE-PIH. Following this approach, Hall (1986) uses regression techniques to approximate the association between America' s GNP and consumption by incorporating military spending in the specification as well. The reason for selecting military spending as an explanatory variable does make sense: it is the only main external influence on the American economy. His results show that consumption is not affected by military spending, whereas GNP increases. Hall then concludes that "the actions of

consumers is autonomous from macroeconomic fluctuations, and that accidental shifts in consumption are an important source of overall fluctuations" (Mei, 2012).

The second category of research follows Flavin (1981) approach who extended Hall's (1978) model to propose that unexpected changes in current income can lead to revisions in permanent income and therefore to current consumption. Hence, under the RE-PIH only lagged consumption and unexpected income should be helpful predictors of current consumption. Therefore, the significance of expected income variable, or any other element of the information set other than lagged consumption, is considered evidence against the RE-PIH.

The third category of research is based on the well known DHSY approach (Davidson et al, 1978). The basic idea is to analyze the long run properties of consumption and income. If the two series are stationary in first difference, then the two series may be cointegrated and have an error correction representation. The RE-PIH may be rejected if the model has an error correction representation (Khalid, 1994).

Applying any of the above mentioned approach, the RE-PIH has been formally rejected (with exceptions like Campbel and Mankiv, 1989) whenever tested on data from various countries. Two leading explanations have been postulated to account for the apparent discrepancy between the theory and the data. One explanation is that consumers are unable to borrow when income is temporarily low; that is, they are liquidity constrained. The second reason is that aggregation problems may nullify tests of the model on aggregate data (Wirjanto, 1995, Kankaanranta, 2006, Blinder and Deaton, 1985).

3.6 Excess Sensitivity

3.6.1 Theory

Majority of the empirical tests of the RE-PIH have rejected the RE-PIH. The null hypothesis in these empirical studies normally consists of the combined hypothesis that 1) expectations are rational, 2) consumption is a function of permanent income, and 3) there are no liquidity constraints. Majority of the empirical literature is of the opinion that consumption is more explained by current income which essentially amounts to the failure of the RE-PIH, but little is said about which component of the joint hypothesis of causes the failure of the RE-PIH.

Soon after Hall's (1978) publication, Flavin (1981) found that consumption is too much sensitive to current income. It implied that either AIH correctly explains the aggregate consumption behavior or if the PIH is correct, then either consumer are shortsighted (myopic behavior) or otherwise the excess sensitivity is caused by liquidity constraints (Flavin, 1985). The subsequent research, e.g. Zeldes, 1989, Carroll and Kimball, 1996 and Carroll, 2001, found that it is indeed the liquidity constraints that cause consumption to be more sensitive to current income. If the findings of the mentioned researchers are correct, then there is no room for Hall's Random Walk hypothesis.

Consumers are said to be liquidity constrained if they cannot borrow th amount they want to borrow, or if the borrowing rate differs from the lending rate (Hayashi, 1985). When consumption displays a direct correspondence with current income, this behavior is known as myopic behavior and which has often been put as an explanation for the observed direct relationship between consumption and current income (Paz and Gomez, 2008). Such consumers are also known in the literature as the Keynesian consumers. Note that the source of liquidity constraints, either myopia or liquidity constraints, have important implication for the whole of

macroeconomic theory (Flavin, 1985). If excess sensitivity is caused by liquidity constraints, then the assumption of rational forward looking optimizing consumers is all right. But if the source of excess sensitivity are liquidity constraints, then it puts doubt on the rationality assumption. However, myopic behavior does not necessarily means that consumers are not rational and forward looking but the income uncertainty may induce a more cautious behavior. That is, it may be possible that consumers may increase/decrease precautionary savings when decrease/increase is expected in income, causing consumption to be highly correlated with current income (Madsen and McAleer, 2001). On the other hand, financial market imperfections are sought to be the most noticeable sources of liquidity constraints and it is claimed that financial deregulations will cause consumers to behave more like that implied by the RE-PIH (Habibullah *et al*. 2006, Blundell-Wignall *et al.* 1990).

The two sources of excess sensitivity are clearly distinguishable. Under myopia, consumption would be determined by the current income. That is, consumption should then decrease with a decrease in income and vice versa (Shea (1995). But the presence of liquidity constraints results in a asymmetry in the consumption behavior (Altonji and Siow, 1987). In particular, liquidity constraints imply that people cannot maintain their best possible consumption plan by borrowing during periods of low income. But liquidity constraints have no influence on savings and hence the presence of liquidity constraints imply that consumption should be more strongly associated with expected income increases than decreases (Shea 1995, Drakos, 2002).

3.6.2 Empirics

Tests for liquidity constraints utilize either the Euler equation approach or the consumption function approach. The lifetime budget constraint implies that consumption should not change in response to income if we control for total wealth. The consumption function

approach for testing liquidity constraints utilizes this information. That is, consumption is regressed on total wealth and current income. In principle, if there are no liquidity constraints, then the coefficient of current income should turn out to be insignificant and vice versa.

The Euler equation approach uses another proposition of intertemporal optimization subject to the lifetime budget constraint. At the optimum, the marginal rate of substitution between current consumption and future consumption is set equal to the marginal rate of transformation. If liquidity constraints are present, then the Euler equation does not hold. This is so because liquidity constrained consumers (those who would like to borrow at the prevailing rate but who are not able to do so) would consume relatively less in period 1 and more in period 2 than those who are not liquidity constrained. Thus if liquidity constraints are present, there should be a negative correlation between the marginal rate of substitution and total purchasing power available to the consumer in the current period (i.e. current assets/wealth and current income) or any variable that reduces the harshness of liquidity constraints (Hayashi, 1985).

Attempts to formalize the idea of liquidity-constrained individuals have not led to directly testable implications, because the key variable in the model, which is the price of borrowing, is not obvious. As a result, most empirical implementations have to use proxy variables or sample-separation information to identify the liquidity constraints. In aggregate time-series studies, Muellbauer (1983) uses the ratio of the current disposable income to previous consumption, while Flavin (1985) uses the unemployment rate as a proxy for liquidity constraints. In studies using cross sectional data, Zeldes (1989) and Runkel (1991) employ low asset holdings to separate their samples, while Jappelli (1990) utilizes survey questions [Wirjanto, 1995] while Shea (1995) uses income asymmetry. The most noticeable

among these methodologies are Flavin (1985) and Shea's (1995) which has been extensively used to uncover the issue of excess sensitivity.

In my knowledge, there is not a single study in Pakistan that uses Flavin's (1985) methodology to know the sources of excess sensitivity. However, a number of attempts have been made to trace the source of excess sensitivity using the Shea (1995) methodology by various researchers, and majority of these scientific researched that excess sensitivity of consumption is caused by liquidity constraints (Drakos 2002, Paz and Gomez, 2008). In Pakistan, the attempt of Khan and Nishat (2011) needs a mention as they also adopted the very same methodology for the purpose. But unfortunately, there is huge mismatch in their empirical results and their interpretation. That is, the results shows (at least in one specification) that excess sensitivity is caused by liquidity constraints but the authors interpret it as evidence against PIH and in favor of AIH.

3.7 DHSY Approach (Including Hybrids)

3.7.1 Theory

The seminal work of Davidson, Hendry, Srba and Yeo (1978) gave an alternative approach to modeling economic relationships. This approach, known as DHSY, is based on the cointegrating error correction modeling. The hallmark of this approach is that it does not require strong theoretical foundations and lets the data to speak for themselves. This mechanism is such that it concentrates on the long run properties of the data and allow enough space for short run dynamic specification as well. The fact that the DHSY approach does not require strong theoretical foundations does not means that the modeling approach is inconsistent with economic theory. In fact, Muellbauer and Bover (1986) has shown that an error correction model (ECM) can be derived from a multi-period utility maximizing model by assuming that some agents are facing liquidity constraints.

The seminal paper of Davidson *et al.* (1978) pre-dates the cointegration literature and was primarily an attempt to reconcile the difference between the low value observed for the short term MPC and the higher value of the longer run APC. In the Davidson *et al.* (1978) paper, however, an early form of error correction modeling (ECM) was used to estimate non-durables consumption, using disposable income and inflation with first and fourth differenced variables included to account for the time series properties of the data series. A stable long run relationship (what would now be tested as a cointegrating relationship) between consumption and income was assumed with the coefficient equal to I. in line with the PIH. Their model allowed for the existence of both a long run and short run response of consumption to changes in income. Fundamental to their paper was an explicit examination of the seasonal dynamics of the relationship between consumption and income but, again, this was before the development of seasonal unit root and seasonal cointegration tests [Williams, 1999].

This approach provides the flexibility to the researcher to include as many relevant variables in the model as he/she considers to effect consumption. Since this work also follows this methodology, the details are explained in the methodology chapter.

3.7.3 Empirics

Recent empirical research on consumption has almost thoroughly followed this methodology. For example, Hansen *et al.* (2001) estimated the DHSY type consumption function and tested it against various alternative specifications (such as LCH and PIH). The author concludes that the DHSY type consumption function explains consumer behavior more accurately than the alternative ones. Similarly, following the same approach and extending the model of Sawyer (1992), Craigwell and Rock (1995) found that income, wealth, government spending, interest rates, and liquidity constraints may well be related explanatory variables for

aggregate consumption. Moreover, various other researchers have added more variables in the consumption function and have come up with very interesting results. Examples include the inclusion of exchange rate to capture the effect of openness on consumption by Dhakal *et al.* (2009), stock market wealth by Bindu *et al.* (2011), remittances by Khan *et al.* (2007), and advertising expenditure by Khan and Siddiqui (1990).

Concluding the literature review chapter, one can see that consumption has been investigated extensively in Pakistan. We have mentioned a number of cross sectional studies, such as Siddiqui (1982), Ali (1985), Malik *et al.* (1987), Malik and Sarwar (1993) and Jamal (2005), and time series studies that have been conducted in Pakistan to know various factors explaining household and/or aggregate consumption. Since the current study is based on time series data, it is revealing that some of the time series based studies conducted in Pakistan, to investigate consumption behavior, are discussed in length. For example, Khan and Siddique (1989) investigate the effects of advertising on aggregate consumption expenditure using time series data 1969-1988. Realizing t

he bidirectional causality between consumption and advertising expenditures, the authors uses both single equation and simultaneous equation methods. Average propensity to consume (APC) is estimated as function of income, advertisement intensity and last year APC (as proxy for wealth). The results are the standard ones. That is, APC decreases with an increase in income, increases with advertisement and wealth. However, the paper suffers from some serious theoretical and methodological issues. For example, Consumption at the individual level may be affected by the level of advertisement but may have no effect on consumption at the aggregate level. It simply reallocates consumers between different available firms. Similarly, the authors use three different measures of advertising in various specifications, i.e. advertising expenditure,

advertising intensity and lag advertising intensity. The authors also apply the mentioned methodology without a mention of the order of integration of the variables concerned.

Khalid (1994) tested the Random Walk hypothesis, based on time series observations from 1960- 1992, for Pakistan by first considering six various specifications in the Hall's tradition and he was unable to reject that consumption follows a random walk. However, all those six specifications does not include current income as one of the explanatory variables and hence, as the author himself observe, the results may be misleading. In order to check the robustness of the result, the author then includes current income as one of the explanatory variable and the results thus found shows that the random walk hypothesis is strongly rejected in case of Pakistan. This paper suffers from the same limitations as discussed above. That is, time series data and OLS technique has been used without mentioning the order of integration of the variables.

Khan *et al.* (2011) used a Campbell and Mankiw (1989) type test to test the validity of AIH and PIH in case of Pakistan. The data period of the study is 1992-2010. According to their estimates, the proportion of forward looking consumers is 22 percent, 32 percent, and 33 percent of the total population, shown by the instrumental variable (IV), OLS, and non linear least square (NLLS) regression respectively, while the rest of the consumers spend according to their current income. Thus, according to the authors, consumption does not follow the PIH in Pakistan. However, the conclusion of the authors may be misplaced due to many reasons. For example, the authors call equation five of their paper given below;

$$\Delta C_t = \sim + \quad \Delta Y_t + £_t$$

As PIH which, by no means, represent PIH as there is no variable in the equation that represent permanent income. Interpreting β = 0 as the validity of PIH may be misleading because ΔY_t represent both transitory and permanent changes in income. Hence one cannot judge the efficacy of something which is not tested in the first place. Above all, though the Campbell and Mankiw test suggest otherwise, the authors interpret it as the evidence against the PIH.

In an attempt to identify the component of the joint hypothesis that causes the rejection of the RE-PIH, Khan and Nishat (2011) empirically explores the impact of liquidity constraints on consumption behavior in Pakistan. The data period of this study is from 1971 to 2010. The authors strongly reject the RE-PIH in favor of AIH, but their results are highly doubtful due to many reasons. For example, the authors estimate the following Shea (1995) type equation;

$$\Delta C_t = u + \text{a}_1(POS_t)(\Delta \hat{Y}_t) + \text{a}_2(NEG_t)(\Delta \hat{Y}_t) + \text{¥}_t + \text{£}_t$$

Where POS is a dummy variable for periods in which changes in income ($\Delta \hat{Y}_t$) are positive. Similarly NEG is a dummy variable for periods in which changes in income are negative. If LC-PIH is true, then a_1 and a_2 should equal zero. With liquidity constraints, a_1 should be significantly positive and should also be significantly greater than a_2.Under myopia, the $\text{a}'s$ should be positive, significant and equal.

The empirical results reveals that there is no evidence of the presence of liquidity constraints, as the estimated λ_1 is negative under one specification and positive in others but is less than λ_2, but the authors interpret it as the presence of liquidity constraints. The conclusion of the study that AIH is valid for Pakistan, based on the finding of presence of liquidity constraint, is totally incorrect. Rather this finding implies the behavioral validity of the LC-PIH.

Majority of the time series studies either focused on the empirical validity of the permanent income hypothesis, such as Qureshi (1981), Khalid (1994), Khan and Che (2012) and Khan *et al*. (2011), or on the rational expectations version of PIH (Khalid, 1994). Occasionally, excess sensitivity has also been investigated, such as the study by Khan and Nishat (2011), but there is not a single time series study in Pakistan in the DHSY tradition which incorporates all relevant variables explaining consumption behavior in Pakistan. Moreover, judged from the contemporary advances in economic theory and econometric techniques, one cannot put trust on the results obtained from the previous studies, which leaves a huge gap in the area. Thus the current study has been designed to incorporate most of the relevant variables explaining consumption behavior and employ modern techniques of dynamic econometric modeling.

Chapter 4

DATA AND METHODOLOGY

Spending some time and effort on identifying and then employing the relevant methodology is the hall mark of the modern day scientific research. To this end, this chapter has been devoted to the selection of variables, measures and sources of data and the econometric methodology that has been employed in the thesis.

4.1 Variable selection

There are some variables which no economist and no theory will oppose to be included in the consumption function. Such variables include some concept of income, wealth and the interest rate which are commonly included (or mentioned) in the consumption function since Keynes (1936). However, there are variable which are being less frequently used in the specification of the consumption function, either due to non availability of suitable data or due to their less perused importance in explaining consumption behavior. I do not pass on personal judgments on the desirability/undesirability of including various variables and hence would include those entire variables in the consumption function specification which has been used by earlier researchers and which has some economic theory behind. The only thing that could potentially restrict me to include explanatory variable(s) is the data availability issue. However, where possible, relevant proxies would be used of those variables whose direct measurement is not available.

Table 4:1 Variable Selection

Variable	Description	Economic rationale
Consumption	Personal consumption expenditure	Dependent variable/variable of interest
Income	Per capita personal disposable income	None of the known consumption theories repute the importance of this variable in explaining consumption.
Wealth	M_2 +Public debt	After Friedman, Wealth is also consider to be a major determent of consumption
Interest rate	Call Money rate	According to the Euler equation, it effects intertemporal choices.
Inflation/Relative price level	The ratio of non durables to durables price index (Blinder and Deaton, 1985) or "The implicit price of goods relative to the implicit price of services" (Craigwell and Rock, 1995).	In order to capture the price confusion effect on consumption. According to Deaton (1987), individual consumers buying one thing at a time cannot distinguish unanticipated inflation from relative price increase and, in response, tend to postpone purchases which is known as price confusion effect.
Unemployment	Unemployment rate	The unemployment rate can plausibly enter the consumption function on its own merit, since unemployment can cause consumers to reduce their consumption. But unemployment rate is also used to approximate liquidity constraints by Cuddington (1982), Flavin (1985), and Carroll and Summers (1987).
Government spending	Non-defense component (Craigwell &Rock, 1995)	As Aschauer (1985) and Bean (1986) shows, government expenditure do effect private consumption, either positively (government expenditure complements private consumption) or negatively (if both are substitutes).
Uncertainty	"The absolute deviation between current income growth and average income growth over the last 5 years" (Muellbauer, 1994)	Uncertainty makes rational planning difficult and hence may make consumers to consume less than optimally.
Exchange Rate	Real Exchange rate	Since exchange rate affects the import component of consumption.

As can be seen, the list of variable and the economic rationale for their inclusion in the consumption function almost covers all variables suggested by various theories and issues raised

by empirical research. The only exception here is the relative income hypothesis but the inclusion of lagged consumption can be considered as a proxy for habit persistence.

4.2 Data

The theoretical model derived identified the important variables which effects consumption decisions by the household. However, identification of important variables does not solve the problem of estimation. Sometimes, economic theory does identify important variables but data may or may not be available on the variables identified by the theory. Therefore one needs to identify relevant proxies for those variables whose data is not available from the secondary sources. This study will use the following variables while estimation consumption functions for Pakistan.

Table 4:2 Variables Measurement and Sources of Data

Variable	Description	Measure/Proxy	Potential source
C	Consumption	Private consumption	IFS
Y	Income	Real GDP	IFS
W	Wealth	M_2 + Public Debt	IFS
R	Interest rate	Call Money rate	IFS
P	Relative price		PES
N	Liquidity Constraints	Unemployment rate	IFS
G	Government Spending	Non-defense federal expenditure	PES
U	Uncertainty	Absolute difference between current income growth and average income growth	PES
E	Exchange Rate	Real Exchange rate	IFS

The study will be base on time series data and observation will be collected on the mention variables for a period 1971 to 2012.

4.3 Methodology

There are two ways (not necessarily opposing as Molana (1991) has proved it) of modeling consumption function, i.e. the Euler equation based approach and the so called solved out consumption function/error correction specification (Blinder and Deaton 1985, Meullbaur 1995). The Euler equation approach is based on forward looking rational consumers and focuses on the optimality conditions linking consumption in adjoining periods. The solved out consumption function solves the full set of optimality conditions and derives a consumption function in terms of initial assets human capital.

It is usually claimed that since the Euler equation is derived from the intertemporal optimization of the representative individual, the estimated parameter does have micro foundations and interpretation is straight forward. However, there are four significant reasons for questioning the supposed dominance of the Euler approach. First, the claimed advantage that there is one to one correspondence between theory and estimation under the Euler equation approach seems to be an illusion. For example, if a particular Euler equation holds at the micro level, it would not hold for aggregate data without taking the assumption that households live an infinite life. This is because when households die and is replaced by new households, the information connection linking consumption in adjoining periods is broken.

Second, both the solved-out approach and the Euler equation approach needs some simplifying assumptions when some households are credit constrained. The reason is that the actual fraction of credit constrained households is unobservable and is not constant either, since all those who are credit constrained don’t spend only their current income.

Third, owning to the fact that a significant proportion of the population don’t form expectations rationally, the Euler equation approach does not seems to be a reasonable

approximation of the population, which is based on rational expectations. Finally and most importantly, since the Euler approach involves some form of first differencing of the data, it throws away important long-run information on the levels of consumption, income, assets, and demography. Such information can be retained by using the solved-out consumption function and the mechanism of cointegrating and vector error correction modeling (Muellbauer, 1994).

Thus keeping the above observations in mind, the current study will utilize the solved out consumption function specified as:

$$C_t = f(Y_t, W_t, R_t, P_t, N_t, G_t, U_t, E_t) \qquad (4.1)$$

The expected signs of most of the variables are clear except those variables that involves more than one offsetting effects. Examples of such variables, in the above specification, are rate of interest, relative prices, government expenditure and exchange rate.

Having decided about the variables that should be included in the model and the nature of study (i.e. whether cross sectional or time series), the next step is to chose an appropriate econometric technique for estimation. Most of the econometric analysis and inference are based on the assumption that the economic time series are stationary. However, this is not the usual case and we have to deal with non stationary economic time series. Thus regressing one non stationary variable on another would produce significant relationships, where in fact none exists. This problem has been termed by Granger and Newbold (1974) as the 'spurious' regression problem. However, the Error Correction representation avoids such problems.

The ECM modeling approach is based on the idea of cointegration, first introduced by Granger (1981) and further developed by Engle and Granger (1987). “Two non stationary time series are said to be cointegrating if it is possible to find a linear combination of the two such that it is

stationary". Based on the concept of cointegration, Engle and Granger (1987) build an EC model that first estimates the error term from the regression equation of two cointegrated processes and then includes the error term in the difference equation as an "error-correction term". This procedure avoids the problem of spurious regression and also captures the long run adjustment process through the error correction term.

However, one major weakness of EG approach is that the model breaks down if we have more than one cointegrating relationship among the variables. This is why the EG approach is not usually used when testing models involving more than two variables, although there are no restrictions on the number of variables or cointegrating relationships theoretically. Since we have more than two variables in the consumption function, and that the number of cointegrating relationship is also unknown, the EG approach is not appropriate for our purposes. Instead, we use the Johansen and Juselius approach (1990) which utilizes the Vector Autoregressive approach and hence do not limit the number of cointegrating relationships.

Keeping in view the variables that are considered relevant for explaining aggregate consumption behavior, the long run consumption function can be specified as;

$$logC_t = \alpha_0 + \alpha_1 logY_t + \alpha_2 logW_t + \alpha_5 R_t + \alpha_6 P_t + \alpha_7 N_t + \alpha_3 logG_t + \alpha_4 U_t + \alpha_8 E_t + e_t$$

(4.2)

Equation (4.2) expresses consumption as a function of income, wealth, government expenditure, uncertainty, rate of interest, relative prices, unemployment and exchange rate. Moreover, to capture the speed of adjustment to the long run equilibrium relationship and to find the short run dynamics, an error correction model is needed and can be articulated in the following form:

$$\Delta \log C_t = \sum_{i=1}^{p} \ _i \Delta \log C_{t-i} + \sum_{i=1}^{p} \mathrm{g}_i \Delta \log Y_{t-i} + \sum_{i=1}^{p} \ddot{} _i \Delta \log W_{t-i} + \sum_{i=1}^{p} \mathrm{¢}_i R_{t-i} + \sum_{i=1}^{p} \mu_i P_{t-i} + \sum_{i=1}^{p} {}^2 _i N_{t-i} +$$

$$\sum_{i=1}^{p} \mathrm{a}_i \log G_{t-i} + \sum_{i=1}^{p} {}^\circ _i U_{t-i} + \sum_{i=1}^{p} \ll_i E_{t-i} + \circledR ECT_{t-i} + u_i \qquad (4.3)$$

Where Δ denotes the "first difference operator", ECT_{t-1} is the "one period lag error correction term" estimated from equation (2), and u_t is the "error term" for the short-run equation. The coefficient of the lagged error correction term measures the speed of adjustment to the long run equilibrium relationship (Saad, 2011).

Moreover, following Qayyum (2002) and Ahmed and Qayyum (2007), the following three step methodology is adopted to estimate the consumption function specified in equation (2) and (3);

Step I. The univariate time series analysis.

Step II. The multivariate cointegration analysis and the estimation of the long-run consumption function by using the Johansen (1988) maximum likelihood method.

Step III. To obtain a parsimonious short-run dynamic private consumption function through the error correction mechanism.

Step I. Univariate Analysis

While modeling an economic time series, we start with the assumption that the series is non stationary. If a variable is stationary, i.e. if its basic properties such as mean, variance and covariance are time invariant, it is said to be integrated of order zero. On the other hand, if a variable is not stationary in its original form but can be converted into a stationary one by differecing it d times, the variable is known as integrated of order d. To test for stationarity, we

used the Augmented Dickey-Fuller (1979, 1981) test which is based on the following regression specification;

$$\Delta X_i = \sim + \quad t + ¢X_{t-1} + \sum_{i=1}^{m} ¥\Delta X_{t-i} + £_t \qquad \text{For} \quad i = 1,2,3,..., m \qquad (4.4)$$

Where X_t is "any time series to be tested for unit roots", t is "time trend" and $£_t$ is "a white noise error term". In the above specification, if i = 0, then the test reduces to the simple Dickey and Fuller (1979, 1981) test. But if the error term is serially correlated, then lags of the dependent variable are included in the model until the error term becomes white noise. We test the hypothesis that $¢ = 0$ and alternative hypothesis is $¢ < 0$ in equation (4.4) by τ -test.

Step II. Multivariate Cointegrating Analysis

In multivariate cointegrating analysis, we will be testing for no cointegration between the consumption and its determinants by utilizing Johansen (1988) maximum likelihood method. The key hypothesis that is being tested is that there exist r cointegration vector(s). Inference on the "r" of the system is conducted through the method of likelihood ratio (LR) test. The null of the test can be stated as;

$$H_{0(r)} : rank\ (\Pi) = r \qquad (4.5)$$

The alternative hypothesis of the test is an unrestricted one and can be stated as;

$$H_{1(r+1)} : rank\ (\Pi) = r + 1 \qquad (4.6)$$

The above test is termed as "trace statistics". Similarly, the validity of $H_{0(r)} : rank\ (\Pi) = r$ against the alternative of $H_{1(r+1)}$ is tested by looking at the maximal eigenvalue statistic. The

likelihood ratio (LR) test statistic for the hypothesis that there are at most " r " cointegrating vector is:

$$-2\ln Q = -T\sum_{i=r+1}^{p}\ln(1-\hat{a}) \qquad (4.7)$$

Where the " $\hat{a}_{r+1},.....\hat{a}_{p}$ " are the (p-r) smallest canonical correlations. Johansen (1988) proved that these statistics follows ¡ ^{2} distribution with r (p–r) d.f. and whose critical values are being provided by Osterwald-Lenum (1992). The LR test is applied to test the significance of the estimated parameters in cointegrating relationship between consumption and its determinants.

Step III. Short-run Dynamic Consumption Function

The third step is to estimate the sort run consumption function, using the error correction mechanism. Using the JJ test, if the variables under consideration are found to be cointegrated, then it implies that the linear combination of the integrated variables is stationary i.e., I(0). Therefore, the residual term, called error correction, term is stationary.

The estimation of the VECM requires that the variables under consideration be cointegrating. Once this has been established, then unrestricted VAR is estimated in which each variable enters with the pre specified optimal lag length. Since all the variables of the model are stationary, the function is estimated by using the ordinary least square method. The preferred dynamic consumption function, which would be acquired by using Hendry's (1993) general to specific approach, would pass a number of diagnostic tests. For example, serial correlation in the residual term would be tested using the Lagrange Multiplier (LM) test. Similarly, normality of the residuals would be checked by using the Jarque-Bera (1987). The LM version of Heteroskedasticity test and ARCH test are also used. The Brown, *et al.* (1975), CUSUM and CUSUM of Squares tests are used to verify the stability of estimated consumption functions.

Chapter 5

RESULTS AND DISCUSSION

5.1 Introduction

This chapter, being the heart of this study, has been divided in four main sections. Section 5.2, named as univariate time series analysis, contains testing for unit roots in the individual time series, using the ADF test. Section 5.3 then deals with multivariate analysis and has been further divided into four sections. Section 5.3.1 deals with the optimal lag selection for Johansen cointegration and the subsequent vector error correction model. Results of the Johansen cointegration test are presented and discussed in sub section 5.3.2. The following sub-section, that is, 5.3.3, contains results and discussion of the VEC model. Long run and short run causality is then discussed in the subsection 5.3.4. Section 5.4 then presents some of the diagnostic tests which are necessary to verify the validity of the short run and long run results estimated in the previous sections. Section 5.5 is the last one which concludes this chapter.

5.2 Univariate Time Series Analysis

The current study is designed to estimate the long run and short run consumption function for Pakistan, based on time series data. But one of the serious problems of time series data is that if we apply ordinary least square (OLS) technique on the level forms of the variables, provided that their important characteristics such as mean, variance and covariance are time variant (non stationary), we would get nonsense results. Such regressions, known as spurious regressions, usually have High R^2 but very low Durbin-Watson values and hence do not reflect the true relationships amongst the variables.

Thus to check for the possibility of unit roots in the individual time series, we utilize the ADF test and the results are appended in Table 5.1. The null hypothesis of the test is that the time series under consideration is non stationary.

Table 5:1 Augmented Dickey-Fuller Test

Series	Constant and trend (c,t)	Lag	$\ell = 0$ t-Statistic	Decision
At Level				
LNC	c, t	0	-2.887	UR Exists
LNY	c	1	-0.197	UR Exists
LNW	c	2	-1.442	UR Exists
R	c	0	-2.231	UR Exists
P	c	0	-4.213	No Unit Root
N	c,t	0	-2.494	UR Exists
LNG	c	1	-1.733	UR Exists
U	c	0	-5.982	No Unit Root
E	c	0	-1.620	UR Exists
At first difference				
ΔLNC	c	0	-7.04	No Unit Root
Δ LNY	c	0	-4.135	No Unit Root
ΔW	c	0	-4.888	No Unit Root
ΔR		0	-6.899	No Unit Root
ΔN		0	-5.546	No Unit Root
ΔLNG	c	0	-11.825	No Unit Root
ΔE		0	-6.462	No Unit Root

Table 5.1 shows that all variables are integrated of order 1, i.e. I(1), except relative prices (P) and uncertainty (U).

5.3 Multivariate Time Series Analysis

As has been outlined in the previous section, most of our time series variables are non stationary at level but becomes stationary after first differencing. Thus a natural response to the

spurious regression problem, as suggested by Granger and Newbold (1974), is to take first difference of the variables and estimate the model by OLS. But this process of estimating the model in the difference form necessarily wastes the long run properties of the data. Thus to estimate both the long run and short run consumption, we utilize the cointegration approach, along with the Vector Error Correction Mechanism. The subsequent sections presents and explains all the steps necessary to get both the short run and long run consumption function for Pakistan.

5.3.1 Optimal Lag Selection

Before going into the details of the long run and short run consumption function, it is appropriate to decide upon the optimal lags of the variables. This is so because both the Johansen cointegration approach and the estimation of the VECM require the specification of the optimal lag length. Theoretically, the optimal lag length could be found by estimating the Vector Autoregressive (VAR) model for a large number of lags, and then reducing the lag length and re-estimating the model sequentially, until zero lag is reached. However, there are a number of other statistically criteria which performs the same function.

Thus, the following table contains information about the optimal lag length suggested by various criteria. It is well known that various criteria's can give different results, but as a rule of thumb, the lag length suggested by most of the criteria is recommended. In our case, only one criterion suggests lag length to be 2 while the rest are suggesting lag length of one. Hence we would use lag length of 1 in the subsequent analysis.

Table 5:2 Test for optimal lag length using VAR model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-148.0259	NA	5.48e-06	7.751293	8.046847	7.858156
1	116.4213	423.1154*	1.19e-10*	-3.021064	-0.656633*	-2.166160*
2	166.4086	62.48420	1.43e-10	-3.070432*	1.362877	-1.467487
3	210.2760	39.48060	3.68e-10	-2.813799	3.688387	-0.462814

Note: LR stands for Likelihood ratio, FPE for Final Prediction Error, AIC for Akaike Information Criteria, SC for Schwarz Information Criterion, and HQ for Hannan-Quinn Information Criterion. The asterisk (*) indicates the lag length selected by each criterion.

5.3.2 Johansen Cointegration Test Results

The concept of cointegration was first introduced by Granger (1981) and further extended by Engle and Granger (1987). The basic idea of cointegration analysis is that, if the variables under consideration are non stationary, then it may be possible to form a linear combination of those variable which may be stationary and exhibit long run relationship at the same time. Engle and Granger (1987) also proposed the methodology, based on the error correction mechanism, to carry out cointegration analysis. But the said methodology is not applicable when we consider more than two variables at a time (although there are no limits of variables in the methodology theoretically).

Alternatively, we use the Johansen and Juselius (1990) approach to examine cointegration between consumption and its determinants. The Johansen and Juselius (JJ) approach is based on the VAR model which uses multiple equations and hence works even if there is more than one co integrating relationships amongst the variables.

The first step, in applying the JJ test, is to choose the optimal lag length which has already been choosen in section 5.3.1, using various statistical criteria. The next step is to decide upon the model of the JJ approach that should be used for cointegration. There are five models available

in the JJ test, and the difference amongst the models centers around whether or not a trend or intercept should be used. Three of the five models are frequently used by the economists, that are model 2, 3 and 4. Model 2's long run equation does have an intercept but not in the short run equation. Model 4 has an intercept in both short run and long run equation but also has a trend in the long run equation. These two feature makes these two models less attractive for us, because most of the short run consumption theories agrees upon a positive intercept, i.e. the so called autonomous consumption expenditure, which is absent from model 2. Similarly, a trend in the long run equation of model 4 implies ever increasing or decreasing consumption, which is also rare in the actual world. Thus we are left only with model 3 which is used for cointegration analysis. The following tables present the results of cointegration, based on the JJ test.

Table 5:3 JJ Cointegration Test Results (Trace Test)

Null Hypothesis (λ_{trace}rank tests)	**Alternative Hypothesis**	**Trace statistic**	**Critical values (5%)**	**P-Value**	**Decision**
Ho: r=0	H1: r=1	180.416	125.615	0.000	Co-integration Exists
Ho: r=1	H1: r=2	114.309	95.753	0.001	Co-integration Exists
Ho: r=2	H1: r=3	71.138	69.818	0.039	Co-integration Exists
Ho: r=3	H1: r=4	37.605	47.856	0.319	No co-integration

Table 5.3 scientific researchs the results based on the trace statistics while table 5.4 scientific researchs the cointegration results based on the maximum Eigen value statistics. The null

hypothesis of no cointegration is rejected by the trace test up to r =2, meaning that there are 3 cointegration vectors in the model. However, the maximum Eigen value test shows that there are at most 2 co integrating vectors in the system. In any case, we can conclude that when model 3 of the Johansen and Juselius cointegration method is used with optimal lag length 1, personal consumption expenditure, disposable personal income, government non defense expenditure, wealth, exchange rate, interest rate and liquidity constraints are found to be cointegrated.

Table 5:4 JJ Cointegration test results (Max-Eigen value Test)

Null Hypothesis (λ_{max}rank tests)	Alternative Hypothesis	Max-Eigen Statistic	Critical values (5%)	P-Value	Decision
Ho: r=0	H1: r >0	66.10635	46.23142	0.0001	Co-integration Exists
Ho: r≤1	H1: r >1	43.17121	40.07757	0.0217	Co-integration Exists
Ho: r≤2	H1: r >2	33.53371	33.87687	0.0549	No co-integration

5.3.3 Vector Error Correction Model

The estimation of the VECM requires that the variables under consideration must be cointegrated, the fact that has been established in the previous section, using the JJ approach. The other necessities for the estimation of the VECM, i.e. optimal lag length and the particular JJ model to be used are already fulfilled. What remains ambiguous is the number of co integrating

equations, since the trace test recommends 3 while the maximum Eigen value test recommends 2 co integrating equations.

We have estimated the VECM with 2 and three cointegrating equations, but the results of VECM with two cointegrating equations seems reasonable and hence are given below. Note that since both P and U are stationary at level, these are not included in the JJ test and are included as exogenous variables in the VECM specification.

Table 5:5 Results of the VECM (Long Run Coefficients)

Long Run analysis		
Variables	Coefficients	t-statistics
LNY	-0.239	-1.341
LNW	0.577	10.658*
R	-0.015	-6.462*
N	-0.040	-5.401*
LNG	-0.249	-4.058*
E	-0.005	-8.970*

Note: Dependent variable is log of private consumption expenditure and the asterisk (*) represent statistical significance at 1 percent.

Table 5.4 scientific researchs the estimated long run consumption function for Pakistan. We can see that all variable except personal disposable income are significant at 1 percent level. Note that the estimated long run equation is given as;

$$\mathrm{LNC} + 0.239\mathrm{LNY} - 0.577\mathrm{LNW} + 0.015\mathrm{R} + 0.040\mathrm{N} + 0.249\mathrm{LNG} + 0.005\mathrm{E} = 0 \qquad (5.1)$$

This can be re-arranged to yield results that are presented in table 5.4.

$$LNC = -0.239LNY + 0.577LNW - 0.015R - 0.040N - 0.249LNG - 0.005E \quad (5.2)$$

Of the six variables on the right hand side of equation 5.2, only wealth has a positive sign while the rest of the variables have negative signs. While some of these signs make economic sense, others do not. But is we look at the statistical significance of these variables, then although negative, personal disposable income is insignificant at nay acceptable level. Thus we can safely ignore personal disposable income and conclude that long run consumption in Pakistan is not influenced by current disposable income (in accordance with Friedman's PIH).

According to our estimates, Pakistan's Government non defense expenditure effects consumption negatively in the long run and this relationship is statistically significant at 1 percent level. As is discussed in chapter four, if government expenditure substitutes for private expenditure, one would expect a negative sign. Alternatively, if government expenditure complements private expenditure, in one way or the other, then a positive coefficient of the government expenditure is expected. What we get is a negative sign which implies than government non defense expenditure substitutes private expenditure, a phenomenon that resembles the well known crowing out or the Ricardian equivalence principle. However, our present analysis do not incapable us to term this phenomenon and needs further investigation, which is beyond the scope of this scientific research.

On the other hand, liquidity constraints as measured by the unemployment rate are found to be negatively affecting private consumption in the long run. And given that interest rate is also affecting consumption negatively, the liquidity constraints we are considering can be removed by removing the interest rate differentials on loan able funds. The wealth variable, as expected has a positive and significant relation with the long run consumption in Pakistan.

The exchange rate, measured as the amount of rupees needed to purchase a dollar, also affects consumption negatively. This result could be explained in conjunction with Figure 2.4 of chapter 2, which shows that consumption of imported goods and non factor services is increasing overtime in Pakistan. This implies that exchange rate should influence private consumption, since variations in interest rate causes variations in the prices of imported commodities. To be precise, exchange rate variations, in theory, has both demand side and supply side effects on consumption. On the demand side, an increase in exchange rate implies expensive imported commodities and hence demand should decrease. On the supply side, an increase in the exchange rate implies that the price of exports is decreased which, in turn, leaves less domestic supply for domestic consumption and hence less is consumed domestically. Our empirical results are exactly in line with this theoretical preposition.

Next we turn to the estimated short run consumption function for Pakistan and the results are appended in table 5.5. Note that since the VECM is estimated with two lags, all the variables including consumption have two short run coefficients. But when we followed the Hendry's (1993) general to specific approach, where the said approach eliminates variables that are insignificant at successive steps, only the results appended in the following table are seemed to be reasonable candidates for explanting the short run dynamics of the private consumption in Pakistan.

Table 5:6 Results of the VECM (Short Run Coefficients)

Variables	Coefficients	Std. Error
ΔLNC(-1)	-0.255	0.182
ΔLNY(-1)	0.906**	0.390
ΔLNW(-1)	0.246	0.149
ΔR(-1)	-0.011*	0.005
ΔP(-1)	-0.348**	0.130
ΔN(-1)	-0.012	0.008
ΔU(-1)	-0.010**	0.004
ECM_{t-1}	-0.609*	0.175
R	0.557	
Adj-R	0.419	
F_ Statistics	3.757*	

Note: Dependent variable is log of private consumption expenditure and the asterisk (*) and (**) represent statistical significance at 1 percent and 5 percent respectively.

First consider the ECM term (-0.61) which is negative, statistically significant at 1 percent level and is less than one in absolute magnitude, as is expected from a meaningful VECM. This confirms our cointegrating analysis and additionally provides the information that almost 61 percent of the deviations from the long run equilibrium are corrected each period.

The rest of the result are standard and we will only focus on the short run relationship that has statistical significance but occasionally insignificant terms are also discussed, in particular where short run and long run comparisons are made. In Particular, as the previous table (5.4) shows, disposable income has no effect on the long run consumption but we see that this relationship turns to a positive and significant one when we consider short run consumption

function for Pakistan. Wealth was positively effecting long run consumption but this regularity disappears when we consider short run consumption. Similarly, liquidly constraints were negatively affecting long run consumption but we do not have statistical evidence regarding this negative relationship in the short run.

Likewise, the price confusion effect was missing from the long run consumption function but we see the very price confusion effect in the short run. Rate of interest was redundant in the long run consumption function but seems to be a very relevant determinant of the short run consumption function in Pakistan. This, in a way, supports the Euler equation which asserts that rate of interest effects the intertemporal choices of the consumers. Thus rate of interest is relevant when we consider a short run planning horizon, but not in the long run. Interestingly, the positive and significant impact of uncertainty on the long run consumption in Pakistan turns to negative and significant impact in the short run. These are all very interesting results and are considered in depth when we discuss policy implications in chapter 6.

5.3.4 Causality Tests

Causality can be multivariate or bi-variate, , both types of causality can be unidirectional or bidirectional. Our interest lies in the multivariate unidirectional causality and hence we take it first. Multivariate causality can be directly established from the estimated VEC model, where long run causality is explained by the ECM term and short run causality can be established from the short run coefficients, using the Wald test.

Long run Causality is said to run from the explanatory variables to the explained variable if the ECM term turns out to be negative and statistically significant. But if the ECM term is positive and/or insignificant, then the explanatory variables do not cause the dependent variable. The results appended in table 5.5 shows that the ECM term is both negative and statistically

significant. Hence we conclude that long run consumption expenditure in Pakistan is caused by personal disposable income, wealth, government expenditure, liquidity constraints, rate of interest, exchange rate, relative prices and uncertainty.

To establish the short run causality from personal disposable income, relative prices and rate of interest to the short run consumption function, we utilize the Wald coefficient restriction test and the results are given in table 5.6 below.

Table 5:7 Short Run Multivariate Causality (Wald Coefficient restriction test)

Variable	Coefficient Restriction	Chi-Square Value	df	Probability
Personal Disposable Income	C(11) = C(12) = 0	7.727125	2	0.0210
Relative Prices	C(15) = C(16) = 0	9.750313	2	0.0076
Interest Rate	C(17) = C(18) = 0	12.88668	2	0.0016

Note: C(11) and C(12) represent one period and two period lagged income, C(15) and C(16) represent one period and two period lagged relative prices, C(17) and C(18) represent one period and two period lagged interest rate.

The null hypothesis of the test is mentioned in column 2 which will be rejected if the p-value turns out to be less than 5 percent. Since the p-value is less than 5 percent in all of the above cases, hence we reject the null hypothesis of no short run causality in all the cases. That is, personal disposable income, relative prices, and interest rate all causes short run consumption variations in Pakistan.

5.4 Diagnostic Tests

We said that the estimated long run and short run consumption for Pakistan are both meaningful, as most of the results are standard ones. However, their genralizability and applicability for policy purposes requires that the estimated model passes a number of diagnostic

tests. These tests ranges from whether or not the residuals of the model are serially correlated, heteroskedastic and are normal. Similarly we needs to check the functional form of the model and the stability of the parameters estimated. The results of all such tests are given in table 5.7 which shows that there is no problem with the model and hence can be used for policy purposes as well.

Table 5:8 Results of the Diagnostic Tests

Test	F-Statistics	P-Value	Remarks
LM	0.680539	0.516250	No Serial Correlation
ARCH	0.604803	0.441833	No ARCH effects
J.B	2.717069	0.257037	Normal
White's Heteroskedasticity	1.109213	0.442494	No Heteroskedasticity
RAMSEY RESET	0.150548	0.701432	Correct Functional form

Figure 5:1 Plot of CUSUM test

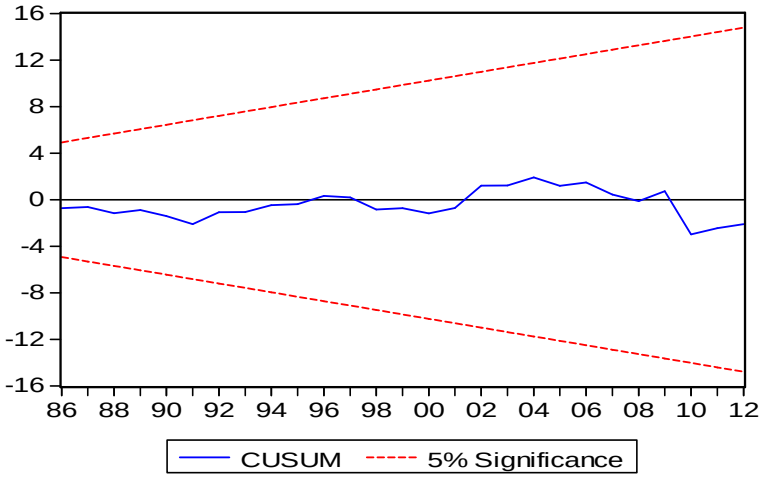
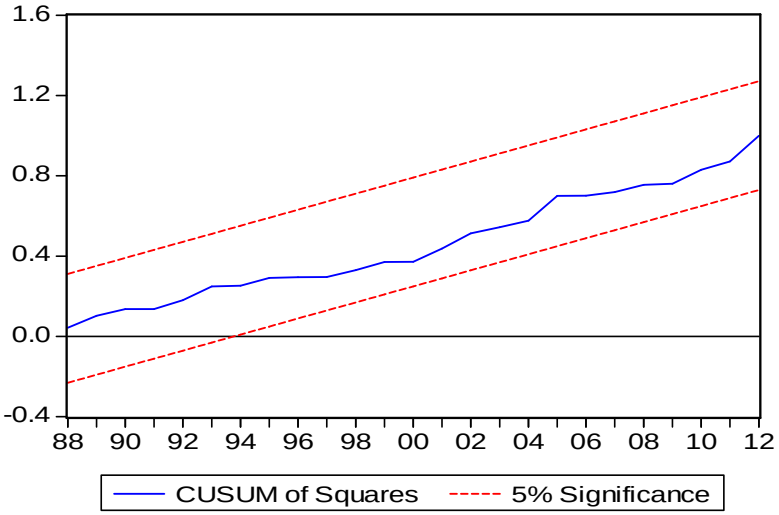


Figure 5:2 Plot of CUSUM of Square



In particular, the results shows that there is no serial correlation in the residuals obtained from the short run error correction model, no ARCH effects are present, no Heteroskedasticity in the error term and are also normally distributed. The stability of the short run coefficients is examined by using the Cumulative Sum of Recursive Residuals (CUSUM) and CUSUM of square residuals tests. Since the graph of both the tests lies within the five percent confidence interval, thus the short run parameter stability is established.

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

Besides gross domestic product, aggregate consumption is the single most important macroeconomic variable which affects various sectors of the economy, directly or indirectly. For example, consumption is said to be the biggest component of aggregate demand and hence is a major determinant of economic fluctuations in an economy. Besides these well known effects of consumption, it also has a number of other effects which are very relevant from the policy perspective. For instance, variations in consumption are strongly associated with variations in government tax revenues (in particular where bulk of tax revenue is collected through consumption taxes), variations in the balance of trade, inflation and so on.

Keeping this immense importance of aggregate consumption in mind, it is important to know the sources that cause variations in aggregate consumption. This very topic is under serious scrutiny since the times of Keynes (1936) but no single answer has been reached as yet. In particular, there are still debates on the differences of short run and long run consumption functions and on the relevance of current income as a source of variation in consumption. This study has been designed to seek answers for some of the debated issues in the area.

The study utilizes time series data from 1971 to 2012 and most of the variables mentioned relevant in the literature. As is the routine in contemporary time series based econometric analysis, we have checked all the variables for their order of integration. Since most of the variables under consideration were found to be non stationary, the use of conventional ordinary least square was ruled out and we searched for our answers using the relatively new cointegration analysis. The relevant technique, in our case, was the Johansen and Juselius con

integration technique which has a number of advantages over the Engle-Granger cointegration technique.

In order to run the JJ cointegration technique, we have first determined the optimal lag length, using various statistical criteria. Then, based on the model at hand, we have selected model 3 of the JJ test. The JJ test confirms the long run equilibrium relationship between consumption and the set of explanatory variables and then we moved to estimate the VECM model to get the long run and short run coefficients of the variables explaining consumption. The resulting ECM term turned out to be negative and statistically significant, meaning that the set of explanatory variables considered in the model causes variations in long run consumption behavior of Pakistan. We then utilized the Hendry's (1993) general to specific modeling approach to estimate a parsimonious ECM model and short run causality analysis are then carried out on that specific ECM model.

The specific conclusions that can be drawn from the long run consumption function in Pakistan are presented in the following bullets;

- Long run consumption behavior in Pakistan is not determined by current income (current GDP), as this variables is statistically insignificant at any acceptable level.
- Government expenditure (Non Defense) affects long run private consumption negatively, implying that government consumption and private consumption are gross substitutes rather than complements in Pakistan.
- Unemployment rate used as a proxy for liquidity constraints, effects private consumption in Pakistan negatively in the longer run.
- Rate of interest and exchange rate effects private consumption negatively in the long run in Pakistan.

- Wealth has a positive and significant influence on the long run consumption function in Pakistan.

As mentioned in chapter five, all these results are standard ones except the impact of disposable personal income on long run consumption. We expected long run consumption to be sensitive to income but it seems that Friedman was right in placing greater emphasis on permanent income (or wealth for that matter) in his consumption theory.

The specific conclusions that can be drawn from the short run consumption function in Pakistan can be stated as;

- Personal disposable income (GDP) has a positive and significant impact on the short run consumption behavior in Pakistan.
- Wealth and liquidity constraints don't have any influence on the short run consumption behavior in Pakistan.
- In the short run, Pakistani consumers do suffer from the price confusion effect as the relative price variable has a negative and significant coefficient in the short run.
- Rate of interest effects short run consumption behavior negatively.
- Future uncertainty has a negative impact of the short run consumption behavior in Pakistan.

Both the long run and short run causality analysis confirms the above stated conclusions. Moreover, since the estimated models confirms to all the diagnostic tests which are necessary for generalizing the results of the model, hence the above stated results are valid and can be used for policy simulations. Therefore, the next paragraphs discuss what policy relevance can be obtained, and what could be recommended to the policy maker from the above results.

There are two major policies at the disposal of the government, i.e. Fiscal Policy and Monetary Policy. The major instruments of fiscal policy are taxation and government spending. Monetary policy is comprised of actions taken by the State Bank of Pakistan to influence interest rates and/or money supply. Thus the policy prescriptions that we outline, based on the estimated short run consumption function for Pakistan, centers around these conventional policy instruments. Further, we simplify our discussion by assuming that the sole of the policy is to influence consumption so that to direct the economy in a desirable direction.

According to the estimated short run consumption function, deviations in personal disposable income causes short run deviations in private consumption. More specifically, an increase in personal disposable income is followed by an increase in private consumption. This result makes the government taxation policy very relevant to correct for short run fluctuations, since taxation affects personal disposable income directly. For example, if the economy is going through a down turn, then the government can reduce the tax rates to boost personal disposable income and hence consumption. Being the single most important determinant of aggregate demand, the increasing consumption can potentially twist the state of the economy towards a booming one. Similarly, in times of inflation (provided that inflation is caused by excessive demand), the government can increase the tax rate to control inflation.

The short run model also shows that wealth and liquidity constraints have no effect on the short run consumption behavior in Pakistan. These results are important, in particular the evidence that there are no liquidity constraints. This is so because the presence of liquidity constraints shortens the planning horizon of the individuals which, in turn, makes the monetary policy ineffective. But since there are no liquidity constraints and we have also established a negative relationship between rate of interest and short run consumption behavior, this implies

that monetary policy is also effective to influence aggregate consumption and hence aggregate demand. For example, reducing rate of interest will increase consumption and hence aggregate demand and could take out the economy from recession.

These two results combined, i.e. the positive influence of income and negative influence of interest rates, in a way supports that Pakistani consumers are forward looking. This is so because RE-PIH implies that if consumers are rational (forward looking), then changes in interest rates and personal disposable income should cause variations in current (short run) consumption rather than future (long run) consumption. Our short run and long run empirical consumption functions exactly produce the same results. In turn, these results imply that consumers will react differently to transitory and permanent policy announcements of any kind. That is, the impact of permanent policy announcement will have more impact of consumption than a transitory one.

The uncertainty variable, in our short run consumption function, has a negative coefficient, implying that uncertainty affects short run consumption behavior negatively. Theoretically, the more uncertain an economy, the more people will have precautionary savings and hence less will be consumed. Thus stabilizing the economy through fiscal policy and/or monetary policy will necessarily boost consumption and hence aggregate demand. The last variable, the price confusion effect, may have policy relevance, as Deaton and Blinder (1985) himself points out, that the price confusion effect measures the influence of expected inflation on consumption, but its inclusion also means that the equation not only contains current variables but also expected variables. This, in turn, improves the fit of the model (Deaton and Blinder, 1985)

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