Dynamics of Aggregate Consumption in Niger

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ABSTRACT

This study attempts to analyse the relationship between consumption expenditure and income from 1960 to 2018 in Niger. We used the Dual Adjustment approach which models the dual co-movements of the variables, as an alternative to the traditional cointegration analysis that implicitly enforces a singular adjustment between the variables.

Our results provide evidence on the existence of common Hodrick Prescott trend for income and consumption in Niger. The results also show a significant relationship between the transitory components of our variables. Overall, our results indicate that Dynamic Keynesian Consumption Function is valid for Niger. Our results also show that an increase in income leads to a decrease in the Average Propensity to Consume (APC) and hence increase in the Average Propensity to Save (APS). Furthermore, our findings suggest that an increase in public expenditure can help to stimulate the economic growth of Niger.

Keywords: Household Consumption Expenditure, Income, Cointegration, Dual Adjustment

ÖZ

Bu çalışma, Nijer'de 1960-2018 dönemi için tüketim harcamaları ile gelir arasındaki ilişkiyi analiz etmeyi amaçlamaktadır. Değişkenlerin ortak ikili hareketlerini modelleyen İkili Uyarlanma yaklaşımını, değişkenler arasında örtük olarak tekil bir uyarlamayı içeren geleneksel eşbütünleşme analizine bir alternatif olarak kullandık.

Sonuçlarımız Nijer'de gelir ve tüketime yönelik ortak Hodrick Prescott eğiliminin varlığına dair ampirik bulgular sağlıyor. Sonuçlar ayrıca değişkenlerimizin geçici bileşenleri arasında önemli bir ilişki olduğunu göstermektedir. Genel olarak, sonuçlarımız Dinamik Keynesyen Tüketim Fonksiyonunun Nijer için geçerli olduğunu göstermektedir. Sonuçlarımız ayrıca, gelirdeki bir artışın Ortalama Tüketim Eğiliminde (APC) bir azalmaya yol açtığını ve dolayısıyla Ortalama Tasarruf Eğilimi'ni (APS) artırdığını göstermektedir. Ayrıca, bulgularımız kamu harcamalarındaki bir artışın Nijer'in ekonomik büyümesini canlandırabileceğini göstermektedir.

Anahtar Kelimeler: Hanehalkı Tüketim Harcamaları, Gelir, Eşbütünleşme, İkili Uyarlanma

To My Family

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Chapter 1

INTRODUCTION

The Republic of Niger is a landlocked country located in West Africa. It shares borders with Benin, Algeria, Chad, Burkina Faso, Libya, Nigeria and Mali. Niger is a French speaking country that was a France colony until 1960. It gained its independence on the August 3rd 1960. According to the World Bank, Niger has a population of about 22 million of people as of 2018. The Nigerien Economy thrives majorly on agriculture and exports of raw commodities and it is a poor country. The economy of Niger is considered as a subsistence economy, in other words the economy of Niger is based on subsistence activities such as food, clothing and shelter.

This study attempts to analyse the relationship between consumption expenditure and changes in income from 1960 to 2018 in Niger. Aggregate consumption is the largest component of total spending; hence, it is important to study its dynamics since it will help us to understand macroeconomic fluctuations and business cycles. Moreover, aggregate consumption influences the economy's long-term productivity as aggregate saving is determined by aggregate consumption. That is, understanding the determinants of consumption can help to understand the long-run dynamics of income, and therefore the means for enhancing the economic growth of a country.

For some time-series variables, it is necessary to divide them into transitory and permanent components and investigate their dual co-movements. For example, the

prerequisite of a strong Permanent Income Hypothesis (Friedman, 1957) is that permanent consumption depends on permanent component of income while transitory components of consumption and income are not related. Therefore, it is argued that permanent and transitory components could have different co-movements which is referred to as dual adjustment (İsmihan, 2019). The Dual adjustment approach is used as an alternative to the cointegration analysis for non-stationary data, because the cointegration analysis can sometimes unexpectedly show a spurious relationship for some variables. For example, in the case of simple consumption function Baltagi (2008) found no long-run relationship among consumption and income for USA (1950-1993), while previous researchers found the existence of cointegration between consumption and income for US data (see İsmihan, 2019 for more detail).

To analyse our data, we used the cointegration analysis as well as the dual adjustment approach. As is well-known, the cointegration analysis is the most popular method of analysing non-stationary variables. However, as we shall explain later in this thesis, the cointegration analysis enforces a singular adjustment between the variables, while some variables like consumption and income in our case, need to be analysed by modelling their dual co-movements. To that end, this study utilizes the dual adjustment analysis approach along with the empirical consumption models of Dual Adjustment Hypothesis (DAH) and Singular Adjustment Hypothesis (SAH) developed by İsmihan (2019). More specifically, this thesis attempts to answer the following question: Is there any evidence of dual adjustment on consumption behaviour in Niger?

This thesis covers five chapters. The organization of the study is as follows:

- Chapter 2 presents the literature review.
- Chapter 3 explains the model and methodology used for this research.

- Chapter 4 focuses on the empirical analyses and their interpretation.
- Chapter 5 provides the conclusion that can be drawn from this research.

Chapter 2

LITERATURE REVIEW

This chapter initially focuses on the studies of well-known economists who worked on the determinants of consumption and then it provides a review of selected empirical studies.

2.1 Theoretical Arguments on the Determinants of Consumption

The traditional macroeconomic models that analysed and studied consumption expenditure are Absolute Income Hypothesis (Model) by Keynes; Life Cycle Hypothesis by Modigliani; Permanent Income Hypothesis by Friedman and Relative Income Hypothesis by Duesenberry.

All the above economists agreed on one fact, consumption expenditure mainly depends on the level of income but they all thought of different types of income. Keynes with his absolute income hypothesis argued that consumption is function of absolute income. Duesenberry rejected the idea of absolute income and proposed that consumption depends on relative income. Friedman claimed that consumption depends on permanent income in his permanent income model. And Modigliani and his co-workers maintained that consumption depends not on current income but on the whole lifetime income (In Section 2.1 we benefited extensively from various sources posted at https://www.economicsdiscussion.net).

2.1.1 Keynesian Absolute Income Theory

John Maynard Keynes was a British economist. He is the pioneer of studies on consumer expenditure with his well-known book *The General Theory of Employment, Interest and Money* (1936). In his book, Keynes mainly focused on the relationship between consumption and income. He also attached an importance to objective and subjective factors. However, for Keynes from all the factors he stated, he argued that income is the main determinant factor of consumption expenditure. Keynes mentioned that the main factor that determines consumption is Absolute Income; hence his hypothesis is called as Absolute Income Hypothesis. This theory is based on a positive relationship between consumption and income, which means that if income increases consumption expenditure will tend to increase accordingly. This theory is not based on empirical evidence but on Keynes assumption which he called "*Fundamental Psychological Law*".

Keynes based his consumption function on four main characteristics:

- Aggregate real consumption expenditure is a stable function of real income

  $$C = f(Y)$$

  With C = Current Real Consumption and Y = Current Real Income.
- Marginal Propensity to Consume (MPC), which is the slope of the consumption function defined as dC/dY, must have a value between 0 and 1 ($0 < MPC < 1$).
- Marginal Propensity to Consume remains constant or decreases when income level increases.
- Average Propensity to Consume (APC), which is the proportion of income spent on goods and services, should decrease when income level increases. In

other words, when income increases people prefer to save part of their money instead of consuming all their income, for different reasons such as for preparing their retirement, for possible accidents or illness, for investment purposes in order to gain profit, or for security if eventually they come to lose their jobs. Keynes assumed that low income consumers save less proportion of their income and higher income consumers save higher proportion of total income. However, as his approach was not based on theoretical analysis or empirical data, but instead from Keynes intuition which he called "*Fundamental Psychological Law*".

Keynesians demonstrated the consumption-income relation as a simple linear consumption function as follows (see Figure 1):

$C = a + cY$ where $a > 0$, $0 < c < 1$

where

C = Current Real Consumption

Y = Current Real Disposable income

a = Autonomous Consumption

c = Marginal Propensity to Consume

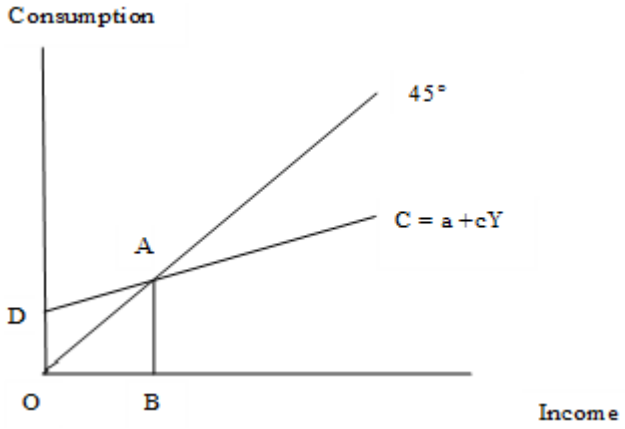

Figure 1: Keynesian Consumption Function

The above consumption function satisfies all four characteristics that describe a Keynesian consumption function:

1. It characterizes a stable relationship between consumption and income.
2. The MPC which is the slope of the curve is positive. Also, the consumption function is flatter than the 45° line; that is the consumption function meets the requirement of having 0<MPC<1.
3. As the consumption function is a straight line it means that the MPC is constant at every points of the curve.
4. The APC = C/Y. APC at any point on the consumption function is the slope of the line from the origin to that point. APC decreases as income increases moving along the consumption function.

2.1.2 Duesenberry's Relative Income Theory

James Duesenberry developed the relative income hypothesis of consumption in his book Income, *Saving and the Theory of Consumer Behavior* (1949). His studies on this theory came after Keynes ones as empirical evidence could not prove the legitimacy of Keynesian theory. In his theory, Duesenberry argues that consumer spending does not depend on absolute income but instead on relative income. He assumes that the percentage of income assigned to consumption expenditure is influenced by the level of income but also by other people like neighbours, in other words people tend to imitate their neighbours and to endeavour higher living standard.

Duesenberry says that people with lower income who live in a community of members with higher level of income tend to emulate their neighbours by consuming more. Consequently, as their income is lower than their neighbour's income, they allocate a higher proportion of their income compared to their neighbours. He chose to study the

behaviour of a household (X), that he took from a group of several other households, when their income changes compared to the other households. He then implemented different assumptions:

- When the income of the whole group of households (including X) increases at the same rate, consumption expenditure will also increase by the same rate. Similarly, when the income of the whole group of households falls at the same rate, consumption expenditure will also fall by the same rate. This means MPC remains constant.
- If the absolute income of X increases while the relative income remains the same, consumption and absolute saving rise. And MPC remains the same.
- If the income of the other households increases while relative income of X remains the same, MPC of X will increase.

Duesenberry talked about two different effects: Demonstration Effect and Ratchet Effect:

1. Demonstration Effect: In his book, Duesenberry introduced a theory of behaviour that he called "*Keeping up with the Joneses*". This theory says that the amount of income that people allocate to consumption expenditure depends not only on their preferences but also on the choices or consumption behaviour of their neighbours.
2. Ratchet Effect: Duesenberry claimed that consumption depends on the former level of income. When income decreases people try to continue consuming the same level of goods and services they used to consume. This is partially due to the demonstration effect described above; people try to maintain their consumption at the same level as they do not want their neighbours to see that

they are no longer able to afford their former standard of living. It is also due to their consumption habits; people are used to a certain standard of living and find it difficult to change their consumption behaviour when their income falls.

2.1.3 Friedman's Permanent Income Hypothesis

Milton Friedman is a well-known American economist who won a Nobel Prize for his studies. He developed a theory in his book *A Theory of The Consumption Function* (1957) that he called Permanent Income Theory. Different from the Keynesian absolute income that claimed that consumption depends on absolute income, and from Duesenberry hypothesis that argues that consumption depends on relative income, Friedman claimed that consumption expenditure depends on long term expected income which he called "permanent income" and which gave its name to his hypothesis. According to Friedman, people who work and receive a monthly payment on let's say every 30^{th} of the month will not consume all of the income received on one day and then consume nothing the other days of the month, instead they will prefer to divide that income among all of the days of the month. Consequently, consumption during one day does not depend on the income received on that particular day but on part of the "permanent income" received on that day.

Friedman divided income into two different parts: permanent income and transitory income. Permanent income is an income expected to be received constantly for a long period of time while transitory income is the unexpected subtraction or addition to income due to some unforeseen events such as accidents, illnesses, bonuses at work or even winning the lottery.

Friedman claimed that consumption expenditure does not depend on current income and therefore emphasized the idea that both consumption and income could be divided into two components: permanent and transitory:

Y or $Y_m = Y_p + Y_t$

$C = C_p + C_t$

with,

p = permanent,

t = transitory,

Y = income,

C = consumption.

Y being the total of both permanent and transitory income is the consumer's measured income or current income. It is important to note that the transitory income can either be positive or negative which means it can either rise or fall depending on if the individual is lucky or not and on how much effort the individual makes. If for example the transitory income is positive due to the fact that the individual got a Christmas bonus at work, the current income will be greater than the permanent income. Contrarily, if the transitory is negative (e.g. due to theft), then the current income will tend to decrease below the permanent income. If the transitory income turns out to be zero, then current income will be equal to the permanent income. (Demoussis & Mihalopoulos, 2001).

According to Friedman, like income, C being the total of both permanent and transitory consumption is the measured consumption or current consumption. Also, as the current income, the current consumption can be either higher or lower than the permanent

consumption or even equal to the permanent consumption depending on if the transitory consumption is positive, negative or zero.

Permanent consumption is equivalent to k proportion of permanent income in the long-run (see Figure 2).

$C_p = k\ Y_p$ and $k = f(r, w, u)$

where,

k = proportion of permanent income consumed,

r = interest rate,

w = ratio of non-human wealth to income,

u = consumer's propensity to consume.

Here it is necessary to state that there is no relationship between Y_p and Y_t, between C_p and C_t and between Y_t and C_p. Therefore, the coefficient of correlation among those variables is zero (see also SPIH in Section 2.3).

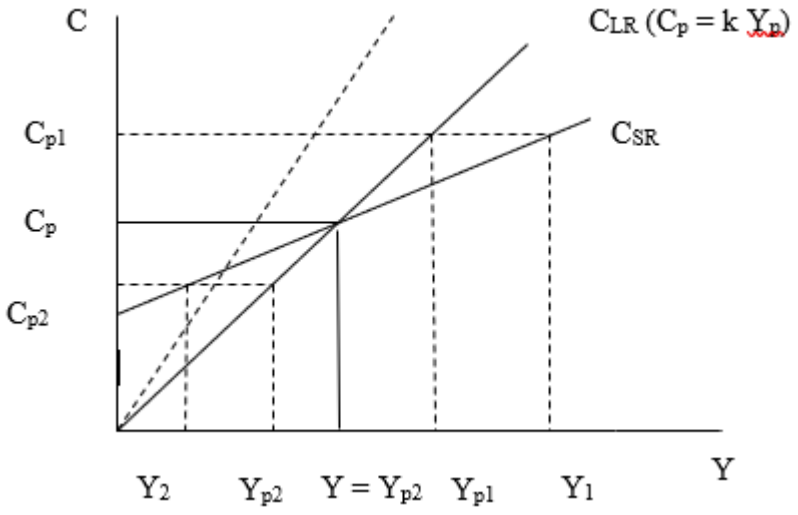

Figure 2: Friedman's Consumption Function

2.1.4 Modigliani's Life Cycle Hypothesis

The Life Cycle theory of consumption was developed in the late 1950s and early 1960s by Franco Modigliani in collaboration with Albert Ando and Richard Brumberg. Like the permanent income hypothesis, the Life Cycle hypothesis criticizes its predecessor (the Keynesian absolute income hypothesis) because of its basis arguing that consumption depends on current income. Instead Modigliani claimed that consumer spending depends on the whole lifetime estimated income (see Figure 3). The life cycle theory argues that consumption expenditure is subject to three important factors:

- The rate of return of the individual's capital
- The individual's resources including the value of the current and future and income and the value of the wealth such as properties, cars, or assets
- And the individual's age.

The key assumptions of the Life Cycle theory are as follows:

- Consumer price level does not change during the lifetime
- Inheritance is not part of the wealth of the consumer but saving is
- Interest rate of the wealth is zero
- Future consumption depends on current savings
- Certainty on present and future income
- Rationality of the consumer
- Small relationship between current income and current spending
- Spending depends on income and wealth

$C = aW_R + cY_L$

where,

a is MPC from wealth income,

W_R is real wealth,

c is MPC from labour income,

Y_L is labour income.

Let's assume a person who is expected to live N_L years, starts working at age E and retires at age T.

Working lifetime = $W_L = T - E$.

Lifetime income = $Y_L (T - E)$, where Y_L is annual labour income.

If that person is expected to consume an annual amount C, we can write the consumption function for his N_L years of living as follows:

$C N_L = Y_L W_L$ or $C = [Y_L W_L] / N_L$.

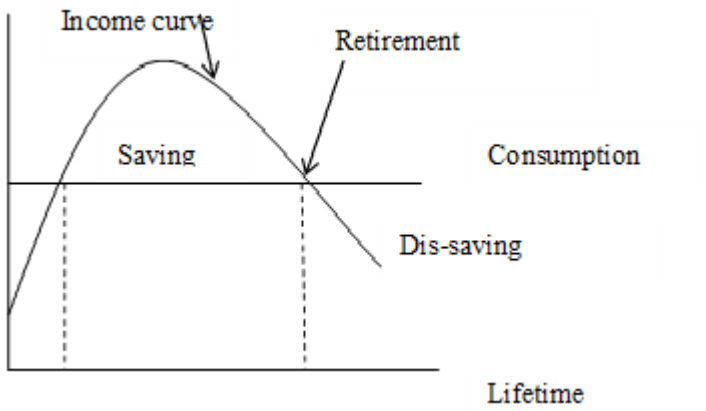

Figure 3: Modigliani's Consumption Function

However, like the others this theory also shows some weaknesses. The assumption of certainty of current and future income is not realistic. The assumption of a well-planned life for the individuals from starting to work to retirement is also not realistic. Also, empirical studies carried out in the attempt to demonstrate the legitimacy of this theory could not support the assumptions of the life cycle theory.

2.1.5 Consumption under Uncertainty

As stated above the certainty of permanent or future income is not realistic. This means that an individual cannot predict exactly the amount of income he or she will receive in the future. If the assumption of certainty of future income was realistic it would mean that consumption would never change, which is impossible.

Robert Hall (1978) developed a theory in response to the unrealistic assumptions of Friedman and Modigliani theories by combining both permanent income theory and life cycle theory. This theory is called as random walk hypothesis or modern approach of PIH. This hypothesis stresses the role of uncertainty in consumption.

The modern version of LC and PI suggests the lifetime utility maximization problem.

Lifetime utility = $U(C_t) + U(C_{t+1}) + \ldots + U(C_{T-1}) + U(C_T)$

With utility maximization defined as:

$MU(C_{t-1}) = MU(C_t) = MU(C_{t+1})$

Considering uncertainty, the above equation cannot be verified as at time t-1 the future marginal utility $MU(C_t)$ is uncertain. The same goes at time t the future marginal utility $MU(C_{t+1})$ is uncertain. Therefore, by using rational expectation for describing consumer behaviour he came up with the following equations:

$E[MU(C_{t+1})] = MU(C_t)$

$E(C_{t+1}) = C_T$

As expected, values are not observable, Hall used the theory of rational expectation and wrote the observed consumption as:

$C_{t+1} = C_t + \varepsilon$

where ε, is the expected consumption due to an increase in the level of income.

This theory is based on the assumption that consumption is function of unpredicted changes in income. If there is an unpredicted increase in income, individuals will increase their spending and if there is an unpredicted fall in their income their consumption will fall accordingly.

2.1.6 Consumption and Interest Rate

When people save, they receive an income depending upon the interest rates. Several economists claim that interest rate is an important factor in consumption and saving behaviour. According to classical economists, higher rates of interest drive people to save more and consume less, on the other hand lower rates of interest drive people to save less and consume more. This theory is explained by two different effects the substitution effect and the income effect:

- Substitution effect: when interest rates increase, the opportunity cost of the present consumption over the consumption in future will rise. Therefore, consumers prefer to consume less and increase saving and by substituting their present consumption for their future consumption.
- Income effect: when interest rates decrease, the opportunity cost of the present consumption over the future consumption will decrease. Therefore, individual prefer to save less and consume more by allocating a higher proportion of their income into consumption expenditure and smaller proportion into saving.

2.2 Dual Adjustment Approach and Dual Consumption Function

As noted in the introduction chapter, according to the dual adjustment approach, it is necessary to divide the time series variables and their respective relations into two parts; namely, transitory and permanent components. As stated above regarding the Permanent Income Hypothesis (PIH), with permanent consumption being function of permanent income.

$$C_t^P = \beta_0 + \beta_1 Y_t^P \quad (1)$$

where C_t^P is permanent consumption and Y_t^P is permanent income.

Considering the fact that $C_t = C_t^P + C_t^T$ we can re-express the above function as

$$C_t = \beta_0 + \beta_1 Y_t^P + C_t^T \quad (2)$$

where C_t is total consumption and C_t^T is the transitory consumption. Note that by definition transitory consumption (C_t^T) is stationary.

From the equation above we can get

$$C_t^T = C_t - \beta_0 + \beta_1 Y_t^P \quad (3)$$

By definition $C_t - \beta_0 + \beta_1 Y_t^P$ ($=C_t^T$) is stationary, it suggests the existence of common trend [e.g. Hodrick Prescott trend] between C and Y, this is called the weak version of Permanent Income Hypothesis (WPIH), given the probability that transitory or cyclical components are related:

$$C_t^T = \beta_2 Y_t^T \quad (4)$$

Hence, it is more realistic to assume that cyclical and permanent components may have dual or distinct co-movements, which is called as dual adjustment consumption function (İsmihan, 2019). From this, three hypotheses arise:

- Strong version of PIH (SPIH) $\{\beta_2 = 0, 0 < \beta_1 < 1\}$

  Considering that C_t^T is stationary, SPIH is empirically valid when the null hypothesis of $\beta_2 = 0$ is not rejected, which means that consumption is smoothed in the long run and cyclical components are not related.

- Dual Adjustment Hypothesis (DAH) $\{0 < \beta_2 \neq \beta_1 < 1\}$

  In the case where WPIH is confirmed, cyclical components are correlated (i.e. Ho: $\beta_2 = 0$ is rejected), and there is existence of separate dual co-movements of both components.

- Singular Adjustment Hypothesis (SAH) $\{0 < \beta_2 = \beta_1 < 1\}$

  Here, both components are related and both of their respective slopes are equal ($\beta_2 = \beta_1$, which means that MPC from permanent income equal MPC from transitory income), and $C_t^T = C_t - \beta_0 + \beta_1 Y_t$ is stationary, and now $C_t^T = \beta_1 Y_t^T$ which leads to $C_t = \beta_0 + \beta_1 Y_t$. It is noted that in this case SAH can be referred to as Dynamic version of *Keynesian Consumption Function* that implicitly contains WPIH (İsmihan, 2019:6).

In this study we will attempt to investigate the empirical validity of the above hypotheses for Niger.

2.3 A Selective Review of Empirical Findings on Consumption Function in Low Income Countries

Several researchers studied the relation between income and consumption. Nevertheless, there is a lack of comprehensive analysis of consumption function for Niger. Therefore, this study is a new attempt to provide empirical evidence on consumption-income nexus in Niger.

However, some studies have been conducted on the same topic for other low-income countries. In this section we provide a selective review of empirical literature to compare our results (later in this thesis) with theirs:

- **ECOWAS region**

  Keho's (2019) paper analyses the relationship between income and consumption from the Keynesian perspective for 12 ECOWAS countries (including Niger) from 1970 to 2016. His results verify the hypothesis of an existence of a positive relationship between consumption and income both in

the short and long run, and therefore conclude the validity of the Keynesian Absolute Income Hypothesis for ECOWAS countries.

- **Lesotho**

  Damane (2018) analyses private consumption for the period 1982 to 2015 in Lesotho. The author used Autoregressive Distributed Lag (ARDL) bounds test approach to cointegration. His results suggest the existence of positive relation between private consumption and disposable both in short and long run and hence validate the Keynesian Absolute Income Hypothesis for Lesotho.

- **Pakistan**

  Khan and Nishat (2011) estimates consumption functions for Pakistan over the period 1971 to 2010 in order to verify the Permanent Income Hypothesis. Khan used the OLS method as well as the instrumental variable estimation. However, his results show that the Keynesian Absolute Income Hypothesis is valid but not the Permanent Income Hypothesis for Pakistan.

- **Nigeria**

  Alimi (2013) analyses the relation between consumption and income from the Absolute Income Hypothesis perspective for Nigeria over the period 1970 to 2011 by using the OLS analysis. The results show that in the short run, the Absolute Income Hypothesis perspective is valid, however it is not valid in the long run.

Chapter 3

MODEL AND METHODOLOGY

This chapter is about the model and methodology.

3.1 The Model and Related Hypotheses

Our *theoretical* model is as set-out in Section 2.2 and comprises two equations:

$C_t^P = \beta_0 + \beta_1 Y_t^P$

$C_t^T = \beta_2 Y_t^T$

In our case the hypothesis that is tested is whether there exists singular ($\beta_1 = \beta_2$) or dual adjustment. Considering Section 2.3, we expect to have a similar value of parameters hence prove the existence of a singular adjustment for Niger. This means that Dynamic Keynesian Function is valid and hence we can have a single equation (restricted) consumption model as follows:

$$C_t = \beta_0 + \beta_1 Y_t \quad (5)$$

where MPC from permanent income (β_1) equal MPC from transitory income (β_2).

It should be noted that this version of *Keynesian Consumption Function* implicitly contains the weak form of PIH (WPIH). Therefore, we also expect the null hypothesis (H_0) of no common Hodrick Prescott trend to be rejected (This will imply that the WPIH is valid).

3.2 Stationarity and Cointegration

A time series data is known to be stationary when the key properties (e.g. mean, variance and covariance) of its distribution does not vary with time. When a data is

non-stationary, it may lead to spurious or false results. A stationarity or unit root test is conducted to verify if the data is stationary or non-stationary.

A cointegration test is conducted in the presence of non-stationary data. It is applied to verify the existence of correlation between the variables in the long run. Two non-stationary variables are known to be cointegrated when there is a stationary linear combination of those variables.

When analysing time series data with OLS for example, we usually assume that the data are stationary, however dealing with non-stationary data might lead to biased results, thus those non-stationary data must be analysed by using the cointegration analysis.

3.3 Empirical Procedures

The empirical procedures related to the dual adjustment approach are similar to the ones of Engle Granger (EG) cointegration approach, as it is the benchmark case.

EG Method:

Considering the following equation,

$$Y_t = \beta_0 + \beta_1 X_t + u_t \quad (6)$$

where Y and X are non-stationary and u is the disturbance term. u can be specified as $u_t = \rho u_{t-1} + \varepsilon_t$, where ρ stands for the correlation between u_t and u_{t-1} and ε is the white noise disturbance term. In EG co-integration test, residuals obtained from the above equation are utilized to estimate the following Equation, which is used as a test equation.

$$\Delta u_t = \gamma u_{t-1} + \varepsilon_t \quad (7)$$

where $\gamma = \rho - 1$.

If the null hypothesis of no cointegration is rejected, it means that the residuals are stationary, and thus Equation (6) is an attractor, conversely if the null hypothesis is not rejected, it means that the residuals are non-stationary.

In the dual adjustment approach the first step is to divide the variables into two components (See İsmihan (2019) for more detail on Dual Adjustment Approach and related empirical issues). To do so, it is important to apply Hodrick-Prescott (HP) method. However, when using the HP method, one shall choose the smoothing parameter λ. Indeed Hodrick and Prescott (1997) suggested to use λ=100 for annual data, however, other researchers such as Ravn and Uhlig (2002) suggested to use λ=6.25, while Mills (2003 : 95) suggested to use a value between 5 and 10. Therefore, in this study we used the values suggested by HP (λ_{HP}), RU ($\lambda_{RU)}$, as well as the upper (λ_{OU}) and lower (λ_{OL}) limits suggested by Mills.

Following the decomposition of the variables, Ordinary Least Squares analysis (OLS) is applied to the following equation,

$$Y_t = \beta_0 + \beta_1 X_t^P + u_t \quad (8)$$

where X_t^P is the Hodrick Prescott trend of X, u is the disturbance term.

Afterwards, as in EG test, residuals obtained from Equation (8) are used to estimate the following equation,

$$\Delta u_t = \gamma u_{t-1} + \varepsilon_t \quad (9)$$

If the null hypothesis of no co-HP trend is rejected, it means that the residuals are stationary around the zero mean.

The final step is to analyse the short run (gap) relationship by estimating the following equation using OLS,

$$Y_t^T = \beta_2 X_t^T + v_t \quad (10)$$

Where Y_t^T and X_t^T are "gap" or transitory components filtered by HP method and v is the white noise disturbance.

Chapter 4

EMPIRICAL RESULTS

This chapter presents the empirical analyses carried out for this study. In this chapter we try to answer the question posed in the introduction but we also provide detailed empirical analyses as indicated in chapter 2 and 3.

4.1 The Data and Unit Root Tests

This study used data from the World Bank Development Indicators (WDI) for a sample period of 59 years from 1960 to 2018. Figures 4 and 5 show the time plots of GDP and consumption expenditure. The Real Gross Domestic Product represents the actual value of goods and services produced during a certain time period at constant prices. We used the GDP as a proxy of the disposable income for the reason that disposable income was not available.

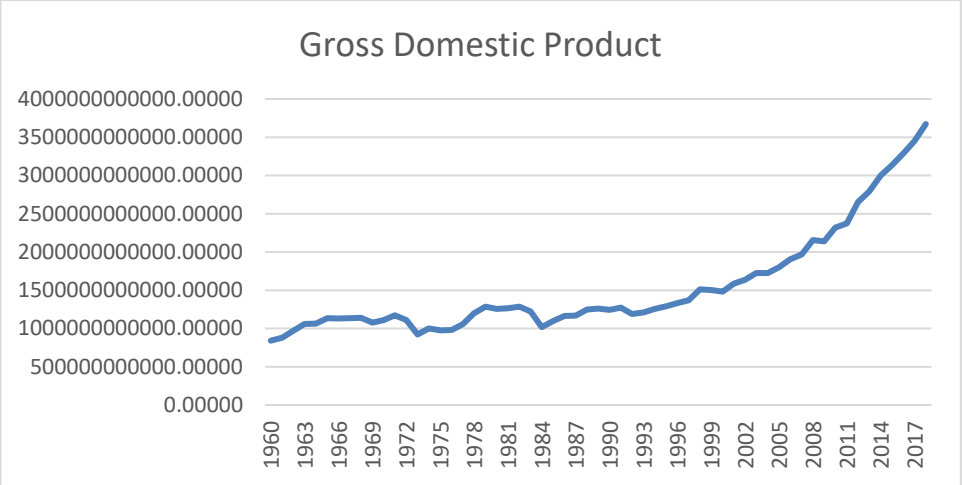

Figure 4: GDP (Constant LCU) in Niger

The Household Consumption Expenditure represents the value of final expenditure in goods and services made by resident households.

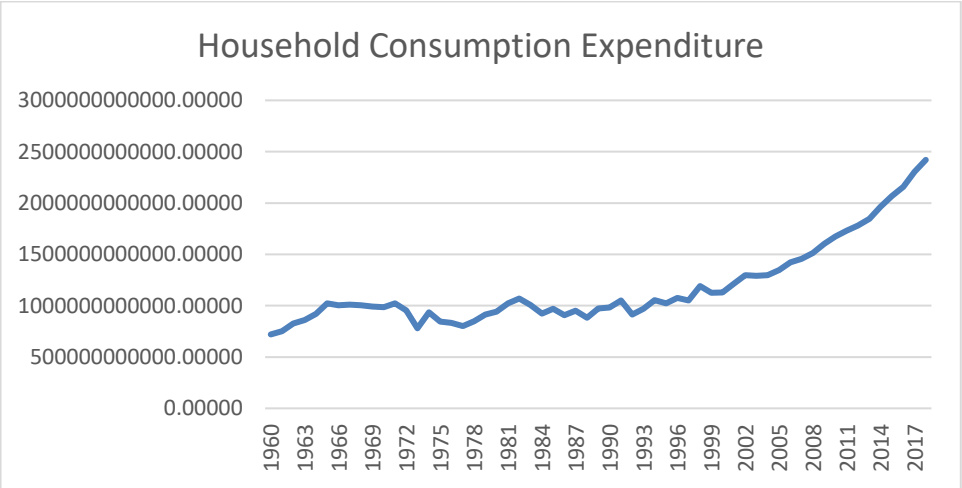

Figure 5: Household Consumption Expenditure (Constant LCU) in Niger

Visual inspection suggests that our time series variables are non-stationary, however, we also present Augmented Dickey Fuller (ADF) test results.

The aim of the unit root test is to verify the stationarity of the data. The stationarity test is really important when dealing with time series data because when the data are non-stationary they lead to spurious results when conducting regression analysis with the OLS method. In other words, if we start analysing the data by having the OLS analysis without checking for stationarity and if our data are non-stationary, our results might be spurious. For our analysis, in order to check the stationarity of our data, we used the Augmented Dickey Fuller Test with EViews software.

The results obtained from the test are shown in Table 1.

Table 1: Unit Root Tests

Variables	Augmented Dickey Fuller Test		
	Level		First Difference
	Without Trend	With Trend	Without Trend
CEP	3.646736* [1.0000]**	1.836151 [1.0000]	-7.541088 [0.0000]
GDP	5.124455 [1.0000]	2.523335 [1.0000]	-2.742865 [0.0733]

*t-Statistics **p-values

Note: We use the abbreviations CEP to represent the Consumption Expenditure data and GDP for Gross Domestic Product data.

- **Stationarity at level for both variables**

  From the above table we can observe that for CEP, with the p-value being equal to 1 the data are not stationary at level, that is, we do not reject the H_0 of unit root. For GDP it is also clear with the p-value equal to 1 that the data is not stationary at level. We have to verify the stationarity by checking the first difference.

- **Stationarity at first difference for both variables**

  Our results show that when analysing the stationarity of CEP at first difference the data are stationary. Put differently, as the p-value equal 0, we reject H_0, that is the data are stationary at first difference.

  For GDP, we can see that the p-value equals to 0.0733. This means that at 10% H_0 can be rejected and we conclude that the data are stationary but the null

hypothesis cannot be rejected at 5% and 1% level. Therefore GDP is characterized as I(2) at 5% level. Consequently, we will utilize the Dual Adjustment approach.

4.2 Cointegration and Dual Adjustment Analyses

For the sake of comparison, initially we provide the traditional cointegration analysis. The cointegration test is used to analyse the existence of long run relationship for non-stationary time series or unit root variables. In order to do so, we will use Engle-Granger cointegration analysis. The Engle-Granger cointegration approach can be described as follows: first, we have to check the stationarity of our variables by using the unit root test, second we have to estimate our equation by using the OLS method, third we have to take residuals from our OLS results and then (fourth) we have to apply the unit root test on our residuals.

As we have already applied the unit root test on our variables, we will continue with the second step.

The equation below represents the OLS results:

$$CEP = 2.87E+11 + 0.577766\ GDP$$

R-square = 0.982981 T=59

When we use the residual from the above equation and apply the unit root test, we can reject the null hypothesis of no cointegration. Hence there is a cointegration relation between CEP and GDP. The EG test results are shown in the table below.

Nevertheless, considering the possibility that GDP is I(2), this result is only suggestive. Because of this and theoretical reasons we will use the dual adjustment approach and verify the existence of WPIH, SPIH and DAH.

In order to analyse our data by using the dual adjustment approach we shall first decompose income and consumption into two components: permanent and transitory.

$Y_t = Y_t^P + Y_t^T$

and

$X_t = X_t^P + X_t^T$

where permanent components are non-stationary and transitory ones are stationary.

The first step of our analysis will be to apply the Hodrick-Prescott filter, after that we will estimate our equation by using the OLS method (See Chapter 3 for more detail), we will then obtain residuals and apply the unit root test on the residuals, finally we will analyse the short run relationship via transitory (gap) components.

In terms of the HP filter, Hodrick and Prescott suggested to use the smoothing parameter as 100 (λ_{HP}=100), Ravn and Uhlig (2002) suggested to use λ_{RU}=6.25, Mills suggested to use a value comprised between 5 and 10. We used λ_{HP}, λ_{RU}, as well as the upper and lower limits suggested by Mills (λ_{OL} and λ_{OU}) in our analysis in line with İsmihan (2019).

The table below displays the empirical results (see EViews output in Appendix for λ_{HP}=100). We also presented the results found from the Engle-Granger analysis to help us see the difference.

From the table below we can see that values of β_0 and β_1 are pretty similar for different values of lambda and to the ones obtained with EG analysis. Also, the null hypothesis of no Co-HP trend is rejected with the four values of λ, which means that $C_t - \beta_0 + \beta_1 Y_t^P$ is stationary, thus the WPIH is confirmed for Niger. Considering the transitory components, the null hypothesis of $\beta_2 = 0$ is rejected for the four values of λ, this means that SPIH is not supported with Nigerien data.

Table 3: Dual Adjustment Analysis

Engle-Granger CI	Co-HP Trend Analysis			
	λ_{HP}	λ_{RU}	λ_{OL}	λ_{OU}
β_0 (s.e)*	2.87E+11 (1.70E+10)	2.81E+11 (1.98E+10)	2.84E+11 (1.75E+10)	2.84E+11 (1.75E+10)	2.83E+11 (1.76E+10)
β_1 (s.e)	0.577766 (0.010070)	0.5817765 (0.011708)	0.579721 (0.010339)	0.579583 (0.010321)	0.580004 (0.010415)
EG/Co-HP**	-4.3004040	-4.497909	-4.936215	-4.934033	-4.925617
β_2 (Adj. s.e)	-	0.458416 (0.097674)	0.427246 (0.130000)	0.439160 (0.135167)	0.407150 (0.120355)
Singular Adj. Test	-	[0.2182]***	[0.2448]	[0.3017]	[0.1563]
Lambda		100	6.25	5	10
Akaike info criterion	52.26467	52.54668	52.30986	52.30696	52.32332
Schwarz criterion	52.33510	52.61711	52.38029	52.37739	52.39374

Notes:
s.e = standard errors
Adj. s.e = Newey West standard errors
*** p-values for t-tests [H_0= singular adjustment]

The t-test results lend support to singular adjustment in Niger (see Table 3). That is, we found that $\beta_1=\beta_2$, this means that MPC from permanent income equals MPC from transitory income. In order words, SAH is supported by Nigerien data. Therefore, Dynamic Keynesian Consumption Function is valid for Niger.

Chapter 5

CONCLUSION

The purpose of our study is to examine the relationship between household consumption expenditure and changes in income over time in Niger for the period 1960-2018. The main inquiry was to find out how income determines the level of household consumption and how consumer spending responds to changes in income within the domain of dual adjustment consumption function.

Our results show that Dynamic Keynesian Consumption Function is valid for Niger That is, there is a positive relationship between income and consumer spending.

Our results also show that an increase in income will lead to a decrease in the Average Propensity to Consume (APC) while the Average Propensity to Save (APS) will increase. In terms of policies, our results suggest that an increase in public expenditure will increase private consumption, and may help to boost domestic investments and hence the economic growth of the country.

Our results are broadly in line with the previous studies on Lesotho, Nigeria, Pakistan and the ECOWAS region, as noted earlier in this thesis. This means that the dynamics of consumption behaviour in some low-income countries are characterized by Keynesian consumption function and this suggests that an increase in public expenditure can help to stimulate their economic growth.

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APPENDIX

This Appendix presents the dual adjustment results obtained with EViews for λ_{HP}=100. Please note that GDPTREND100 is the trend component of GDP and, CEPGAP100 and GDPGAP100 are the transitory components of the respective variables (λ=100)

Common HP Trend and Gap Analysis (Lambda=100)

Dependent Variable: CEP
Method: Least Squares
Sample: 1960 2018
Included observations: 59

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.81E+11	1.98E+10	14.18728	0.0000
GDPTREND100	0.581765	0.011708	49.69026	0.0000

R-squared	0.977436	Mean dependent var	1.18E+12
Adjusted R-squared	0.977040	S.D. dependent var	4.04E+11
S.E. of regression	6.12E+10	Akaike info criterion	52.54668
Sum squared resid	2.14E+23	Schwarz criterion	52.61711
Log likelihood	-1548.127	Hannan-Quinn criter.	52.57417
F-statistic	2469.122	Durbin-Watson stat	0.973323
Prob(F-statistic)	0.000000		

Dependent Variable: CEPGAP100
Method: Least Squares
Sample: 1960 2018
Included observations: 59
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPGAP100	0.458416	0.097674	4.693313	0.0000

R-squared	0.354235	Mean dependent var	-0.008625
Adjusted R-squared	0.354235	S.D. dependent var	5.07E+10

Dual Adjustment Test (t-test)

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	-1.244797	58	0.2182
F-statistic	1.549518	(1, 58)	0.2182
Chi-square	1.549518	1	0.2132

Null Hypothesis: C(1)=0.58
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
-0.58 + C(1)	-0.121584	0.097674

Restrictions are linear in coefficients.