# THE DETERMINANTS OF HOUSEHOLD SAVINGS IN ZAMBIA

M.A. (ECONOMICS) THESIS

BY

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[BA (ECON), UNZA, LUSAKA]

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## DECLARATION

*I, the undersigned, hereby declare that this dissertation has not been submitted to this,* or any other university.

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**Date:** 20th May 2005

## CERTIFICATE OF APPROVAL

This dissertation of Mwaka Cynthia Chizoma is approved as a partial fulfilment of the requirement for the award of a Master of Arts Degree in Economics of the University of Zambia.

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# DEDICATION

**This paper is dedicated to my mother**

**Mrs. Anna Lole Chizoma**

**This is for you, mum.**

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## ABSTRACT

While the recent years have seen Zambia become increasingly dependent on foreign savings for its economic and developmental programmes, access to these savings is becoming more difficult. This implies that the country will have to depend more on the mobilisation of domestic savings, if it is to achieve the intended economic growth. It is envisaged that Zambia needs to achieve growth of between 5 to 8 per cent per annum in the medium term in order to have any impact in the reduction of poverty, which in 1998 stood at more than 70 per cent of the total Zambian population. (MFNP, 2001; CSO, 1998)

While private savings are more likely to be available for investible purposes it has generally been found that, in contrast to the developed countries, household savings tend to comprise the largest component of domestic savings in the developing countries (Bautista, 1990). The ability and willingness of households to save, therefore, as well the opportunities to do so, can over time significantly influence the rate and sustainability of capital accumulation and economic growth in developing countries.

This paper thus attempted to investigate and identify the factors that determine household savings in Zambia. In addition to income, other variables that included the interest rate, inflation rate, dependency rate, urbanisation rate and education were analysed for their impact on household savings, basing on theoretical and empirical evidence.

From the analysis, it was found, as opposed to most economic literature, that income while accounting for part of the short-run variations in household savings did not have any long-run effect. Rather, in the long-run, it was education and inflation with positive and negative coefficients, respectively, that influenced household savings. These two variables were also significant in determining the short-run variations, along with interest rates that indicated an inverse relationship with household savings.

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**Abbreviations and Acronyms**

ADB =African Development Bank

ADF = Augmented Dickey Fuller

BOZ = Bank of Zambia

CSO = Central Statistical Office

ECM = Error Correction Model

FDI = Foreign Direct Investment

GDI = Gross Domestic Investment

GDP = Gross Domestic Product

GDS = Gross Domestic Savings

HIPC = Highly Indebted Poor Countries

IMF = International Monetary Fund

INDECO = Industrial Development Corporation

LDC = Less Developed Country

MIBS = Ministry of Information and Broadcasting Services

MOFED = Ministry of Finance and Economic Development

MFNP = Ministry of Finance and National Planning

NCDP = National Commission for Development Planning

NSCB = National Savings and Credit Bank

OECD = Organisation of Economic Co-operation and Development

OLS = Ordinary Least Squares

SAP = Structural Adjustment Programme

UNCTAD = United Nations Conference on Trade and Development

UNDP = United Nations Development Programme

UNZA = University of Zambia

US = United States (of America)

ZCCM = Zambia Consolidated Copper Mines

# CHAPTER ONE: INTRODUCTION

## 1.1 Background

Development economics has long recognised the importance of the mobilisation of domestic savings in developing countries in order to achieve economic growth. It is purported that savings, by facilitating the process of capital accumulation, ensures that economic growth is realised. In the Harrod-Domar model, for instance, the saving rate and the incremental capital-output ratio jointly determine the growth rate of the economy. The two-gap and classical models also recognise the critical role of saving in capital accumulation and economic development. This is not to say that raising the rate of savings (both domestic and foreign) is sufficient in itself to achieve economic growth. However, given that savings finance the (physical and human) capital formation needed to increase output, these do seem necessary for growth. Of course, other important determinants of economic growth emphasised in development literature include technological progress, institutional development, domestic policies, and the external environment among others.

According to the World Bank (1993) gross domestic savings (GDS) as a percentage of gross domestic product (GDP) was nearly 40 per cent for the high performing (middle-income) Asian economies in 1990. It is argued that these relatively high saving rates were an engine to growth in many of these countries, since they financed higher rates of investments as well. Thus, policies to promote savings have a central role to play in

driving growth via investment and reducing aid dependence in Sub-Saharan Africa, particularly in the face of the anticipated global decline in aid.

The Sub-Saharan African countries (Zambia included) have for a long time been characterised by a worrisome problem of low savings and investment. As statistics show, private savings in Sub-Saharan Africa have declined from 11.4 per cent of disposable income in the 1970s to only 7.5 per cent in the 1980s and only partially recovering (to less than 9 per cent) in the 1990s. In addition, public saving in Sub-Saharan Africa has remained low at less than 3 per cent of disposable income in the 1990s, declining from 4.3 per cent in the 1980s. The slowdown in gross domestic investment (GDI) as a fraction of GDP has been equally dramatic. It declined steadily from 21 per cent in the 1970s to about 17 per cent in the 1990s (Elbadawi and Mwega, 2000). Consequently, the region has heavily been dependent on foreign savings, mostly overseas development assistance to finance the gap between savings and investment, averaging slightly less than 11 per cent of GDP for the period 1970 to 1995.

Over the years though, foreign aid to the Sub-Saharan African region has been registering a decline in availability. For instance, net concessional assistance to developing countries totaled US $32.7 billion in 1998, slightly below the US $33.4 billion received in 1997 and US $12 billion below the 1990 level. Official Development Assistance (including technical co-operation grants) from the Organisation of Economic Co-operation and Development (OECD) confirms continued decline in assistance to developing countries. Furthermore, there were regional changes in allocation of concessional flows in 1998

with lesser amounts being targeted to Sub-Saharan Africa and more to South Asia (World Bank, 1999).

Zambia, also highly dependent on foreign financing[1], has been no exception to these trends. While foreign financing has generally been declining (see Table 1.1a below) it has furthermore become volatile due to various conditionalities attached for receipt. For instance, in 1998 the country experienced the withholding of funds by donor countries[2], a

**Table 1.1a: External Debt Statistics in US$ Millions**

| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|
| Total External Financing | 1 479 | 982 | 816 | 793 | 755 | 630 |
| Gross External Debt Service | 926 | 710 | 616 | 578 | 453 | 371 |
| Net Transfer To Zambia | 553 | 272 | 200 | 215 | 302 | 259 |
| Total External Debt | 7 041 | 6 919 | 6 204 | 6 411 | 6 571 | 7 143 |

**Source: MOFED: Economic Report 1997**

situation that meant the cost of intended investment could not be covered. While the estimated budgetary support was K411 billion from co-operating partners, only K316

[1] In 1998, an estimated 26 per cent of the budgetary revenue was supposed to come from donors or foreign financing while in 1999 this actually rose to 35 per cent (UNZA, 1999).

[2] Citing the failure of the Zambian Government to meet governance and democratisation conditions and its failure to privatise ZCCM on time (the major parastatal mining company) (UNZA, 1999).

billion was actually disbursed (UNZA, 1999). Such conditions are quite disagreeable to the country's goal of resuscitating and sustaining economic growth. Furthermore, if required investment will have to be financed through foreign borrowing, this will continue raising the already high outstanding debt liability.

## 1.2 Statement of the Problem

On the one hand, with the increasing unreliability of foreign savings in planning the country's growth process, the high debt overhang on Zambia on the other hand, means that the desperate demand for foreign exchange to service the external debt may imply that much of the public savings as well as aid resources routinely find themselves diverted to debt service payments (Table 1.1a). This means that the country will have to rely more on the mobilisation of private savings (constituting corporate savings and household savings) that are more likely to be readily available for investible purposes and therefore have greater potential to contribute to growth.

While corporate savings accounted for around 70 per cent of national savings during the 1970s[3], the situation has drastically changed over the years. With a devastation of the manufacturing sector following the onset of the structural adjustment programme (SAP) in 1991 - aimed at resuscitating growth - which included policies such as trade liberalisation, with no due attention paid to the protection of certain industries, the consequence has been a decline in particular of corporate savings.

[3] In 1973 corporate savings accounted for 75 per cent of national savings and 72.5 per cent in 1979 (BOZ, 1982),

And whereas privatisation has increasingly becoming an important determinant of attracting foreign direct investment (FDI), a survey by United Nations Conference on Trade and Development (UNCTAD) found most multinational corporations less inclined to invest in smaller economies. In 1999 the bulk of FDI inflow into Africa went to a handful of countries, mainly energy exporters (ADB, 2001).

Consequently, today, with the common feature of a fragmented corporate sector, household savings have been found to be usually the largest component of domestic savings in less developed countries (LDCs) especially the lower income, predominantly agricultural LDCs (Bautista, 1990). Therefore the ability and willingness of households to save as well the opportunities to do so can over time significantly influence the rate and sustainability of capital accumulation and economic growth in developing countries.

However, according to the *2001 African Development Report* (ADB, 2001), in the absence of radical policy changes and institutional development, rising poverty would mean that the growth of domestic financial assets among households in Africa would rise far slower than is required for acceptable levels of growth.

This study thus aimed to investigate the empirical determinants of particularly household savings in Zambia.

The need to understand these factors stems from:

(i) The rising uncertainty of foreign financing on which the country has largely been dependent on in planning its economic growth process. This is in terms of both aid and FDI.

(ii) The fact that despite various policies that have been instituted, domestic savings (as a percentage of GDP) have not been improving. Being relatively high at 16.6 per cent in 1990, this fell to 7.4 per cent in 1994. And according to statistics, in 1998 and 1999 the ratio stood at 3.9 per cent and –1.1 per cent respectively (World Bank, 2001). This implies not only a fall in public savings but in private savings as well.

(iii) The evidence that no significant savings are likely to be expected, at least in the short-term, from the corporate sector, owing to its fragmented size.

### 1.3 The Significance of the Study

Stabilisation programmes currently in place are contingent on sufficient private savings to offset continued public sector borrowing requirements. Furthermore, projections for future economic growth are contingent upon strong private saving even as measures to reduce fiscal deficits may entail extensive cutbacks in public investments (Conway, 1995). Private savings are thus of centrality in economic development issues and as such render important an investigation into the motivations and incentives to private savings in the developing countries, including Zambia.

It was not the interest of this study, however, to look into private savings as a whole, but rather at one component of these, namely household savings.

Without dispute, income is an important determinant of (household) savings, as has often been found in empirical studies. As income increases, consumption tends to take a lower proportion of income leaving more to be saved, to put it in the simplest way.

Having embarked on the deregulation and liberalisation of its financial system, Zambia has not seen growth in household savings going by the negative statistics reflected by private savings. Hence, the question that arises is whether all efforts to increase household savings are rendered impotent in the face of the rising poverty levels.

An investigation into whether there are other important factors besides income that influence household savings in Zambia could have significant policy implications for a country that is meant to employ all efforts to increase (domestic) resource mobilisation for investment, considering the observed decline of foreign aid to developing countries (World Bank, 1999). In fact, policies that promote domestic savings should be an essential element in any strategy aimed at making the country less dependent on aid, given the extent of its dependency and the global reduction in foreign aid.

With calls for debt cancellation, it is imperative that Zambia develop a good and feasible domestic savings mechanism so as to ensure that the country does not tumble into the same trap of debt due to its dependency on foreign aid. And such planning can be

facilitated only by investigations into the factors that influence the different components of domestic savings.

## 1.4 Objectives of the Study

The study sought to establish the extent to which income in the Zambian context affects the level and rate of household savings and the other factors that (based on theoretical and empirical literature), do have a significant effect on the same. Such an investigation is aimed at contributing to the understanding of how Zambia can influence household savings in order to maximise the economic and development benefits of the economy.

This was sought to be achieved by explaining the dismal performance of household savings and identifying policies that could help reverse the declining trend.

The study thus focused on variables that could influence household savings based on theoretical and empirical evidence and their relevance to Zambia, compounded by data availability.

## 1.5 Organisation of the Study

The rest of the study is covered under five more chapters. Chapter Two gives a brief discussion of Zambia's savings performance over the years. The next chapter, Three,

gives the literature review in terms of both the theoretical and empirical bases for the study as well as the hypotheses.

Chapter Four outlines the methodology of the study which includes the model specification, definitions of the variables, sources of data and method of estimation. The empirical findings, which are the results of the study, are discussed in Chapter Five. Lastly, Chapter Six covers the conclusion and policy recommendations.

# CHAPTER TWO: ZAMBIA AND SAVINGS PERFORMANCE

## 2.1 Introduction

It is not only the right policies, but also, the right investments that enhance the achievement of sustainable economic growth. And investments require financial resources that are today considered a key form of resource to any country, especially for the developing countries that are faced with the challenge of achieving economic growth. In this light, the banking sector plays a vital role in the mobilisation of resources in the form of deposits and profits thereby allocating these resources to the most productive sectors to meet the investment requirements.[4]

This chapter is meant to give a discussion of the country's savings performance (that is, domestic savings). Prior to this, however, the chapter proceeds with a brief overview of the country's economic performance since independence.

## 2.2 An Overview of Zambia's Economy

Zambia, having gained its independence in 1964, was one of the richest countries in the Sub-Saharan African region during the early 1970s. Its wealth emanated from the copper exports that were, and continue to be, the mainstay of the economy. For instance, in 1964 copper accounted for 90 per cent of Zambia's foreign exchange earnings.

[4] For most developing countries alternative capital markets are not well developed such that banks continue to be the main source of investment financing.

In contrast, today, the country with an area of 752,610 square kilometers and a population of 10, 285, 631 people (CSO, 2001) is one of the poorest countries in the world. Both the social and economic indicators show unprecedented deterioration compared to those achieved during the early years of independence.

Having inherited a copper driven economy, the government of Zambia, despite efforts to diversify the economy through massive investments that went into the establishment of large-scale industries, saw little achievement of this goal. The rapid industrialisation embarked on only resulted in industries characterised by a heavy dependence on imported inputs for which the source of foreign exchange were the copper mines. For instance, in 1982 copper still accounted for as high as 82 per cent of total exports while in 1989 this stood at 87 per cent (BOZ, 1982). This reflected the mining sectors continued significance in the Zambian economy.

The world recession of the early 1970s that resulted in a plummeting of the copper prices coupled with the rise in the oil prices, thus, drastically changed Zambia's economic prospects. Having adjusted to the situation by simply running down the country's reserves and borrowing from external sources; with the prolonged fall in the copper prices, the country experienced serious resource constraints which have led it to become one of the poorest and highly indebted countries in the world. With the shortages of foreign exchange, the country's large expenditure bill that ranged from subsidies on various goods and services (such as the offer of free education and health services) to imports that included inputs for its industries could hardly be contained. By the end of the

1980s, Zambia's economic growth had become insignificant, recording 0.1 per cent in 1989 while poverty was on the rise at 69.7 per cent of the total population in 1991 (CSO, 1992; 1996). In addition, the provision of social services such as education and health was drastically deteriorating while inflation was running in the triple digit range.

In a bid to resuscitate the economy, Zambia in 1991 under the prescription of the International Monetary Fund (IMF) and the World Bank initiated a sustained SAP centred on the liberalisation of the economy. This involved the removal of price controls and subsidies; privatisation of state-owned enterprises; liberalisation of trade (both domestic and foreign); and the deregulation of the financial system.

However, sustained economic growth is yet to be achieved as evidenced from the rather erratic trend as shown by Table 2.2a below. Furthermore, most of the positive growth achieved during the 1990s has largely been attributed to the good performance of the agricultural sector due to favourable weather during the planting season. In 1993 this is wholly attributed to a bumper harvest following the 1992 drought, while in 1996, much of the growth came predominantly from agriculture as well (UNDP, 1997).

**Table 2.2a: Real GDP Growth Rates (in Percentages)**

| 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | -1.7 | 6.8 | -8.6 | -2.1 | 6.6 | 3.3 | -1.9 | 2.4 | 3.6 |

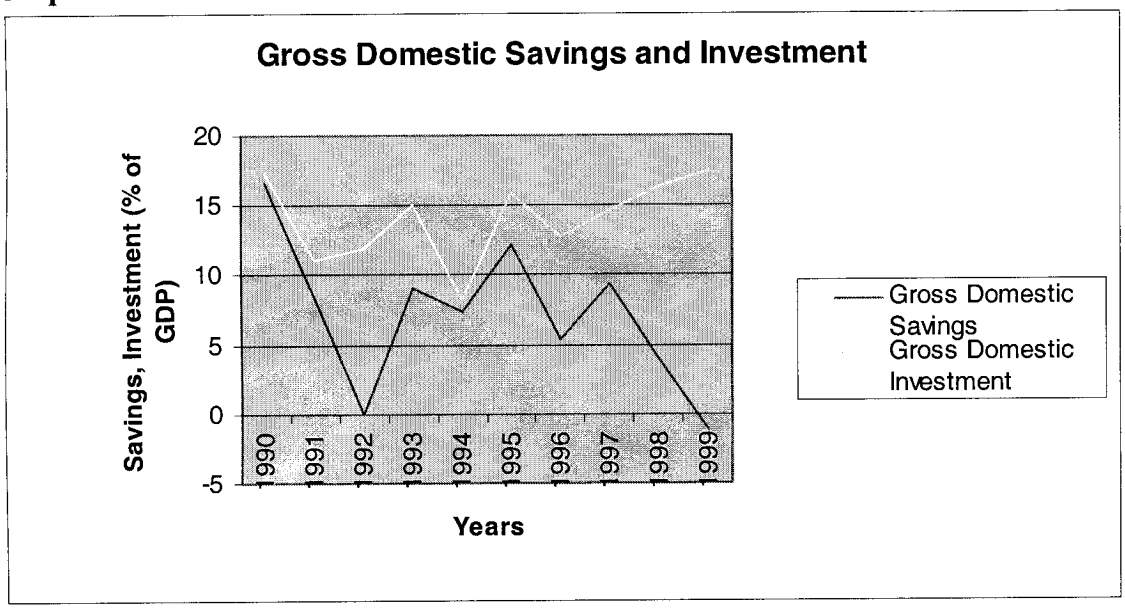
**Source: CSO: Selected Socioeconomic Indicators 1996; Data Base**
**World Bank: African Development Indicators 2001**

## 2.3 Savings Performance

Zambia's GDS as a percentage of GDP averaged 30 per cent per annum during the early independence years through to the 1970s. However, in 1975 this fell to 12.6 per cent from the previous year rates of 34.5 per cent and 35.6 per cent in 1973 and 1974, respectively. With the country's economic downturn, GDS remained relatively low throughout the 1980s. Graph 2.3a (below), shows that for the most part of the 1990s, the level of GDS remained still lower in comparison to the early 1970s, averaging a little less than 10 per cent. In comparison though, the performance of GDI has faired better throughout the 1990s thus implying substantial external financing for investment.

Following the fall in the international copper prices, the Zambian government budget has been characterised by large deficits throughout the 1980s and 1990s due to the failure of revenues to keep up with current expenditures. Under the liberalised economy, the government has had little success in curbing the deficits despite the introduction of the cash budget in 1993 and the unburdening of government of inefficient parastatals and

**Graph 2.3a: GDS and GDI Performance in the 1990s**




**Source: World Bank, 2001, African Development Indicators**

numerous subsidies. Any achievement of surpluses such as that registered in 1997 of 1.1 per cent (as a percentage of GDP) has been at the expense of extensive cutbacks on a number of important expenditures such as in agriculture and social services (UNDP, 1997). Furthermore, the servicing of government external debt has continued to contribute largely to the gross depletion of public savings despite the number of debt relief mechanisms[5] that the country has benefited from.

In the case of private savings, while the corporate sector accounted for 75 per cent of Zambia's overall national savings in 1973 and 72.5 per cent in 1979, the latter was in comparison at a much lower level in that, while in 1973 national savings stood at 34.5 per

[5] Zambia has benefited from 7 debt relief agreements from the Paris Club since 1982 when a cut-off date of January 1st 1983 was established, making all debt accrued prior to 1983 eligible for debt relief (MFNP, 2001). The most recent debt relief mechanism is the Highly Indebted Poor Countries (HIPC) Initiative.

cent of GDP, in 1979 the ratio had fallen to 12 per cent of GDP according to (BOZ, 1982).

Since the government's parastatal holding, the Industrial Development Corporation (INDECO) accounted for over three-quarters of the country's industry, the analysis of this Corporation gives a good prognosis of the corporate sector's performance in terms of savings for the period preceding the privatisation of public entities (BOZ, 1982). Thus as the performance of INDECO worsened with the ensuing shortages of foreign exchange, corporate sector savings largely represented by retained earnings and depreciation allowances could hardly be achieved. For most part of the late 1970s and throughout the 1980s, it meant then that this component of savings would only improve with copper prices, given that the industrial sector's performance was critically dependent on imported inputs which were facilitated by foreign exchange earnings obtained through the mining sector.

Post privatisation, with about 86 per cent of the corporate sector in private hands (MIBS, 2000), savings, from inference (considering the level of GDS) continue to be constrained. This is explained by the fact that the withdrawal of government subsidisation coupled with the opening up of the domestic market through trade liberalisation resulted in the collapse of much of the country's industrial sector. The opening up of the economy through trade liberalisation resulting in the inflow of cheap but relatively higher quality imports, made it difficult for Zambia's once heavily protected and subsidised industries to compete favourably.

In addition to this have been the high financial and production costs. Due to the fact that the banks have continued to be the predominant source of investment finance for the business or corporate sector in Zambia, the high cost of bank borrowing greatly constrains expansion. For the most part of the 1990s for instance, borrowing rates averaged about 60 per cent making credit unaffordable and posing severe liquidity problems (World Bank, 1997).

In the case of household savings, there is hardly any specific data available to indicate the trend in this component. However, it is documented by the Bank of Zambia (1982) that in 1979 household savings accounted for 45.5 per cent of GDS. Today, due to the high levels of poverty, one would conclude that household savings are more likely constrained. This is not to say though that income, clearly a major determinant (both from theoretical and empirical evidence) when it comes to savings, will solely determine whether households save. For instance, Taiwan (China) characterised by its people's high propensity to save achieved high levels of savings from a background of very low household income levels (Kraay, 2000).

Hence, household savings though often underestimated hold potential for the mobilisation of domestic savings. In Asia for example, it is estimated that in 1985, 50 to 60 per cent of gross savings were by households. However, 50 to 75 per cent of these were in the form of tangible assets like jewellery, livestock and other excess inventories of all sorts such that, if financial assets were made more attractive, the level of financial savings would rise (Musokotwane, 1985).

Although households may save in various forms, ranging from financial assets to wealth such as in household durables, livestock and surplus agricultural production among others, the interest of this paper lies in the discussion of the form of savings that finds itself in the financial system. For only when savings find themselves in the form of financial savings, are they made available for lending to productive investment purposes.

# CHAPTER THREE: LITERATURE REVIEW

## 3.1 Introduction

This chapter discusses the theoretical underpinnings and empirical evidence on savings and it determinants.

While theories of household saving behaviour were initially developed to explain the developed countries' saving patterns, the understanding of savings behaviour in LDCs hinges to a great extent on reference to the studies of private savings in developed countries. In sum and total, all the basic theories put forward the prognosis that within any particular country, high-income households tend to save more; and that in the long-run, the savings ratios tend to, generally, be constant over time; with household savings varying without any clear relation to income across countries.

Available literature identifies a number of factors that may likely exert a significant influence on the level and the rate of household savings. These include income, interest rates, inflation rates, demographic factors, the level of education as well as the spatial distribution of banking institutions.

## 3.2 Theoretical Framework and Empirical Evidence

### 3.2.1 Income

Following the work of Keynes (1936), it is widely accepted that the level of income exerts a positive influence on savings. According to Keynes, 'men and women are disposed as a rule to increase their consumption as their income increase, but not as much as the increase in their income'. He thus makes a point that consumption depends on and is a positive function of the level of absolute income, though consumption expenditure does not have a proportional relationship with income. As income increases, the average propensity to consume and the marginal propensity to consume tend to fall. This implies then that the proportion of income that is saved increases with increase in income.

There is empirical evidence of rising saving rates as income levels increase. As a prominent example, Bhalla (1980) has estimated a non-linear saving function for rural households in India in which the average propensity to save is zero at subsistence level and increases at an accelerating rate in the low income range, followed by a deceleration and eventual tapering off to an asymptotic value. And according to Denizer et al (2000), savings are found to be higher among high-income households but also to be high for households expecting decreasing income (as they tend to save as a buffer against the future). Thus, the myths that the poor have no margin over consumption for saving, and in any case do, not respond to economic incentives is increasingly being questioned. Though the poor are likely to be at their biological or social minimum level of current

consumption, this does not mean zero saving by the poor as they also seek to cushion themselves against fluctuating income.

The ratchet theories of spending assume that by virtue of habit or out of a sense of caution, individuals are slow to increase their consumption as their income grows. Therefore, the more swiftly income expands the greater will be the volume of savings in an economy. Milton Friedman assumes that by making educated guesses as to their future incomes, people derive a sum they treat as 'their permanent income' a much stabler aggregate than their actual earnings. What is spent or saved is determined therefore by reference to their permanent income. And any unexpected increase in income is treated as transitory and frequently saved (Yusuf and Peters, 1984).

The extreme version of Freidman's permanent income hypothesis holds that consumption approaches 100 per cent of permanent income and that saving 100 per cent of transitory income. Modified versions however hold only that saving out of permanent income is constant over a person's lifetime but can be positive. And although the propensity to save out of transitory income is high, not all such income may be saved.

Thus, consumption-smoothing models in their forms predict that temporal fluctuations in income should go on to saving. If households are not credit constrained and the temporal fluctuations do not affect the perception of permanent income, consumption would not change at all in response to temporary fluctuations and most of it would be saved.

Households tend to be credit constrained, however, particularly in developing countries (Gupta, 1987).

Furthermore, the life cycle and permanent income hypotheses are less likely to be binding in the less developed countries given the multidimensional and multigenerational nature of households. That is, to say, that households first accumulate and then dissave. Since adults expect their children to support them in their old age, there may be little need for 'hump' or retirement savings as a vehicle for transferring income between high and low income productivity phases of the life cycle (as the life cycle model postulates). In such households, savings are a buffer against stochastic decreases in income. Deaton (1990) asserts that such households dissave as often as they save, do not accumulate assets over the long term and have on average very small asset holdings.

### 3.2.2 Interest Rates

Much of the literature on interest rates postulates that when these are kept or fixed at low levels, there is little incentive for economic units to hold surplus in the form of financial assets. Thus, the supply of investible funds will be limited. A policy of financial liberalisation resulting in higher real interest rates is therefore espoused in order to institute a virtuous cycle of increased savings (McKinnon, 1973).

However, theoretical ambiguity exists concerning the effect of interest rates on savings behaviour such that the conclusion of whether savings behaviour is interest elastic is a

matter of empirical analysis. Theoretically, the influence of real interest rates on savings depends on the relative strengths of the offsetting substitution and income effects. That is, a rise in the real rate of return may increase savings by making future consumption cheaper relative to current consumption (substitution effect). At the same time, though, higher real interest rates by raising the incomes of positive savers may lead to a rise in consumption and thereby institute a reduction in savings (income effect).

Increasing evidence from developing countries suggests that private saving (or consumption) typically does not respond to real interest rates. Edwards (1994) confirms the insensitivity of private savings to real interest rates for a cross-section sample of OECD and developing countries. And Rossi (1988) finds that increases in the real rate of return are not likely to elicit substantial increases in savings especially in the low-income developing countries.

On finding a zero or near zero interest rate sensitivity, researchers have hypothesised that consumption in developing countries may be related more to subsistence considerations rather than intertemporal consumption smoothing (Rebelo, 1992). That is, households must first achieve subsistence consumption level. This implies that for relatively poor countries, where budget shares of food are relatively high, the interest rate elasticity of saving would be relatively low.

Rossi (1988) further argues that low-income countries are characterised by pervasive liquidity constraints, which implies that consumption growth in such countries is more likely to follow income growth rather than changes in the expected rate of return.

### 3.2.3 Inflation

While it is generally reported that inflation, by entering into the calculation of the interest rate tends to lead to a lower rate of return therefore implying a disincentive for savings, theoretically, the effect of inflation on household savings is ambiguous. This is because uncertainty about the future value of assets could either discourage saving due to the substitution effect of the lower effective rate of return or encourage saving from precautionary motives.

In the first instance, rising commodity prices (inflation), adversely affect household savings since consumers are expected to make adjustments in their consumption levels, in their savings or in both. More often than not, in developing countries where a large number of consumer items are relatively price inelastic, there is an implication of a rise in expenditures whenever price items go up. With income held constant, this involves a reduction in savings as a result of a combined outcome of two effects. Firstly, a direct own-price effect in which an increase in the price of the *ith* commodity raises its expenditure by virtue of being price inelastic. Secondly, expenditures on other commodities may fall through cross-price elasticities. If the cross-price effect is not

sufficient to compensate for enhanced expenditures due to own-price effect, savings would necessarily decline (Ali, 1990).

Furthermore, under conditions of persistent inflation, people expecting goods to grow ever costlier might advance their purchases by eating into their savings. They may also restructure their asset portfolios with real estate, hedging out financial holdings. Since the prices of such items often times increase more than proportionately during inflationary times, the wealth effect can result in the depression of new savings.

However, in the second instance, there is argument by empirically minded practitioners that inflation by disturbing relative prices, increasing uncertainty about unemployment and income in the future, and in particular reducing the value of financial assets could lead to a spurt of savings especially where financial assets occupy a large share of households' wealth. Savings would also rise, following an unanticipated surge in inflation, if individuals respond to the increasing costliness of certain items by cutting purchases (Yusuf and Peters, 1984).

Gupta (1987) and Lahiri (1989) include both expected and unexpected inflation rates as determinants of saving (with Gupta including nominal interest rates). For Gupta, both the inflation variables in Asia have positive and significant coefficients while in Latin America neither coefficient is significant. In the case of Lahiri's all-Asian sample, the signs on both inflation variables are mixed for the separate country regressions.

In a study by Elbadawi and Mwega (2000) however, inflation is found to exert a significant negative relationship with private savings in the African developing countries.

### 3.2.4 Demographic Factors

Singled out among the demographic variables as factors influencing savings are the dependency rate and rate of urbanisation.

In the life cycle models of saving, there is an implication that demographic variables would affect saving rates. This is drawing from the fact that the models suggest that individuals save more during certain periods of their lifetime (for instance, pre-retirement) in order to provide for consumption in old age. Therefore, making the age of an individual a determinant of savings.

Leff (1969, 1980) found a significant inverse relationship between dependency rates and savings rates in LDCs. The explanation being that rapidly growing populations (as found in LDCs) were characterised by high ratios of dependants (young people and those of the older age groups) to the working age population. These, while they contributed to consumption, make no concomitant contribution to production and so tended to impose a constraint on society's potential for saving.

However, according to Wood (1995) Leff's conclusions have been challenged by a number of authors including Bilsborrow (1979, 1980) and Ram (1982) on the grounds of specification and sample biases and the general reliability of data.

Rossi (1989) also questions the reliability on which the existing evidence on dependency rates and savings behaviour is based. He concludes that, with the exception of that on Southern Europe, the empirical evidence does not allow for conclusive linkages between the dependency rate and the savings rate.

However, Loayza et al (2000) confirms that a rise in the dependency rates does tend to lower private savings, with the negative impact of the old –age dependency rate being twice as large in comparison to that of the young-age dependency rate.

### 3.2.5 Urbanisation

According to literature, the effect of urbanisation on savings could be either positive or negative. On the one hand, a large urban population could induce higher savings due to the fact that urban dwellers are better placed to access financial instruments, besides having more stable incomes. On the other hand though, a higher urban population could actually depress savings rates, as the precautionary saving associated with the volatility of income in the agricultural sector is reduced. In addition, higher urbanisation could induce a fall in savings because, more often than not, urban populations tend to suffer from the desire to 'keep up with the Jones'. That is whereby the low-income groups strive to

emulate the consumption patterns of high-income groups, and the high-income groups that of the wealthy income groups in developed western countries.

An empirical research conducted by Elbadawi and Mwega (2000) on the determinants of private savings in Sub-Saharan Africa, finds a negative coefficient for urbanisation. Thus, suggesting that the reduction of the precautionary savings associated with the volatility of income in the agricultural sector exerts a stronger influence relative to the increase in savings associated with urban dwellers' access to better financial instruments.

### 3.2.6 Education

According to Morisset and Revoredo (1995) there is reason to believe that education (formal education) will exert an influence on savings either positively or negatively. For instance, education would likely induce an increase in savings; borrowing from the fact that higher education attainment is on average associated with higher levels of income; and higher income positively correlated with higher savings. Moreover, education is likely to lead to knowledge about investment opportunities and other benefits of savings.

However, education could likewise depress savings if there is a precautionary motive for savings, in that because educated people are less likely to be unemployed or if employed, may already be covered by some unemployment insurance (such as pensions schemes), then education should reduce income volatility resulting in a reduced need for savings. Furthermore, the study by Morisset and Revoredo (1995) suggests a negative relationship

particularly in the short-run because education expenses initially increase consumption and reduce current disposal income. According to the findings of the study, the positive long-run relationship between education and savings takes more than five years for the effect through income to compensate the initial negative impact on savings.

### 3.2.7 Spatial Distribution of Banking Institutions

For most developing countries where alternative capital markets are not well developed, the banking sector continues to be the basic player in the mobilisation of savings, mainly through deposits. Hence, the spatial distribution of banks would necessarily have an effect on the extent to which household savings are tapped from the population.

A study by Kraay (2000) suggests that the rapid development of China's financial sector since 1978 in increasing household's access to banking institutions especially in rural areas, may have contributed to the growth in deposits simply by encouraging a shift in the composition of household savings from physical commodities such as grains to deposits. Thus, suggesting that the absence of banking institutions in certain areas, especially in rural areas as is often the case in LDCs tends to limit the mobilisation of savings by inhibiting households from exploiting alternative (financial) savings opportunities.

### 3.3 The Case of Zambia

In a paper by Mrak (1989) on *The Role of the Informal Financial Sector in the Mobilisation and Allocation of Household Savings: The Case of Zambia,* the author alludes to a number of factors that motivate the average Zambian household to save. These include the desire to buy or build a house; to improve /enlarge a farm; to buy equipment and inputs for farm production; to buy household equipment; to finance education of children; and to have money for irregular expenses, such as funerals, weddings and various ceremonial occasions. However, according to Mrak (1989), substantial portions of such savings find themselves outside the banking system both in terms of monetary and (particularly in the rural areas a substantial amount of total household savings remains in) non-monetary forms, such as in the form of agricultural products, livestock, valuables and construction materials.

The reasons cited for this trend include the lack of investment opportunities; lack of physically accessible banking facilities; fear of taxation; high rate of illiteracy and low level of education; need for secrecy; lack of confidence in the formal financial institutions; lack of price stability and fear of inflation; very limited spectrum of formal savings facilities and instruments; and the persistence of traditional investment habits.

And according to the *Bank of Zambia* (1982) household savings increases are largely restricted by factors that include, firstly, the extended family unit (a firmly entrenched tradition in the Zambian society). Consequently, large proportions of income are spent on

relatives, particularly common among the low-income groups both in urban and rural areas. Secondly, by the desire to "keep up with the Jones". Thirdly, by inflation, which distorts the incentives to save as people seek investment forms that appreciate in nature (such as real estate) to protect their savings.

While Zambia's financial sector is made up of the Bank of Zambia (central bank), commercial banks, non-bank financial institutions (such as building societies and insurance companies) and foreign exchange bureaus; the main players when it comes to the mobilisation of (household) savings are the commercial banks. Non-bank financial institutions offering savings services have largely been uncompetitive in this respect (Musokotwane, 1985).

Throughout Zambia's post-independence period, commercial banks have however been characterised by a concentration in urban areas (mainly in provincial centers) while the rural areas have largely remained neglected. And while the government of Zambia has constantly intervened in the rural areas in order to improve household access to credit, these initiatives have not targeted the mobilisation of savings.

One notable effort though to mobilise savings in the neglected rural areas that cannot be overlooked was the National Savings and Credit Bank (NSCB) that during the 1980s had the broadest network of offices across the country, having been part of the post office network. However, due to its uncompetitive deposit services, though, such as lower

interest rates, stringent withdrawal regulations in comparison to those of commercial banks, the NSCB did not perform well in mobilising savings (Musokotwane, 1985).

Consequently, there may exist, more than necessary, liquidity outside the banking sector, which may be deemed idle from a macroeconomic point of view, as it is not made available for productive investible purposes.

### 3.4 Hypothesis

The basic hypothesis tested by this study was that the level of household savings in Zambia was significantly determined by a number of factors, against the alternative that income was the only major determinant.

The specific independent variables besides income that are tested for their impact on savings are interest rates, demographic factors, the level of education and the rate of inflation. Due to the lack of availability of data on the spatial distribution of banks in Zambia, this research was unable to carry out an investigation on the effect of this variable. Hence, it is not included among the independent variables.

# CHAPTER FOUR: METHODOLOGY

## 4.1 Introduction

In this chapter, the methodology employed by this research, that is, the model specification and estimation procedures are presented. The chapter, which begins with the specification of the model, proceeds with the definition of the variables and sources of data before outlining the estimation procedure applied.

The empirical results are presented and discussed in the ensuing chapter.

## 4.2 Model Specification

Surveys suggest that the literature on household savings is somewhat fragmented. Thus, there is no single model able to deal with every dimension of the subject of savings that may often be dependent on the availability of data. For this study, basing on theoretical and empirical work as well as introspection, the model is specified as below.

$$\lfloor HS_t = \beta o + \beta_1 \lfloor Y_t + \beta_2 \lfloor I_t + \beta_3 \lfloor Inf_t + \beta_4 \lfloor D_t + \beta_5 \lfloor E_t + \beta_6 \lfloor U_t + \epsilon_t \qquad \sim (1)$$

Where,

HS = household savings

Y = real income

D = dependency rate

E = education

I = real interest rate

Inf = inflation rate

$\ell$ = the natural log

$\epsilon$= error term

U= urbanisation rate

$\beta o$ = constant

$\beta s$ = coefficients to be estimated

t = time

## 4.3 Definition of Variables

**4.3.1** While **household savings** are generally defined as that part of household income not consumed, for the purpose of this study and mainly as a consequence of the unavailability of data, the variable used in the regression analysis was proxied by public savings from commercial banks deposits (see Appendix A). In part, the justification for use of the named proxy lies in the fact that deposits in the commercial banks would generally represent income left over from consumption. However, while this may in actual fact not represent household savings in their totality, the impetus for using this variable (given the lack of specific data on household savings is based on the fact that the need to mobilise savings is to make available resources for investment. And in a developing country such as Zambia, where the development of alternative capital markets is still in its infancy, commercial banks represent the most important intermediary for the mobilisation of savings as well as for making available these resources for investment credit.

**4.3.2** The **income** variable used is real GDP. GDP is defined as the total value of goods and service produced in a year for final use by an economy, by residents and non-residents (excluding provisions for depreciation).

**4.3.3** The **interest rate** is the average of the three-month or quarterly deposit rate on time, savings and demand deposits paid to depositors by deposit money banks and similar financial institutions.

**4.3.4** The **inflation rate** is the consumer price index, which shows the changes (inflation) in the cost of acquisition of a basket of goods and services purchased by the average consumer.

**4.3.5** The **dependency rate** is the ratio of the population below 15 years and those 65 years and above in the mid-year population, to the proportion of the population in the working age-group, which is defined as ages 15 to 64 years.

**4.3.6** The **education** proxy is the gross secondary school enrollment ratio. This is the total number of students enrolled at the secondary level of education, regardless of the age, expressed as a percentage of the population corresponding to the official school age (14 – 18 years) of secondary school education.

**4.3.7** The **urbanisation rate** is the ratio of the population living in (according to national definition) urban areas to that of the total population.

## 4.4 Data Sources

The data used in the regression analysis represents annual data obtained for the period 1975 to 2000. The sources of the data include the *Bank of Zambia Annual Reports*; Central Statistical Office and its publications; World Bank publications such as the *Selected Statistics on African Countries* and *African Development Indicators*; the *International Financial Statistics*; as well as publications of the Ministry of Education.

## 4.5 Estimation Procedure

In estimating the model defined under section 4.2 of this chapter, the research employed the method of ordinary least squares (OLS) using the econometric package software PcGive 8, Professional Series Version.

### 4.5.1 Econometric Methodology

The fundamental methodology employed was the Engle-Granger cointegration approach.

In the use of time series data in regression analyses, the implicit assumption made is that the data is stationary. That is, to say, the mean and variance of the data are constant over time and the value of covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed (Gujarati, 1995). In such a case, a series is said to be integrated of order zero,

denoted as I(0). A non-stationary series on the other hand may be integrated of any higher order depending on how many times it has to be differenced in order to induce stationarity. For instance, if a times series variable $X_t$ is differenced d times for it to become stationary, then X is said to be integrated of order d or $X_t \sim I(d)$.

Most economic time series data does tend to exhibit problems of non-stationarity, however, such that a regression of variables in levels may obtain spurious results. Precisely, though a regression analysis may obtain a very high $R^2$, this may not reflect the actual existence of a true or meaningful relationship among the variables but rather, the presence of a common or identical trend-like pattern over time. Therefore, making the conventional hypothesis testing procedures such as the t and F tests unreliable.

In view of the fact that often, results obtained from empirical research are used for forecasting and consequently tend to form the basis for policy formulation, it is imperative then that investigations are carried out into whether or not the depicted relationship among the variables is true or spurious. Thus, this study tested for stationarity as well as for the existence of cointegration among the variables. According to econometric theory, if variables are cointegrated, then regression analysis involving variables in levels (though non-stationary) will not obtain spurious results and the conventional t and F tests are valid.

Variables are said to be cointegrated if the linear combination of the variables is stationary, even when the variables are individually non-stationary. That is, if the

resulting residuals from the cointegrating regressions are found to be stationary. For instance, given $X_t$ and $Y_t$ both I(1) variables; if we write $Y_t = \beta_0 - \beta_1 X_t + \epsilon_t$, as follows,

$$\epsilon_t = Y_t - \beta_0 + \beta_1 X_t \qquad \sim (2)$$

and find that $\epsilon_t$ (the linear combination) is I(0) or stationary, then the variables are said to be cointegrated. This, in essence implies the existence of some long-run relationship between the variables.

# CHAPTER FIVE: EMPIRICAL RESULTS

## 5.1 Introduction

This chapter presents the empirical findings from the regression analysis and the consequent discussion of the results.

Prior to running the regression analysis, stationarity tests were conducted on the various time series data, subsequent to which the Engle-Granger cointegration method was applied, and consequently, an error correction model (ECM) specified.

## 5.2 Testing for Stationarity

With no clear cut and consistent evidence on the robustness of alternative unit root tests (Moosa, 1994), this research opted to utilise the Augmented Dickey Fuller (ADF) test to test for stationarity, and subsequently, the order of integration of the various time series. Generally the ADF test for any given variable $X_t$ is defined as follows:

$$\Delta X_t = \alpha_0 - \delta_t X_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \epsilon_t, \qquad \sim (3)$$

Where,

$\Delta$ = the difference operator

k = the lag operator, which is chosen so as to ensure that any autocorrelation in $\Delta X_t$ is absorbed and the error term is empirically white noise.

The ADF tested the null hypothesis that any given time series $X_t$ was stationary ($H_0 : \delta = 0$) against the alternative that it was not ($H_1: \delta \neq 0$).

The test run on one lag was applied to the variables in log form, since that was the form in which they entered the savings model (Equation 1), and tested at a 5% level of significance. The null hypothesis was not rejected if the absolute value of the computed ADF T (tau) statistic exceeded the absolute T critical value obtained from the Dickey-Fuller tables. However, if the absolute value of the computed T statistic was less than the absolute T critical value, the null hypothesis of stationarity in the series was rejected.

From the results as presented in Table 5.2a below, all the time series were found to be non-stationary in their levels. However, on differencing and reapplying the ADF test, real household savings (HS), real income (Y), real interest rates (I), education (E) and the dependency rate (D) became stationary at first difference {I(1)} as seen from Table 5.2b. The ADF tests however, suggested inflation (Inf) and urbanisation (U) to be integrated of order two {I(2)} and three {I(3)}, respectively (see Appendix D).

**Table 5.2a: Unit Root Test of Variables in Levels**

| **Variable** | HS | Y | I | Inf | D | E | U |
|---|---|---|---|---|---|---|---|
| **t-adf (lag)** | -0.42057 (1) | -1.1654 (1) | -1.5517 (1) | -0.40283 (1) | -0.43961 (1) | -0.13848 (1) | -1.4832 (1) |
| Critical Value (5%) = -2.991 | | | | | | | |

**Table 5.2b: Unit Root Test of Variables in First Differences**

| **Variable** | HS | Y | I | Inf | D | E | U |
|---|---|---|---|---|---|---|---|
| **t-adf (lag)** | -5.9914 (1) | -3.2060 (1) | -4.0369 (1) | -1.7286 (1) | -3.6185 (1) | -3.6894 (1) | -0.5962 (1) |
| **Order of Integration** | I (1) | I (1) | I (1) | I (2) | I (1) | I (1) | I (3) |
| Critical Value (5%) = -2.997 | | | | | | | |

## 5.3 Testing for Cointegration

Following the results obtained from the unit root tests, the research preceded to investigate whether the hypothesised long-run equilibrium relationship specified by equation (1) was the correct form, by applying the Engle-Granger cointegration approach

due to its simplicity and alternative relevance to small samples. While the Johansen's maximum likelihood estimation procedure has frequently been used since the 1990s, due to its advantage in providing a more detailed analysis of multiple cointegration relationships, it is quite complex (Adam, 1992). Furthermore, the procedure is largely unknown in terms of small sample properties such that it usually necessitates a higher number of observations as may be obtained by the use of quarterly or monthly time series data.

Despite the fact that cointegration essentially focuses on incorporating non-stationary variables, particularly, I(1) variables, inflation and urbanisation were included in the cointegration regression basing on econometric theory which postulates that, generally the properties of I(1) series apply to all non-stationary series. Furthermore, according to econometric theory, though most macroeconomic variables would exhibit unit roots, they would become stationary after the first difference. Otherwise, macroeconomic variables would be stationary (Enders, 1995). Thus, implying that there could have been statistical biases in making the two series integrated of a higher order.

Table 5.3a below, presents the results as obtained following the cointegration analysis.

**Table 5.3a: Modelling LHS by OLS**

Present Sample: 1975 to 2000

| Variable | Coefficient | t-value | p value |
|---|---|---|---|
| Constant | -1.0621 | -0.086 | 0.9324 |
| LY | 0.20176 | 0.453 | 0.6560 |
| LI | 0.045587 | 0.328 | 0.7467 |
| Linf | -0.28644 | -2.543 | 0.0199 |
| LD | -0.37963 | -0.127 | 0.9006 |
| LE | 1.7556 | 1.492 | 0.1522 |
| LU | 1.0818 | 0.740 | 0.4681 |

$R^2 = 0.884506$ DW = 1.85

Ecm1[6] t-adf = -5.3459 * (Critical 5% value = -2.991)

Diagnostic Tests[7]

AR 1-2F(2,17) = 1.5556 [0.2397]

ARCH 1 F(1,17) = 0.33709 [0.5691]

Normality Chiý(2) = 6.7062 [0.0350]*

[6] Ecm 1 is the error term from the cointergration regression.
[7] See Appendix B.

RESET F(1, 18) = 0.063132 [0.8045]

With the exception of inflation, all the variables were found to be insignificant at the 5 % level. However, while the Engle-Granger test implied the existence of cointegration [as shown by the Ecm1 (error term) ADF statistic], the normality test was significant, therefore, rendering the t, F and chi-square tests (which require the normality assumption) unreliable.

Consequently, further investigations were carried out to test for cointegration on a bivariate level in order to determine the actual (if possible) cointegrating (long-run equilibrium) relationship. Using the Engle-Granger procedure, the bivariate cointegrating relationship was specified as shown below:

$$Y_t = \alpha_0 + \alpha_1 X_t + \varepsilon_t \qquad \sim (4)$$

Where,

$Y_t$ = household savings

$X_t$ = respective independent variable

The error terms of the respective cointegration regressions where stored and tested for stationarity. From the summarised results presented in Table 5.3b, only inflation and education were found to be cointegrated (or had a long-run relationship) with the dependent variable (household savings). Hence, the hypothesised long-run equilibrium

**Table 5.3b: Testing for Cointegration (Bivariate Case)**

Dependent Variable: LHS

| Equation for Variable | Error Term t-adf | Conclusion |
|---|---|---|
| Y | -2.1806 | No Cointegration |
| I | -1.3870 | No Cointegration |
| Inf | -4.6721 | Cointegration |
| D | -1.6924 | No Cointegration |
| E | -3.0847 | Cointegration |
| U | 0.27931 | No Cointegration |
| Critical value (5%) = -2.991 | | |

relationship was re-estimated with inflation and education as the only independent variables {see equation (5) }.

$$\lfloor HS_t = \beta o + \beta_1 \lfloor Inf + \beta_2 \lfloor E_t + \epsilon_t \qquad \sim (5)$$

The regression analysis found both variables to be significant at the 5% level of significance, and on applying the Engle-Granger test to the resulting error term, the

existence of cointegration was confirmed. Furthermore, all the mis-specification tests for the model were insignificant thus purporting that the specified long-run equilibrium relationship was correct (see Table 5.3c below).

**Table 5.3c: Modeling LHS by OLS**

Present Sample: 1975 to 2000

| Variable | Coefficient | t-value | p value |
|---|---|---|---|
| Constant | 2.8574 | 1.206 | 0.3399 |
| Linf | -0.30220 | -4.937 | 0.001 |
| LE | 1.9107 | 2.423 | 0.0237 |

$R^2 = 0.876261$ DW = 1.71

Ecm2[8] t-adf = -6.1655 (Critical 5% value = -2.991)

Solved Static Long-Run Equation

LHS = +2.857 – 0.3022 Linf +1.911LE ~ (6)

(SE) (2.369) (0.06121) (0.7885)

Diagnostic Tests

AR 1-2F(2,21) = 1.9067 [0.1734]

[8] Error term from the re-estimated cointegration regression with education and inflation as the independent variables.

ARCH 1 F(1,21) = 3.9776 [0.0593]

Normality Chiý(2) = 4.7401 [0.0935]

RESET F(1, 22) = 0.0013286 [0.9713]

### 5.4 Estimation of the Error Correction Model (ECM)

According to the Cointegration Representation Theorem, if a set of variables is cointegrated, they will have an error correction mechanism that will ensure an adjustment process in which the long-run relationship does not grow over time; that is, the short-run dynamic relationship will converge with the long-run. Hence, as the second step of the Engle-Granger procedure, the research proceeded to specify and estimate an ECM.

Essentially, while the long-run relationship is useful for policy formulation, its usefulness fundamentally hinges largely on the extent to which the short-run movements taken together correlate with the policy controlled variables. For this reason, the ECM by encompassing both short-run and long-run information has been found to be superior to either modelling data in a single equation in first differences or simply in levels[9]. While the former ignores levels (long-run) information; the latter is subject to spurious regressions and further fails to capture the dynamic influences on the variables.

In estimating the ECM, the 'general to specific' approach was employed by initially specifying an over-parameterised model. Though desirable to include several lags, the lag

[9] The dynamic (short-run) structure is captured by the differenced terms while the error correction term captures the levels (long-run) information.

was set to a length of one on all the variables (including the dependent variables) in order to preserve degrees of freedom and avoid the problem of multicollinearity. Equation 7 shows the over-parameterised ECM in which the lagged Ecm2 was entered as one of the independent variables.

$$\Delta LHS_t = \alpha_0 + \alpha_1 \Delta LY_t + \alpha_2 \Delta LY_{t-1} + \alpha_3 \Delta LI_t + \alpha_4 \Delta LI_{t-1} + \alpha_5 \Delta LInf_t + \alpha_6 \Delta LInf_{t-1} + \alpha_7 \Delta LD_t + \alpha_8 \Delta LD_{t-1} + \alpha_9 \Delta LE_t + \alpha_{10} \Delta LE_{t-1} + \alpha_{11} \Delta U_t + \alpha_{12} \Delta U_{t-1} + \alpha_{13} \Delta LHS_{t-1} + \alpha_{14} Ecm2_{t-1} + \varepsilon_t \quad \sim (7)$$

Where,

Ecm2 = the error term from equation (6).

The over-parameterised equation[10] was continually reparameterised and estimated by deleting insignificant lags of the variables, as well as checking the diagnostic tests, until a parsimonious model was arrived at[11]. The following was the resulting dynamic equation obtained.

$$\begin{array}{lllll} DLHS = & 0.0379 & + 1.126DLY & - 1.1727\ DLI & - 0.2344DDLInf \quad - 1.591\ DLE \\ (SE) & (0.03842) & (0.3487) & (0.06065) & (0.1235) \qquad (0.7759) \end{array}$$

$$- 0.4885\ Ecm \qquad \sim (8)$$

$$(0.2098)$$

[10] See Appendix D.

[11] By parsimony we seek to maximise the goodness of fit of the model with the minimum number of variables (Adam, 1992) (Refer to Appendix D).

$R^2 = 0.71794$ DW = 1.59

Diagnostic Tests

AR 1-2F(2,13) = 0.84527 [0.4517]

ARCH 1 F(1,13) = 0.046153[0.8332]

Normality Chiý(2) = 1.9991 [0.3681]

RESET F(1, 14) = 0.72982 [0.4073]

All the diagnostic tests for model misspecification were insignificant. The autocorrelation test (AR 1 –2F) indicated that the residuals were distributed as white noise while the ARCH test rejected the presence of autoregressive conditional heteroscedasticity. The Ramsey's RESET test also indicated that the functional form of the model was quite sound. Moreover, the Jacques Bera normality test gave credence to the OLS estimates as being efficient and consistent while the Ecm was also statistically significant and had a correct (negative) sign. Hence, the coefficients of the correctly specified cointegration regression could be interpreted as the long-run coefficients in the relationship.

### 5.5 Discussion of the Results

From the dynamic model, it is noted that the change in the rate of change of income, cited both theoretically and empirically as a prime determinant of savings, had a significant positive influence on the change in the rate of change of household savings in the short-run with a coefficient of 1.126. A one per cent rise in the change of the rate of change of

income would thus lead to a slightly above one per cent increase in the change of the rate of change of household savings. A result that gives credence to Friedman's permanent income hypothesis that postulates that any transitory increase in income will go to savings.

In the long-run, however, savings seemed to vary with no clear distinction to income, as no relationship was found to exist between the change in the rate of change of income and that of household savings. Thus purporting that income was not the only and important determinant of household savings in Zambia. In fact, that over time then, factors other than income became more important in determining whether or not households would save. In which case, the achievement of higher savings mobilisation would be possible despite the low levels of income prevalent among the majority of Zambian households.

The significance of the lagged variables for the change in the rate of change of interest rates and the change in the rate of change of education in the dynamic model implied that the phenomena are sluggish in the short-run.

The coefficient of the lagged interest rate was found to be negative as opposed to the highly purported hypothesis by McKinnon (1973) that a rise in interest rates would lead to an increase in savings. The findings of this research therefore implied that a rise in the change of the rate of change of interest rates would induce a plunge in the change in the

rate of change of savings. Explaining these findings could be a number of underlying factors peculiar to the Zambian case.

Prior to 1992, interest rates were, as was with other prices, centrally controlled. And according to literature, would have implied that the interest rates were repressed (McKinnon, 1973). Hence, in 1992 the Zambian Government embarked on the liberalisation of the financial sector. However, despite the liberalisation of interest rates and the, therefore, implied subsequent higher (positive) rates, the high and fluctuating rate of inflation that during the 1990s averaged above 20 per cent (MFNP, 2002) may have continued to be a disincentive to savings.

Additionally, the various commercial bank charges (instituted mainly during the 1990s) such as account maintenance and withdrawal charges, among others, may impose a form of taxation on savings resulting in the negation of interest gains. This, according to Mrak (1989), may be one of the reasons that a substantial amount of household savings remains in non-monetary forms, or if in monetary forms, outside the banking system. Moreover, positive interest rates are often reflected on deposit accounts that demand high minimum balances, over and above the average incomes of the general citizenry. Hence, the effect of which would be the observed negative correlation of household savings with interest rates.

And while, the banking crisis of 1995 may have undermined public confidence in the banking sector with a resultant growth of liquidity outside the system (MFNP, 1997), the

spatial distribution of banking institutions, not captured in this study, could undercut the effect of interest rates.

It is also noted, though, that a number of researchers have purported aggregate data to be especially problematic for testing the effects of interest rates on savings (Schimdt-Hebbel et al, 1991).

With respect to the change in the rate of change of education, while a positive long-run relationship was found to exist between this variable and the change in the rate of change of household savings, the dynamic model implied a negative relationship in the short-run. Whereas, in the long-run a one per cent increase in the change in the rate of change of education would lead to an almost two per cent rise in the change of the rate of change of household savings, in the short-run this would lead to a 1.6 per cent reduction.

While generally accepted that people with higher education would earn higher income and consequently save more, the relationship among these variables takes time to be completely realised according to Morrisseti and Revoredo (1995). In the short-run, an increase in expenditures due to higher education expenses would imply that fewer funds are available as savings.

From the regression analysis, inflation was indicated as a disincentive to household savings as observed from the negative coefficients in both the short-run and long-run. That is, for every one per cent increase in the change of the rate of change of inflation,

the change in the rate of change of household savings would fall by about 0.23 per cent in the short-run and 0.30 per cent in the long-run.

Any existence of a relationship between household savings and the rates of dependency and urbanisation in Zambia was, however, refuted by the regression analysis, in either the short-run or long-run. This could be due to the limited variation of these variables as seen in Appendix C.

Overall, from the ECM, the coefficient of the Ecm indicated a feedback of about 49 per cent of the previous years disequilibrium from the long-run relationship.

# CHAPTER SIX: CONCLUSION

## 6.1 Introduction

This chapter outlines the concise findings of the paper, the limitations of the study and consequent policy implications and considerations.

## 6.2 Conclusion

The thrust of the study was to identify the factors that determine household savings in Zambia. This is in view of the decline in, and uncertainty of foreign savings (both FDI and foreign aid), which in essence implies that the country would have to rely more on domestic savings for economic growth. Moreover, given the fragmented corporate sector and deficiency of public savings (due to the debt service obligations), household savings would tend to comprise the largest component of domestic savings in the developing countries. Hence, the ability and willingness of households to save, therefore, as well the opportunities to do so, could over time significantly influence the rate and sustainability of capital accumulation and economic growth in developing countries.

Though an increase in savings is not sufficient in itself for achieving economic growth, without dispute, savings do determine a nation's capability to invest and thus produce (which ultimately culminates into economic growth). In support of this, the World Bank

acknowledges that countries that performed well during the 1980s had relatively high investment ratios of about 22 per cent or more of GDP (McCarthy, 1990).

While widely accepted as a foregone conclusion that income is a major determinant of savings, this paper endeavoured to find out the extent to which this variable, along with a number of other variables, influenced household savings in Zambia. Thus basing on theoretical and empirical literature, as well as relevance to the Zambian context, this research tested for the impact that the interest rate, inflation rate, dependency rate, urbanisation rate, education and income had on household savings.

A long-run relationship was thus, hypothesised and estimated using the OLS technique.

The analysis indicated short-run variations in the change of the rate of change of household savings to be significantly explained by changes in the rate of change of income, interest rates, inflation and education. And while interest rates, education, and inflation had negative coefficients, income was found to be positively correlated with household savings in the short-run. In the long-run however, only education and inflation with positive and negative coefficients, respectively, were found to exert an influence on the change in the rate of change of household savings. Hence, converse to popular theoretical and empirical literature, though the change in the rate of change of income had a significant effect on the change in the rate of change of household savings in the short-run, in the long-run it proved to be inconsequential. Suffice to say, these findings may

have significantly been influenced by the lack of cointegration as well as the lack of control of structural breaks in the data.

In addition, there was no depicted relationship between household savings and dependency rates or with the rate of urbanisation in either the short-run or long-run which may be attributed to the limited variation of these variables as seen in Appendix C.

### 6.3 Limitations of the Study

Primarily, the quality of the data and methodology used in the study, which includes the choice of the proxies (due to the unavailability of data), posed a significant challenge and limitation to the study. In particular, is the data for household savings employed in the study as proxied by commercial banks deposits (see Appendix A). While in actual fact household savings, these, however, do not encompass total household savings since households also save not only in the form of physical assets but also in other non-bank financial institutions such as insurance companies, pension schemes and building societies among others as well as in the form of currency holdings. Furthermore, the use of commercial bank deposits was based on a number of assumptions as outlined in Appendix A.

Moreover, the use of GDP at market prices (which is, in economic terms, all encompassing), as a proxy for income could have created some bias when regressed on the household savings proxy that represents but part of the whole.

Another challenge to the regression analysis could have been in regard to the population data which more often than not are derived from postulations due the costliness of undertaking surveys in a developing country such as Zambia.

With reference to the methodology employed, while the error term would have generally represent all those factors that affected household savings but not explicitly taken into account, the lack of incorporation of structural changes such as financial liberalistion and the 1995 banking crisis may have posed a challenge to the findings of this study.

### 6.4 Policy Implications and Considerations

Notwithstanding the limitations of the study as outlined above, a number of policy implications could still be drawn from the findings of this research. This is purported by the fact that while household savings as proxied by financial savings are not all encompassing, the main interest of this study was in household savings that are to be found in financial institutions such as banks. Since these are the savings that are most likely to be readily available for investible purposes.

Given the significant coefficient reported for education, particularly, in the long-run it would seem most prudent for the Zambian government to rather employ its efforts in educating its population if it is to encourage the internal mobilisation of resources (although this would reduce deposits in the short-run). Since income is not cointegrated with household savings, the fact that Zambia has over three quarters of its population

classified as poor, holds no impregnable constraint to efforts of mobilising internal savings for investment, and consequently, for economic growth. It is the knowledge of the masses, of the importance and essence of saving that ultimately makes the difference in that matter.

And while the results indicated a negative short-run correlation between savings and interest rates, it would be recommended that further research (particularly on primary level) be carried out into the effect of net interest, less various bank charges (which may indeed negate the effect of positive interest rates on savings deposits).

Lastly, due to the resultant effect that inflation has on savings by causing people to shift their savings into consumer durables, efforts to reduce inflation would be of paramount concern as well. This means addressing policy variables that go to feed into inflationary pressures as well.

Citing the words of Soon and Suan (1993), "the most unpromising starting point need not stop a country from developing...what matters is a realistic strategy and intelligent policies". In support of this statement is the prominent example of China. Today, with the savings rates among the highest in the world (similar to those of the East Asia Miracles economies), the country managed to achieve these high savings rates at much lower income levels (Loayza et al, 2000).

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## APPENDIX A

## HOUSEHOLD SAVINGS PROXY

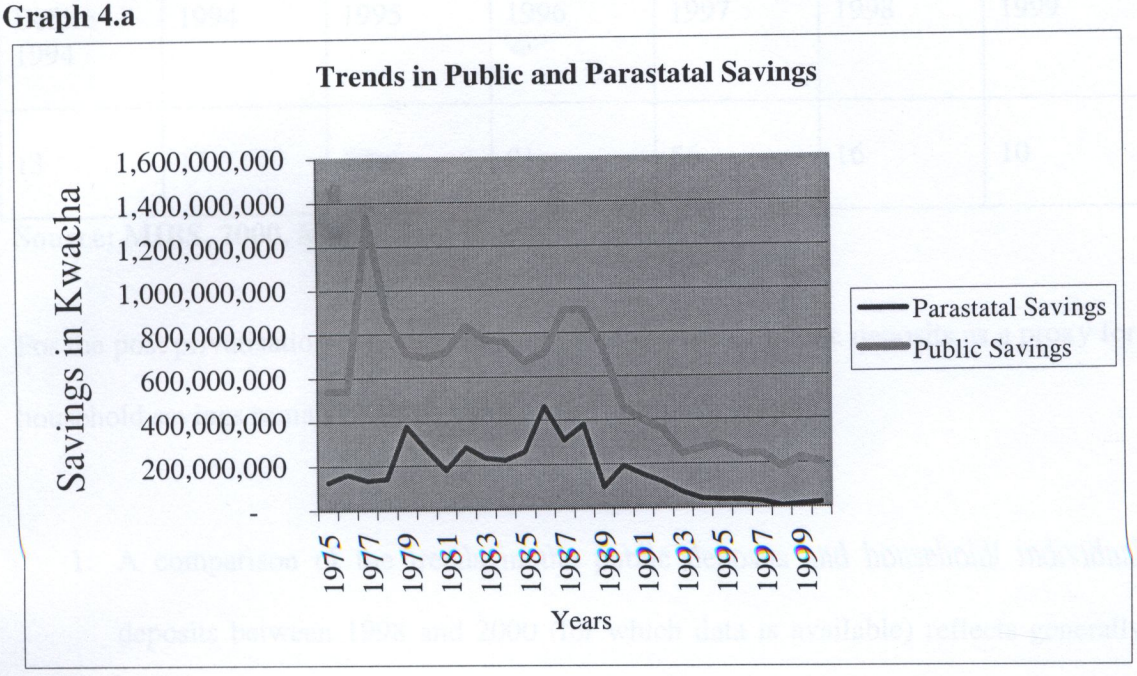
Data used as household savings were obtained from the *Bank of Zambia Annual Reports* tabulated as public savings. The justification for which is explained below.

For the period commencing in 1968, when the incumbent President of the Republic of Zambia announced the first take-over of controlling interests in a number of foreign entities by the government parastatal holding, INDECO, Zambia's economy remained until 1991 a centrally controlled economy (INDECO, 1972). In fact prior to the commencement of the privatisation programme in 1994, about 80 per cent of economic activity was in government hands (MIBS, 2000). The private sector was basically negligible being viewed by government as highly susceptible to structural vulnerabilities and "partly responsible for the country's occasional foreign exchange difficulties" ... as it ... "consumes a lot of foreign exchange but exports very little to compensate the country for imports" (NCDP, 1979).

Thus, inference from the above suggests that public savings as recorded by the commercial banks for the period prior to 1992 constituted in large part household deposits while the corporate sector savings mainly fell under parastatal deposits. According to the Bank of Zambia (1982), the analysis of INDECO (a parastatal holding) that came to represent about three-quarters of the country's total industrial activity would

give a general trend in the savings of the corporate sector. Hence, the factors accounting for the poor performance of INDECO could be generalised to the whole corporate sector.

**Graph 4.a**




**Source: Bank of Zambia Annual Reports** (Various issues)

As Graph 4a above depicts, the relatively erratic pattern of parastatal savings suggests a reflection of the marked problems of foreign exchange availability that largely determined the parastatal companies' performance. And beginning in 1991, there is a sustained fall in parastatal savings that seems to correspond with the initialisation of the economic liberalisation programme embarked on in 1991, that involved the privatisation of public enterprises (in order to curb government deficits). By 1992, 242 of the 280 companies earmarked for privatisation had completely been transferred to the private sector (Table 4.1a).

**Table 4.1a: Total Number of Privatisation Transactions Completed**

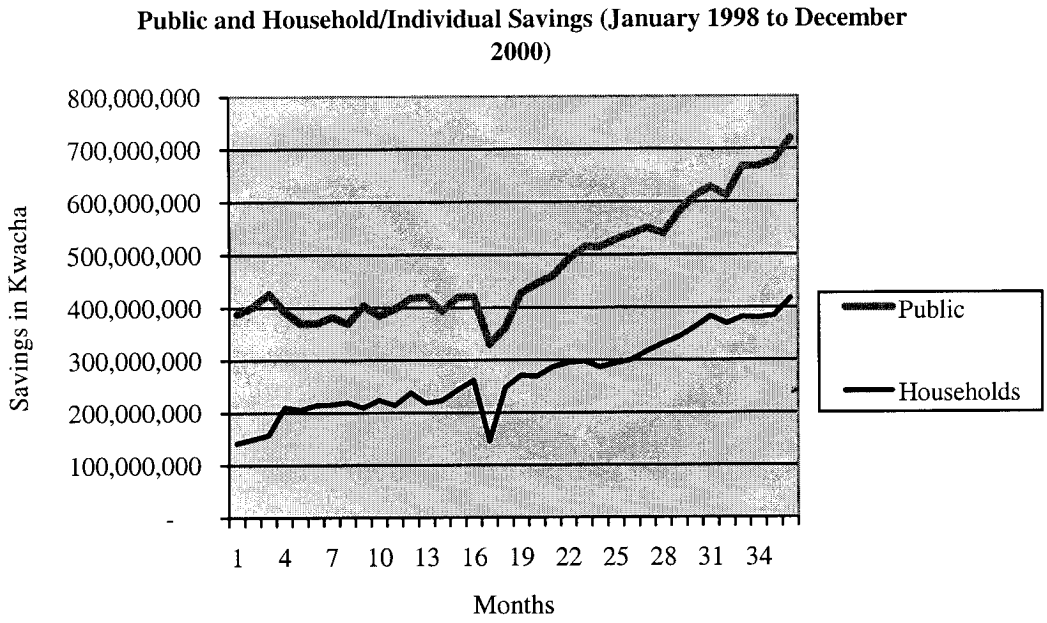
| Before 1994 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|
| 13 | 17 | 60 | 91 | 56 | 16 | 10 |

**Source: MIBS, 2000, Millennium Dawn**

For the post privatisation period preceding 1992, the use of public deposits as a proxy for household savings remains valid basing on the following reasons.

1. A comparison of the trends in the public deposits and household/ individual deposits between 1998 and 2000 (for which data is available) reflects generally identical patterns in the two time series as depicted by Graph 4b below.

**Graph 4b.**




2. From computations, household savings are found to account for a significant portion of public savings; constituting on average, 55 per cent of public savings for the period 1998 to 2000 (see Table 4.1b below).

Furthermore, from Graph 4a there seems to be no marked increase in public savings post privatisation, that is, after 1991. Implying then that corporate savings have remained largely constrained as a proportion of savings. Among the reasons of which could be the externalisation of resources by foreign investors though there is no factual documentation on this.

**Table 4.1b: Commercial Bank Deposits (K'000)**

| Year Month | Household/Individual Savings | Total Public Savings | Household/Individual (% of Total Public Savings) |
|---|---|---|---|
| January 1998 | 141631000 | 387989000 | 36.50 |
| February | 148748700 | 401673908 | 37.03 |
| March | 157339262 | 426518013 | 36.89 |
| April | 209991704 | 392532581 | 53.50 |
| May | 205645781 | 369867630 | 55.60 |
| June | 214479472 | 369616412 | 58.03 |
| July | 215368597 | 382107056 | 56.36 |
| August | 219412897 | 369405290 | 59.40 |
| September | 209678407 | 404128488 | 51.88 |
| October | 224610000 | 384742000 | 58.38 |
| November | 214116000 | 397990000 | 53.80 |
| December | 237764000 | 417881000 | 56.90 |
| January 1999 | 218333000 | 420680000 | 51.90 |
| February | 223866000 | 393395000 | 56.91 |
| March | 244458000 | 420194000 | 58.18 |
| April | 261887000 | 420575000 | 62.27 |
| May | 145262900 | 329684900 | 44.06 |
| June | 248272000 | 362034000 | 68.58 |
| July | 271453000 | 427815000 | 63.45 |
| August | 269405000 | 445726000 | 60.44 |
| September | 285913000 | 459400000 | 62.24 |
| October | 294804000 | 491790000 | 59.95 |
| November | 297548000 | 515138000 | 57.76 |
| December | 286062000 | 514603000 | 55.59 |
| January 2000 | 293681000 | 527340000 | 55.69 |
| February | 300101000 | 539371000 | 55.64 |
| March | 316738000 | 550951000 | 57.49 |
| April | 331856000 | 540197000 | 61.43 |
| May | 343525000 | 581250000 | 59.10 |
| June | 362521000 | 611143000 | 59.32 |
| July | 383665000 | 628017000 | 61.09 |
| August | 369381000 | 611237000 | 60.43 |
| September | 382408000 | 667217000 | 57.31 |
| October | 380491000 | 667728000 | 56.98 |
| November | 384861000 | 678151000 | 56.75 |
| December | 417291000 | 719686000 | 57.98 |

**Source: Bank of Zambia Annual Report 2000**

## APPENDIX B

## DIAGNOSTIC TESTS

AR1- 2F is a test statistic for the null hypothesis of the presence of autocorrelation. If AR 1- 2F is les than 1, then residual autocorrelation is rejected The F-form is also reported.

ARCH test is a test statistic for the null hypothesis of the presence of autoregressive conditional hetereoscedasticity and it is based on the squared residuals. Autoregressive conditional hetereoscedasticity is rejected if ARCH is less than 1. Also, note that the probability figure shows that the test is insignificant.

RESET (Regression Specific Test) is a test statistic for the functional form of the model. Insignificant results indicate correct functional form.

Normality test is the Jaque-Bera (JB) test, which is based on the residuals. Under the null hypothesis, the residuals are normally distributed. Asymptotically, the JB statistic follows a chi-square distribution with 2 degrees of freedom. If the computed p value sufficiently low, one can reject the hypothesis that the residuals are normally distributed.

# APPENDIX C

## RESEARCH DATA

| Year | Real Household Savings (K Millions) | Real GDP (K Millions) | Real Interest Rates | Inflation Rate (CPI=1995) | Dependency Rate | Education | Urban Ra |
|---|---|---|---|---|---|---|---|
| 1975 | 5411.9 | 31660 | 4.00 | 0.05 | 96.43 | 15.00 | 34 |
| 1976 | 5397.05 | 31600 | 5.31 | 0.06 | 96.00 | 16.00 | 35 |
| 1977 | 13352.21429 | 28371.42857 | 6.25 | 0.07 | 96.26 | 16.00 | 36 |
| 1978 | 8836.85 | 37516.66667 | 6.25 | 0.06 | 97.06 | 16.10 | 37 |
| 1979 | 7057.366667 | 44333.33333 | 6.75 | 0.06 | 96.48 | 15.10 | 38 |
| 1980 | 6934.357143 | 43771.42857 | 7.00 | 0.07 | 100.00 | 16.10 | 39 |
| 1981 | 7143.6875 | 43562.5 | 6.17 | 0.08 | 100.66 | 16.00 | 38 |
| 1982 | 8343.577778 | 39944.44444 | 6.00 | 0.09 | 101.29 | 16.00 | 38 |
| 1983 | 7700.527273 | 38009.09091 | 7.00 | 0.11 | 101.88 | 16.40 | 37 |
| 1984 | 7595.7 | 37930.76923 | 7.71 | 0.13 | 101.20 | 17.60 | 37 |
| 1985 | 6688.622222 | 39288.88889 | 15.33 | 0.18 | 101.17 | 18.80 | 36 |
| 1986 | 7068.433333 | 48574.07407 | 17.74 | 0.27 | 100.57 | 19.50 | 36 |
| 1987 | 9012.002564 | 50712.82051 | 13.23 | 0.39 | 100.55 | 21.10 | 36 |
| 1988 | 9052.381667 | 50035 | 11.44 | 0.60 | 100.00 | 20.80 | 36 |
| 1989 | 7221.719685 | 43449.6063 | 11.44 | 1.27 | 98.48 | 21.90 | 35 |
| 1990 | 4569.816779 | 38033.89262 | 25.65 | 2.98 | 100.00 | 23.00 | 35 |
| 1991 | 3992.928 | 38148.34783 | 30.50 | 5.75 | 100.30 | 24.10 | 35 |
| 1992 | 3591.110078 | 36739.66408 | 48.50 | 15.48 | 100.50 | 25.10 | 35 |
| 1993 | 2458.838631 | 29698.2684 | 86.88 | 48.51 | 98.80 | 26.00 | 35 |
| 1994 | 2735.398296 | 30068.438 | 46.14 | 74.52 | 97.15 | 26.70 | 34 |
| 1995 | 2864.89291 | 29983 | 30.24 | 100.00 | 95.74 | 27.40 | 34 |
| 1996 | 2411.763355 | 27011.69071 | 42.13 | 146.27 | 94.30 | 28.20 | 34 |
| 1997 | 2459.932669 | 28160.60473 | 34.48 | 182.56 | 93.00 | 29.04 | 34 |
| 1998 | 1841.534461 | 26567.0721 | 13.08 | 226.92 | 93.00 | 31.94 | 34 |
| 1999 | 2245.781416 | 27081.88694 | 20.27 | 273.67 | 92.00 | 32.51 | 34 |
| 2000 | 2033.011299 | 25579.09605 | 20.24 | 354.00 | 92.00 | 29.61 | 39 |

# APPENDIX D

## REGRESSION ANALYSIS

Unit root tests 1977 to 2000
Critical values: 5%=-2.991 1%=-3.734; Constant included

| | t-adf | å lag | t-lag | t-prob | |
|---|---|---|---|---|---|
| LHS | -0.42057 | 0.28272 | 1 | -0.42602 | 0.6744 |
| LHS | -0.61339 | 0.27741 | 0 | | |
| LY | -1.1654 | 0.10967 | 1 | 1.2172 | 0.2370 |
| LY | -0.80191 | 0.11086 | 0 | | |
| LI | -1.5517 | 0.39787 | 1 | 0.33490 | 0.7410 |
| LI | -1.5509 | 0.38975 | 0 | | |
| LInf | -0.40283 | 0.20786 | 1 | 5.2234 | 0.0000 |
| LInf | 1.2794 | 0.30794 | 0 | | |
| LD | -0.43961 | 0.012250 | 1 | 1.1744 | 0.2534 |
| LD | 0.068381 | 0.012356 | 0 | | |
| LE | -0.13848 | 0.044437 | 1 | -0.051136 | 0.9597 |
| LE | -0.16635 | 0.043418 | 0 | | |
| LU | -1.4832 | 0.029219 | 1 | 1.6210 | 0.1199 |
| LU | -1.1763 | 0.030281 | 0 | | |

DLHS = diff(LHS, 1);
DLY = diff(LY, 1);
DLI = diff(LI, 1);
DLInf = diff(LInf, 1);
DLD = diff(LD, 1);
DLE = diff(LE, 1);
DU = diff(U, 1);
DLU = diff(LU, 1);

DDLInf = diff(DLInf, 1);
DDLU = diff(DLU, 1);

Unit root tests 1979 to 2000
Critical values: 5%=-3.004 1%=-3.767; Constant included

| | t-adf | å lag | t-lag | t-prob | |
|---|---|---|---|---|---|
| DDLInf | -5.1093** | 0.20139 | 1 | 1.9989 | 0.0601 |
| DDLInf | -4.9325** | 0.21595 | 0 | | |
| DDLU | -0.65581 | 0.032210 | 1 | -0.38441 | 0.7049 |
| DDLU | -2.1135 | 0.031516 | 0 | | |

DDDLU = diff(DDLU, 1);

Unit root tests 1980 to 2000
Critical values: 5%=-3.011 1%=-3.785; Constant included

| | t-adf | å lag | t-lag | t-prob | |
|---|---|---|---|---|---|
| DDDLU | -2.2144 | 0.032032 | 1 | 0.84890 | 0.4071 |
| DDDLU | -4.5119** | 0.031796 | 0 | | |

EQ( 1) Modelling LHS by OLS
The present sample is: 1975 to 2000

| Variable | Coefficient | Std.Error | t-value | t-prob | PartRý |
|---|---|---|---|---|---|
| Constant | -1.0621 | 12.355 | -0.086 | 0.9324 | 0.0004 |
| LY | 0.20176 | 0.44585 | 0.453 | 0.6560 | 0.0107 |
| LI | 0.045587 | 0.13911 | 0.328 | 0.7467 | 0.0056 |
| LInf | -0.28644 | 0.11266 | -2.543 | 0.0199 | 0.2539 |
| LD | -0.37963 | 2.9988 | -0.127 | 0.9006 | 0.0008 |
| LE | 1.7556 | 1.1768 | 1.492 | 0.1522 | 0.1048 |
| LU | 1.0818 | 1.4611 | 0.740 | 0.4681 | 0.0280 |

Rý = 0.884506 F(6, 19) = 24.252 [0.0000] å = 0.222447 DW = 1.85
RSS = 0.9401714164 for 7 variables and 26 observations

Solved Static Long Run equation

| | | | |
|---|---|---|---|
| LHS = | -1.062 | +0.2018 LY | +0.04559 LI |
| (SE) | ( 12.36) | ( 0.4459) | ( 0.1391) |
| | -0.2864 LInf | -0.3796 LD | +1.756 LE |
| | ( 0.1127) | ( 2.999) | ( 1.177) |
| | +1.082 LU | | |

WALD test Chiý(6) = 145.51 [0.0000] **

Analysis of lag structure

| Lag | 0 | 1 | 2 | 3 | 4 | 5 | ä |
|---|---|---|---|---|---|---|---|
| LHS | -1 | 0 | 0 | 0 | 0 | 0 | -1 |
| Std.Err | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Constant | -1.06 | 0 | 0 | 0 | 0 | 0 | -1.06 |
| Std.Err | 12.4 | 0 | 0 | 0 | 0 | 0 | 12.4 |
| LY | 0.202 | 0 | 0 | 0 | 0 | 0 | 0.202 |
| Std.Err | 0.446 | 0 | 0 | 0 | 0 | 0 | 0.446 |
| LI | 0.0456 | 0 | 0 | 0 | 0 | 0 | 0.0456 |
| Std.Err | 0.139 | 0 | 0 | 0 | 0 | 0 | 0.139 |
| LInf | -0.286 | 0 | 0 | 0 | 0 | 0 | -0.286 |
| Std.Err | 0.113 | 0 | 0 | 0 | 0 | 0 | 0.113 |
| LD | -0.38 | 0 | 0 | 0 | 0 | 0 | -0.38 |
| Std.Err | 3 | 0 | 0 | 0 | 0 | 0 | 3 |
| LE | 1.76 | 0 | 0 | 0 | 0 | 0 | 1.76 |
| Std.Err | 1.18 | 0 | 0 | 0 | 0 | 0 | 1.18 |
| LU | 1.08 | 0 | 0 | 0 | 0 | 0 | 1.08 |
| Std.Err | 1.46 | 0 | 0 | 0 | 0 | 0 | 1.46 |

Tests on the significance of each variable

| variable | F(num,denom) | Value | Probability | Unit Root t-test |
|---|---|---|---|---|
| Constant | F( 1, 19) = | 0.0073904 | [0.9324] | -0.085967 |
| LY | F( 1, 19) = | 0.20477 | [0.6560] | 0.45252 |
| LI | F( 1, 19) = | 0.1074 | [0.7467] | 0.32771 |
| LInf | F( 1, 19) = | 6.4645 | [0.0199] * | -2.5425 |
| LD | F( 1, 19) = | 0.016026 | [0.9006] | -0.12659 |
| LE | F( 1, 19) = | 2.2255 | [0.1522] | 1.4918 |
| LU | F( 1, 19) = | 0.54821 | [0.4681] | 0.74041 |

AR 1- 2F( 2, 17) = 1.5556 [0.2397]
ARCH 1 F( 1, 17) = 0.33709 [0.5691]
Normality Chiý(2)= 6.7062 [0.0350] *
Xiý F(12, 6) = 2.1947 [0.1722]
RESET F( 1, 18) = 0.063132 [0.8045]

ECM = Residual values of equation 1

Unit root tests 1977 to 2000
Critical values: 5%=-1.956 1%=-2.665

| | t-adf | å lag | t-lag | t-prob | |
|---|---|---|---|---|---|
| ECM | -5.3893** | 0.17492 | 1 | 1.9579 | 0.0630 |
| ECM | -5.2250** | 0.18538 | 0 | | |

EQ( 2) Modelling LHS by OLS
The present sample is: 1975 to 2000

| Variable | Coefficient | Std.Error | t-value | t-prob | PartRý |
|---|---|---|---|---|---|
| Constant | -12.079 | 3.9358 | -3.069 | 0.0053 | 0.2818 |
| LY | 1.9639 | 0.37547 | 5.230 | 0.0000 | 0.5327 |

Rý = 0.532684 F(1, 24) = 27.357 [0.0000] å = 0.398129 DW = 0.767
RSS = 3.804156681 for 2 variables and 26 observations

AR 1- 2F( 2, 22) = 6.8955 [0.0047] **
ARCH 1 F( 1, 22) = 0.090719 [0.7661]
Normality Chiý(2)= 16.749 [0.0002] **
Xiý F( 2, 21) = 0.80722 [0.4595]
Xi*Xj F( 2, 21) = 0.80722 [0.4595]
RESET F( 1, 23) = 1.437 [0.2428]

r2 = Residual values of equation 2

Unit root tests 1977 to 2000
Critical values: 5%=-2.991 1%=-3.734; Constant included

| | t-adf | å lag | t-lag | t-prob | |
|---|---|---|---|---|---|
| r2 | -2.1806 | 0.33060 | 1 | 0.15568 | 0.8778 |
| r2 | -2.4073 | 0.32319 | 0 | | |

EQ( 3) Modelling LHS by OLS
The present sample is: 1975 to 2000

| Variable | Coefficient | Std.Error | t-value | t-prob | PartRý |
|---|---|---|---|---|---|
| Constant | 9.7909 | 0.27680 | 35.372 | 0.0000 | 0.9812 |
| LI | -0.48279 | 0.099218 | -4.866 | 0.0001 | 0.4966 |

AR 1- 2F( 2, 22) = 9.6197 [0.0010] **
ARCH 1 F( 1, 22) = 3.0788 [0.0932]
Normality Chiý(2)= 3.3715 [0.1853]
Xiý F( 2, 21) = 1.2792 [0.2991]
Xi*Xj F( 2, 21) = 1.2792 [0.2991]
RESET F( 1, 23) = 0.0095005 [0.9232]

r3 = Residual values of equation 3

Unit root tests 1977 to 2000
Critical values: 5%=-2.991 1%=-3.734; Constant included

| | t-adf | å lag | t-lag | t-prob | |
|---|---|---|---|---|---|
| r3 | -1.3870 | 0.30264 | 1 | -0.18328 | 0.8563 |
| r3 | -1.6638 | 0.29592 | 0 | | |

EQ( 4) Modelling LHS by OLS
The present sample is: 1975 to 2000

| Variable | Coefficient | Std.Error | t-value | t-prob | PartRý |
|---|---|---|---|---|---|
| Constant | 8.5955 | 0.045736 | 187.938 | 0.0000 | 0.9993 |
| LInf | -0.15702 | 0.013744 | -11.424 | 0.0000 | 0.8447 |

Rý = 0.844676 F(1, 24) = 130.52 [0.0000] å = 0.229529 DW = 1.26
RSS = 1.264408066 for 2 variables and 26 observations

AR 1- 2F( 2, 22) = 1.8319 [0.1837]
ARCH 1 F( 1, 22) = 14.491 [0.0010] **
Normality Chiý(2)= 2.8581 [0.2395]
Xiý F( 2, 21) = 1.9383 [0.1689]
Xi*Xj F( 2, 21) = 1.9383 [0.1689]
RESET F( 1, 23) = 5.4617 [0.0285] *

r4 = Residual values of equation 4

Unit root tests 1977 to 2000
Critical values: 5%=-2.991 1%=-3.734; Constant included

| | t-adf | å lag | t-lag | t-prob |
|---|---|---|---|---|
| r4 | -4.6721** | 0.18793 | 1 | 1.2466 0.2263 |
| r4 | -4.6692** | 0.19028 | 0 | |

EQ( 5) Modelling LHS by OLS
The present sample is: 1975 to 2000

| Variable | Coefficient | Std.Error | t-value | t-prob | PartRý |
|---|---|---|---|---|---|
| Constant | -44.434 | 12.535 | -3.545 | 0.0016 | 0.3436 |
| LD | 11.550 | 2.7349 | 4.223 | 0.0003 | 0.4263 |

Rý = 0.426327 F(1, 24) = 17.836 [0.0003] å = 0.441114 DW = 0.475
RSS = 4.669949055 for 2 variables and 26 observations

AR 1- 2F( 2, 22) = 15.511 [0.0001] **
ARCH 1 F( 1, 22) = 2.2441 [0.1483]
Normality Chiý(2)= 3.1536 [0.2066]
Xiý F( 2, 21) = 3.0323 [0.0697]
Xi*Xj F( 2, 21) = 3.0323 [0.0697]
RESET F( 1, 23) = 1.9262 [0.1785]

r5 = Residual values of equation 5

Unit root tests 1977 to 2000
Critical values: 5%=-2.991 1%=-3.734; Constant included

| | t-adf | å lag | t-lag | t-prob | |
|---|---|---|---|---|---|
| r5 | -1.6924 | 0.30230 | 1 | 0.090460 | 0.9288 |
| r5 | -1.8068 | 0.29540 | 0 | | |

EQ( 6) Modelling LHS by OLS
The present sample is: 1975 to 2000

| Variable | Coefficient | Std.Error | t-value | t-prob | PartRý |
|---|---|---|---|---|---|
| Constant | 14.294 | 0.69367 | 20.606 | 0.0000 | 0.9465 |
| LE | -1.8998 | 0.22680 | -8.377 | 0.0000 | 0.7451 |

Rý = 0.745139 F(1, 24) = 70.169 [0.0000] å = 0.294015 DW = 0.859
RSS = 2.074676353 for 2 variables and 26 observations

AR 1- 2F( 2, 22) = 3.8663 [0.0364] *
ARCH 1 F( 1, 22) = 11.636 [0.0025] **
Normality Chiý(2)= 1.579 [0.4541]
Xiý F( 2, 21) = 1.0812 [0.3573]
Xi*Xj F( 2, 21) = 1.0812 [0.3573]
RESET F( 1, 23) = 11.63 [0.0024] **

r6 = Residual values of equation 6

Unit root tests 1977 to 2000
Critical values: 5%=-2.991 1%=-3.734; Constant included

| | t-adf | å lag | t-lag | t-prob | |
|---|---|---|---|---|---|
| r6 | -3.0847* | 0.23903 | 1 | 0.66641 | 0.5124 |
| r6 | -3.1171* | 0.23599 | 0 | | |

EQ( 7) Modelling LHS by OLS
The present sample is: 1975 to 2000

| Variable | Coefficient | Std.Error | t-value | t-prob | PartRý |
|---|---|---|---|---|---|
| Constant | -15.198 | 8.7504 | -1.737 | 0.0952 | 0.1117 |
| LU | 6.5967 | 2.4353 | 2.709 | 0.0123 | 0.2341 |

Rý = 0.234141 F(1, 24) = 7.3374 [0.0123] å = 0.509674 DW = 0.436
RSS = 6.234428239 for 2 variables and 26 observations

AR 1- 2F( 2, 22) = 17.641 [0.0000] **
ARCH 1 F( 1, 22) = 0.46961 [0.5003]
Normality Chiý(2)= 5.5009 [0.0639]
Xiý F( 2, 21) = 6.2326 [0.0075] **
Xi*Xj F( 2, 21) = 6.2326 [0.0075] **
RESET F( 1, 23) = 71.418 [0.0000] **

r7 = Residual values of equation 7

Unit root tests 1977 to 2000
Critical values: 5%=-2.991 1%=-3.734; Constant included

| | t-adf | å lag | t-lag | t-prob | |
|---|---|---|---|---|---|
| r7 | 0.27931 | 0.33566 | 1 | -1.3110 | 0.2040 |
| r7 | -0.22962 | 0.34110 | 0 | | |

EQ( 8) Modelling LHS by OLS
The present sample is: 1975 to 2000

| Variable | Coefficient | Std.Error | t-value | t-prob | PartRý |
|---|---|---|---|---|---|
| Constant | 2.8574 | 2.3685 | 1.206 | 0.2399 | 0.0595 |
| LInf | -0.30220 | 0.061214 | -4.937 | 0.0001 | 0.5145 |
| LE | 1.9107 | 0.78855 | 2.423 | 0.0237 | 0.2034 |

Rý = 0.876261 F(2, 23) = 81.438 [0.0000] å = 0.209273 DW = 1.71
RSS = 1.007288032 for 3 variables and 26 observations

Solved Static Long Run equation

| | | | |
|---|---|---|---|
| LHS = | +2.857 | -0.3022 LInf | +1.911 LE |
| (SE) | ( 2.369) | ( 0.06121) | ( 0.7885) |

WALD test Chiý(2) = 162.88 [0.0000] **

Analysis of lag structure

| Lag | 0 | 1 | 2 | 3 | 4 | 5 | ä |
|---|---|---|---|---|---|---|---|
| LHS | -1 | 0 | 0 | 0 | 0 | 0 | -1 |
| Std.Err | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Constant | 2.86 | 0 | 0 | 0 | 0 | 0 | 2.86 |
| Std.Err | 2.37 | 0 | 0 | 0 | 0 | 0 | 2.37 |
| LInf | -0.302 | 0 | 0 | 0 | 0 | 0 | -0.302 |
| Std.Err | 0.0612 | 0 | 0 | 0 | 0 | 0 | 0.0612 |
| LE | 1.91 | 0 | 0 | 0 | 0 | 0 | 1.91 |
| Std.Err | 0.789 | 0 | 0 | 0 | 0 | 0 | 0.789 |

Tests on the significance of each variable

| variable | F(num,denom) | Value | Probability | Unit Root t-test |
|---|---|---|---|---|
| Constant | F( 1, 23) = | 1.4554 | [0.2399] | 1.2064 |
| LInf | F( 1, 23) = | 24.372 | [0.0001] ** | -4.9368 |
| LE | F( 1, 23) = | 5.871 | [0.0237] * | 2.423 |

AR 1- 2F( 2, 21) = 1.9067 [0.1734]
ARCH 1 F( 1, 21) = 3.9776 [0.0593]
Normality Chiý(2)= 4.7401 [0.0935]
Xiý F( 4, 18) = 0.74107 [0.5763]
Xi*Xj F( 5, 17) = 0.61722 [0.6885]
RESET F( 1, 22) = 0.0013286 [0.9713]

Res8 = Residual values of equation 8

Unit root tests 1977 to 2000
Critical values: 5%=-1.956 1%=-2.665

| | t-adf | å lag | t-lag | t-prob | |
|---|---|---|---|---|---|
| Res8 | -6.1655** | 0.16258 | 1 | 2.2769 | 0.0329 |
| Res8 | -5.6680** | 0.17675 | 0 | | |

EQ( 9) Modelling DLHS by OLS
The present sample is: 1980 to 2000

| Variable | Coefficient | Std.Error | t-value | t-prob | PartRý |
|---|---|---|---|---|---|
| Constant | -0.018422 | 0.037888 | -0.486 | 0.6474 | 0.0452 |
| DLY | 0.89404 | 0.18232 | 4.904 | 0.0045 | 0.8279 |
| DLY_1 | -0.070180 | 0.25053 | -0.280 | 0.7906 | 0.0155 |
| DLI | 0.018387 | 0.043644 | 0.421 | 0.6910 | 0.0343 |
| DLI_1 | -0.15824 | 0.034643 | -4.568 | 0.0060 | 0.8067 |
| DLD | -0.62112 | 1.2384 | -0.502 | 0.6373 | 0.0479 |
| DLD_1 | 2.9136 | 1.3952 | 2.088 | 0.0911 | 0.4659 |
| DLE | 1.6640 | 0.68521 | 2.428 | 0.0595 | 0.5412 |
| DLE_1 | -1.3688 | 0.50254 | -2.724 | 0.0416 | 0.5974 |
| DDLInf | -0.28469 | 0.10451 | -2.724 | 0.0416 | 0.5974 |
| DDLInf_1 | 0.11563 | 0.067405 | 1.716 | 0.1469 | .3705 |
| DDDLU | 0.63596 | 0.75731 | 0.840 | 0.4393 | 0.1236 |
| DDDLU_1 | -0.48731 | 0.78033 | -0.624 | 0.5597 | 0.0724 |
| DLHS_1 | 0.27539 | 0.13037 | 2.112 | 0.0884 | 0.4716 |
| rea3_res5 | 0.70198 | 0.13100 | 5.359 | 0.0030 | 0.8517 |
| rea3_res_1 | -0.85564 | 0.17719 | -4.829 | 0.0048 | 0.8234 |

Rý = 0.985271 F(15, 5) = 22.298 [0.0014] å = 0.0436386 DW = 2.15
RSS = 0.00952163043 for 16 variables and 21 observations

Solved Static Long Run equation

DLHS = -0.02542 +1.137 DLY -0.193 DLI
(SE) ( 0.05216) ( 0.3682) ( 0.08037)
+3.164 DLD +0.4074 DLE -0.2333 DDLInf
( 2.06) ( 1.336) ( 0.1842)
+0.2052 DDDLU -0.2121 rea3_res5
( 1.782) ( 0.2488)

WALD test Chiý(7) = 33.013 [0.0000] **

Analysis of lag structure

| Lag | 0 | 1 | 2 | 3 | 4 | 5 | ä |
|---|---|---|---|---|---|---|---|
| DLHS | -1 | 0.275 | 0 | 0 | 0 | 0 | -0.725 |
| Std.Err | 0 | 0.13 | 0 | 0 | 0 | 0 | 0.13 |
| Constant | -0.0184 | 0 | 0 | 0 | 0 | 0 | -0.0184 |
| Std.Err | 0.0379 | 0 | 0 | 0 | 0 | 0 | 0.0379 |
| DLY | 0.894 | -0.0702 | 0 | 0 | 0 | 0 | 0.824 |
| Std.Err | 0.182 | 0.251 | 0 | 0 | 0 | 0 | 0.309 |
| DLI | 0.0184 | -0.158 | 0 | 0 | 0 | 0 | -0.14 |
| Std.Err | 0. 0436 | 0.0346 | 0 | 0 | 0 | 0 | 0.0572 |
| DLD | -0.621 | 2.91 | 0 | 0 | 0 | 0 | 2.29 |
| Std.Err | 1.24 | 1.4 | 0 | 0 | 0 | 0 | 1.46 |
| DLE | 1.66 | -1.37 | 0 | 0 | 0 | 0 | 0.295 |
| Std.Err | 0.685 | 0.503 | 0 | 0 | 0 | 0 | 0.96 |
| DDLInf | -0.285 | 0.116 | 0 | 0 | 0 | 0 | -0.169 |
| Std.Err | 0.105 | 0.0674 | 0 | 0 | 0 | 0 | 0.133 |
| DDDLU | 0.636 | -0.487 | 0 | 0 | 0 | 0 | 0.149 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Std.Err | 0.757 | 0.78 | 0 | 0 | 0 | 0 | 1.3 |
| rea3_res5 | 0.702 | -0.856 | 0 | 0 | 0 | 0 | -0.154 |
| Std.Err | 0.131 | 0.177 | 0 | 0 | 0 | 0 | 0.161 |

Tests on the significance of each variable

| variable | F(num,denom) | Value | Probability | Unit Root t-test |
|---|---|---|---|---|
| DLHS | F( 1, 5) = | 4.4619 | [0.0884] | -5.5579* |
| Constant | F( 1, 5) = | 0.23643 | [0.6474] | -0.48624 |
| DLY | F( 2, 5) = | 12.059 | [0.0122] * | 2.6622 |
| DLI | F( 2, 5) = | 10.661 | [0.0157] * | -2.4447 |
| DLD | F( 2, 5) = | 2.2369 | [0.2024] | 1.568 |
| DLE | F( 2, 5) = | 9.3689 | [0.0204] * | 0.30744 |
| DDLInf | F( 2, 5) = | 6.0619 | [0.0461] * | -1.2717 |
| DDDLU | F( 2, 5) = | 0.93357 | [0.4524] | 0.1147 |
| rea3_res5 | F( 2, 5) = | 17.601 | [0.0055] ** | -0.9528 |

Tests on the significance of each lag

| Lag | F(num,denom) | Value | Probability |
|---|---|---|---|
| 1 | F( 8, 5) = | 14.257 | [0.0048] ** |

Tests on the significance of all lags up to 1

| Lag | F(num,denom) | Value | Probability |
|---|---|---|---|
| 1- 1 | F( 8, 5) = | 14.257 | [0.0048] ** |

AR 1- 2F( 2, 3) = 2.7053 [0.2130]
ARCH 1 F( 1, 3) = 0.0052323 [0.9469]
Normality Chiý(2)= 3.5297 [0.1712]
RESET F( 1, 4) = 0.8294 [0.4140]

EQ(10) Modelling DLHS by OLS
The present sample is: 1980 to 2000

| Variable | Coefficient | Std.Error | t-value | t-prob | PartRý |
|---|---|---|---|---|---|
| Constant | 0.037897 | 0.038421 | 0.986 | 0.3396 | 0.0609 |
| DLY | 1.1260 | 0.34871 | 3.229 | 0.0056 | 0.4101 |
| DLI_1 | -0.17270 | 0.060654 | -2.847 | 0.0122 | 0.3509 |
| DLE_1 | -1.5909 | 0.77590 | -2.050 | 0.0582 | 0.2189 |
| DDLInf | -0.23444 | 0.12348 | -1.899 | 0.0770 | 0.1938 |
| Res8 | -0.48849 | 0.20976 | -2.329 | 0.0343 | 0.2655 |

Rý = 0.71794 F(5, 15) = 7.636 [0.0010] å = 0.110255 DW = 1.59
RSS = 0.1823419956 for 6 variables and 21 observations

Solved Static Long Run equation

| | | | |
|---|---|---|---|
| DLHS = | +0.0379 | +1.126 DLY | -0.1727 DLI |
| (SE) | ( 0.03842) | ( 0.3487) | ( 0.06065) |
| | -1.591 DLE | -0.2344 DDLInf | -0.4885 Res8 |
| | ( 0.7759) | ( 0.1235) | ( 0.2098) |

WALD test Chiý(5) = 38.18 [0.0000] **

Analysis of lag structure

| Lag | 0 | 1 | 2 | 3 | 4 | 5 | ä |
|---|---|---|---|---|---|---|---|
| DLHS | -1 | 0 | 0 | 0 | 0 | 0 | -1 |
| Std.Err | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Constant | 0.0379 | 0 | 0 | 0 | 0 | 0 | 0.0379 |
| Std.Err | 0.0384 | 0 | 0 | 0 | 0 | 0 | 0.0384 |
| DLY | 1.13 | 0 | 0 | 0 | 0 | 0 | 1.13 |
| Std.Err | 0.349 | 0 | 0 | 0 | 0 | 0 | 0.349 |
| DLI | 0 | -0.173 | 0 | 0 | 0 | 0 | -0.173 |
| Std.Err | 0 | 0.0607 | 0 | 0 | 0 | 0 | 0.0607 |
| DLE | 0 | -1.59 | 0 | 0 | 0 | 0 | -1.59 |
| Std.Err | 0 | 0.776 | 0 | 0 | 0 | 0 | 0.776 |
| DDLInf | -0.234 | 0 | 0 | 0 | 0 | 0 | -0.234 |
| Std.Err | 0.123 | 0 | 0 | 0 | 0 | 0 | 0.123 |
| Res8 | 0 | -0.488 | 0 | 0 | 0 | 0 | -0.488 |
| Std.Err | 0 | 0.21 | 0 | 0 | 0 | 0 | 0.21 |

Tests on the significance of each variable

| variable | F(num,denom) | Value | Probability | Unit Root t-test |
|---|---|---|---|---|
| Constant | F( 1, 15) = | 0.97289 | [0.3396] | 0.98635 |
| DLY | F( 1, 15) = | 10.427 | [0.0056] ** | 3.229 |
| DLI | F( 1, 15) = | 8.1072 | [0.0122] * | -2.8473 |
| DLE | F( 1, 15) = | 4.2042 | [0.0582] | -2.0504 |
| DDLInf | F( 1, 15) = | 3.6048 | [0.0770] | -1.8986 |
| Res8 | F( 1, 15) = | 5.4233 | [0.0343] * | -2.3288 |

Tests on the significance of each lag

| Lag | F(num,denom) | Value | Probability |
|---|---|---|---|
| 1 | F( 3, 15) = | 4.4383 | [0.0201] * |

Tests on the significance of all lags up to 1

| Lag | F(num,denom) | Value | Probability |
|---|---|---|---|
| 1- 1 | F( 3, 15) = | 4.4383 | [0.0201] * |

AR 1- 2F( 2, 13) = 0.84527 [0.4517]
ARCH 1 F( 1, 13) = 0.046153 [0.8332]
Normality Chiý(2)= 1.9991 [0.3681]
Xiý F(10, 4) = 0.15661 [0.9919]
RESET F( 1, 14) = 0.72982 [0.4073]