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DOES WAGE INFLATION CAUSE PRICE INFLATION IN ZIMBABWE (1970-2008)

BY

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ABSTRACT

There has been much debate in literature on the direction of causality between price inflation and wage inflation. The Johansen procedure suggests that wage growth and price inflation are co-integration. Variables used in this study are real interest rates, money supply growth, real wages, productivity, real exchange rate and price inflation. This study employs an Error Correction Model (ECM) together with the Granger causality test to examine the causal relationship which is presumed to exist between these two variables. The empirical findings of the study show that (i) there is a long run relationship between price inflation and wage growth and (ii) there is bidirectional causality between inflation and wage growth. This shows that there is both cost push and demand pull inflation in Zimbabwe. Results also suggested that interest rates and exchange rate had a negative influence while money supply growth, exchange rate, wage growth and inflation lags had positive impact on inflation.

Key words: Price Inflation, Wage growth, Zimbabwe, Cointegration, Granger Causality.

DECLARATION AND COPYRIGHT

I, the undersigned Zvikomborero Nyamazunzu of student number 200509111, do hereby declare that this dissertation is my own original work and that it has never been submitted at any other University or institution for a degree award.

Signature Z. Nyamazunzu

Date 11/05/2011

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DEDICATION

This thesis is dedicated to my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at a time. To, Yemurai, Tadiwa, Lin-Anne, Bro Cosy, Lee, Andy and the entire family members and friends, with love and admiration.

LIST OF ACRONYMS

AD	Aggregate demand
ADF	Augmented Dickey Fuller
AIC	Alkaike Information Criterion
AS	Aggregate supply
BG	Breusch Godfrey
CPI	Consumer Price Index
CSO	Central Statistical Office
DF	Dickey Fuller
DRC	Democratic Republic of Congo
DW	Durbin Watson
E	Equilibrium
ECM	Error Correction Model
ER	Exchange Rate
ESAP	Economic Structural Adjustment Program
GDE	Dynamic General Equilibrium
GDP	Gross Domestic Product
HQIC	Hannan–Quinn Information Criterion
IMF	International Monetary Fund
ILO	International Labour Organisation
IR	Interest Rate
KUR	Kurtosis
LP	Labour Productivity
M	Money supply
MAX	Maximum
MIN	Minimum
NAIRU	Natural Rate of Unemployment/Non Accelerating Rate of Inflation
NERP	National Economic Revival Program
NCDs	Negotiable Certificates of Deposits
TNF	Tripartite Negotiating Forum

NW	Nominal Wages
OPI	Optimal nominal Price Index
OLS	Ordinary Least Square
P	Price
Q	Quantity (Output)
UDI	Unilateral Declaration of Independence
UK	United Kingdom
USA	United States of America
V	Velocity
VAR	Vector Auto Regression
VECM	Vector Error Correction Model
W	Wages
SD	Standard Deviation
SIC	Schwarz Information Criterion
SK	Skewness
ZIC	Zimbabwe Investment Center
ZIMCORD	Zimbabwe Conference for Reconstruction and Development

TABLE OF CONTENTS

ABSTRACT i
DECLARATION AND COPYRIGHT ii
ACKNOWLEDGEMENTS iii
DEDICATION iv
LIST OF ACRONYMS v
TABLE OF CONTENTS vii
LIST OF TABLES x
LIST OF FIGURES x
CHAPTER ONE 1
INTRODUCTION 1
1.1 Background of the study 1
1.2 Statement of the problem 5
1.3 Objectives of the study 5
1.4 Hypothesis of the study 6
1.5 Significance of the study 6
1.6 Organisation of the study 7
CHAPTER TWO 8
EVOLUTION OF WAGES AND INFLATION IN ZIMBABWE 8
2.1 Introduction 8
2.2 Historical background 8
2.3 Wages and Inflation before Independence 10
2.3.1 Wages 10
2.3.2 Labour Productivity and Wages 13
2.3.3 Inflation 14
2.3.4 Inflation and Wage Trends before Independence 15
2.4 Wages and Inflation after Independence 16
2.4.1 Wages 17
2.4.2 Inflation 20
2.4.3 Determination of Price and Wages 22
2.5 Wages and Inflation After 1990 24

2.5.1 Employment 28
2.6 Real Wage Flexibility, Unemployment and Wage Elasticity of Labour 29
2.7 Conclusion 31
CHAPTER THREE 32
LITERATURE REVIEW 32
3.1 Introduction 32
3.2 Theoretical Literature 32
3.2.1 Inflation Theories 32
3.2.1.1 Cost Push Inflation 33
3.2.1.2 Demand Pull Inflation 36
3.2.1.3 Quantity Theory of Money 38
3.2.2 Wage Determination 41
3.2.2.1 Perfect Competition 41
3.2.2.2 Imperfect Market Structures 43
3.2.2.3 Labour Unions and Wage Formation 43
3.2.2.4 The Philips Curve 45
3.3 Empirical Literature 49
3.3.1 Literature from developed countries 50
3.3.2 Literature from Developing Countries 60
3.4 Conclusion 64
CHAPTER FOUR 65
METHODOLOGY 65
4.1 Introduction 65
4.2 Model Specification 65
4.3 Description and Sources of Variables 67
Nominal Wages (NW) 67
Labour Productivity (LP) 67
Money Supply (M_3) 68
Exchange Rate (ER) 68
Interest Rate (IR) 69
4.4 Stationarity Tests 69

4.4.1 Dickey - Fuller Tests 70
4.5 Tests for Cointegration 71
4.6 The Johansen's Methodology 73
4.7 Diagnostic Tests 75
4.8 The Granger - Causality Model 76
4.9 Variance Decomposition and Impulse Response Functions 76
4.10 Data Types and Sources 78
4.11 Conclusion 78
CHAPTER FIVE 79
ESTIMATION AND RESULTS PRESENTATION 79
5.1 Introduction 79
5.2 Descriptive Statistics 79
5.3 Multicollinearity Test 81
5.4 Stationary Tests 82
5.4.1 Stationarity Tests in First Difference 85
5.5 COINTEGRATION 87
5.6 Error Correction Model (ECM) 89
5.7 Presentation and Estimation of Results 89
5.8 Analysis of Results 90
5.8.1 Diagnostic Checks 90
5.8.2 Discussion of Results 92
5.9 Granger Causality Tests 94
5.10 Conclusion 96
CHAPTER SIX 97
CONCLUSION AND POLICY RECOMMENDATIONS 97
6.1 Conclusion 97
6.2 Policy Recommendations 99
6.3 Limitations of the Study 100
6.4 Areas for Further Research 101
REFERENCES 102
APPENDIX 117

LIST OF TABLES

Table 2.1: Distribution of income by race (1978) 11
Table 2.2: Movement of minimum real wages of various sectors 19
Table 2.3 Correlation between the rate of exchange in output and wage cost in GDP 30
Table 5.1: Descriptive statistics of all variables 80
Table 5.2: Pairwise Correlation matrix table of explanatory variables 81
Table 5.3; Stationarity Test in Levels 83
Table 5.4: Stationarity Test for Differenced Variables 85
Table 5.5; Lag order selection criteria 87
Table 5.6 Johansen unrestricted Cointegration rank test (maximum Eigen value) 88
Table 5.7; Error Correction Model Results 90
Table 5.8; Diagnostic Tests 91
Table 5.9; Granger Causality Tests 95

LIST OF FIGURES

Figure 2.1 Real Wage Per worker between 1970 and 1980 13
Figure 2.2; Annual Inflation in Zimbabwe (1970 - 1980) 15
Figure 2.3; Inflation and Real Wages (1970 -1980) 16
Figure 2.4: Wages 1981-1991 17
Figure 2.5: Inflation for Zimbabwe between 1980 and 1990. 20
Figure 2.6 Inflation and Real Wages between 1980 and 1990 21
Figure 2.7: Inflation and Real Trends (1970-2007) 27
Figure 3.1: Cost Push Inflation 34
Figure 3.2; Keynesian Aggregate demand induced inflation 36
Figure 3.3; Graphic Explanation of the Equation of Exchange 39
Figure 3.4; Wage equilibrium in a competitive labour market 42
Figure 3.5: The Phillips Curve 46
Figure 5.1; Graphical Unit Root Tests; levels. 84
Figure 5.2; Graphical Unit Root Tests; first difference 86

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Labour market economists have frequently focused on resource market activities to forecast inflationary pressures among other macroeconomic fundamentals. This is in line with the famous Phillips curve analysis which uses unemployment to predict price inflation. According to this analysis, it can be concluded that a low level of unemployment is associated with rising inflation. The analysis postulates that, if an increase in aggregate demand for goods and services causes unemployment to fall, below some natural rate, then inflation should accelerate. However, during periods of high unemployment in Zimbabwe, for example, between 2000 and 2007, inflation never showed a downward trend. Is this due to the Zimbabwean definition of unemployment or is this because of other factors? Staiger, Stock and Watson (1997) suggest that the unemployment rate is a weak tool for forecasting inflationary trends. With uncertainty about the unemployment rate's reliability as an early-warning device for rising inflation, recent attention has turned to wage growth as a labour market predictor of inflation.

Lipsey (1960) concluded that buoyant demand reduces unemployment at the expense of inflationary pressure. When demand for labour is high, firms start bidding against each other. This will give workers more wage bargaining power for salaries that are not commensurate with productivity. Awarding workers these higher wages leads to higher prices and this will be followed by even more higher wages and so on. This is a phenomenon known as "the wage – price spiral" in the language of economics. Thus, the theory postulates that, if wage costs rise faster than productivity, the price level may rise as firms pass forward increased wage costs in the form of higher product prices. Hence, changes in productivity-adjusted wages are believed to be a leading indicator of future inflation.

The intuition behind the view that higher wages cause higher prices is that, since labour costs are a large fraction of a firm's total costs of production, an increase in wages puts pressure on firms to pass the burden to households in the form of higher prices. This analysis is incomplete as it does not take cognizance of the elasticity of supply. First, an increase in wages will not create inflationary pressure if the increase is brought about by improved labour productivity. Hence, controlling labour productivity in the analysis between wages and prices would seem very important. Second, an increase in wages will not create inflationary pressure if it leads to a squeeze in a firm's profits due to their inability to pass along cost increases. No firm inherits the right to simply 'mark-up' the prices of its output as a constant proportion above their costs, as competitive market pressures provide a strong influence on the pricing decisions of firms. Finally, the cause could stem from the opposite direction; an increase in aggregate demand may tempt firms to raise the price of their products. The resulting increase in profits would lead workers to demand a higher wage in future negotiations.

However, this cost-push view of the inflation process does not recognize the influences of Reserve Bank policy and the resulting inflation environment on determining the causal influence of wage growth on inflation. The Zimbabwean monetary policy cannot be ignored as far as factors affecting inflation are concerned. The recent galloping inflation rate has been blamed on the Reserve Bank of Zimbabwe (RBZ) for its policies, especially that of money printing. This is in line with the Monetarists who view inflation as a monetary phenomenon. They believe excess money in circulation will see aggregate demand outstrip supply. According to this view, the causation runs from inflation to wage growth. Firms raise the price of their products because of excess aggregate demand caused by an expansionary monetary policy. The resulting increase in prices leads workers to demand higher wages. This challenges the first proposition which assumes that wage inflation Granger causes price inflation.

A close look at the Zimbabwean economy shows that it has deteriorated progressively for the past few years. Real output has dropped by over one-third cumulatively since 1995. Inflation reached 269 percent in 2003 and 10452.6 percent by the end of 2007 (CSO, 2007). To some extent this high inflation has contributed to a continuous deterioration of social conditions. Severe food shortages have necessitated massive food imports and donor assistance, as two-

thirds of the population required food aid in 2002. The balance of payments has been under severe pressure since 1999, when Zimbabwe began to accumulate arrears. There is little productive investment in the economy, and there are reports of significant capital flight in addition to the emigration of skilled labour.

The economic crisis in Zimbabwe, of late, reflects to a certain extent inappropriate economic policies, loose fiscal and monetary policies, the maintenance of a fixed exchange rate in an environment of rising inflation and administrative controls. Increased government intervention has driven most economic activities out of the formal sector, and contributed to the chronic shortages of basic goods and services, and foreign exchange, among other things. The severity of Zimbabwean problems has also been exacerbated by the fast-track land reform program, recurring droughts, and the HIV/AIDS pandemic. Meanwhile, investor confidence has been eroded by concerns over political developments, weak governance and corruption, problems related to the implementation of the government's land reform program, the push for an increased indigenization of the business sector, and the selective enforcement of regulations. Monetary policy remained accommodative throughout 2002.

As a result, broad money growth accelerated to 165 percent in 2002, as liquidity growth was fueled by concessional lending at highly negative real interest rates and special support schemes for gold and tobacco producers. These developments provided a strong incentive to borrow, and led to a rapid rise in the prices of assets (such as real estate and stocks, and consumer durables), that provided a hedge against inflation. Fiscal policy was expansionary in 2002, reflecting mainly substantial quasi-fiscal rather than budgetary operations. The overall budget deficit declined to 5 percent in 2002 from 10 percent of Gross Domestic Product (GDP) in 2001. However, quasi-fiscal operations related to support schemes for gold and tobacco producers, through the Reserve Bank, amounted to more than 5 percent of GDP.

Zimbabwe's external position has become increasingly constrained. Pervasive shortages of foreign exchange in the official market, partly owing to a decline in exports of 35 percent since 2000, have resulted in a compression of nonfood imports by 15 percent. At the end of 2002, gross usable reserves stood at US$15 million; the equivalent of three days of imports (Mabika,

2001) and arrears to external creditors amounted to US$1.5 billion. The government responded to these pressures in November 2002 by tightening exchange controls, increasing reserve requirements, and closing exchange bureaus. These actions resulted in a slowdown of foreign exchange flows to the official market and an appreciation of the parallel market exchange rate in early 2003.

In response to the deteriorating economic situation, the government adopted the National Economic Revival Program (NERP) at the end of February 2003, after consultation with business and labour under the auspices of the Tripartite Negotiating Forum (TNF). Immediate actions included a devaluation of the exchange rate from Z$55 per US$1 to Z$824 per US$1 (although the government still purchased foreign exchange at the old rate). These actions were followed by a rise in interest rates.

The period prior to Zimbabwean independence was associated with income inequalities between blacks and whites. The distribution was skewed in favor of the latter. For example, according to International Labour Organisation (ILO), during the pre-independence period an average European earned 10.4 times as much as a black Zimbabwean. This was due to the oppressive laws that prevailed at the time, as a consequence of which trade unions for whites were more powerful than those for blacks. Despite these low wages, unemployment for blacks was higher; it was 52 percent in 1972 compared to 3% for the whites. According to the Central Statistical Office of Zimbabwe the annual inflation was below 10 percent between 1970 and 1980. After independence, the government implemented policies which aimed to reduce income disparities between blacks and whites. This saw more blacks getting jobs and there was also an improvement in salary due to minimum wage policies introduced by the government. Wages in most sectors surged by between 12 and 34 percent soon after independence. According to Ncube (1997), the spectacular economic growth rate of 10.6 percent in 1980 and 9.7 percent in 1981 also facilitated the substantial growth in real wages; it was not only the minimum wage policy by the government. The increase in wages was also matched by a surge in inflation, because the government did not consider productivity when setting these minimum wages.

In 1990, the International Monetary Fund (IMF) advocated for the Economic Structural Adjustment Program (ESAP) and this saw the government embarking on a liberalization programme that involved the deregulation of the labour market among other sectors. ESAP impacted negatively on the labour market through the fall in real wages although nominal average national wages continued to rise (CSO, 2006). Inflation was also worsened by the tremendous increase in other macro prices, in particular; interest rates, and the depreciation and devaluation of the Zimbabwean currency. Since the introduction of ESAP in 1990, inflation has been on an upward trend from levels of below 10% to 339.3% in 2004 and 567 % in 2008. For the same period real wages had decreased to, for example, less than US $10 per month in December 2008.

1.2 Statement of the problem

There has been a drastic increase in Zimbabwean annual inflation during the period under study (1970-2008). For example, annual inflation has risen from below 10% during the colonial era to 360% in 2003 and more than a billion in 2008. The unemployment rate has also steadily risen to 90.1% in December 2008 (ILO). According to the IMF, an average Zimbabwean has survived on less than one American dollar a day. This could be as a result of rising inflation levels. Bargains for high nominal salaries by labour unions, against the background of declining productivity, have worsened the situation in Zimbabwe. Against this background, one question comes to the fore: is there a regime of high inflation in Zimbabwe. An associated question is: what is the direction of causality?

1.3 Objectives of the study

The broad objective of this study is to examine the relationship between wage inflation and consumer price inflation in Zimbabwe. However, the specific objectives of the study are:

1. To establish, empirically, whether a causal relationship exists between consumer price inflation and wage inflation.
2. To determine, empirically, the direction of causality between price inflation and wage growth.
3. To empirically establish other factors that cause price inflation.

1.4 Hypothesis of the study

The study will test the following null hypotheses;

- There is a strong correlation between price inflation and wage growth in Zimbabwe.

- There is a bi-directional causality between wage inflation and price inflation. This means (i) wages influence price inflation and (ii) price inflation influences wage growth.

The study therefore hypothesises that there is both a wage-cost push and demand pull inflation in Zimbabwe. This means that we expect wage growth to cause price inflation; and, in the same manner, we also expect price inflation to influence wage growth.

1.5 Significance of the study

There are several reasons for pursuing this study. Rising inflation to a point where prices would change several times a day for the period under study is a cause for concern. This economic ill has caused untold suffering in Zimbabwe. Inflation also causes low worker morale, which affects productivity and the supply of goods and services, retards economic growth, and imposes a penalty on savers who are key to any future investment, growth and development. It is against the background of the above social and economic costs that inflation has generated widespread debate and controversy in Zimbabwe. A low level of inflation is ideal, although not a sufficient condition, to stimulate production. Galloping inflation reduces investor confidence.

Although various studies on the causality between price and wage inflation have been done in both developed and developing countries, generalizations of such results to Zimbabwe may be inappropriate especially after considering that the Zimbabwean economy has factors which are peculiar to it. Also, earlier studies on labour market activities used the unemployment rate variable in the Phillips curve for forecasting inflationary trends. This study will employ wage inflation as an early warning device for rising inflation. Recent studies have turned much of their attention away from unemployment as an indicator of labour market activities to wages.

In addition, literature on the Zimbabwe labour market is very scanty. Among these are Ncube (1997), Kanyenze (1996), Knight (1996) as well as Fallon and Lucas (1993). Ncube (1997) had

focused on the dynamics of employment while Kanyenze (1996), Knight (1996) and Chitiga (1996) looked at various other aspects such as the effects of ESAP on the labour market. In this literature, little attention has been paid to the influence of wages to inflation.

Despite the potential harm the wage-price spiral poses to the economy, empirical evidence to ascertain the direction of causality for the purpose of policy formulation is still limited in Zimbabwe. Knowing the direction and strength of causality, if any, would enable the government to enact policies and implement strategies that would strike a balance or, at least, stabilise one of the variables.

1.6 Organisation of the study

The study will be subdivided into six chapters. Following this introductory chapter, chapter two provides an overview of Zimbabwe's labour market since the Unilateral Declaration of Independence (UDI), particularly with regards to wage development and the possible spill over to the price inflation. Inflation dynamics and trends will also be incorporated in the same chapter. Chapter three reviews the theoretical and relevant empirical literature on wage determination and inflation theories. The fourth chapter presents the research methodology, outlines the data sources and discusses the variables to be used in the study. Chapter five analyses and interprets the results obtained while chapter six concludes the study by providing key findings, policy recommendations and suggestions for further research.

CHAPTER TWO

EVOLUTION OF WAGES AND INFLATION IN ZIMBABWE

2.1 Introduction

This chapter offers insight into the historic background of Zimbabwe and the inflation and wage dynamics experienced between 1970 and 2008. The chapter emphasises trends and their possible causes. This analysis will be discussed in three different timeframes.

The first timeframe under discussion is the pre-independence period, that is, from 1970 to 1979, which was characterized by racial wage discrimination. During this period, the wage rate was not determined by labour productivity or any other factor other than one's skin color. The direction of causality between wages and inflation during this period was not clear. The second period stretches from 1980 to 1989. This period was characterized by the government's action of unilateral determination of wage adjustments.[1] The last period began in 1990 and stretched through to 2007. This period involved a certain level of collective bargaining in the private sector and consultations in the public sector, which culminated in a mutual determination of wage rates. The wage developments and possible inflationary trends in each of the above three periods will be discussed in this chapter, which will be concluded by analyzing wage differentials in Zimbabwe.

2.2 Historical background

In the early 1970s, the economy experienced a modest boom. Real per capita earnings for both blacks and whites reached record highs, although the disparity in incomes between blacks and whites remained; with blacks earning only about one-tenth as much as whites. After 1975, however, Rhodesia's economy was undermined by the cumulative effects of sanctions, declining earnings from commodity exports, worsening guerilla conflict, and increasing white emigration.

Following the Lancaster House settlement in December 1979, Zimbabwe enjoyed a brisk economic recovery. Zimbabwe inherited one of the strongest and most complete industrial

[1] This was when the president of the Republic of Zimbabwe would announce annually "the living wage" on May Day (i.e. on the first day of May each year).

infrastructures in sub-Saharan Africa, as well as rich mineral resources and a strong agricultural base. Real growth for 1980 (soon after independence) exceeded 10%. However, depressed foreign demand for the country's mineral exports and the onset of a drought cut sharply into the growth rate in 1982, 1983, and 1984. In 1985, the economy rebounded strongly due to a 30% jump in agricultural production. However, it slumped in 1986 to a zero growth rate and registered a 3% contraction in GDP in 1987 due, primarily, to drought and a foreign exchange crisis. Growth between 1988-1990 averaged about 4.5%.

Since the mid-1990s, poor management of the economy in addition to political turmoil has led to considerable economic hardships. Since 2000, the national economy has contracted by as much as 35%, inflation vaulted over 600% (month on month) in early 2004 before subscribing to about 300% later in the year. Moreover, there have been persistent shortages of foreign exchange, local currency, fuel, and food. Direct foreign investment has all but evaporated.

Agriculture is no longer the backbone of the Zimbabwean economy. The government's land reform programme which started in 2000 has disrupted a significant portion of the commercial farm economy, leading to a sharp drop in tobacco and corn production.

Most analysts point to the failure of ESAP in the 1990s as the major negative economic turning point. The austerity measures imposed by ESAP led to, inter alia, negative massive retrenchment of skilled and unskilled labour, the closure of many manufacturing firms, general price increases and the deterioration of social services. These factors combined with the liberation of the economy led to the gradual but systemic decline of formal economy and to the growth and emergence of the informal sector, especially in rapidly growing towns.

Three political factors deepened the economic crisis in the late 1990s. Firstly, the appeasement policy towards the war veterans was adopted in 1997 by the government; after the war veterans had threatened to destabilize the government. The handout sparked inflationary spiral from which the economy still has to recover. Secondly, the military intervention in the conflict in the Democratic Republic of Congo has had serious consequences in terms of the budgetary

allocations and deficits. The fast track land reform distribution of 2000 negatively affected agricultural production which is the mainstay of the Zimbabwean economy.

2.3 Wages and Inflation before Independence

Zimbabwe gained her independence from Britain in 1980. During the pre-independence era, Zimbabwe was a country of paradoxes to economists. There was a co-existence of a moderate inflation rate and a domestically funded budget deficit; as well as the existence of price controls and tight foreign currency rationing but with significantly absent levels of parallel market.

2.3.1 Wages

According to the Ministry of Finance, real wages at the beginning of 1970 were generally low, on average Z$1500 per month. They rose steadily after the UDI (Unilateral Declaration of Independence) period, along with economic growth, up to slightly more than Z$1800 per month. During this period, 1970 – 1980, wages were not significantly connected to the productivity of labour. They were merely used as a tool to reflect the racial status of each worker (Government of Zimbabwe, 1985).

Pre-independence wages and compensation distribution was skewed in favor of whites. Wages of African workers were lower than that of their white counterparts. In 1978, for example, the overall annual earnings of Europeans were 10.4 times greater than those of African workers (ILO, 1991). The distribution of income using the 1978 data is shown in Table 2.1.

Table 2.1: Distribution of income by race (1978)

Racial group	Proportion of population (%)	Share in wages and salaries
Africans	97.6	60.0
Europeans	2.0	37.0
Coloreds	0.3	2.0
Asians	0.2	2.1

Source: *International Labour Organisation, 1991*

From Table 2.1, it can be concluded that the period before independence was characterized by skewed income distribution emanating largely from huge racial wage imbalances. There was great disparity in the distribution of incomes across the different races, with Europeans having the greatest share of the national income and black Africans having the smallest.

There were also some restrictions pertaining to access and conditions of employment for black African workers. It was very difficult for blacks to get employment even if they were qualified for the jobs. Black Africans would only get a job if there was no white person willing to take up the post. In some extreme cases, a less qualified white professional would be preferred to a qualified and experienced black African worker. Some black professionals would work under unqualified whites; these blacks would also get salaries which were far below those of their under qualified white peers and juniors.

During the UDI period, white workers were not encouraged, by their employers, to identify themselves with black workers (ILO, 1991). Black Africans and Whites who were employed in the same industry and same profession were affiliated to different labour bodies. Workers'

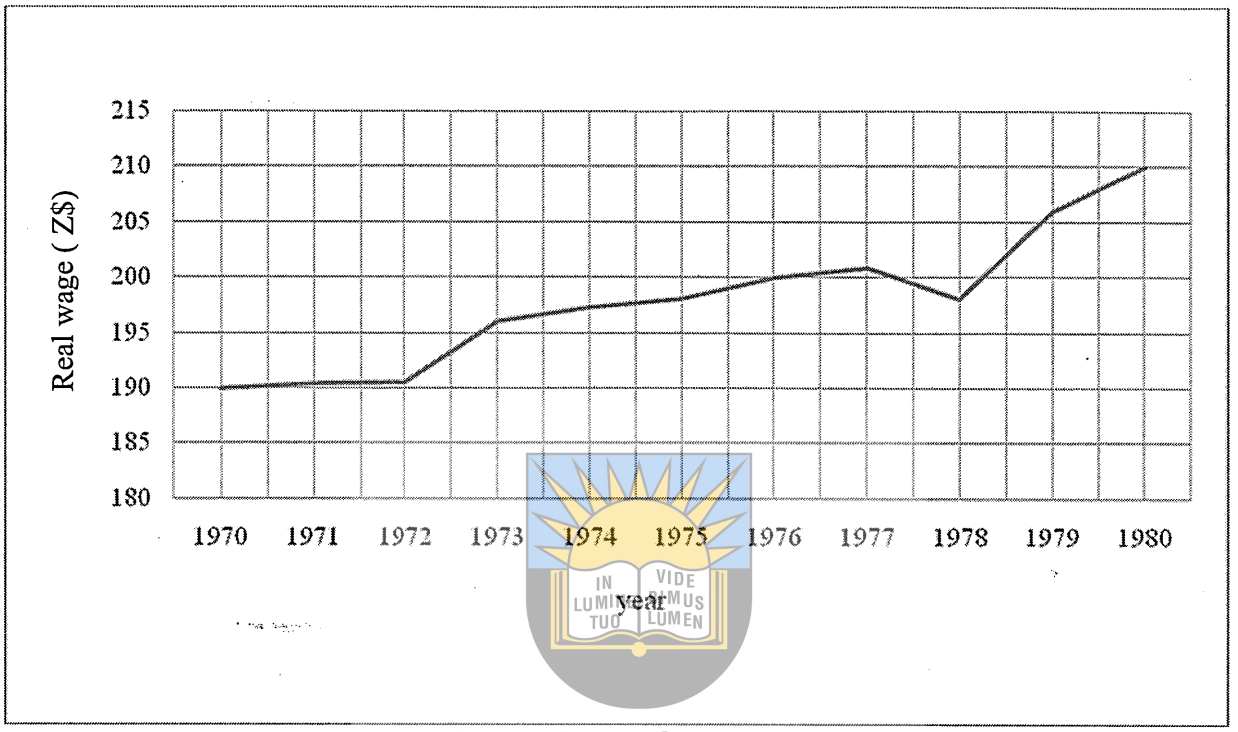
unions and committees for whites were more powerful than black unions. This helped to maintain and, in some cases, widen the salary gap between white and black workers. This resulted in the downgrading of black and African workers' skills.

All better job opportunities especially, managerial and supervisory positions, were reserved for whites, while black skilled workers and black professionals remained underutilized and underpaid. In addition to better education in Universities and apprenticeships, whites got better jobs, especially white collar jobs. Black Africans were excluded from skilled occupation groups and had no access to training programs; they were also affiliated to less powerful labour unions. Furthermore, wage grids and minimum wage laws did not exist during this period. This gave most white farm and other business owners opportunities to employ cheap black labour. The absence of minimum wages also saw most African blacks being exploited through working more than the normal eight (8) hours a day, working over weekends for very little incentives. Some farm workers were even paid 'in kind' for their services; i.e. they were given food and clothes as payment, and they could not get money to send their little ones to school.

The UDI economic sanctions imposed on the Rhodesian economy impacted negatively on wages, productivity and inflation. Economic sanctions on the then Ian Smith government caused a reduced flow of capital and industrial goods from abroad. Irrespective of these economic sanctions, the average annual domestic product growth remained above 7.5% for the period leading to 1980. Wages also maintained the upward trend although at a slower rate compared to when sanctions were absent. During the same period, employment in the manufacturing sector increased at a rate of 7.2 % which was slightly less than the economic growth although national employment was at 3.2 %.

The gentle rise in real wages was in line with improved productivity in the formal sector. Real wage per employee trends are shown in Figure 2.1

Figure 2.1 Real Wage Per worker between 1970 and 1980



Source; IMF data (2008)

The period under review (1970-1980) shows a steady upward trend in real wages despite the economic restrictions which were imposed on Zimbabwe by the rest of the world. Until 1980, real average wages across sectors as well as real wages in manufacturing were characterized by a positive trend. The graph shows that at the beginning of 1970 the average wage rate was Z$190.00 per month, it remained stable at this rate until 1972 when it started to increase to Z$210.00 in 1980.

2.3.2 Labour Productivity and Wages

Productivity (output per unit of input), labour productivity (output per unit of labour input), and real wages in five key departments: agriculture, mining, manufacturing, construction, transport – as well as in the entire formal sector; revealed a wide and increasing divergence between labour productivity and real wages in virtually all sectors. Between 1970 and 1980, real wages were either stagnant or drifted up slightly in both the formal and informal sector. To some extent, the increases in labour productivity and real wage trends have resulted in structural shifts in the

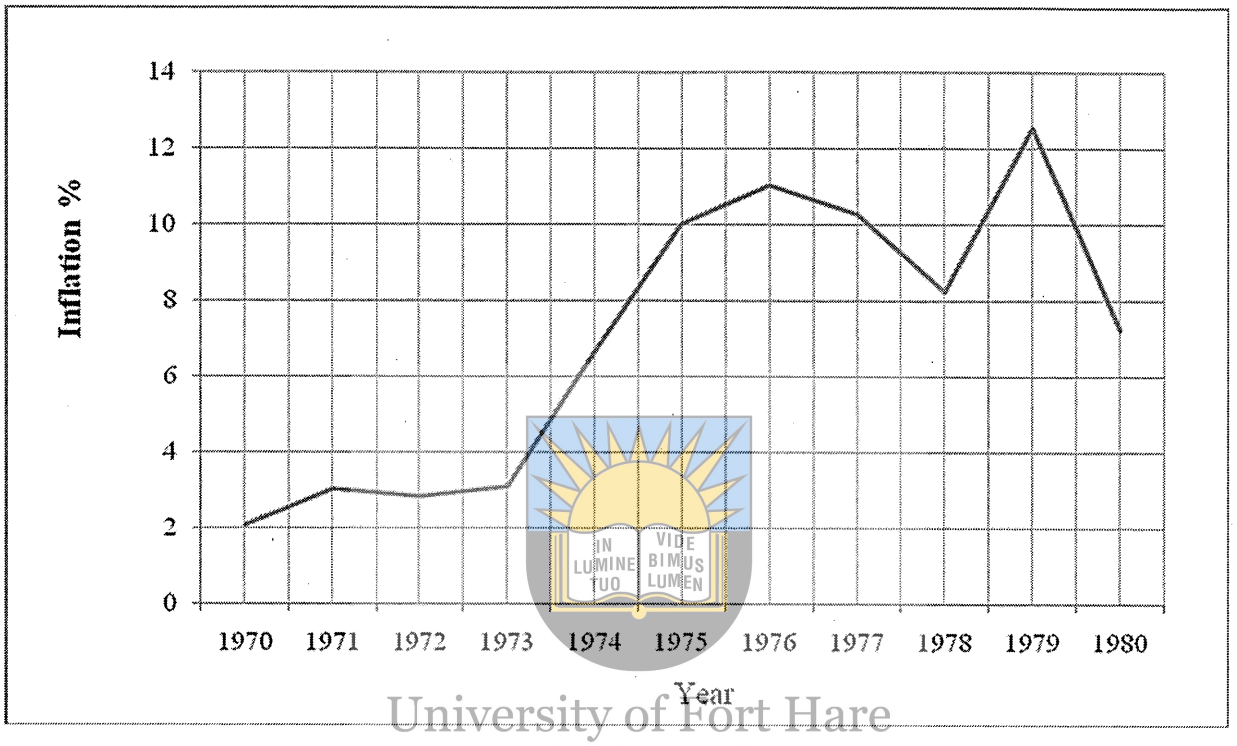
functional distribution of income against labour although there were still positive changes in wages, even in 1980.

Although labour has continued to be marginalised in the sharing of productivity benefits throughout the 1970 – 1980 period, Table 2.1 has shown that workers witnessed an increase in both wages and productivity. However, for the same period the increased wages were far less than labour productivity increases; this has caused structural income shifts. To arrest this unfavourable trend in the functional distribution of income from labour it was important that wage changes are, by and large, linked to productivity. Government and companies did not comply as wage increases remained far below productivity thereby robbing workers of their reward.

2.3.3 Inflation

The inflation patterns during the period leading to independence revealed that Rhodesia (named Zimbabwe after 1980) was, traditionally, a relatively moderate inflation country. During the pre-independence period, for example, in 1970, the national annual inflation rate was slightly above 2% before rising to slightly less than 11% in 1976 before falling to 8.2% in 1977. It rose to 12.35% in 1979 before falling below 8% in 1980. This inflation trend for the period is illustrated in Figure 2.2 below.

Figure 2.2; Annual Inflation in Zimbabwe (1970 - 1980)



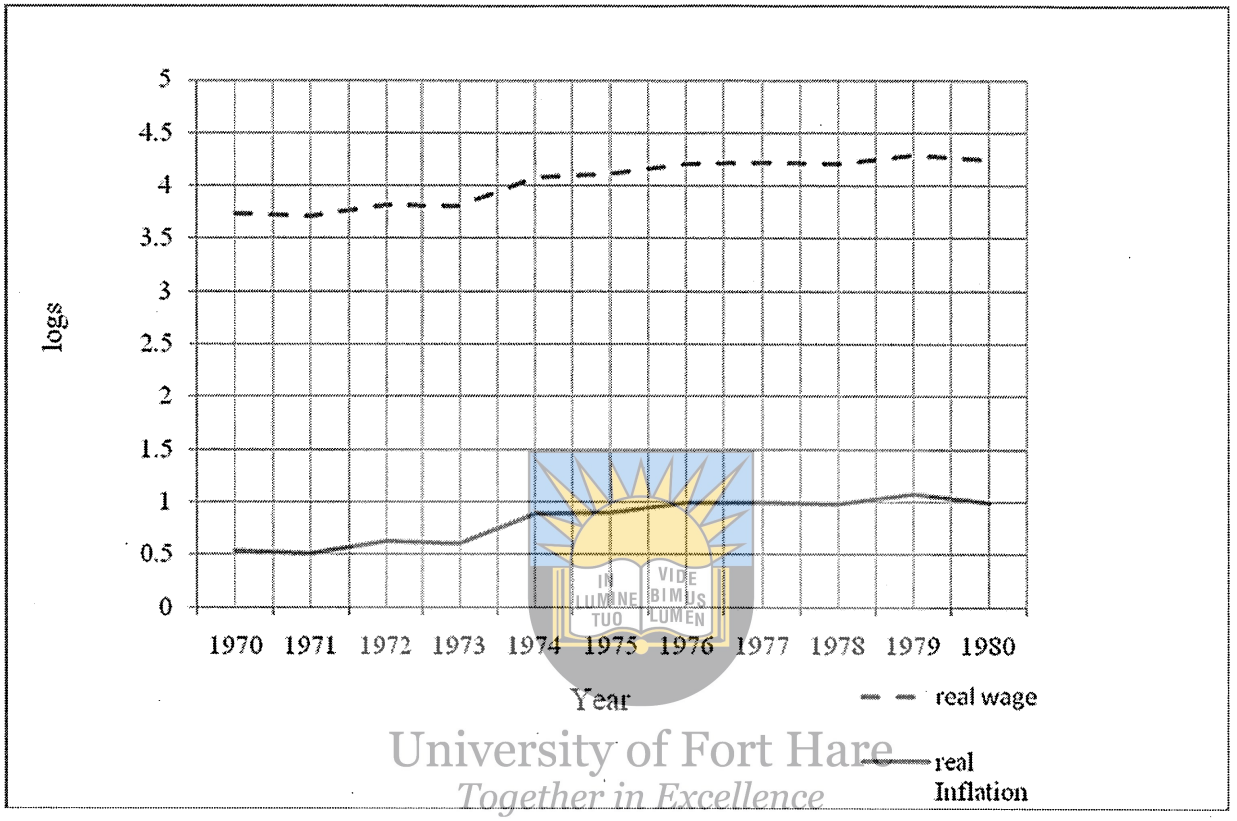
Source; IMF data (2008)

Although Figure 2.2 shows an upward surge in inflation during the 1970-1980 periods, inflation in Zimbabwe was generally lower than foreign inflation. During this period there was a divergence in inflation for high income and low income households. Zimbabwe, like many countries in Africa, has had tighter controls over the prices of few selected wage goods and public services.

2.3.4 Inflation and Wage Trends before Independence

There seems to be a positive correlation between inflation and wages in Zimbabwe during the pre-independence period. Both variables have shown a strong upward trend between 1970 and 1980. The relationship between inflation and wages is shown in Figure 2.3.

Figure 2.3; Inflation and Real Wages (1970 -1980)



Source; IMF data (2008)

Logarithms of inflation and wages were employed because of the difference in magnitude of figures of inflation and wages. A logarithm will act as a monotonic transformation; it transforms inflation and wage data in a way that will make sure that the underlying trend of the data is not lost. The natural logarithms also enable us to maintain trends in both wages and inflation in a way that enables us to see and comment on the general trend. The direction of causality could not be established from Figure 2.3, possibly, because wages cause inflation or vice versa, or both.

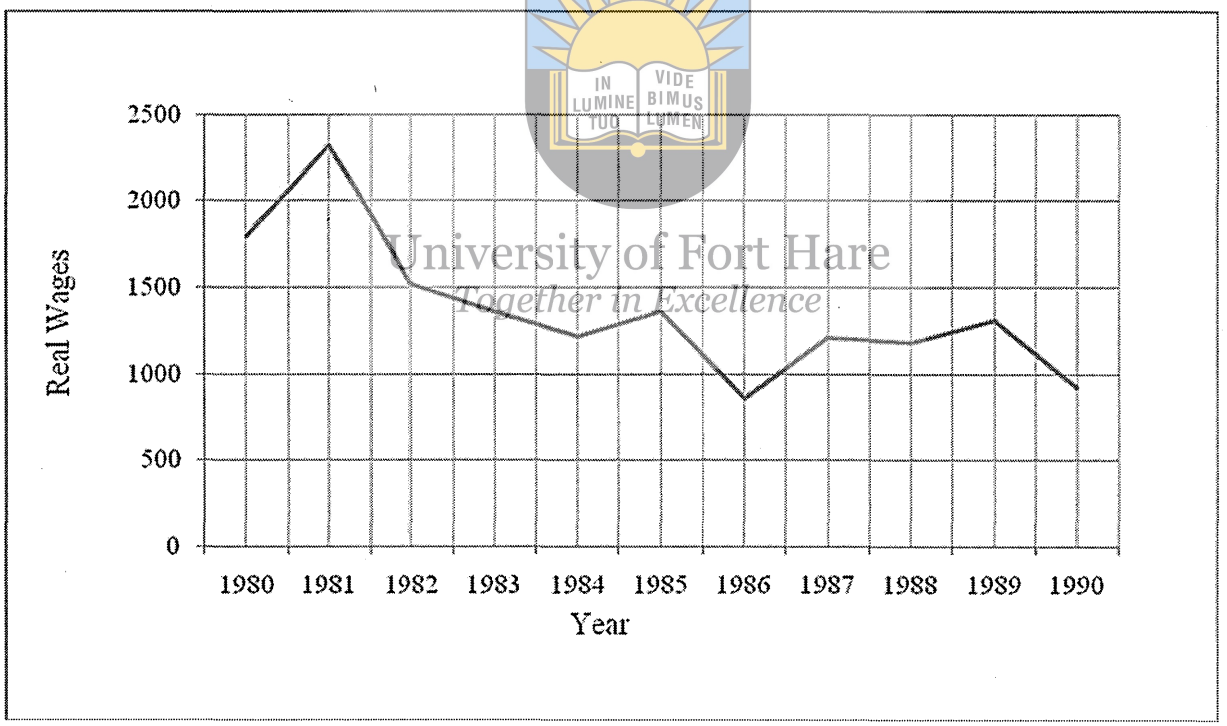
2.4 Wages and Inflation after Independence

This section provides an analysis of the dynamics and trends in inflation and wages between 1980 and 1990.

2.4.1 Wages

The new government intervened extensively in the labour market following independence in order to redress the income imbalances. This was part of the "growth with equity" strategy adopted at independence. Wages were seen as an effective mechanism for redistributing income or redressing colonial imbalances. Trade unions were weak at independence, and collective bargaining failed to act as an effective mechanism for wage determination and employment conditions. Given this scenario, the government saw it fit to intervene and play a major role in the labour market by determining wage rates. Movements in wages are shown in Figure 2.4.

Figure 2.4: Wages 1981-1991



Source; IMF data, 2008

The average real wages for Zimbabwe rose soon after independence, between 1980 and 1981, save for the public sector, where there was a fall in 1981 and a rise in 1982. This trend is shown in Figure 2.4. The strongest upward movement in wages was in the agricultural sector, which recorded a growth rate of 44% in 1981 relative to 1980. This growth can be attributed to the government's quest to improve the agricultural sector as they imposed minimum wages.

Education experienced an increase of money wages of more than 49% during the period 1980-1982 (Government of Zimbabwe, 1985). Wages and salaries went up by nearly 29% in mining, over 20% in manufacturing and 15% in public administration during the same period; 1980-1982. Personnel in the health sector experienced the smallest increase of only 2% on average during the same period although these wages started on a high note in 1980 and 1981. Generally, the trend has been nose diving through to 1990 which is confirmed in Figure 2.4 above. During this same period, annual inflation rate rose from 7.3% in 1980 through 13.8% in 1981 to 14.6% in 1982 (CSO, 1985).

There is a long-run trend of a gentle rise in the real wage that is roughly in line with growth in the average productivity of the formal labour force. This is broken in the immediate post-independence period when significant rises in the minimum wage pushed nominal wage growth far above consumer inflation, leading to relatively large growth in real wages (especially for agricultural workers, the lowest-paid group in formal employment). This proved unsustainable and subsequent nominal wage growth has been held below consumer inflation, to such an extent that by the mid-1980s real wages had adjusted back to their long-run trend position.

The steep rise in real wages in most sectors between 1980 and 1982 was due to several factors. 1980 and 1981 were boom years for Zimbabwe due to the lifting of sanctions and the massive influx of foreign aid. The end of the war saw the release of significant amounts of aid through ZIMCORD (Zimbabwe Conference for Reconstruction and Development). In addition, the "peace dividend" in the rural areas coupled with the rehabilitation of rural infrastructure, good rains, access to credit at concessionary rates and good guaranteed prices led to better yields in the agricultural sector. The spectacular economic growth rate of 10.6% in 1980 and 9.7% in 1981 facilitated the substantial growth in real wages (Ncube, 1997). In turn, real wage growth resulted in improved domestic demand and then increased capacity. This rapid economic growth was accompanied by over 2% increase in the formal sector wage rates.

An increase in labour productivity was also witnessed as a number of sectors, such as manufacturing and mining, increased their utilization of unskilled labour to minimize the adverse effects of increased labour costs on profits. The introduction of minimum wages aggressively

exerted an upward pressure on average wages, especially in the agricultural sector where minimum wages shifted wages up from their historic trend quite substantially (Knight 1996).

The minimum wages legislation was part of post independence changes in the labour market. The minimum wage policy, which was implemented by the government, was meant to raise many workers' living standards. However, this objective was set backwards by a natural phenomenon of drought which hit the economy for three consecutive years (1982-1984). Real minimum wages reached a peak in 1982 in Commerce and Industry and declined thereafter. This level, of 1982, was never reached again, thus reflecting the dominance of the anti-inflationary emphasis after 1982. The emphasis saw the yearly inflation rate first falling from a peak of 19.6% in 1983 to 9.2% in 1985. It rose again to 14.2% in 1986 before it assumed a downward trend in 1988 at 7.1% , the trend which was reversed when it rose through 11.6% in 1989 to 15.5% in 1990 (CSO,1995). The anti-inflationary policy resulted in real wages of various sectors falling between the periods 1980 to 1990 as shown in Table 2.2 below.

Table 2.2: Movement of minimum real wages of various sectors

Occupation	1980 $	1983 $	1985 $	1990 $
Office Orderly (public sector)	70	74	86,50	83,50
Agricultural worker	65	128	119	115
Domestic	60	125	115	110
Office Orderly (private sector)	100	100	156	153

Source: *International Labour Organization, 1991*

Real wages in all sectors of the economy showed a downward trend after 1982/3 mainly as a result of macro-economic disturbances. Table 2.2 above also illustrates wage disparities between

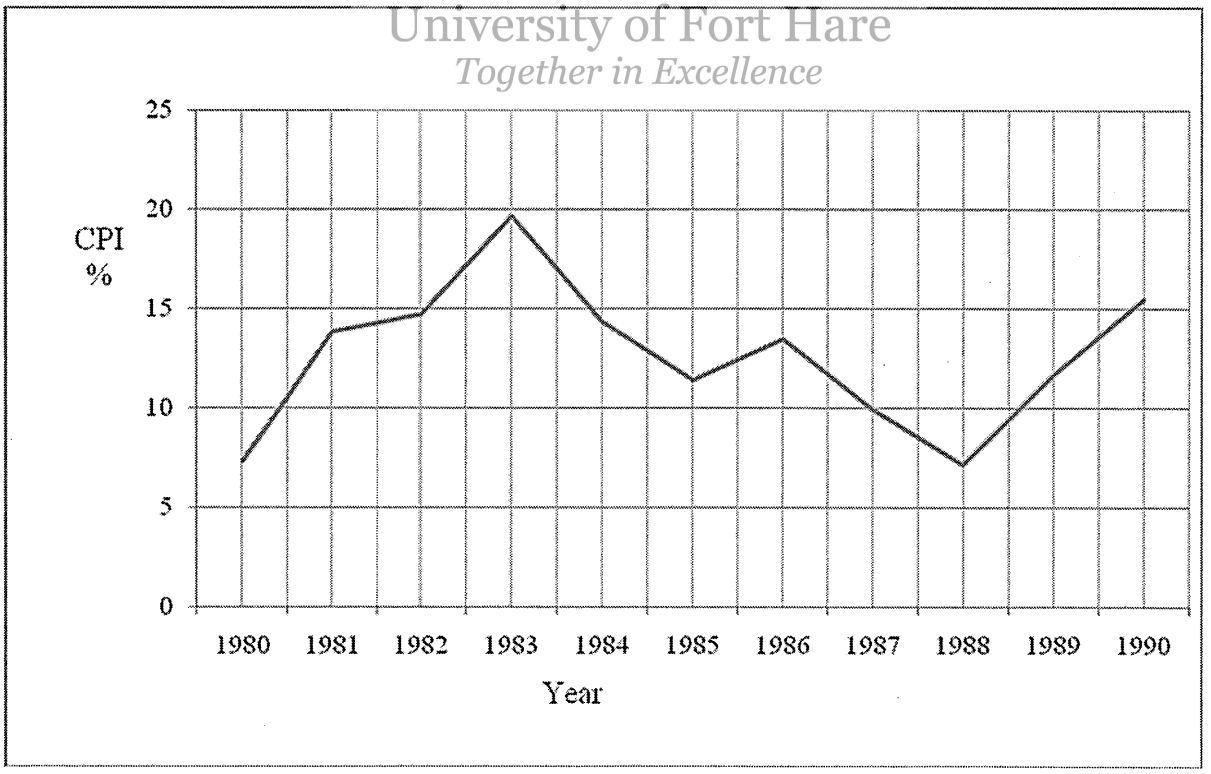
public and private sector employees, with the lowest paid worker in the private sector enjoying an 80% wage premium above the official minimum wage. In 1983 the same public sector employee enjoyed a premium of about 6% (ILO, 1998).

The minimum wage period was officially abandoned in 1989, save for the agricultural and domestic sectors, after it was noted that it was no longer effective. By then, the wages in Industry and Commerce were 3% below their 1980 levels, and were 20% above their 1980 levels in the domestic and agriculture sectors (Kanyenze, 1996).

2.4.2 Inflation

Although in the 1970s domestic inflation was often below foreign inflation the reverse was generally true in the 1980s. Figure 2.5, below, shows the general trends in inflation as measured by the CPI between 1980 and 1990.

Figure 2.5: Inflation for Zimbabwe between 1980 and 1990.

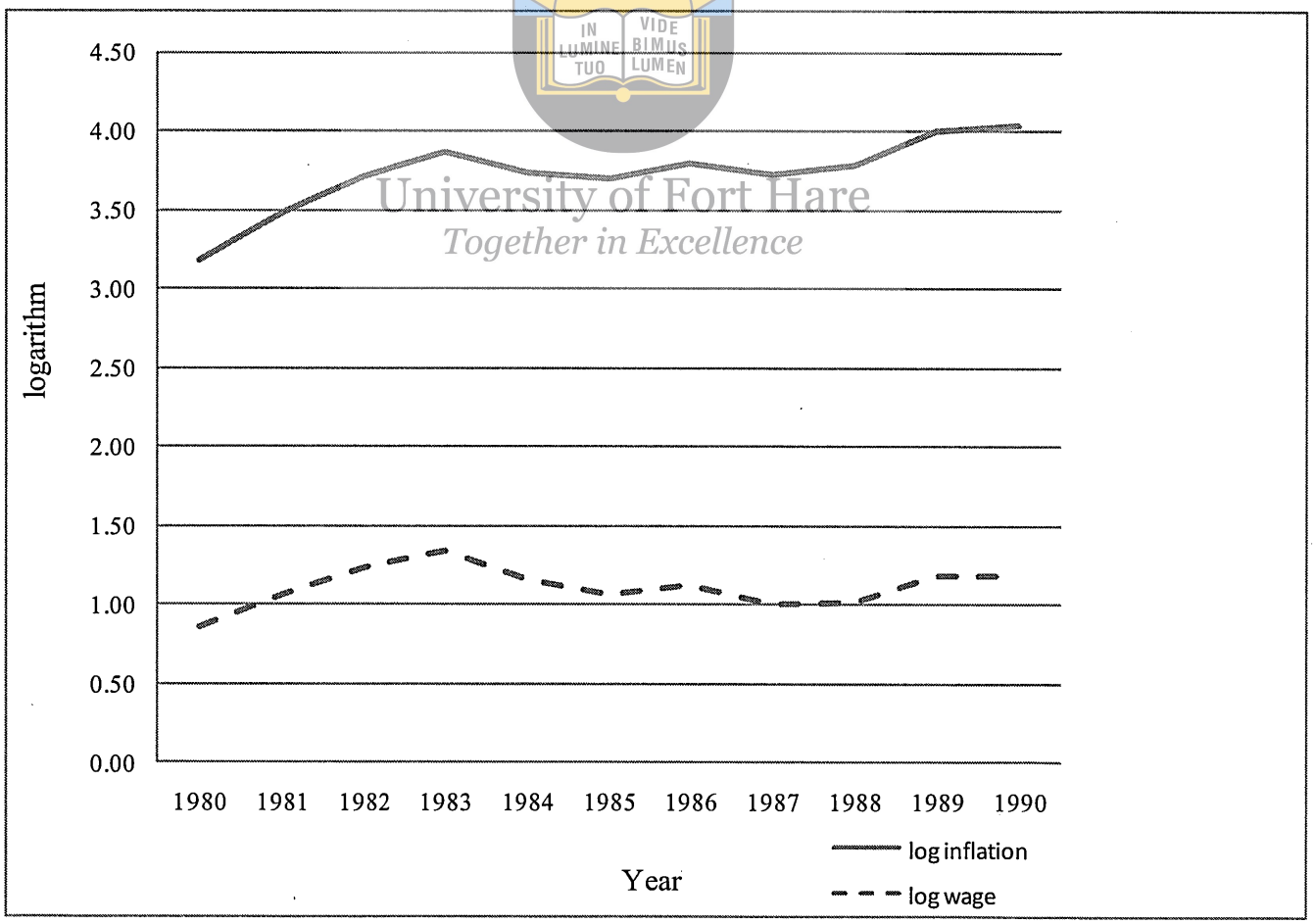


Source; IMF data, 2008

The CPI rose from below levels of 8% in 1980 to 13.8% in 1981 and reached a peak of 17.6% in 1983 before it went down, to as low as 7.5% in 1988. Thereafter, inflation started an upward trend to levels of just above 15% in 1990.

Bringing inflation and wages together will show interesting trends. The two variables are shown in Figure 2.6. In this figure raw inflation and wage data were not used to plot the data, but rather; the logarithms of inflation and wages were plotted against time, from 1980 to 1990. Logarithms are preferred because they transform the data without losing the underlying trend and other crucial properties of the data.

Figure 2.6 Inflation and Real Wages between 1980 and 1990



Source; IMF data, 2008

Figure 2.6 shows an upward trend between 1980 and 1990 throughout this period. Two striking points are noticeable in the 1980 - 1990 period. First, changes in import prices were dominated by changes in foreign currency terms prior to independence while exchange rate movements have become much more important in the 1980s. Second, there appeared to have been a remarkable degree of insulation of domestic price movements from changes in import prices. This was because the Government did not introduce a wedge between producer and consumer prices; indeed, overall consumer price inflation outpaced producer inflation during this period. This could be evidence for the assessment of whether there has been any permanent repression of consumer inflation in Zimbabwe.

There has also been a difference in inflation for low and high income households for many years. Zimbabwe, like many countries, had tighter controls over the prices of selected wage goods and public services. However, unlike some other countries, the period of the suppression of price rises have been followed by significant increases. At least until the price freeze imposed in mid-1987, the high income index was probably a reasonably good measure of underlying consumer inflation in the economy.

At the beginning of the 1980s, and in the 1985-86 periods, there was some coincidence in the directions of movement, but the overall picture was that inflation has moved up and down while the deficit remained consistently high by international standards; 9-11 percent of GDP. This is largely a consequence of the way in which the Government had effected macro-economic adjustment and the relatively well-developed nature of the financial system which is used to finance the high budget deficit.

2.4.3 Determination of Price and Wages

After 1980, the Government of Zimbabwe operated a comprehensive system of price and wage determination for the public and private sectors. The price control system dates back to the formation of the foreign exchange allocation system and can be viewed as directly complementary to this. A major microeconomic objective is to prevent firms from obtaining excess profits as consequences of the shortages created by foreign exchange rationing, while the main macroeconomic objective is to support greater price stability.

Minimum wages were also established prior to independence, but the extent of government influence on wages increased substantially during the 1980s. The price control system could be subdivided into two parts. For a limited set of products, the price was set by the Government. These products covered basic foods, including maize-meal, bread, beef and milk, the producer prices for the major agricultural products, most energy products, selected other intermediate products, including cotton lint, fertilizer and steel, and the prices of most urban and transport services. The bulk of other products were technically covered by an allowable mark-up. For manufacturers this was generally based on the margins obtained in 1981, while specific margins were set for different levels of distribution. Even for the commodities subject to specific price control, a major factor behind any price adjustment is the consideration of cost changes, though this is obviously affected by other objectives, including the maintenance of reasonable prices for wage goods and the need to reduce subsidies in the budget.

The use of regulated prices to moderate overall inflation has not been an explicit objective but, no doubt, also has an influence on pricing decisions. The overall picture is thus of a price-setting process governed by mark-ups, with a subset of publicly-determined prices adjusting with a lag (or occasionally a lead). Although prescribed mark-ups dominated in principle, it was quite easy for changes in demand pressure to influence prices since both manufactures and retailers, in practice, have some latitude. An initial increase can then swiftly pass through the system in line with the regulations. It is difficult to obtain direct evidence for variations in mark-ups through the cycle, but indirect support is provided by the short-run shifts in the rate of change of nominal wages and prices. This is associated with variations in the share of profits in the economy.

As noted above, a change was effected in July 1987, when the Government imposed a freeze on price and wage adjustments that, in principle, applied to all products. This price freeze was largely the consequence of an attempt to hold down recurrent expenditures through avoiding increases in public wage. This was extended to private wages and then to prices. This led to a marked deceleration in inflation for both the low and high income brackets of goods in the second half of 1987. Inflation was previously expected to be around 15 percent and there appears to have been some genuine repression in the inflation rate for a while. The freeze was partially lifted early in 1988, but only a five percent nominal increase was automatically approved.

The low income index became quite erratic on a month-to-month basis as it tended to be dominated by specific increases of a limited number of goods. There was some evidence of a squeeze in margins in poorer corporate profits in the results reported in mid-1988, but there was also reported to be evasion of the price freeze. Probably for the first time, many observers became sceptical of the pace of price change reported in the CPI. Controls on wage adjustments have been more comprehensive than on prices (prior to the wage and price freeze).

The Government's view since independence was that the trade union movement has been too weak to operate in a collective bargaining framework and the Government has had to intervene to ensure an adequate level of wages. It has also had the objective of narrowing the wide overall wage and salary differentials inherited from the pre-independence racial divisions. This has led to both the establishment of nation-wide minimum wages (divided by three or four broad sectors) and instructions on the required rate of increase for different salary levels in both the public and private sectors.

As discussed elsewhere, these policies initially raised average wages above their trend level in 1980-81 and subsequently held wage increases below the rate of inflation, bringing real wages back to the average trend level by the mid-1980s. The narrowing of differentials has been successful in the public sector but appear not to have been effective in the private sector. There is some evidence for a cyclical pattern of wages through the business cycle, especially since independence, which has been heavily influenced by policy intervention.

2.5 Wages and Inflation After 1990

Due to poor economic performance and a high rate of unemployment, in 1990 the government shifted from growth with equity and systematic intervention in the economy to a structural adjustment programme (ESAP). The major policies pursued with the adoption of ESAP included; trade liberalisation, monetary policy and financial sector reforms, economic deregulation, agricultural marketing reforms, public enterprise reforms and fiscal policy reforms.

The fundamental objective of economic reform in Zimbabwe was to improve living conditions, especially that of the poorest groups. This meant increasing real incomes and lowering

unemployment, by generating sustained higher economic growth. This major macro-economic objective could be fulfilled through achieving the other small set targets of ESAP. These targets were to achieve a five percent annual growth rate in GDP between 1991 and 1995, raise savings to 25 percent of GDP, raise investment to 25 percent of GDP, reduce inflation from 17.7 percent to 10 percent by 1995, reduce budget deficit from over ten percent to five percent of GDP by 1995 and achieve export growth of nine percent per annum. The fundamental objective of introducing economic reforms was not met. According to the Central Statistical Office (1998), the incidence of poverty in Zimbabwe increased from 40.4 percent in 1990 to 63.3 percent by 1995 and the situation has generally worsened since.

Most of the set macro-economic targets were never met. Instead of the budget deficit falling from 10.4 percent of GDP to five percent by 1994; it increased to 13.4 percent of GDP. Inflation peaked at 42.1 percent in 1992 before falling to 22.5 percent in 1995; against a target of 10 percent and by the year 2000, the rate of inflation was above 60 percent. The manufacturing sector has been shrinking and its contribution towards national output declined from 24 percent prior to economic reforms to about 17 percent. Employment declined in key sectors such as manufacturing, construction, education, health and mining. In the first three years of the 1990s earnings were reduced by 36 percent.

Furthermore, benefits such as housing and schooling allowances, enjoyed by manufacturing sector workers, were cut. Earnings in the manufacturing sector were steadily eroded. They were 68 percent above average real earnings in 1979 and only 36 percent above in 1990 (Knight; 1996). A decline in real earnings of this magnitude may indicate that the Zimbabwean labour market is rather flexible.

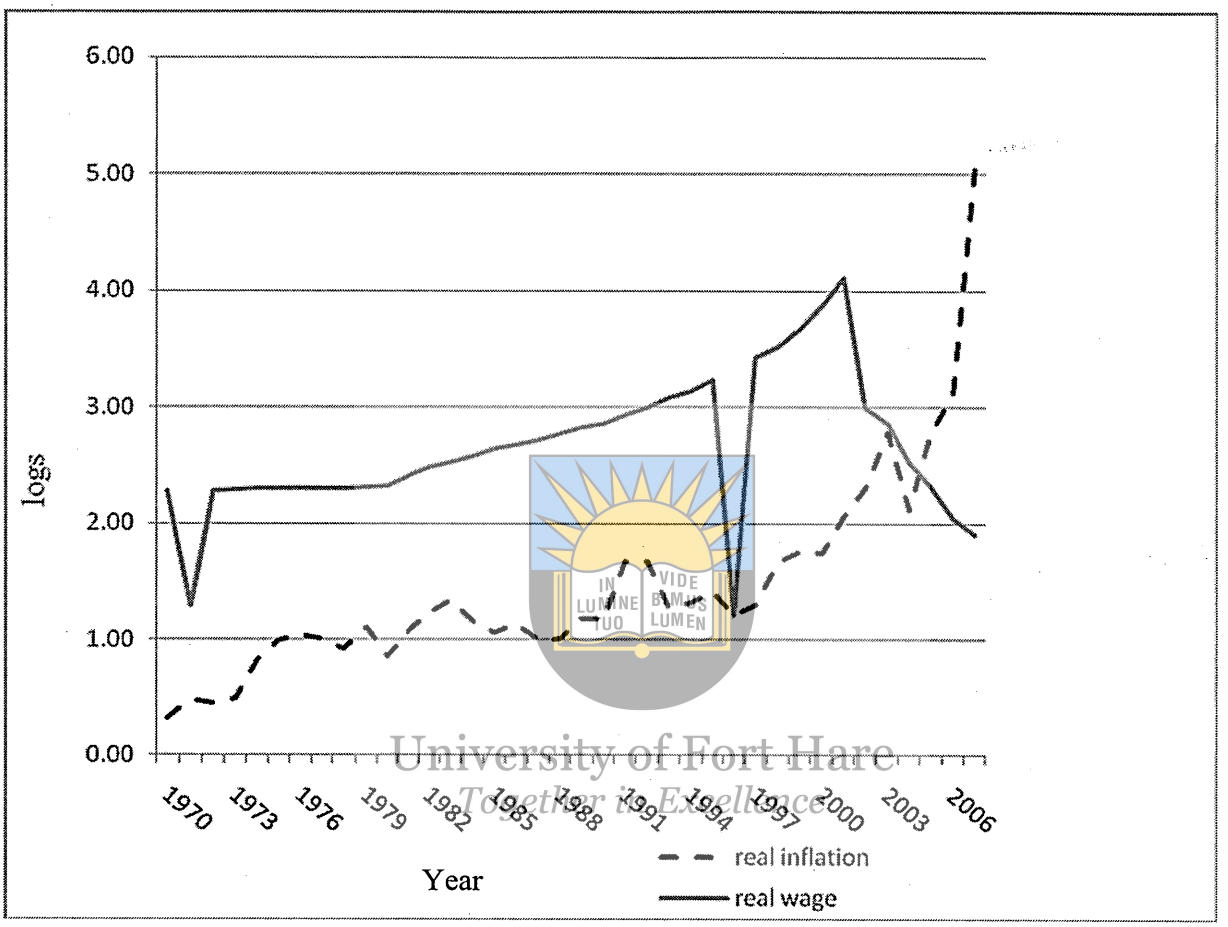
The burden of adjustment under ESAP was borne largely by the compression of wages and personal consumption expenditures. Real wages declined by a cumulative 60 percent in agriculture, 35 percent in manufacturing, and 28 percent in mining, although nominal average wages continued to rise from Z$9183 in 1990 through Z$129 752 in the year 2000 to Z$6 071 070 in 2004 (CSO, 2006). In terms of real wages, the worst affected were the private, domestic and agriculture sectors who suffered declines of 21 and 12 percent in real wages per annum

between 1991 and 1995, respectively. In these sectors, real wages were, in 1997, less than 50 percent their 1990 levels. While real wages were declining, company profits increased by a cumulative 80 percent during the six years leading up to 1996.

ESAP unleashed inflationary pressures that had been contained for almost three decades by an elaborate and sophisticated system of price controls. High inflation eroded wages in the formal sector as a whole. Inflation was also worsened by the tremendous increase in other macro prices, in particular; interest rates, and the depreciation of the currency. The average annual inflation rose by 18 percentage points from 28.5% in 1991 to 46.6% in 1998. It continued with its upward trend in 2003 when it reached a peak of 365.0%, before it fell to 350.0% in the year 2004. After the year 2004, annual inflation gained momentum as it rose to 1281.1% in 2006 before it recorded a world high of 10452.6% by the end of 2007.

The exchange rate depreciated from Z$5.1 to the US$ in 1991, to Z$37.4 in 1998. Interest rates, as shown by the 90-day negotiable certificates of deposits (NCDs) rose to 42% in 1998, from 25.5% in 1991. Figure 2.7, below, provides a summary of the trends of price inflation as given by annual percentage change in inflation levels and wage from 1970 to 2007. For easy comparison, logarithms of both inflation and wages were used.

Figure 2.7: Inflation and Real Trends (1970-2007)



Source *; Own calculations using IMF data, 2008*

From Figure 2.7 it can be noted that nominal wages and inflation have increased since 1975 as shown by the upward trend of both curves. National wages rose steadily soon after independence in 1980, partly because of the government's intervention in the wage determination process. Wages and inflation rates experienced the sharpest increase beginning from the year 2002. This upward trend accelerated as we approached the year 2007. Thus, it is precisely from the exhibition of this common trend that the study presumes that wage growth causes price inflation in Zimbabwe.

2.5.1 Employment

The Zimbabwean population has increased threefold during the period from 1970 to 1999, (CSO, 2000). Total employment increased by only 72 percent and, thus, the economy has not been able to absorb the growing labour force. This result also extended to informal sector activities and unemployment. A new labour law was promulgated in Zimbabwe soon after independence, in 1980. The Riddell Commission that framed the early 1980s legislation argued that the industrial labour market was asymmetric in the bargaining position of managers (of European origin) and workers (of African origin). The new legislation was expected to redress a, basically, non-competitive bargaining structure in the labour market.

After 1980, trade unions experienced an increase in membership and grew in coverage, as a result of which; total employment and output increased. Furthermore, minimum and maximum wages were introduced in recognition of workers' needs. However, they were abolished again in 1990 except for agricultural and domestic workers. In 1990 the government started to deregulate labour markets as part of the general reforms causing a change in the structure of employment. The aims were to reduce the size of the public sector and to reduce public intervention in labour markets. At present, the labour codes are more flexible than in the 1980s as employers can set wages and contracts, retrench, and dismiss employees without consulting the Ministry of Labour (Knight; 1996).

After the introduction of the ESAP and the droughts, the rate of increase in employment slowed significantly in the industry. It barely increased in the period between 1991 and 94. In the same period, employment in the service sector decreased yearly by 0.3 percent whereas it showed an increase of increased 2.1 percent yearly in agriculture. The employment loss has been concentrated in sectors vulnerable to competition from trade liberalization and sparked a rise in interest rates for sectors such as textiles.

The share of total employment in agriculture, construction, finance, and distribution increased in the 1987-94 period while it decreased in manufacturing, mining, transport/communication, and services; and slightly more in the latter than in the three former sectors.

2.6 Real Wage Flexibility, Unemployment and Wage Elasticity of Labour

A labour market is where demanders and providers of labour interact and is an important market for economic growth. This market has strong linkages with other markets. Policy makers are often interested in the proper functioning of markets. If markets are working well, then a *Pareto* optimal outcome will be generated. If one market is not functioning well, it becomes a constraint to other markets. A labour market that "works well" is necessary for other markets, and for economic growth. The classical competitive market, which was advocated by Adam Smith, can be used as a benchmark to assess the performance of the labour market. The classical competitive model believes in the forces of supply and demand to reign in the market to achieve *pareto* optimality. In this market, wages should be flexible and be good signals for the efficient allocation of resources. The orthodox view associates persistent unemployment with labour inflexibility. The employment protection regulations and minimum wages in Zimbabwe have been widely cited as examples of factors impeding labour market flexibility and, possibly, causing unemployment.

In the 1980s, these factors may have had a negative effect on the functioning of the labour market. Fallon and Lucas (1993 and 1994) claim that protection regulations had a misemployment effect in the manufacturing sector. Besides minimum wages and employment regulations, institutional forces (like trade unions) distort the functions of the labour market and lead to unemployment. However, in Zimbabwe in the 1980s, trade unions were not strong enough to bring about any negative effects

Flexibility in the labour market is seen as central to any structural adjustment programme. Flexibility takes two forms – wage flexibility and employment flexibility. Wage flexibility usually refers to the speed at which real wages adjust to equilibrate supply and demand in the labour market. This includes the employers' ability to affect the wage rate. In this section we shall analyse the issue of wage flexibility and the unemployment problem during the structural adjustment phase.

The aspect of wage flexibility can also be investigated through correlation coefficients. Correlation coefficients between changes in wage costs and output give some insight into

whether employers were able to adjust wage costs in the face of changes in the economic environment. Although correlation coefficients are not a watertight measure, as they do not control for other factors, they nevertheless give rough indications of whether or not real wages are adjusted to equilibrate supply and demand in the labour market. The correlation coefficients for the reform and pre-reform periods are presented in Table 2.3.

Table 2.3 Correlation between the rate of exchange in output and wage cost in GDP

Period	1986 - 90	1991 - 95	1996 – 00
Correlations Coefficients	0.23	0.34	0.36

Source; CSO, *2001*

The correlation coefficients clearly point to increased association between wage costs and output, an increase of at least 11 percentage points from the pre-independence period. Three factors might explain the increase in wage cost flexibility. Firstly, the inflation triggered by ESAP may have facilitated real wage flexibility (Collier and Garg, 1995). Secondly, the engagement of large numbers of casual workers may also have contributed to adjustments of their working hours, hence their wage rates (Valenchik, 1996). Lastly, collective bargaining may have increased wage cost flexibility as it allowed for wages to be set at industry level.

Wages in Zimbabwe were, to a larger degree, flexible during ESAP. How then does this picture square with the employment situation during ESAP? During the same period over 50,000 workers lost their jobs, both in the public and private sectors. Unemployment persisted despite wage-cost flexibility and the fall in real wages, sometimes to less than half of their peak levels. It cannot be argued that wages did not fall fast and far enough to reverse the unemployment trend. The severe falls attest to the fact that real wage inflexibility is not an appropriate explanation and one should look elsewhere for more plausible explanations. This implies that wage flexibility is not a panacea if the unemployment problem is to be solved. Severe declines in real wages beyond a certain point may actually increase unemployment because of their adverse effect on

aggregate demand. If falling real wages are accompanied by a falling share of wages in national output, aggregate demand will fall, assuming that wage earners have a lower propensity to save compared to profit earners.

According to standard trade theory, trade liberalisation in a country rich in labour and poor in capital should increase the demand for labour, real wages, and the share of wages in national income. In Zimbabwe, however, labour demand and real wages in fact followed an opposite course. This is true of the share of labour income as well after 1991. Between 1985 and 1990 this share fluctuated above 47 percent, but in 1991 it dropped to 43 percent and then to below 40 percent in most subsequent years. The profit share, on the other hand, increased from 50 percent in the 1980s to an average of 60 percent between 1991 and 1997. For profit recipients the gains were large among public corporations and financial institutions, while non-financial private sector companies only maintained their shares.

What then does this evidence imply about the predictions of theory? The fall in the share of labour income exonerates wage inflexibility as the cause of persistent unemployment; it rather suggests that severe real wage declines during ESAP may have precipitated low aggregate demand. Persistent unemployment may not have been a result of the labour market not working well or wage rigidity, but partly have resulted from poor aggregate demand feedbacks from real wages.

2.7 Conclusion

Zimbabwe, soon after independence, inherited a labour market in which the black majority was paid a significantly low salary in comparison to their white counterparts. This prompted the new government to introduce minimum wage regimes to raise the income levels of the black majority. Inflation rose to modest levels. The minimum wage was, however, abandoned following the adoption of ESAP in 1990 which was followed by annual inflation rates rising at an increasing rate thereafter. A study by the Zimbabwe Investment Center (ZIC) stated that there appears to be two issues that largely explain why there exists serious economic problems in Zimbabwe. The main reason being the policies that are formulated improperly or only partially implemented.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter conducts a review of the theoretical and empirical literature on the causality between wage growth and price inflation. The first section reviews the theoretical work while the subsequent section presents and critically analyses empirical literature. The theoretical underpinnings provide an outline for the discussion of inflation theories and wage determination while the empirical literature will analyse relevant recent studies on the effects of wage growth on inflationary processes in both developing and developed countries.

3.2 Theoretical Literature

This section serves to review the theoretical underpinnings of the causality between wage growth and price inflation. It will also concentrate on wage determination theories and other related theories.

3.2.1 Inflation Theories

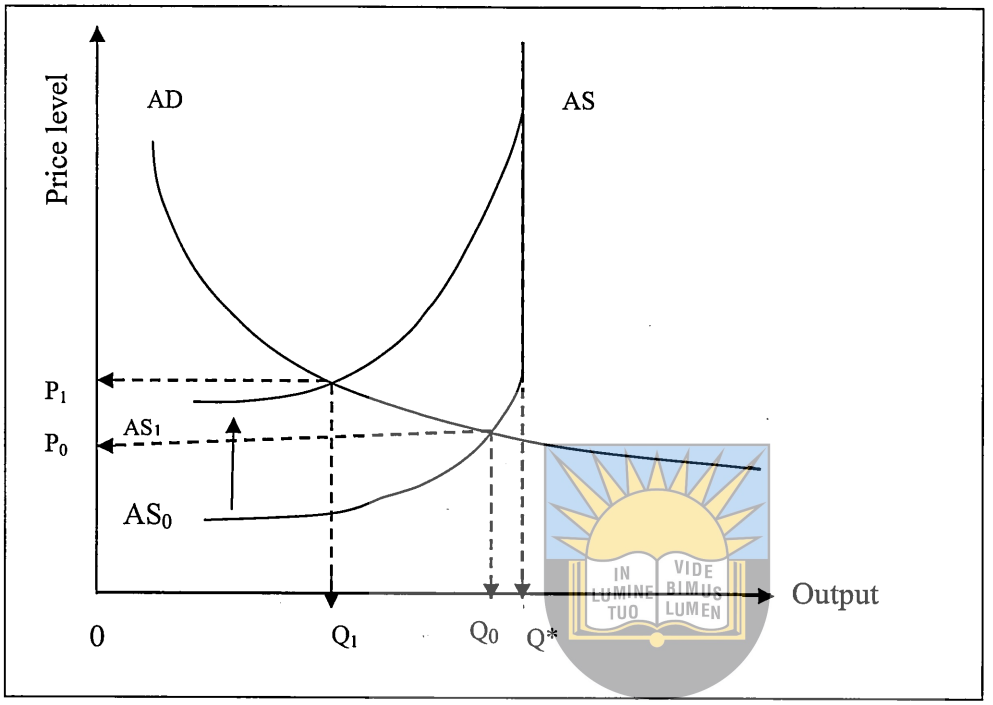
Economists refer to any consistent increase in the general price level as inflation. Monetarists define it as a situation where too much money is chasing too few goods. Generally, inflation can be demand pull or cost push. It is caused by factors that change and shift the supply and demand conditions in the market. For example, if there is a continuous increase in aggregate demand with a fixed aggregate supply, prices will keep rising. This aggregate demand approach coupled with less than immediate adjustment of inflationary expectations leads to the notion of a trade off between inflation and output; this will be explained later under the Phillips curve analysis. Aggregate supply also has a role to play in inflation. A persistent rise in the cost of raw materials may lead to a reduction in aggregate supply so that prices will eventually rise. Other shocks that cause a leftward shift of the aggregate supply curve are natural disasters, drought and wage cost push by labour unions.

3.2.1.1 Cost Push Inflation

The cost push theory was propounded after World War II, as an explanation of causes of inflation. In this model, prices are pushed upwards by rising costs while the economy operates at less than its full capacity. In part, this theory was propounded to explain why prices rise in the face of unemployed labour, with firms operating at less than full capacity. The theory argues that production costs, especially labour costs, rise more rapidly than is warranted by existing conditions of the labour market (Allen, 1986).

The theory notes wage cost push as one of the supply shocks that bring long-run macroeconomic disequilibrium. If such supply shocks are repeated, adjustments to equilibrium will depend on whether the shocks are accommodated or not by the central bank. If supply shocks are repeated, the theory notes powerful unions as having the ability to raise money wages faster than productivity increases, even in the face of a significant excess supply of labour. Firms then pass these higher wages on in the form of higher prices which gives rise to wage cost push inflation. According to the inflation theory, if the central bank does not accommodate the supply shocks, the initial effect is to open up a recessionary gap. If unions continue to negotiate for higher wages, subjecting the economy to further supply shocks, firms will, in turn, pass the burden to consumers in the form of rising prices. Cost push inflation is depicted graphically in Figure 3.1

Figure 3.1: Cost Push Inflation



Source: Carter, 1959

Where Q is national output, AD is aggregate demand and AS being aggregate supply. Initially the economy will be assumed to be operating at less than full employment output, that is, at Q_0, with AS_0 and AD as its aggregate supply and demand curves respectively. The reduction in supply caused by increases in costs of production will cause the aggregate supply curve to shift up and to the left from AS_0 to AS_1 thereby reducing the quantity supplied at every price. The new equilibrium will see prices, depending on the elasticity of supply and demand, rise from P_0 to P_1 and output fall from Q_0 to Q_1. As these costs of raw materials continue to rise, through labour unions bargains, output will also continue to fall (beyond Q_1) and prices will continue to rise (beyond P_1) leading to inflation. Long before everyone is unemployed, unions will cease to force an increase in wages in order to maintain jobs for those who are already employed and are at risk of losing their jobs should the unions continue advocating for higher wages.

The theory puts it that once the wage cost push ceases, there are two possibilities. First, unions may succeed in holding on to their high real wages and may not push for a further increase of money wages in excess of changes in productivity. The economy will then come to a rest with a

stable price level; a large recessionary gap may also result. Second, persistent unemployment may eventually erode the power of the unions so that real wages and unit production costs begin to fall, because money wages rise at a slower pace that the rise of labour productivity.

However, according to Valenchik (1997), if the central bank accommodates the repeated supply shocks with an increase in the money supply the aggregate demand in the economy will increase. A new full employment equilibrium, where national income is at its potential level, will be attained when both money wages and prices have risen. The rise in wages has been offset by a rise in prices. Workers are no better off than they were originally, although those who remained in jobs were temporarily better off in the transition period when wages had risen, but before the price level had risen enough to restore full employment.

If unions succeed in negotiating further increases in money wages, they would hit the economy with another supply shock. If the central bank accommodates the shocks again, the full employment is maintained; but at the cost of a further round of inflation. If this process goes on repeatedly, it can give rise to continual wage cost push inflation. The wage cost push tends to cause a stagflation, with rising prices and falling output. The process set up by this sequence of wage cost push and monetary accommodation is often called a wage price spiral.

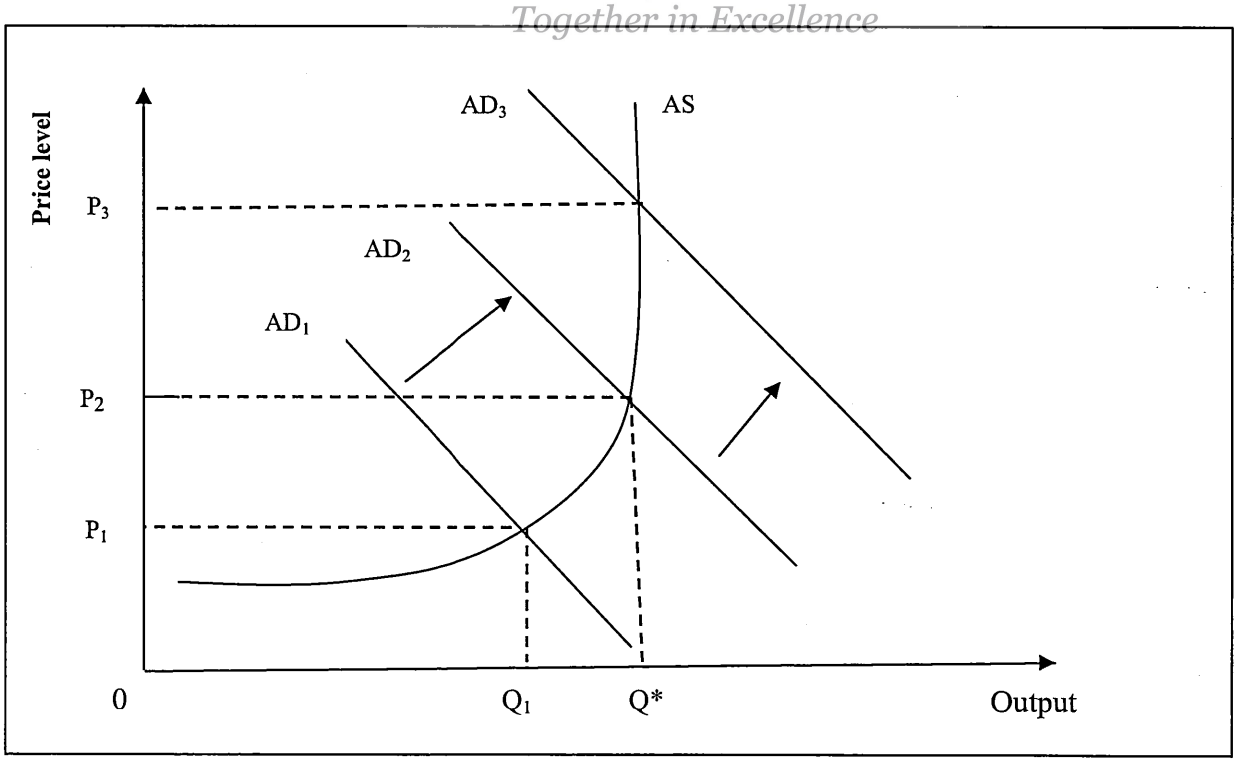
However, the cost push theory cannot go unchallenged especially when analyzed in the macroeconomic framework. The theory breaks down when the government does not behave as expected. For example, if workers' unions succeed in obtaining a wage increase for its workers, such an increase will be a cost to firms and to recover this, the cost push theory states that businesses will have to pass on the burden to consumers by increasing the prices of their final products. The increase in prices forces individuals to demand more money balances to carry out their normal transactions. The cost push theory breaks down completely if the government does not increase the money supply to match the increase in consumer demand for money. This would deprive households of additional money balances thereby forcing them to reduce spending. This would further reduce aggregate demand leading to a reduction in prices to their original level prior to the wage increase. However, wages will remain high in this instance without a corresponding increase in prices. According to this analysis the cost push theory loses credibility

if the government does not respond to increases in demand for money by printing more money to match the new level of wages. Regardless of this weakness, the cost push theory remains a very relevant inflation theory.

3.2.1.2 Demand Pull Inflation

An influential macro-economist, Keynes, provided an explanation for the demand pull inflation; this explanation was a mirror image of his explanation for unemployment. If unemployment is caused by insufficient aggregate demand in relation to supply capacity, inflation will consequently be a result of aggregate demand in excess of the capacity of the economy to supply goods and services. According to Keynes, an increase in aggregate demand is inflationary only if the economy is operating at, or near, full employment output. Figure 3.2 illustrates how an increase in aggregate demand may initially have no impact on the price level, but beyond full employment, will cause prices to rise.

Figure 3.2; Keynesian Aggregate demand induced inflation



Source: Carter, 1959

In Figure 3.2, Q* represents the full employment level of output, AS is the aggregate supply curve and AD is the aggregate demand curve. An increase in aggregate demand in the economy at low levels of economic activity, that is before Q*, will see a slight increase in prices and this will be an incentive for firms to produce more. This is shown in Figure 3.2 by a rightward shift of the aggregate demand curve from AD_1 to AD_2, and prices will also rise from P_1 to P_2. It is this price increase which will give firms an incentive to produce more. Therefore the diagram shows that the increase in demand from AD_1 to AD_2 will ultimately cause an output increase from Q_1 to Q*.

An increase in aggregate demand beyond AD_2, for example, from AD_2 to AD_3 will see prices increase at a faster rate than the increase in output. In this case price will rise from P_2 to P_3 whereas real output remain unchanged at Q*. The increase in aggregate demand beyond full capacity is reflected exclusively in higher prices, and this is because the economy cannot expand its output and supply capabilities in the short run to absorb the increase in aggregate demand. However, with very limited mobility of factors of production in the short run, inflationary pressures may settle before aggregate demand reaches absolute full capacity utilization , that is, before Q*. This means that bottlenecks arise before Q* as some sectors of the economy reach their capacity utilization before others. If factors of production are not perfectly mobile in the short run, as is most often the case, inflation will commence in the sectors where bottlenecks have arisen, and the aggregate price level will begin to increase before the entire economy reaches full capacity utilization.

This theory cannot also go without a challenge as it contradicts real life situations in some instances. According to this theory, inflation can only result when full employment is achieved in the economy. This makes the theory less applicable, because most African countries are clearly operating below full employment as evidenced by very high levels of unemployment. According to CSO (2008), Zimbabwe's 2007 inflation went up to an all time high of 108844.1% as measured by the Consumer Price Index (CPI) against an unemployment rate of 89%. This shows the weakness of the theory, to some extent, because it implies that a hyperinflationary environment can only be achieved when all factors are employed but, in Zimbabwe; only 11% of labour was employed. No country in the world, especially an African country, has achieved full

employment in its true sense. The theory, however, applies only to economies that are near or approaching full employment.

3.2.1.3 Quantity Theory of Money

This theory was postulated by, among other economists, Marshal (2005).These classical economists assume that the economy will under no circumstances operate under full employment. This is one of the major axioms of classical economists and most classical policies and implications hinge on the assumption that economies always operate at full employment. According to this theory an increase in the quantity of money in circulation leads to a proportionate increase in the price level. Goods markets continuously clear and relative prices adjust flexibly to ensure that equilibrium is reached. The theory assumes and illustrates that money is a veil. This implies that money only has an influence on nominal and does not affect real variables. Any changes in the level of money in circulation will have no impact on real variables such as income and interest rates. They argued that changes in money supply have only one effect on changing price levels; an increase in money supply will lead to a proportionate increase in prices, hence inflation.

According to the quantity theory, inflation is purely a monetary phenomenon and can formally be expressed in an equation as shown in Equation 3.1.

$$MV = PQ \quad \ldots\ldots 3.1$$

The expression 3.1 is more of an identity than an equation. M is the amount of money in circulation, V is the velocity of circulation, P is the price level and Q is the national output and is a measure of the level of economic activity in the economy. M, the money supply, will be determined by all three economic agents: the consumer through cash balance holding, the money creation process by financial institutions and by the Central Bank through its control of the reserve requirement ratio and its ability to print money to finance government activities. However, much influence lies with the central bank and the government who can increase M directly by printing money. The velocity of circulation (V), can be defined as the number of times that a unit of currency changes hands to produce goods and services in a year and is normally affected by institutional factors. The price level (P), is the average price taken to represent the price of all goods and services in the economy. It is measured by the CPI. A

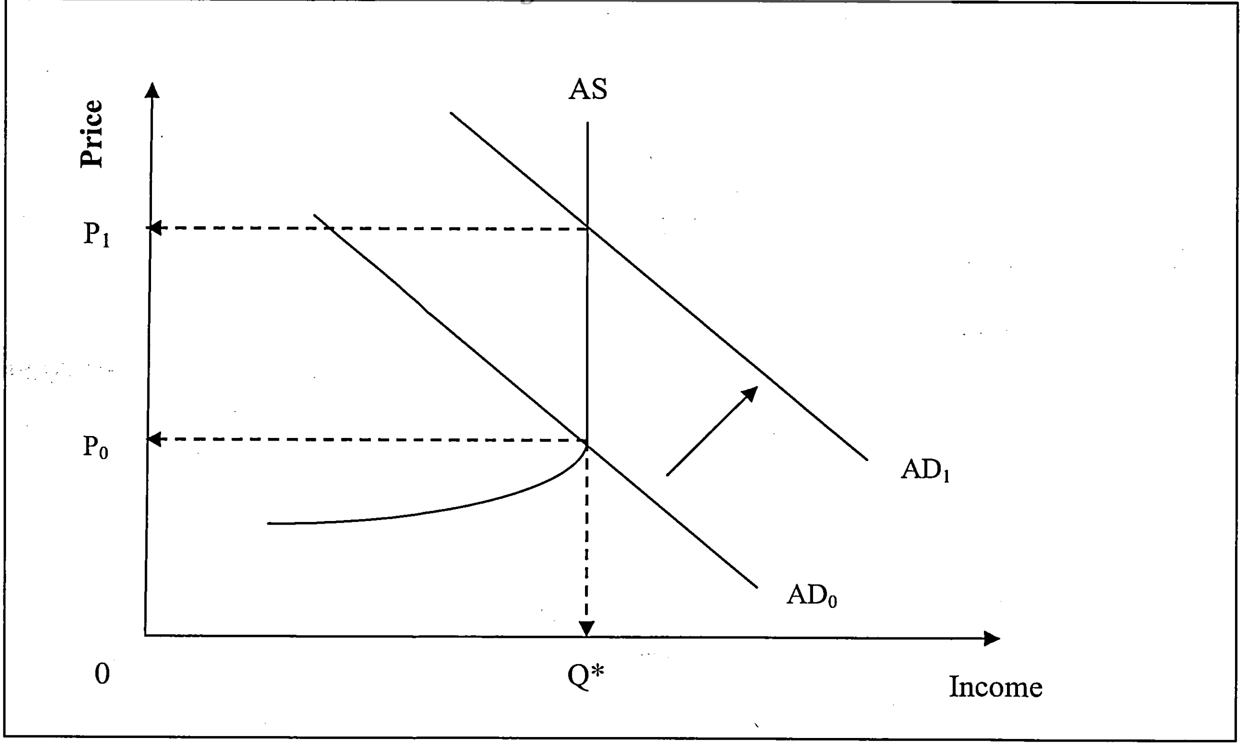
persistent increase in this price is viewed as inflation. Q, the national output, is measured by the GDP.

The classical theory assumes that the velocity of circulation (V) is fixed, because it takes time for factors that influence it (that is, institutional factors) to be altered, hence, it must enter the identity as $\overline{V}$. Since the economy is assumed to be operating at full capacity, there is no point in increasing factors of production so as to boost the national output. In the system, Q is assumed to be fixed hence it will enter the equation as $\overline{Q}$, as shown in 3.2 below.

$$M\,\overline{V} = P\,\overline{Q} \qquad (3.2)$$

The equation of exchange, above, is also an identity. Since the velocity (V) and national income (Q) are fixed, it follows that there is a proportionate relationship between Money supply (M) and price level (P). From 3.2, it can be seen that an increase in money supply will lead to a proportionate increase in the price level, because V and P are fixed. Graphically, this relationship is illustrated in Figure 3.3.

Figure 3.3; Graphic Explanation of the Equation of Exchange



Source: Marshal, 2005

In Figure 3.3, P, AD, AS and Q* refer to prices, aggregate demand, aggregate supply and classical full employment output, respectively.

An increase in money supply can be done in a number of ways, for example; through money printing by the reserve bank, money creation by financial institutions and high propensity to spend by the public. This increase in money supply will see the public with greater money balances than before. This will increase the aggregated demand from AD_0 to AD_1 as shown in Figure 3.3. According to this theory, the classical economists assumed a vertical aggregate supply curve and this supply curve must correspond to the full employment level of output. This full employment output is shown as Q* in Figure 3.3.

The diagram shows that before an increase in M, the national income will be at Q*. An increase in money supply will increase demand from AD_0 to AD_1. This graph is consistent with the equation of exchange because it shows that an increase in money does not affect real variables, but prices. An increase in M only results in a proportionate increase in the price level (P) and the opposite is true with a decrease in M. The quantity theory by classical economists, therefore, views money supply growth as the most significant contributor to price inflation.

The quantity theory, like other theories, has its weaknesses. The theory assumes that money is a veil, in that changes in money supply do not affect real variables. This conclusion is not always true. Most, if not all, countries in the world use monetary policy as a powerful tool to influence real economic activity, especially output and employment. The Keynesian transmission mechanism assumes that money affects real variables through interest rates. Should there be an increase in money supply, the Keynesians believe the opportunity cost of holding money will be lowered. This implies low interest rates and low cost of investment. This will encourage prospective investors to borrow funds and invest in investment projects of their choice. In this process, the consequence of an initial increase in money supply will be an increase in output, which is contrary to inflation, as explained by the quantity theory.

The theory also assumes the full employment of resources. It is very difficult to find a society where all factors of production are fully employed. In reality, not all labour is employed, banks do not always surrender all savings as capital for investment projects and, more often than not, there are always pieces of land that lay idle in most countries. The theory assumes that velocity of circulation is always fixed; which is not realistic. The Keynesian economists assume that institutional factors always change and, as a result, the velocity of circulation is not always fixed. This implies that changes in money supply might be offset by changes in velocity of circulation.

3.2.2 Wage Determination

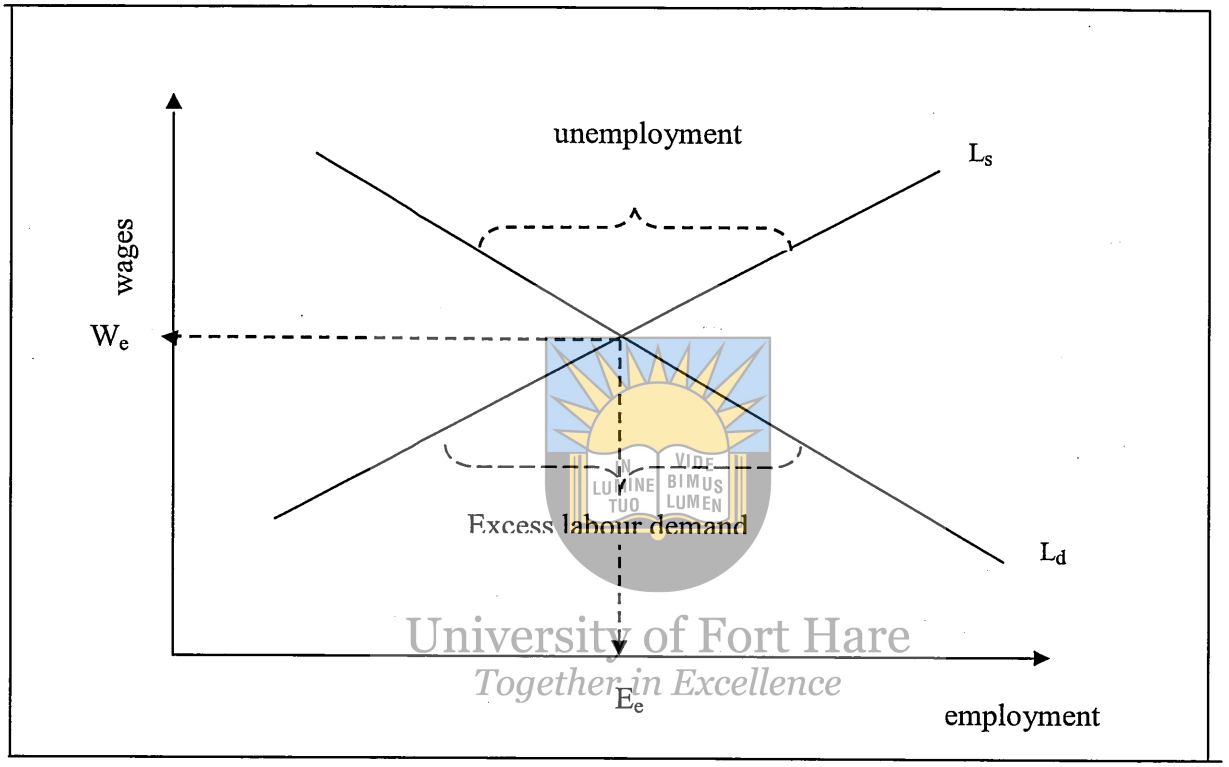
Wage changes play a significant role in the inflationary process. Labour costs are an important component of total costs and reductions, in the rate of price increase, are unlikely to occur (except temporarily) without accompanying reduction in the rate of wage increase. For this reason, policies to control inflation are typically directed towards achieving reductions in wages as well as price increases. The first step in the design of such policies is to understand the factors that influence wage determination. This section will consider wage determination theories under perfect competition, imperfect competition and under the influence of powerful trade unions (Zanetti, 2005).

3.2.2.1 Perfect Competition

The labour market is a composite of independent decision making institutions, that is, firms and households. The labour demand in the labour market is an aggregate of all the separate labour demand curves from the employment decisions made by firms in their quest to maximize profits. The supply curve of labour in the labour market is an aggregate of all the separate decisions made by households to supply labour at different wage rates in order to achieve their highest levels of satisfaction as they peruse both the consumption of non income producing time and the acquisition of income. To derive labour supply and demand curves we have to use the axiom of homogeneity[2] to aggregate firm demand and household supply curves. This assumption simply means the separate units (households or firms) that are added up are assumed to be identical in their crucial attributes. Figure 3.4 shows how labour demand and supply can be used to set the wage rate under perfect competition labour markets.

[2] The homogeneity assumption criticised by Alfred Marshall's 1960 Cambridge critique theory.

Figure 3.4; Wage equilibrium in a competitive labour market



Source: Corbo, 1995

Ls and *Ld* represent labour supply and labour demand, respectively. In Figure 3.4, the equilibrium wage rate (*We*) and the equilibrium employment rate (*Ee*) are determined by aggregate supply and aggregate demand for labour. Figure 3.4 thus shows how wages are determined according to the neo-classical economist in a perfectly competitive market. A wage rate deviating from the equilibrium will be opposed by forces of labour demand and supply. Above the equilibrium, for example, there will be excess supply of labour; this is because at a high wage rate (higher than *We*) households will be willing to supply much more labour while firms will be willing to hire less. Because of a mismatch in the demand and supply of labour, with more labour being supplied relative to its demand, there will be an excess labour supply; a feature commonly known as unemployment and which is also depicted in the Figure 3.4. High levels of unemployment will force the unemployed households to compete against each other for

the relatively scarce jobs available. Workers will begin to accept lower wages because of high unemployment. These wages will continuously go down until they reach the equilibrium wage rate, *We*. Also, if the wage rate is set at levels below the equilibrium rate, *We*, there will be an excess of demand for labour by firms. Firms will demand more labour and will continue to employ more labour until the marginal productivity of labour is equal to the wage rate. On the contrary, due to low wages; workers will find it profitable to supply less labour and spend more time on leisure. This will create an excess labour demand in the market and firms will compete against each other for workers, in the labour market, by inflating wages. Firms will continue to induce workers by giving them more wages and the process will continue until the equilibrium wage rate is achieved.

3.2.2.2 Imperfect Market Structures[3]

According to Allen (1986), perfect competition does not always prevail in labour markets as there are imperfect market structures in which wages also need to be determined. Under such conditions of imperfect competition, it is only in the product market where we assume imperfect competition otherwise there will be perfect competition in the labour supply market. Because, if there exists perfect competition in the labour market, such changes are not worth analyzing because, in the labour market, these firms will be so small that they will not be able to influence the wage rate by their employment decisions. Therefore, for all imperfect competition market structures, wages will be determined by forces of demand and supply, in the same manner as if under perfect competition.

3.2.2.3 Labour Unions and Wage Formation

Assuming the economy is divided into many sectors with each sector producing differentiated products; each sector is also assumed to have its separate labour union. The theory assumes that workers in each sector are trained to work only in that sector, hence they cannot move to other sectors in search of jobs. If ***b*** is the unemployment benefit, ***w*** the wage rate and ***p*** the general price level, then the real wage rate will be given by ***w/p*** and the net income gained from being employed will be ***(w-b)/p***. The theory further assumes that labour unions, in any sector, will care

[3] Imperfect market structures include monopolistic competition, oligopoly, duopoly and monopoly market structures.

much about maximizing $w - b$ as well as increasing the total number of jobs in their sector. This can be formally expressed as:

$$U = (w_i - b) L^z{}_i \; ; \qquad z \succ 0 \qquad \text{.....3.5}$$

Where **U** refers to the utility of labour unions and **z** represents the weight that the union attaches to high employment relative to the goal of high real wage rate for union members. The more the union is concerned about employment relative to wages the higher the value of z. Furthermore, when setting the wage rate the union must also take into account the fact that higher wages reduce the demand for labour by firms, which can be formally expressed as:

$$L_i = \left(\frac{Y}{nB}\right)^{e/\sigma}\left[\frac{B(1-\alpha)}{m^p}\right]^e\left(\frac{Wi}{P}\right)^{-e} \; ; \; e = \frac{\sigma}{1+\alpha(\sigma-1)} \succ 0 \qquad \text{.....3.6}$$

3.6 shows that labour demand is a declining function of real wages and, taking this equation into account, the utility for trade union in 3.6 above will be expressed as:

$$U(w) = (w_i - b)[L_i\ (w_i)]^z \qquad \text{.....3.7}$$

Differentiating 3.7 and solving it will result in

$$w_i = m^w \bullet b, \qquad m^w = \frac{ze}{ze-1} \qquad \text{.....3.8}$$

According to 3.8, the target by labour unions is a wage mark-up over the opportunity cost of employment. The opportunity cost of employment is the income that a worker foregoes when employed, will be the unemployment benefit: b. From 3.8 it can also be concluded that unions' wage claims will be lower the greater the weight it attaches to the goal of unemployment (that is, the higher the value of z). It also follows that the target real wage rate will be lower the greater the elasticity of labour demand. This is because higher labour demand elasticity increases the loss of jobs resulting from any given increase in the real wage. Finally, equation 3.8 also shows

that a higher rate of unemployment benefit pushes the target wage rate up because it reduces the income loss incurred by those union members who lose their jobs when the union charges a higher wage rate (Allen, 1986).

The analysis may not be suitable and relevant to developing countries because it introduces an unemployment benefit; a characteristic of developed countries which does not exist in African countries. The trade union theory also assumes that workers only specialise in one industry in which they are employed, this is not realistic for African countries. Most African countries are characterised by workers who are jacks of all trades although they are masters of none. One of the main reasons for this is that such economies are not highly formalised and workers just join any firm, business or activity that pays the most at that moment. For example, in Zimbabwe, towards the end of 2008, many people left their formal jobs since the economy was becoming too informal. However, irrespective of these drawbacks, the theory remains a credible one because trade unions are very influential in determining wages.

3.2.2.4 The Philips Curve

Phillips (1958) provided an ingenious, yet simple, device for depicting the sources of inflation. The theory depicts a correlation between rate of change of money wages and unemployment. When the demand for labour is high (excess labour demand), we expect employers to compete against each other for workers by offering higher wages. Each firm will be tempted to offer a little above the prevailing wage rate on the labour market to attract experienced and qualified labour from the market and other industries. When the labour supply is high, relative to its demand (high unemployment), firms will pay less to workers who will be competing for employment and thus willing to accept low wages. The second factor to possibly influence the rate of change in money wages was the rate of change of labour demand.

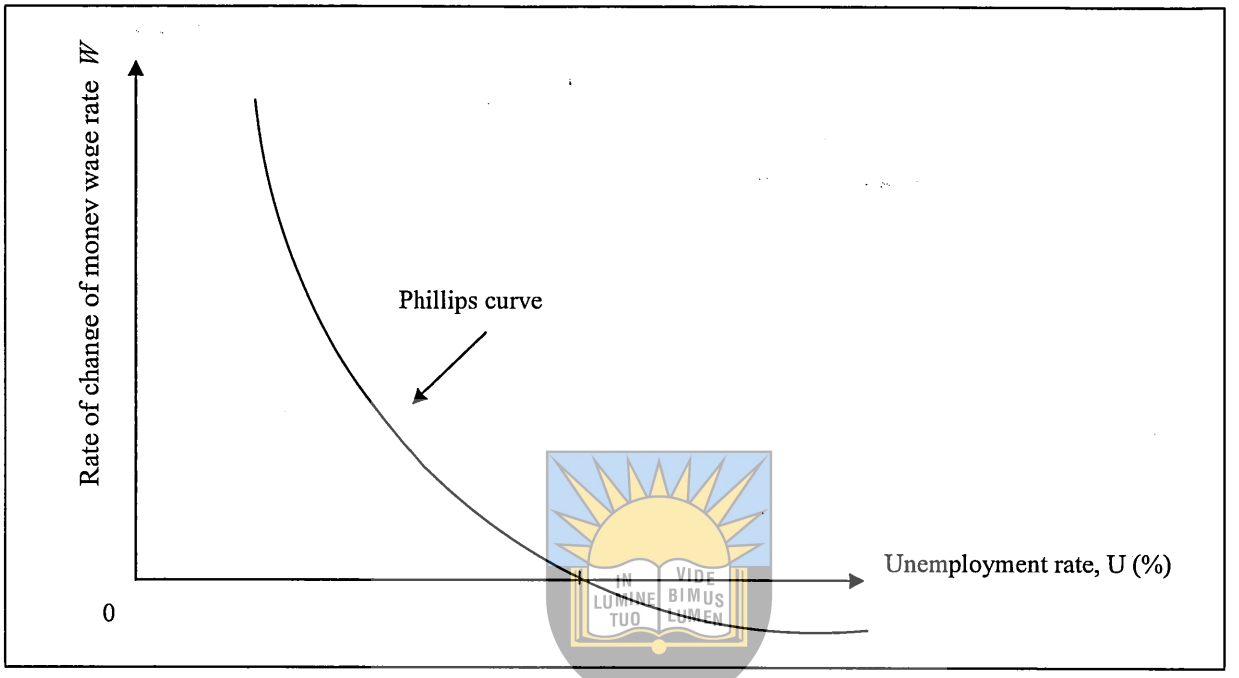
During periods of high economic activity, the demand for labour will start increasing and the percentage of unemployment decreasing. Firms will offer higher wages as compared to periods when average employment was the same but the demand for labour was not increasing. Conversely, when economic activity declines, such as periods of economic recession, the

demand for labour as well as unemployment decreases and employers are less willing to offer wages increases to workers. Employees will be in a weaker position during this period in comparison the period when the average percentage unemployment was the same but the demand for labour was not deceasing. The third factor assumed to affect wage changes was the change in retail prices. Workers and labour unions will always ask for higher wages in the form of a cost of living adjustment if retail prices go up.

However, Phillips (1958) paper mainly focussed on developing the relationship between inflation and unemployment, particularly the relationship between the rate of change between money wages and the rate of unemployment in the United Kingdom between 1861 and 1957. The theory assumes that firms put a constant mark up on the cost of production to obtain the prices of final products. The theory also assumes that labour cost is a fiction of the degree of demand pressure and expected inflation. The theory postulates that low levels of unemployment; that is, below the natural rate of unemployment, are associated with a rising inflation rate. Economies that grow at a rate faster than their potential output will see firms employ more workers to meet the excess demand. An increase in the demand for labour will see labour costs increase in order to bring equilibrium to the labour market. Firms will pass on the increase in production costs to consumers in the form of higher prices, especially on products whose demand is price elastic.

The outcome of the study suggested a negative correlation between the rate of nominal wage growth and the rate of unemployment. The famous Phillips curve is formally presented in Figure 3.5, below.

Figure 3.5: The Phillips Curve



Source: Phillips, 1958

The Phillips curve shows that there is a non linear relationship between wage inflation and unemployment as shown in Figure 3.5. This means that for low levels of unemployment a further (but only small) reduction in unemployment will be followed by more than the proportionate increase, that is, by a sharp increase in wages. The increase in wages will be far more than the decrease in unemployment. Conversely, for high levels of unemployment, a large reduction in unemployment will have an insignificant and small effect on wages. This nonlinearity exists in the Phillips curve because the unemployment rate is a proxy measure of the extent to which demand pressures occur in the economy. If unemployment rates are low, the economy will approach full capacity utilization of both labour and capital resources, and further reduction in unemployment will produce relatively large wage increases. Underutilized labour and capital resources exist if unemployment rates are high. When unemployment rates are high, however, reductions in the unemployment rate will have a relatively smaller impact on wages.

Another point to note about the theory is that the flatter the Philips curve the more important are the cost push factors in explaining inflation. However, the basic augment of the Phillips curve is

that the main causes of inflation are demand pull factors. It was the excess demand in the United Kingdom labour market which was the triggering force for wage inflation and the factors that determine its speed.

The Phillips Curve has been criticized for not taking into account the fact that economic agents consider inflation expectations in wage decision making. If households experience higher inflation in their everyday lives, they will expect a higher average rate of inflation in future time periods. Employees and trade unions may incorporate these expectations into their wage bargaining process. Friedman accepted that the short run Phillips Curve existed, but that in the long run this Curve is vertical and that there was no trade-off between unemployment and inflation. He argued that each short run Phillips Curve was drawn on the assumption of a given expected rate of inflation. So, if there were an increase in inflation caused by a large monetary expansion and this had the effect of driving inflation higher than expected, then this would cause an upward shift in the short run Phillips Curve. The monetarists argue that any attempts to boost aggregate demand in order to achieve faster growth and lower unemployment have only a temporary effect on both.

The Phillips curve views inflation and employment as incompatible. In other words, it suggests that governments must make a choice of either low inflation levels at the expense of high unemployment levels or an option of low unemployment at the cost of high inflation. This has been proved wrong by many studies carried out in Africa and developed countries. A study by Hanke (2008) showed that such a trade-off between inflation and wages did not exist in Zimbabwe. This was very pronounced between 2000 and 2008 when Zimbabwe suffered both very high unemployment and hyperinflation, simultaneously. Some of these weaknesses led to adjustments of the original Phillips curve, for example, the augmented Phillips Curve which incorporated household expectations. Lipsey (1960) also introduced his Lipsey Phillips Curve in order to cater for the weaknesses of the original Phillips curve.

Friedman (1960) also criticized the original Phillips Curve basing on NAIRU. The criticism has been further developed by economists in the United Kingdom and America. NAIRU is defined as the rate of unemployment when the rate of wage inflation is stable. The NAIRU assumes that

there is imperfect competition in the labour market while the Phillips Curve assumes perfect competition. This will see some workers have collective bargaining powers through membership of trade unions with employers.

NAIRU sees the equilibrium level of unemployment as the outcome of a bargaining process between firms and workers. In this model, workers have in their minds a target real wage. This target real wage is influenced by what is happening to unemployment. It is assumed that the lower the rate of unemployment, the higher workers' wage demand will be. Employees will seek to bargain their share of a rising level of profits when the economy is enjoying a cyclical upturn. According to Friedman, whether or not a business can meet the target real wage during pay negotiations depends partly on what is happening to labour productivity as well as the ability of the business to pay a markup on cost in product markets in which they operate. In highly competitive markets where there are many competing suppliers, one would expect lower markups (that is lower profit margins) because of competition in the market. In markets dominated by monopoly suppliers, the markup on costs is usually much higher and there is, potentially, an increased share of producer surpluses that workers might opt to bargain for.

If actual unemployment falls below the NAIRU, theory suggests that the balance of power in the labour market tends to switch to employees rather than employers. The consequence can be that the economy experiences acceleration in pay settlements and the growth of average earnings. Ceteris paribus, an increase in wage inflation will cause a rise in cost push theory (Friedman, 1960).

3.3 Empirical Literature

Studies which have been carried out on the relationship between wage growth and price inflation in Africa are sketchy. Elsewhere, researchers have extended enormous effort in attempts to investigate, empirically, the relationship between wages and inflation; with mixed results. Studies in developing and developed countries will be discussed under this section.

3.3.1 Literature from developed countries

Developed countries have contributed much more to the debate on causality between wage and price inflation than developing countries. Studies from these developing countries include those by Mehra (1991), Mehra (1993), Ghali (1999), Palley (1999), Darrat (2000), Datten (2003), Josson and Palmqvist (2004), Gordon (2005) and Zanetti (2005), among others.

An old, but quite interesting, study is that of Mehra (1991). Mehra employed the technique of cointegration and the error-correction model on the United States' quarterly data for the period 1959 : 1-1989 : 3. The model encompasses three basic variables, that is; prices (p), productivity-adjusted wages (w) and an output-gap (q). The methodology tested each of the three variables (in natural logarithms) for the presence of the unit roots. There was evidence of double unit roots in prices and wages, but a single unit root in output gap. After differencing these variables, Mehra then examined cointegration of the two variables having two unit roots. His results suggest that first-differences (but not levels) of prices and wages are cointegrated. He concluded that inflation and wage growth are cointegrated, implying that their long-run movements are correlated as the expectations augmented the Phillips curve view. Mehra argued that the inflation and wage growth long run correlation is primarily the outcome of the former as a cause of the latter. Following Granger (1986; 1988), the finding implies an error-correction model for inflation and wage growth and the presence of a Granger-causality between the two variables, at least in one direction.

Mehra's cointegration inferences may suffer from a serious omission-of-variable problem; potentially biasing his results. Important missing variables include interest rates, money supply and exchange rate. Their inclusion could have produced different results. Granger (1988) has shown that cointegration and Granger causality are closely related concepts. As such, cointegration tests may also be sensitive to the omission-of- variables phenomenon discussed by Lutkepohl (1982) for Granger causality tests. It is well-known that causality (and, by extension cointegration) inferences in a trivariate inflation model are not necessarily robust to the inclusion of other relevant macroeconomic variables that could influence inflation. Cointegration results reported by Miller (1991) indicate that the omission of important variables from a basic model significantly distorted his cointegration findings. However, the model adjusted wages for

productivity to avoid nonsensical results. The research remains credible because most of the techniques and necessary tests were included in the model. These include checking for unit roots, for all variables, testing for cointegration and finally running a VECM.

In a follow up study, Mehra (1993) found that the casual effects between wages and prices often depend on the sample length, the number of explanatory variables used (including the number of lags of each variable), and the proxies of prices used. Mehra (1993) examines a system of variables that includes inflation, the output gap, unit labour costs as a measure of wages, as well as dummy variables for wage and price controls and a measure of energy prices for the time period (1956: Q1 to 1992: Q4) for the United States using a VAR model preliminary tests such as the unit root, muticollinearity and the Johansen cointegration tests were carried out. Results of the study showed that wages granger-cause inflation only when one uses the CPI index to measure prices. Prices would granger-cause wages when GDP price deflector is used as a proxy for inflation. These results that prices are more likely to granger - cause wages than wages granger - cause prices, are consistent with earlier work by Mehra (1991), Gordon (1988) as well as Huh and Trehan (1995). This will bring much more confusion when analysing results because the choice of inflation and wage proxy as well as data point or sample period length prove to have much influence on the results.

Ghali (1999) re-explored the econometric issues in Mehra's (1993) paper using United States data and modifies the system of variables to include the relative price of imported goods, although he shortens the sample period to 1959 : Q1 to 1989 : Q 4 and only considers prices as measured by the GDP price deflator. Ghali (1999) used inflation (measured by GDP deflator), the output gap, unit labour costs as measure of wages, as well as dummy variables for wage and price controls. In contrast to the findings of Mehra (1993), Ghali (1999) reports that there is strong evidence that wages granger-cause prices, and advocates that the Federal Reserve should monitor unit labour costs as a predictor of future inflation. The differences in results between Ghali (1999) and Mehra (1993) hinged on the choice of variables and sample period. They both used the same methodology of the VAR model. However, although CPI is preferable to the GDP deflator, Ghali's (1999) bigger sample period of 30 years with four data points each year leading to a total of 120 data points makes his results more appealing. More data points will have an

advantage of compensating degrees of freedom lost due to the estimation of parameters which makes the results of Ghali (1999) more credible.

Palley (1999) empirically investigated whether wage inflation granger - causes price inflation between 1963 and 1997 causality using Canadian data. They employed a VAR to run a granger causality technique to establish the relationship. The following model of equation was employed. Data was also tested for stationarity using the Dickey Fuller tests.

$$Y_t = A_0 + B_{t-1} Y_{t-1} + C_{t-1} X_{t-1} + U_t \quad \text{.....3.13}$$

Where, Y and X represent price inflation and the lagged values of wage inflation respectively. Causality results between wage inflation and price inflation were complex. Over the full sample period there was strong evidence of bidirectional causality and this was in contrast to results obtained by Mehra (1993) and Ghali (1999) who obtained unidirectional causality. However, when the data was divided into sub samples, different results were obtained. There appeared to be no relationship between price and wage inflation during the early age, that is, between 1963 and 1973 for all measures of price inflation and at all lag lengths of inflation. Between 1973 and 1981 wage inflation seemed to granger - cause price inflation; however, this relationship was reversed between 1981 and 1990. In the most recent period, 1990 to 1997, there seemed to be no causality between wage inflation and price inflation. The sample period was long enough (1963-1997) to give credible results. Because of the contradicting results emerging due to changes in sample periods, it would make more sense to stick to the results for the whole 35 year period. These results contradict those of Mehra (1993) who also studied causality for the United States for almost the same period. Mehra (1993) concludes that there was causality from wages to inflation only if CPI changes were used as a proxy for inflation. Although Palley (1999) used CPI changes as a proxy for inflation his results, to some extent, contradicted those of Mehra (1993). This could be as a result of a slight difference in sample periods.

Darrat (2000) also tested, empirically, the direct impact of industrial wage on inflation, government budget deficit, unemployment, real output and money supply growth based on United Kingdom and United States data. The study differs from other past research in that it

tests, directly, the impact of wage and budget deficits on inflation rather than restricting the effect of these variables to induce monetary changes and is based on more than one country. The paper utilised quarterly data for the period covering 1960 to 1982 for both the United States and the United Kingdom.

The methodology employed Theil's residual-variance criterion in conjunction with multivariate granger causality tests to identify, simultaneously, the significant explanatory variables and their appropriate lag structures. Results of the tests seem to, in general, suggest a strong influence of industrial wages on inflation. In particular, from the UK data, wage growth and high budget deficits seem to have the greatest influence among the various potential determinants of inflation; money supply growth for the same country had no significant inflationary process in the United Kingdom. For the United States, empirical results showed that wage and money supply growth were the major drivers of inflation while budget deficits were an insignificant variable. Results, therefore, seem to suggest a strong influence of wage growth on inflation for both the United Kingdom and the United States.

The study by Darrat (2000) is credible because it took into account all the necessary and recent techniques for causality. These include the use of both the Phillips Peron and the Dickey Fuller tests statistics to check for the presence of unit roots, as well as the Johansen method for cointegration. Although the sample period was only 33 years it made use of quarterly data to cover a shorter sample period. The use of Theil's residual-variance criterion in conjunction with multivariate granger causality tests to identify, simultaneously, the significant explanatory variables and their appropriate lag structures made Darrat's (2000) methodology more appealing. Hess and Schweitzer (2000) empirically examined the direction of causality between price inflation and wage inflation. The study was based on the United States' quarterly data covering the period 1961:1 to 1999:4. The study employs the VAR in exploring its granger causality techniques and three different panels were regressed.

The study was very comprehensive in its use of model variables. The variables used include; price inflation, wage inflation, lagged inflation, lagged wage growth and lagged productivity. The first panel used a full sample, that is, from 1960 to 1999. This panel adopted compensation

based as opposed to conventional wage proxies. Results of this panel showed that there was no evidence to claim that wages granger cause price inflation, which is consistent with results obtained by Mehra (1991). Results suggested that prices were driven by their long run relationship with all other variables in the model.

The second panel also analyzed causality between price inflation and wage inflation except that unit labour costs were now used as a proxy for wages. Findings suggested that prices granger cause wages and not vice versa. The last panel in the study, panel C, replaced compensation with a more conventional form of wage. Findings from this panel were in tandem with the results obtained in panel A and B, that prices granger-cause wages and not vice versa.

This study was unique because it used various measures of wages; the use of measure that takes into account employment benefits, bonuses and salaries for those who are self employed. Although Hess and Schweitzer (2000) recognized output gap as a very important variable in influencing inflation, this variable was deliberately omitted because such measures are unreliable. Orphanides and Van Norden (1999) demonstrate that in some cases the revision in the output gap is as large as the total variability of the output gap hence it must not be included in the mode.

Gordon (2005) analyzed the role of wages, if any, on the inflation process. The study employed a price and wage equation in the analysis; both equations included not just lagged values of wages and prices but also the current value of wage and price changes. Regression results showed that labour share was statistically insignificant; hence, according to the study, wage behaviour was insignificant in explaining price inflation. Results also showed that price changes have no impact on prices, that is, price inflation and labour costs have lives of their own. The study did not take into account changes in productivity despite the fact that it is a very important factor as far as wage changes and inflation are concerned. An increase in wages may not be inflationary as long as such an increase is, at least, equal to productivity changes. To avoid such a misleading conclusion there was a need to use productivity adjusted wages. Gordon (2005) did not have enough data points recommended in research studies. Quantitative research must have enough data points (at least 25) to substantiate the analysis and give a credible policy prescription.

Hossain (2005) used annual data for the period 1954-2002 in the investigation of the causal relationship between money growth, inflation, currency devaluation and economic growth in Indonesia. Three hypotheses were investigated: (1) Does the money supply growth Granger-cause inflation? (2) Does currency devaluation Granger cause inflation? (3) Does inflation affect economic growth? The empirical results suggest that there exists a short-run bi-directional causality between money supply growth and inflation, and between currency devaluation and inflation. For the complete sample period, the causality running from inflation to narrow money supply growth was stronger than that from narrow money supply growth to inflation. The result was consistent with the view that, in a high-or hyperinflationary economy, inflation does have a feedback effect on money supply growth and thus generates a self-sustaining inflationary process. The short-run bi-directional causality between currency devaluation and inflation was, however, weak or less robust for the complete or any shorter sample period. With regard to the relationship between inflation and economic growth, the results suggest that there was no short-run causality from inflation to economic growth for the complete or any sub-sample period.

Datten (2003) criticizes the cost push theories of inflation. Political leaders blame random shocks and profiteering by firms and labour unions as the major cause of inflation. Random shocks, such as drought and increases in oil prices, are assumed not to be persistent and will thus change only the price level. The higher rate of price change due to random shock is not a continuing phenomenon, but simply a transitory deviation of the rate of inflation from its trend. Most governments who blame the cost push factors and not themselves, as causes of inflation, often place much of the blame on business and labour.

Economic theory argues that some firms with monopoly power continuously increase their prices to the detriment of consumers. A similar argument can also be made for powerful trade unions. Labour unions are assumed to, from time to time, advocate for higher than market determined wage rates. Employers will be forced to raise their prices as a result of the increase in wages since the wage bill constitutes a bigger percentage of companies' cost of production. Labour unions will also ask for further wage increases because they feel the price increase will erode their nominal wages. This scenario will continue and, as a result, there will be a wage price spiral. Such an explanation does not put the government in the picture as far as causes of

inflation are concerned. This is done to make the public believe that every one, excluding the government, is responsible for inflation and myriad of government agencies are formed to regulate prices in various markets, protecting some people from the presumed excess of others.

According to Datten, although the cost push argument presented above is appealing on the surface, neither economic theory nor empirical research indicates that business and labour can cause continually rising prices. Monopolists, for example, are blamed for causing inflation because they are assumed to increase prices randomly. Monopolists face a downward sloping demand curve which means that they can sell more only if they reduce their prices. By increasing the prices, monopolists will see their profits fall; a monopolist thus has no incentive to increase prices, and will just produce an output where the marginal revenue equals costs.

Monopolists obviously charge higher prices in comparison to perfect competition but this does not imply that prices are constantly rising. A more convincing argument has been levelled against markets moving from perfect competition to monopoly. This will see a persistent rise in prices as monopolies charge high prices in comparison to perfect competition. However, economic theory also says that as firms move from perfect competition to markets, where they acquire market power, in addition to price rise; output must fall. Datten (2003) reached such a conclusion after studying the inflation and output patterns of many countries including the United States, between 1965 and 1981.

The cost push argument was also viewed as less credible even when analyzed in the macro-economic framework. Assuming a certain industry in any economy succeeds in obtaining a wage increase for its workers, such wage increases will be a cost to firms and to recover this, business will have to pass on the burden to consumers by increasing the prices of their final products. Other things being equal, these higher prices cause the overall price level to rise. Individuals will demand more money balances because of the increase in prices. If the government does not increase the money supply individuals will not have additional money balances to hold. Therefore, to increase money balances, individuals must decrease spending which will reduce aggregate demand leading to a reduction in prices to their original level prior to the wage increase. However, wages will remain high in this instance without a corresponding increase in

prices. This explanation sounds convincing, but there was one assumption which might not be realistic. Datten assumed that, following an increase in wages in the economy, the government will respond by not increasing money supply and this will see households spend less which would, consequently, lead to falling prices. In most countries, governments are normally forced to increase money supply to match consumer purchase following wage increases. An increase in money supply by the government may disqualify Datten's analysis.

More often than not, businessmen claim to have raised their prices following an increase in the cost of production. Datten questioned the authenticity of this view. According to Datten (2003), retailers always hold some buffer stock with them because of fluctuation in demand of their goods and services; sales can be above or below normal in certain periods. An increase in demand will see retailers run down their stock and will not immediately raise the price because they will not be sure if the increase in demand will be permanent. If such a demand persists, retailers will increase purchases from their suppliers to maintain their stock at desired levels. The suppliers will also face an increase in demand and their stocks will be depleted very fast, thus motivating them to increase the rates at which they purchase from their suppliers.

The process will continue down to the suppliers of raw materials for the supply of goods and services. In the raw materials market, the amount available is insufficient to meet the increased amount demanded at the old price. The increase in demand for commodities will see all manufacturers demanding more raw materials which will, in turn, see raw materials (which are fixed in supply) increase in price so as to clear the market. Since the higher price for raw materials increase their cost of production, manufacturers will charge wholesalers a higher price for their product by citing increased raw materials costs as a reason and this will continue amongst retailers who will sell their goods at higher prices by citing rising costs as a reason. Datten pointed out that although it appears that the increase in costs of raw material have caused the increase in retail prices, the actual cause of higher prices is the initial increase in aggregate demand for the final good. The price increase is delayed until the impact of the increase reaches the raw material market by the existence of inventories at each level that are sufficient to buffer transitory, but not permanent changes in demand.

The explanation against cost push inflation, given by Datten, holds water. Datten was discrediting the cost push causes of inflation by using a demand pull argument. He argued that costs of production will only increase following an increase in demand. However, to some extent, I disagree with the analysis because it rules out, completely, the cost push causes of inflation. Costs of raw material have increased due to other factors besides increases in demand. For example: scarcity of resources, political factors, and imports from other countries has all caused prices to rise without a change in demand.

Josson and Palmqvist (2004) empirically investigated, for the United States, whether variations in wage mark up increases are inflationary using a two sector dynamic general equilibrium model. The model was calibrated for the US economy's annual data between 1960 and 2001, and it supports and tries to prove Hess and Schweitzer's (2000) notion that wage growth does not granger - cause price. Josson and Palmqvist (2004) made their study unique in that it analyses all economic agents in the study; that is, retailers, households, government and firms. The study analyses the objectives and constraints in relation to wage growth and inflation for each agent. In using the calibration model, the study identified sector one (1) as representing the goods, that is, durable and nondurable goods while sector two (2) was the service sector. The methodology utilized a VAR model which also included impulse response functions.

Two measures were used to measure inflation, the CPI and the optimal nominal price index (OPI), the latter is unique to this study only. To make sure the results were robust, the study carried out a sensitivity analysis on various adjustment costs and parameter values. The study analyzed results under two different conditions, a constant money supply which is an exogenous monetary policy and under the Taylor Rule, which is an endogenous monetary policy. Josson and Palmqvist (2004) empirically suggest that wage increases do not lead to price inflation. Their results show that a 10 percent increase in wage markup will, under Taylor's assumption of constant money supply rule, see prices increase only by about two percentage points. In the other case, where money supply is exogenous, a ten percent increase in wages would see zero percent increase in prices. This result supports Hess and Schweiter's (2000) proposition that wage growth has no effect on price inflation. Although these studies produced similar results, they used different methodologies; Josson and Palmqvist (2004) employed a two sector DGE model

while Hess and Schweiter (2000) employ the granger causality technique and three different panels were regressed.

Zanetti (2005) empirically investigated the direction of causality between wages and inflation in Switzerland between 1971:1 and 2004:4 using quarterly data. Wages were proxied by quarterly income which was calculated from annual labour income using the Chow and Lin procedure. Labour productivity was calculated by dividing GDP by worked hours. Narrow money (M1) was used as a measure for the output gap to measure the state of global demand. Changes in the producer price index and the consumer price index were used interchangeably as a measure of inflation.

The study employed the Augmented Dickey Fuller technique to check for the presence of unit roots. Both productivity adjusted wages and the CPI were not stationary in their levels and had to be differenced once for them to be stationary. The granger causality technique showed that causality works in both directions, that is, from wages to prices and vice versa. In particular, results showed that prices granger - cause wages while the influence of wages on prices was much more sensitive to the choice of sample period. In addition, wages were more useful in explaining inflation during inflationary periods; otherwise, the link was weak. Zanetti (2005) also regressed a separate Granger causality test within the framework of the Phillips curve making this study very unique. Results showed that prices had much power in influencing productivity adjusted wage changes via the error correction term.

The study is useful in that it uses the Granger causality in two different cases, the general one and in the Phillips curve framework. The 1971-2004 sample period was also divided into sub-samples just to make sure the results are consistent. Results are also more meaningful because the study makes use of productivity adjusted wages, and not nominal wages as in other studies. The use of nominal wages will always overstate causality especially in countries of high inflation. However, the study made use of annual data to calculate quarterly data; this will reduce the credibility of results obtained because these results are also dependent on the accuracy of the Chow and Lin procedure.

3.3.2 Literature from Developing Countries

There are very few studies that have been carried out on the causality between wage growth and price inflation in developing countries. These scholars include Aziz-Aziz *et al* (2006), Restrepo and Carlos (1999), Emery and Chang (1996), and Brauer (1997) among others.

Aziz-Aziz *et al* (2006) applied a Granger causality technique to examine whether rising labour costs influence consumer prices, or vice versa, in Egypt between 1990 and 2005. Of all the factors suggested by economic literature, to be related to inflation, the study only focused on wage growth. It aimed to choose between the cost push and demand pull theories of inflation on the Egyptian economy. The study employed the famous granger causality technique as a testing procedure. This implies that the information relevant to the prediction of wages and inflation was solely contained in the time series data on the two variables.

The granger causality test was purely based on two equations. One equation showed consumer inflation being explained by both its past values and wage changes. The second equation showed labour costs as a function of its previous values and consumer inflation. The data was tested for stationarity, using the Dickey-Fuller test, to check for the presence of unit roots. The Alkaike information criterion was used for choosing the maximum number of lags of wages and inflation. The data, for all variables, was sub-divided into private and public sectors as well as by industry such as the clothes, footwear, hotels and the restaurant industry. The results of the study showed that public sector wages are independent of consumer prices because these wages are not determined by market forces. However, for the private sector, wages had much influence on prices.

Although the study adopted recent techniques, the granger causality results cannot be heavily relied upon due to some anomalies in the study. An error correction model to capture and harness the short run and long run changes in wages and prices was ignored. Although Aziz-Aziz *et al* (2006) admitted that inflation is caused by a host of factors; the methodology ignored all these crucial variables. Wage and price inflation and their lags were the only variables that were incorporated into the model. The analysis also focused on the relationship between inflation and wage changes. Many economic relationships involve the simultaneous interaction of variables and this simultaneous casual dimension is not picked up at all. Economic theory also suggests

that if vital variables are excluded in the model, it may lead to biased or nonsensical results. Although, the Alkaike information criterion was used to determine lag length, the model used two different lag lengths (of 4 and 8) which had opposing results. However, despite these challenges and limitations the study was very useful especially considering the granger causality technique which was employed.

Restrepo and Carlos (1999) used price and wage equations to study wages and price inflation using Chile Quarterly data from 1986:1 to 2000:4. The 15 year period, with four data points in each year, was long enough to give significant results because, all in all, there were 60 data points. These price and wage equations were based on imperfect competition and used to generate and out-of-sample inflation forecast. Inflation, wages output gap and exchange rate were used as variables in this study.

The data was checked for the presence of unit roots before carrying out cointegration tests. Unit root tests showed that price and wages were integrated of order two. Most of the inflation and wage studies showed only one unit root which means that inflation and wage data had to be differenced twice for it to be stationary. The output gap and exchange rate were integrated of order one; they had to be differenced once for the data to be stationary. The study is unique in that it did not only use the ordinary causality method, it also estimated that the long run relationship together with the dynamic results of the study showed that wages was one of the factors influencing prices and inflation. Therefore, indexation was a very important issue as far as inflation targeting is concerned. Other variables were also found to have influenced inflation.

Productivity was found to reduce unit labour cost, thereby reducing prices which deemed it inversely related to inflation. The effect of the exchange rate on inflation was statistically significant but heavily dependent on economic activity and inflation. The output gap had an insignificant effect on inflation and this could be consistent with Hess and Schweitzer (2000) who completely ignored this variable in their regression estimations. Moreover, according to Orphanides and Van Norden (1999), output gap measures are unreliable. It was also discovered that inflation granger - causes wages. The study showed that inflation was imposing important costs on firms and workers. These results were consistent with those of Mehra (1991), in which inflation granger - caused wages.

Emery and Chang (1996) made use of unit labour cost in analyzing its relationship with consumer prices for Brazil between 1957 and 1993. The sample period of 37 years was long enough to give enough data points and make results from such a model credible. The study focused on the relationship between labour costs and inflation. The objectives of the study were to statistically determine whether labour costs granger - cause inflation and to examine how much forecasting power labour costs have on price inflation.

The use of unit labour costs as a wage proxy has received much support from labour economists. For example, Mehra (1991) and Aziz-Aziz *et al* (2006) also used unit labour costs as a proxy for wages. However, the unit labour costs used in this study were from the non agricultural sector of the economy. The study used two variables for price inflation, that is; the CPI and the CPIC[4]. The methodology of granger causality was adopted in this study. However, this study is unique because, before carrying out the Augmented Dickey Fuller test, the data was transformed by a filter designed by Baxter and King (1995). The Dickey Fuller test showed that the unit labour cost and both the CPI and CPIC were not stationary, they had double unit roots and had to be differenced twice before they became stationary. This means that at least one variable granger - causes another. The granger causality method used in the study had to incorporate an error correction model (ECM) because the variables were cointegrated.

Results showed that the causality between inflation and wages depends on the choice of price proxy. For CPIC, wages had an influence on prices while with the use of CPI; wages did not granger - cause price inflation. This result was in line with Mehra (1993) who claimed that results were, to some extent, determined by the choice of inflation and wage proxies. However, the results showed that wages were always granger - caused by price inflation irrespective of the price variable used. This study is similar to the one by Aziz-Aziz *et al* (2006) in that it concentrates on only two variables; the wage and price inflation variables. There is a risk of not including very significant variables in the model which will lead to nonsensical results. The causality between unit labour costs may be via another variable which is omitted in the model. The model must have all statistically significant variables for meaningful regression results.

[4] CPIC is the consumer price index, but it excludes all food and energy products.

Bawumia and Abradu-Otoo (2003) conducted a study on the relationship between Monetary Growth, Exchange Rates and Inflation in Ghana and their results confirmed the existence of a long-run equilibrium relationship between inflation, money supply, the exchange rate, and real income. In line with theory, the findings demonstrate that, in the long-run, inflation in Ghana is positively related to the money supply and the exchange rate, while it is negatively related to real income. The empirical deductions from the study also show that inflation adjusts to its equilibrium value fairly rapidly. In addition, the impact of the exchange rate on inflation is transmitted with a one month lag, while the effects of real income and money take place with a 2 and 4 month lag, respectively.

Brauer (1997) empirically investigated the effects of rising labour costs on higher inflation for Kenya between 1983 and 1997. The study broke its aggregated CPI down into its various components so as to isolate commodities whose prices are most likely to respond to changes in labour costs. The study is unique in that it goes beyond viewing CPI as just an inflation variable by going deeper and looking for categories of products whose prices are most likely to respond to changes in labour costs. Splitting the CPI showed that there are other factors, besides labour cost, that are likely to influence price changes. For example, the study shows that energy and food price, which is approximately 17% if Kenyan household expenditure was more significantly influenced by weather conditions political developments and other factors which are not related to labour costs.

The analysis also shows that governments, in most cases, play a vital role in setting prices. For example, the government sets prices in essential services such as healthcare and transport; in some cases the government will even provide the services themselves. Subsidies and taxes imposed by the government may see labour costs have a insignificant effect on prices. The presence of competition from other courtiers also makes labour cost a less significant variable. This effect was found to be high in industries that have high and rising import penetration because imports lead to low prices. This means that even if a firm is faced with rising labour costs it will not raise its price.

Firms have two options; either to boost productivity in order to maintain their profits or just suffer as rising labour costs reduce profits. Therefore, the study showed that for most goods in Kenya we would expect labour costs to have only a limited direct impact on prices. The study used quarterly data for inflation and wages and these were constructed by taking averages of the indexes for individual components, with the averages weighted by the relative importance of the components. Regression results showed that, in addition to labour costs' direct effect on inflation, labour costs have an indirect impact on overall inflation. The study also states that wage growth had a strong effect on prices in the services sector. This was because compensation growth is likely to show up directly as more rapid inflation in service price.

The results from this study must be treated with caution because it was silent about the methodology employed. For example, no tests were carried out to check for the presence of unit root, autocorrelation and heteroschedaticity. The study was more qualitative in its analysis, which is contrary to most of the studies which were highly quantitative in nature.

3.4 Conclusion

This chapter reviewed theoretical and empirical literature on the causality between inflation and wage growth. Theoretical theories include those that are cost and demand pull related and the empirical literature covers studies from developed and developing countries. These theories on inflation and wage showed that the wage determination theory is determined in the labour market while the inflation theory has a bias towards the goods market. However, the Phillips curve tries to combine wage inflation and price inflation.

Following this, Friedman (1968) emphasized the role of inflationary expectations in the wage determination theory. He assumed that employees who expect prices to increase would adjust wage changes upward. This adjustment will be proportional to the amount of expected inflation in order to achieve the desired change in real wage. From empirical literature, there has been evidence of causality between wage inflation and price inflation especially in developed countries. Literature in these previous studies was not very conclusive as to whether wage growth granger causes price inflation, or vice versa. However, there is empirical evidence for this from developing countries, especially Africa, but this is very scanty.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

The previous chapter provided a conceptual framework for the specification of the model to be presented in this chapter. Since models are simplifications of reality, modifications to the theoretical derivations of the previous chapter will be found necessary to capture the policy and institutional decision making processes specific to the Zimbabwean economy. This is necessary because the degree of applying economic theory in model building differs according to the intended use of the model and data availability amongst other factors.

The principal aim of this chapter is to explore and present the estimation procedures and techniques to be used in analysing the direction of causality between consumer price inflation and wage inflation between 1970 and 2008. However, it is important to note that due to data availability constraints actual econometric analysis were confined to the period 1975 to 2007. Diagnostic tests such as those for stationarity, cointegration and Granger Causality will be employed in the study. This chapter discusses model specification, estimation of the Vector Autoregressive (VAR) model, the correlation matrix, impulse response functions and variance decomposition functions.

4.2 Model Specification

A Vector Autoregressive model will be formulated in this study. The VAR model to be adopted will include the following variables: consumer inflation, nominal wage changes, money supply growth, exchange rate, productivity and interest rates. All these variables will enter the VAR model endogenously. In other words, the endogenous / exogenous variable distinction will not be of much importance. The use of the VAR model is to allow the incorporation of feedback in the system in which all the variables are allowed to affect each other and, hence, the interaction of significant variables will be captured. The VAR model will be based on theoretical underpinnings and will be developed from the following equations:

$$\pi_t = \beta_0 + \beta_{1i} \sum_{i=1}^{n} NW_{t-i} + \beta_{2i} \sum_{i=1}^{n} IR_{t-i} + \beta_{3i} \sum_{i=1}^{n} M_{3\,t-i} + \beta_{4i} \sum_{i=1}^{n} LP_{t-i} + \beta_{5i} \sum_{i=1}^{n} ER_{t-i} + \beta_{7i} \sum_{i=1}^{n} \pi_{t-i} + e_{1t} \quad \text{.....4.1}$$

$$NW_t = \phi_0 + \phi_{1i} \sum_{i=1}^{n} \pi_{t-i} + \phi_{2i} \sum_{i=1}^{n} IR_{t-i} + \phi_{3i} \sum_{i=1}^{n} M_{3\,t-i} + \phi_{4i} \sum_{i=1}^{n} LP_{t-i} + \phi_{5i} \sum_{i=1}^{n} ER_{t-i} + \phi_{7i} \sum_{i=1}^{n} NW_{t-i} + e_{2t} \quad \text{.....4.2}$$

Where π is consumer inflation, NW represents nominal wages, M_3 represents money supply, ER represents the exchange rate, IR represents interest rate, LP represents labour productivity, whilst the *e's* represent the stochastic error terms and β and ϕ are constants. 4.1 and 4.2 show that inflation and nominal wages are influenced by numerous variables; lags of these variables are equally crucial. In the model there are no exogenous variables, as all variables are exogenous.

Equation 4.1 can be seen as a price equation. It shows that inflation is influenced by past inflation values, wage growth, money supply, interest rate and exchange rate. Prices are marked over productivity-adjusted wage costs and are also influenced by cyclical demand shocks. This equation implies that wages determine the price level, given demand pressures.

Equation 4.2 is the wage equation. It shows that nominal wages are assumed not to be influenced solely by their past values but by other variables such as money supply, consumer inflation, interest rates, exchange rate and productivity.

The price and wage behavior described above suggests that long-run movement in wages and prices must be related. Furthermore, if one allows for short-run dynamics in such behavior, the analysis above would also suggest that past movements in wages and prices should help predict future changes in those same variables, *ceteris paribus*.

4.3 Description and Sources of Variables

This section discusses variables and proxies measurement to be used in the study. It will also justify the inclusion of some variables, their proxies and the choice of variable measurement.

Nominal Wages (NW)

Wage costs constitute a large component of the total production costs in Zimbabwe. As such, there is a strong presumption that an increase in nominal wages would have a significant bearing on the rate of inflation in the economy. The annual nominal wage rate will be employed in this study. It will be based on multiplying the average monthly income by 12 to get an annual nominal wage figure. In this study, we expect productivity adjusted nominal wages to positively influence inflation following the wage-cost push inflation theory. The natural logarithms of nominal wage will be used because of very high nominal wage figures caused by high inflation in Zimbabwe, especially towards the end of the sample period.

Inflation (π)

Inflation can generally be defined as a persistent increase in price level and will be used to measure the changes in consumer prices. In this study, it will be measured by changes in the consumer price index (CPI). CPI is a measure that examines the weighted average of prices of a basket of consumer goods and services, such as transportation, food and medical care. The CPI is calculated by taking price changes for each item in the predetermined basket of goods and averaging them. The goods are weighted according to their importance (King, 2002). The study will use the logarithm of inflation because of the generally high figures in Zimbabwe, especially towards the end of the sample period; 2007 and 2008.

Labour Productivity (LP)

Nominal wage growth may not be inflationary if followed by an equivalent increase in labour productivity. The trend rate of labour productivity growth is, however, a primary determinant of real wage growth. Over the long term, real wages have tended to increase at the rate of growth of labour productivity (Allen, 1986). This tendency is also evident during the Zimbabwean 1992 drought period when there was a sharp decline in labour productivity growth which was

accompanied by a decline in the growth rate of real income. Thus, in this study, labour productivity is proxied by changes in real income per capita growth. Real income per capita is measured by dividing the total personal income of a country by its population size. The formula below can be used;

PCI = I/P

Where PCI is Per Capita Income, I represent total personal income and P stands for total population (Mehra, 1990).

Money Supply (M_3)

In the literature review the monetarists defined inflation as a monetary phenomenon. Most African countries blame high budget deficits as the main cause of inflation. Monetarists argue that the increase in money supply stimulates demand which fuels inflation if the growth in real output is lower than the growth rate in money supply. When there is excess demand, producers respond by raising prices. Despite disagreeing with monetarist on the transmission mechanism, Keynesians also contend that an increase in money supply is inflationary through the interest rate effect. For instance, if money supply increases; interest falls, raising the demand for investment goods and this result in a rise in aggregate demand, exerting an upward pressure on prices at a given level of output. The failure to respond to the increase in aggregate demand due to supply constraints, for example, causes inflation. Thus, we expect a positive relationship between money supply and inflation. In this study, money supply will be approximated by broad money (M3) which estimates the entire supply of money within an economy.

Exchange Rate (ER)

A theoretical basis for linking inflation to exchange rates can be found in the theory of purchasing power parity. The purported inflationary effects of exchange rate depreciation are captured by the inclusion of the nominal exchange rate of the Zimbabwe dollar against the United States dollar. Essentially, this is because prices of the majority of commodities exchanged between Zimbabwe and its major trading partners are quoted in US dollar. The devaluation of the Zimbabwean dollar increases the costs of production by increasing the costs of procuring imported intermediate inputs and machinery.

Zimbabwe depends on imported capital equipment. Thus, the exchange rate variable is assumed to capture the component of imported inflation and we expect a negative relationship between the exchange rate movement and inflation. Exchange rate is defined as the number of Zimbabwean dollars per unit of the US$. The natural logarithm of the exchange rate will also be used to reduce the effect of dealing with big values caused by Zimbabwean hyperinflation during the last half of the sample period.

Interest Rate (IR)

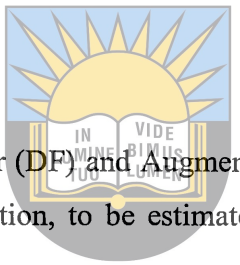
According to the "inflation and the Fisher effect", the nominal interest rate must be equal to the growth rate of money in nominal terms and the real interest rate must be equated to the growth rate of purchasing power. Inflation erodes the purchasing power of money and real interest as nominal interest adjusted for inflation. Based on Fisher's 1930 argument, the nominal interest rate ought to increase one for one with the increase in the expected rate of inflation. Therefore, it implies that a high nominal interest rate should be followed by high inflation and, consequently, one would expect a positive relationship between the two variables. This study will make use of the logarithm of the average money market interest rate in this study.

4.4 Stationarity Tests

Most of the variables in the model are time series variables. This raises the chances that such variables could be non stationary. In recognition of the fact that when a non-stationary variable is regressed on another non-stationary variable spurious relationships may result and, as a preliminary step prior to the estimation, unit root tests are conducted on the data so as to investigate the presence of unit roots in the data.

Stationarity is a situation where the mean and variance are constant over time. Also the covariance between two periods will depend solely on the lag length between the two time periods and not the time at which the covariance is calculated Gujarati (1995). If a series does not meet this definition of stationarity then that variable will be non stationary. A non stationary series will therefore be integrated of some order "d" i.e. I(d) provided the series can only be

stationary after differencing it "d" times. A stationary series is I (0) when it does not have to be differenced for it to be stationary, such a series will be stationary at its levels. Most economic series are non stationary, which means they have at least one unit root and have to be differenced to avoid spurious regression. Regression based on non stationary series will results in high R^2, low Durbin Watson values and in some cases statistically significant t-ratios where variables are highly uncorrelated. As a result, it is of paramount importance to tests all variables for stationarity before any meaningful estimation technique is employed. The Dickey Fuller (DF) and its advanced version, the Augmented Dickey Fuller (ADF) are the most commonly used tests to check for the presence of unit roots.



4.4.1 Dickey - Fuller Tests

This study will employ the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) to test for stationarity. The Dickey-Fuller specification, to be estimated and subsequently tested for unit root, is presented below:

$$\Delta Y_t = B_1 + B_2 t + (1-p)Y_{t-1} + u_t \quad \text{.....4.3}$$

Where Y is the variable under consideration and t is the trend variable, (1- p) and Δ are difference operators and in the case of non stationarity p will be equal to 1. B_1 and B_2 are drift and stochastic trend constants. U_t is the error term and it must comply with the normality assumption, constant error variance and uncorrelated errors i.e. U_t. The DF specification, above, assumes that there is a unit root (i.e. the series is non stationary) under the null hypothesis while the alternative hypothesis assumes the presence of stationarity.

One of the major drawbacks of the DF tests is that it does not correct for the error term (U_t) autocorrelation. However, the Augmented Dickey-Fuller (ADF) test corrects this autocorrelation problem by adding a lagged difference term to the DF equation above. This will result in an ADF which can formally be expressed as follows:

$$\Delta y_t = \mu + \gamma T + \beta y_{t-1} + \sum_{i=1}^{n} \vartheta \Delta y_{t-1} + \epsilon_t \quad \text{4.4}$$

Where y is the variable under consideration Δ represents the first difference operator, and T is the time trend. The null hypothesis is that $\beta = 0$, i.e., a unit root exists and its non-rejection means the time series contains a unit root and is therefore non-stationary (Gujarati, 1995). The alternative hypothesis assumes that the series is stationary, that is $\beta \prec 0$, and this entails the absence of a unit root. The decision to accept or to reject the null hypothesis in favour of the alternative is reached by comparing the ADF statistic against the critical Mackinnon values. If the calculated ADF statistic, in absolute terms, is less than the critical Mackinnon values (at 5% or 1%) then the null hypothesis of non stationarity (presence of a unit root) cannot be rejected in favour of the alternative hypothesis.

However, the ADF is not without its flows. Gujarati, (2003), argues that the ADF unit root is weak and this makes it fail to detect stationarity in some cases. It may also lead to a false decision if there is insufficient information to reject a wrong null hypothesis. In this study, the ADF is assumed to give correct rejection criterion because the sample size is big enough to give sufficient rejection information. If a series has a unit root, it has to be differenced till it is stationary.

4.5 Tests for Cointegration

Having checked the order of integration of the variables through carrying out unit root tests, it is also necessary to check for the possibility of cointegration amongst given non-stationary variables (Gujarati, 1995; Enders, 1995; Engle and Granger, 1987). Gujarati (1994) defined cointegration as a long term or equilibrium relationship between variables. The existence of such a long run relationship typically takes place because of the relations of the stochastic trends of the given variables (Enders, 1995). As such, the variables may deviate from each other in the short run but eventually show affinity in the long run.

Enders (1995) explained three important points with regard to the existence of cointegration:

a) Cointegration refers to a linear combination of non-stationary variables and the linear combination of the given non-stationary variables should necessarily be stationary.

b) For there to exist cointegration, all the variables in a given model should be integrated of the same order. However, it does not necessarily follow that all variables that are integrated of the same order are cointegrated.

c) If a given vector, say H_t has n variables, there can be at most $n - 1$ linearly independent cointegrating vectors and the number of cointegration vectors gives the cointegration rank.

Therefore, the fundamental aspect preceding the execution of any cointegration tests is that the variables should be integrated of the same order. A linear combination of variables that are individually integrated of the same order may also be integrated collectively of order zero or of the highest order of one other individual series. If the linear combination of the non stationary series is I(1) then the series are cointegrated. This means that although the series may seem to be drifting away from each other in a stochastic fashion there will be chances that such variables are cointegrated. If the variables are integrated of different orders, then there is no way they can be cointegrated.

Cointegration tests can be residual based such as the Engle-Granger approach or maximum likelihood based like the Johansen based method. Harris (1995) discredited the Engle Granger based cointegration methods because they are associated with may flows; they lack power in unit root and cointegration tests and most importantly they are unable to detect more than one cointegration relationship that may exist in a model hence such methods are highly likely to produce inconsistent results. It is against this background that this study will employ the Johansen based VAR to test for cointegration. In particular, the Johansen technique will be used to test the presence of cointegration between wage growth and consumer price inflation in Zimbabwe.

If variables are cointegrated error-correction models (ECMs) or the Vector Error Correction Models (VECMs) will be employed to check for the direction of causality. The VECM will be introduced as a way of recovering long run information lost through differencing; it also brings the long run and short run dynamics together.

4.6 The Johansen's Methodology

Assuming Z_t is a vector of endogenous variables, such that, $Z_t = [\text{inf}, wage, ms, \text{int}, e.rate]$ and this can be presented in a VAR form as follows:

$$Z_t = x + \sum_{i=1}^{p} \Pi_t Z_{t-t} + \mu_t \quad \text{.....4.5}$$

Where

X is an n x 1 vector, Π is an n x n is vector of coefficient and μ is a vector of error terms. The Johansen test requires that 4.5 be transformed to 4.6; a VECM below.

$$\Delta Z_t = x + \sum_{i=1}^{p-1} Bi\Delta Z_{i-t} + \Pi Z_{t-1} + \mu_t \quad \text{.....4.6}$$

Where Δ is a difference operator, Z_t is a vector of variables which are integrated of order one, B_i is an n x n coefficient matrix. The Π matrix is an n x n matrix which contains information regarding the long run relationships. The rank of matrix Π (r) determines the number of cointegration relationships. The rank of matrix Π can assume three sets of values i.e.;

a) Full rank (r = n). This implies that all variables under study are stationary in their levels.
b) Zero rank (r = 0). This implies that there is no long term relationship between the variables in question.
c) Reduced rank (r $\prec$ n) this implies there exists $n\,x\,r$ matrices such that
   $\Pi = \alpha\ \beta'$. Where α represents matrix adjustment speed and is a matrix of long run coefficients.

The Johansen approach prescribes some stages that have to be followed in pursuit of the rank of matrix Π. They involve testing the order of series in the model. The next step will be that of ascertaining the appropriate order of the VAR model. Since the Johansen approach can be affected by VECM lag length it is crucial that it be set optimally. This means that the lag length

should produce long run relations that conform to economic theory. In addition to what economic theory says, Brooks (2002) advocates for the multivariate versions of information criteria such as the Alkaike Information Criterion (AIC) and the Schwartz information criterion (SC). The next aspect relates to the choice of deterministic assumption for cointegration. This involves choices of whether to assume deterministic trends in the data and whether to include the trend in the VAR. Analysis of data and graphical illustration, economic theory and unit root tests would be used in determining the deterministic trend assumption to be used in the Johansen tests for cointegration.

After determining the order *k* and the deterministic trend assumption, the next step will be that of testing the rank of the Π matrix. The Johansen approach makes use of two likelihood ratio test statistics for cointegration. These are the maximum eigenvalue and the trace statistics and can formally be expressed as follows:

$$\lambda_{trace}\ (r) = -T \sum_{i=r+1}^{N} \ln(1-\hat{\lambda}_i) \quad \text{.....4.7}$$

and

$$\lambda_{\max}\ (r, r+1) = -T\ lin(1-)\hat{\lambda}_{r+1} \quad \text{.....4.8}$$

Where T is the sample size, while $\hat{\lambda}i$ is the *i* th canonical correlation while *r* is the number of cointegrating vectors. The trace statistic tests the assumption in the null hypothesis which assumes *r* cointegrating vectors. The alternative hypothesis assumes that the number of cointegrating relations is equal to the number of exogenous variables *k*. On the other hand, the maximum eigenvalue assumes *r* cointegrating vectors under the null hypothesis against *r+1* assumed under the alternative hypothesis. The calculated trace and maximum eigenvalue values will be compared against their respective critical values. If the calculated values are greater than the critical values then there will be enough evidence to reject the null in favor of the alternative hypothesis.

4.7 Diagnostic Tests

These checks are necessary conditions because they validate parameter estimation outcomes of the estimated model. Model properties such as autocorrelation, heteroskedasticity and normality tests will be applied in the study.

Normality Test

A normality test will be carried out using the Jarque-Bera normality test. The test compares the third and fourth central moments of the residuals to those from the normal distribution. The Jarque-Bera test assumes, under the null hypothesis, that residuals are normally distributed. A statistically significant calculated Jarque-Bera value shows that the residuals of the VECM are not normally distributed. The normality assumption is a necessity, though not a sufficient condition for classical OLS to have valid t- and F- values. However, the absence of non normality does not always mean that error correction models and cointegration tests are invalid.

Ramsey Reset Tests

These are crucial stability tests. Its null hypothesis assumes that the error correction model is correctly specified. A test's statistic checks the presence of misspecification of the model.

Autocorrelation Tests

The Breusch Godfrey (BG) will be used to check for the presence of residuals' serial correlation. The BG test is run under the null hypothesis of no autocorrelation among residuals. The absence of autocorrelation among residuals may also show that no important variable(s) was/were excluded in the VECM and that the correct functional form for the model was used. Autocorrelation is when a relation between observations of a series are ordered in time. It arises in cases where the data has a time dimension and where two or more consecutive error terms are related. In this case, the error term is subject to autocorrelation or serial correlation. According to Gujarati (2003: 454), although OLS estimation will be unbiased, its coefficients will be inefficient.

White Heteroskedasticity Tests

Heteroskedasticity arises if different error terms do not have identical variances, so that the diagonal elements of the covariance matrix are not identical. The error terms are mutually uncorrelated while the variance of μ_i may vary over the observations. The consequences of using the usual testing procedures despite the heteroskedasticity is that the conclusions we draw, or the inferences we make, may be very misleading (Gujarati, 2003:399). In this study we employ the White test. The general white test of heteroskedasticity does not rely on the normality assumption and is easy to implement (Gujarati, 2003:413). The basis of this test is to check whether there is any systematic relation between the squared residuals and the explanatory variables (Mukherjee *at al.*1998:261). It tests the null hypothesis that there is no heteroskedasticity in which the test statistic should not be significant in the absence of heteroskedacity and misspecification.

4.8 The Granger - Causality Model

The causality between wage inflation and consumer inflation is the main argument of this research. The study will adopt the concepts of causality as propounded by Granger (1969). Assuming that there are two variables, X and Y, Granger (1969) explained various definitions in the concept of causality. The definitions incorporated in this study apply to time series only. For non-stationary series, they can then be generalised to incorporate the concept of time series varying moments. Granger (1969) also explained causality as the case where Y is causing X, denoted as $Y_t \Rightarrow X_t$. This is the instance where the use of the information set containing Y_t yields results that lead to a better explanation of X_t than if Y_t is excluded. Granger (1969) also explained the concept of feedback, denoted as $Y_t \Leftrightarrow X_t$ which arises when the two variables cause each other and the inclusion of each of the variables in the prediction of the other variable yields better results; and the concept of instantaneous causality denoted as $Y_t \Rightarrow X_t$. When the inclusion of the present value of Y_t leads to the better yielding results from X_t than if Y_t had not been incorporated in the estimation.

4.9 Variance Decomposition and Impulse Response Functions

The Variance Decomposition and Impulse Response functions will also be employed in the study. These analyse and reveal whether changes in one variable will have either a negative or

positive effect on other variables in the system of equations. They also explain how long it would take for the influences of one variable to be felt by other variables in the model. These are used to capture the sensitivity of the long run response of price inflation and wage changes to price inflation and wage inflation and their lags.

The variance decomposition function is important in that it explains the extent to which fluctuations in consumer inflation can be explained by its own variance and the extent to which it can also be explained by the variance of other variables. Variance decomposition analysis is useful in clarifying the percentage of variance of the forecasted variables which can be attributed to its own variance and that of other macroeconomic variables. In other words it gives linkages between variables in the model and it measures the percentage of forecast error variance in a variable that is explained by innovations in itself and the other endogenous variables. Variance decomposition also gives the proportion of the movement in a variable that is caused by their own shocks against that of other endogenous variables. The impulse response analysis in this study will be based on the Cholesky orthogonalisation approach. There is much preference to this approach, especially in recent studies, because the technique incorporates small sample degrees of freedom adjustment when estimating the residual covariance matrix used to derive the Cholesky factor.

These impulse analysis models are very important in the sense that they enable us to analyse the macroeconomic fundamentals of Zimbabwean price inflation and wage changes using all macroeconomic variables used in the Granger Causality tests. Such models trace the responsiveness of variables in the VAR to shocks to each of the other variables in the model. In our context, the impulse response analysis gives the sign, magnitude and persistence of real and nominal shocks to both consumer and wage inflation. The impulse response analysis assumes that a shock to one of the variables in the VAR model will at most affect all other endogenous variables in the system because of the dynamic structure of the VAR. If the system is stable and sound, the application of impulse response analysis is applied on the VECM shocks will die away gradually. Although there are several ways to tests for impulse response analysis, this study will use Cholesky orthogonalisation.

4.10 Data Types and Sources

The sample will span the period 1975 to 2007. This period is long enough to give enough data points for a meaningful conclusion about causality between the two variables. Data used in the study will primarily be obtained from the following publications; Quarterly Digest Statistics (1975-2003), Central Statistical Office, Reserve Bank Monthly Bulletins, Reserve Bank Quarterly Economic and Statistical Review, Ministry of Labour Yearly publications and the International Labour Organisation (ILO) publication. The period 1975-2007 was selected because it is all encompassing, in that it incorporates the period before independence as well as the period after independence, the ESAP period and the most recent period (2000–2007) of economic meltdown. A 38 year sample will provide an unbiased relationship between consumer price inflation and wage growth.

4.11 Conclusion

This chapter outlined, in detail, the techniques to be carried out in this study when testing the causality between consumer price inflation and wage growth. The chapter highlighted how cointegration and Granger Causality tests would be conducted to ascertain the nature of the relationship between wages and inflation. The derived inflation and wage growth models would give the exact nature of the relationship between wages and inflation by way of directions of feedback from the variables. The succeeding chapter provides an interpretation of the results which involves the use of estimation Eviews Version 3.1 software.

CHAPTER FIVE

ESTIMATION AND RESULTS PRESENTATION

5.1 Introduction

The previous chapter presented the analytical framework of the study. The methodology as well as diagnostic techniques employed in this study were also discussed. The main thrust of this chapter is to present the empirical findings of the study. In addition, economic interpretations of results will also be presented. Stationarity / unit root, correlation and cointegration tests using the Johansen procedure will also be carried out. An error correction model and some granger-causality tests between inflation and wages will be carried out. Finally, results of the model will be presented. A summary of the economic interpretations will round up the analysis found in this chapter.

5.2 Descriptive Statistics.

This section gives a summary of data to be used in the study. The study uses 38 observations for all variables as shown in Table 5.1. This Table shows a summary of statistics of all variables in the model giving, specifically their maximum (MAX), minimum (MIN), average (MEAN), standard deviation (SD), skewness (SK) and kurtosis (KUR). Variables in the correlation matrix are defined as follows:

ER - Exchange Rate,

PRO - Productivity,

PI - Price inflation,

INT - Interest rate,

MS - Money Supply and

WI - Wage Inflation

Table 5.1: Descriptive statistics of all variables

	ER	PRO	PI	INT	MS	WI
MAX	367991.4	1086.000	108844.1	23.00000	66701.00	12823.70
MIN	0.000200	54.6160	2.090000	-58.7000	5.800000	19.40000
MEAN	9694.631	661.5071	2955.907	.221579	1851.482	1267.019
SD	59694.35	259.0066	17643.20	14.84473	10806.88	2404.634
KUR	36.02696	2.93553	36.01390	8.780444	35.99273	16.10006
SK	5.9183	-0.8647	5.91666	-2.16939	5.91393	3.5362
No.	38	38	38	38	38	38

Table 5.1 shows that the average inflation between 1975 and 2007 is 2955.91% with a minimum value of 2.09% in the early 1980s and a maximum of 108844.1% in 2007. Such figures show that Zimbabwean inflation was very high, especially towards the end of the study period. Although there was creeping inflation at the beginning of the period, it turned to hyper inflationary levels towards the end of the period. During the period, the average wage rate was $1267.02, reaching a minimum of $19.00 and a maximum of $12823.70 per month. Table 5.1 also shows that the most volatile variables were the exchange rate and price inflation as shown by their high standard deviations of 59694.35 and 17643.20 respectively. The least volatile variable was the interest rate as witnessed by a standard deviation of 14.84. Only productivity and interest rates were negatively skewed, otherwise Table 5.1 shows that the rest of the variables were positively skewed.

5.3 Multicollinearity Test

Multicollinearity is a situation where at least two of the explanatory variables are either positively or inversely correlated. Hsiao (1996) defined it as a situation where there exists a perfect or exact linear relationship among some, or all, explanatory variables. The existence of multicollinearity will pose problems for econometric research because it makes it difficult to separate the effect of one variable on the dependent variable from the other. Table 5.2 shows the results of pairwise multicollinearity test.

Table 5.2: Pairwise Correlation matrix table of explanatory variables

	ER	PR	PI	INT	MS	WI
ER	1.0000					
PR	-0.1340	1.0000				
PI	0.2873	-0.2025	1.0000			
INT	-0.1340	-0.1092	-0.1312	1.0000		
MS	0.1208	-0.0571	0.2990	-0.1306	1.0000	
WI	-0.0824	0.281679	-0.0829	0.1722	-0.0831	1.0000

Visual inspection of the correlation matrix shows that there seems to be no problem of multicollinearity. This is because there is no correlation coefficient which is statistically significant as all coefficients are below 0.3. The highest correlation coefficient is between price inflation and money supply which is 0.2990. This is in line with economic theory and this shows that, in Zimbabwe, there are other factors that contribute to inflation besides money supply

growth. The correlation coefficient between price inflation and the exchange rate is positive. This shows that there are fluctuations in the exchange rate that have an influence on the Zimbabwean inflation. However, because of low correlation coefficients, it means there is no risk of multicollinearity.

5.4 Stationary Tests

Recent developments in econometrics have shown that there are problems associated with time series data analysis due to non stationarity (see Adam, 1992; and Granger *et al.*, 1987). Before estimating any econometric model involving time series, it is important to establish whether or not the data is stationary. If the data is non stationary, then all convectional techniques of estimation become invalid because estimates which are obtained would be spurious[5]. Statistical tests done on such estimates will be poor and inappropriate, as noted by Gujarati (1995), while forecasting based on such data will be dubious. Since this study uses time series data we are going to test for stationarity for all variables.

Table 5.3 presents the results of stationarity of all the variables in levels; before differencing them. The null hypothesis for this test is that variables are non stationary and must be differenced till they are stationary. Table 5.3, below, shows stationarity test results for all the variables to be used in the analysis.

[5] Spurious regression is generally characterised by high R^2, statistically significant coefficients and low Durbin Watson statistic.

Table 5.3; Stationarity Test in Levels

Variable	t – ADF	t-lag[6]	Conclusion
ER	33.79328**	0	Stationary
PRO	0.403112	1	Non stationary
PI	0.187196	1	Non stationary
RI	-2.683309	1	Non Stationary
MS	-3.394275*	0	Stationary
WI	-2.64118	1	Non stationary

**, * Stationary at 1% and 5% level of significance

Critical Values: 1% = 3.6228 and 5% = 2.9446; Constant and trend included.

The Augmented Dickey Fuller test above was applied with the option of a constant and trend. The null hypothesis under the ADF test means the series does have a unit root and the series is non stationary. Absolute values of the calculated ADF statistic t- ADF in table 5.1 will be used against the critical values of 3.6228 and 2.9446 at 1% and 5% significance level respectively). We thus do not reject the null that productivity (PRO), price inflation (PI), real interest rate (RI) and wage inflation are non stationary. This is because the calculated ADF values are less that their critical values at 5% level of significance. However, for exchange rate (ER) and money supply (MS) the null hypothesis of non stationarity will be rejected in favour of the alternative hypothesis. These two variables are stationary in levels since the calculated ADF statistic is

[6] t-lags shown, indicates the lag level which has the highest ADF calculated and thus the highest level of significance for each variable.

above the critical values at 5% level of significance. Figure 5.1 below shows an informal stationarity test that uses graphs.

Figure 5.1; Graphical Unit Root Tests; levels.

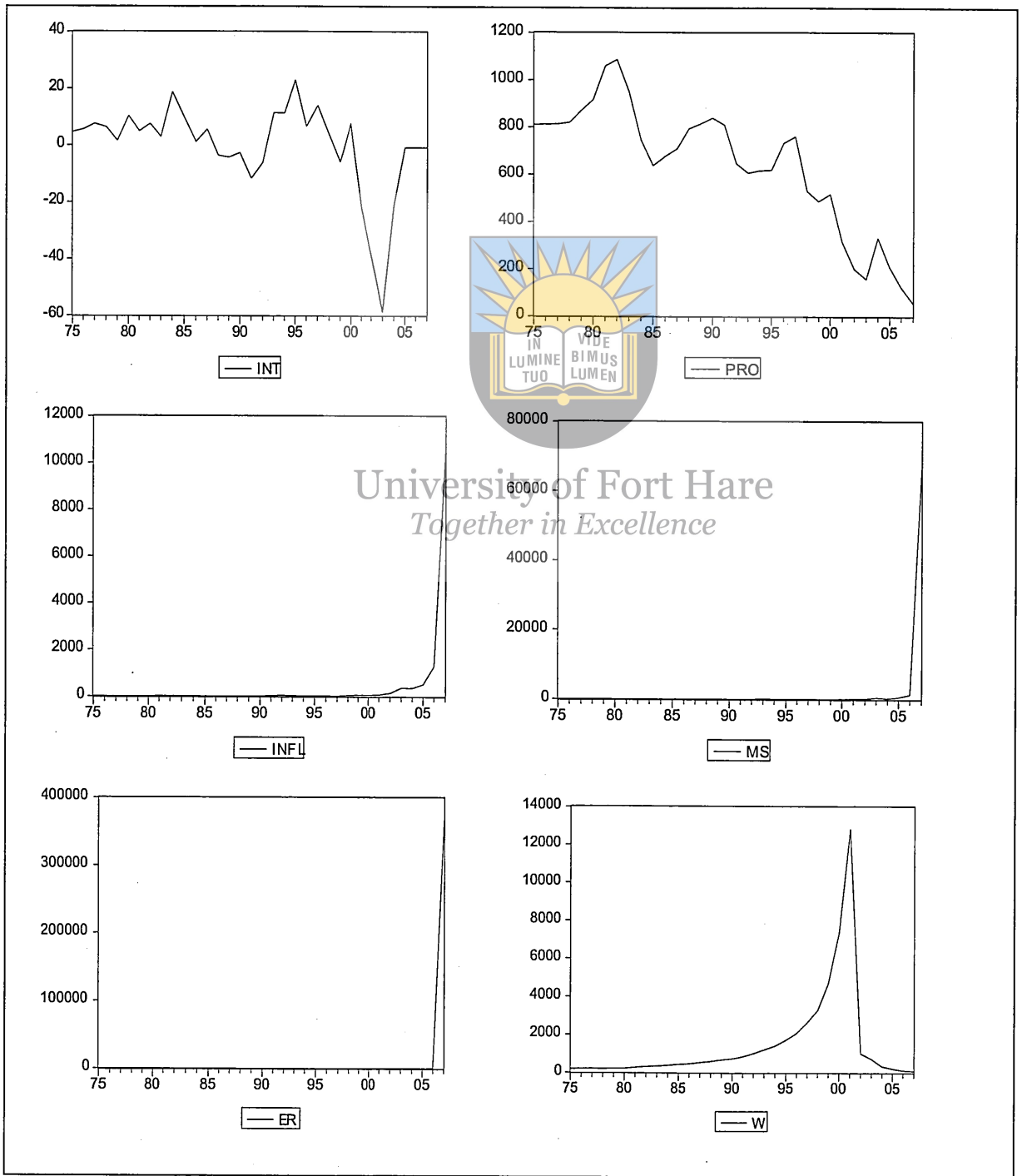


Figure 5.1 supports the ADF results in Table 5.3. The visual plot of time series data in figure 5.1 is crucial as it may show the presence of structural breaks or data capturing errors. Graphs show that interest rate, productivity price inflation and wage inflation are non stationary in levels. The conclusion of non stationarity is arrived at after observing that none of the graphs fluctuate around a zero mean, an indication of stationarity. However, money supply and exchange rate show some element of stationarity especially between 1975 and just before 2000. Fluctuations for these two variables are around a zero mean. Therefore, money supply and exchange are integrated of order zero.

5.4.1 Stationarity Tests in First Difference

The Augmented Dickey-Fuller tests are once again conducted on the first differences of variables which were non-stationary in levels. These variables are price inflation, productivity, wage inflation and real interest rate. Stationarity results for differenced variables are presented in Table 5.4.

Table 5.4: Stationarity Test for Differenced Variables

Variable	t-ADF	t-lag	Conclusion
D (PRO)	-4.664776**	0	Stationary
D(W)	2.954949*	0	Stationary
D(PI)	5.843535**	0	Stationary
D(RI)	-4.316230**	0	Stationary

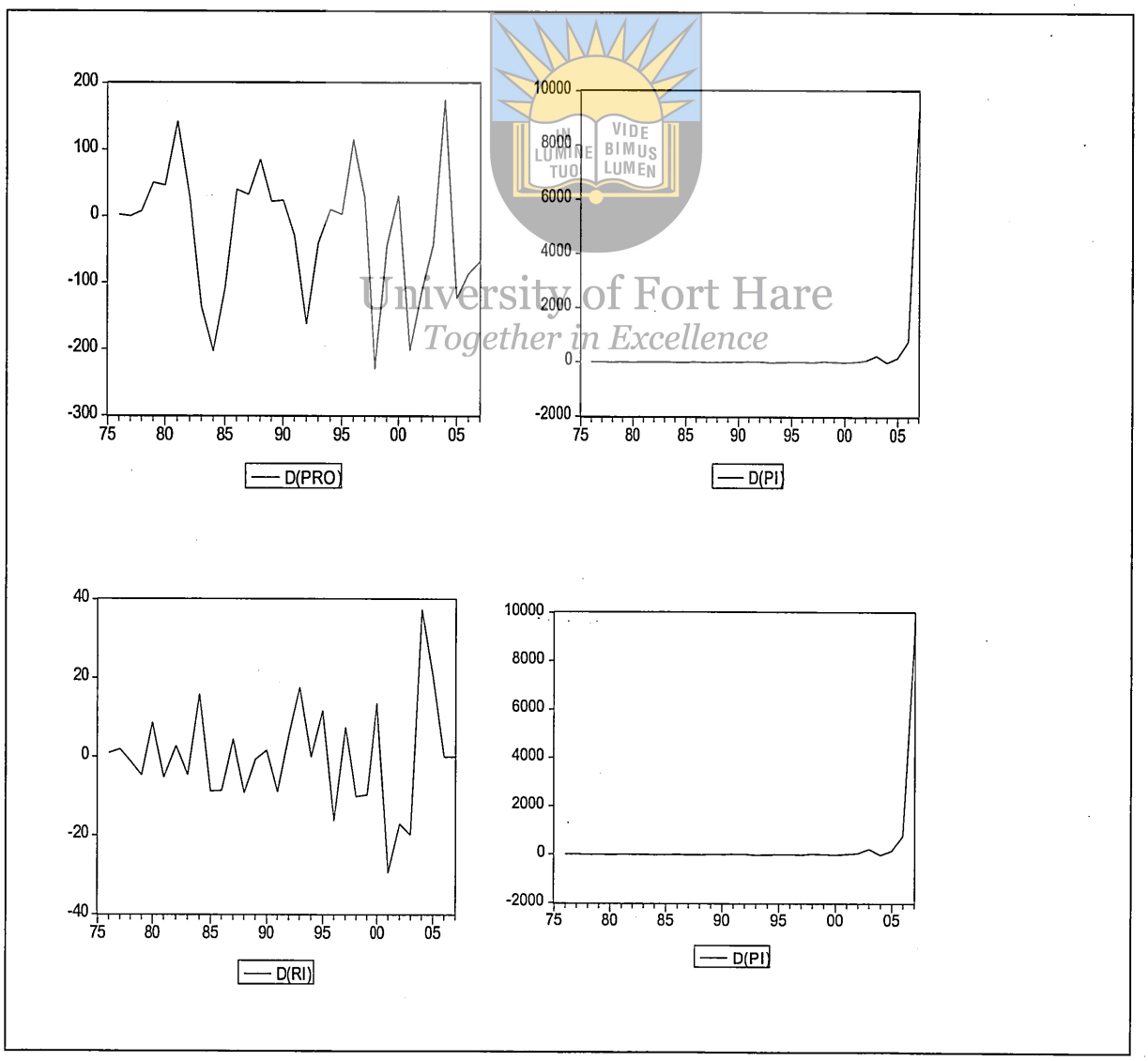
Critical Values: 1% = 3.6228 and 5% = 2.9446; Constant and trend included

**,* Stationary 1% and 5%

D for each variable means the variable is differenced once.

The decision criterion for stationarity in levels will be applied. All variables in Table 5.4 are now stationary after differencing them once, hence, they are integrated of order one i.e. I (1). Figure 5.2 augments the ADF stationarity tests in Table 5.4. The graphs below also show that all variables become stationary with the first difference. This is shown by the fluctuations of the series around a zero; this indicates that the data is now stationary. A visual inspection technique is very subjective and this explains why it cannot be relied on; it has to be supplemented by a formal test such as the ADF test in this case.

Figure 5.2; Graphical Unit Root Tests; first difference



It can be concluded that since price inflation and wage inflation are integrated of the same order there is a possibility that these variables are cointegrated. The next step makes use of the Johansen procedure to carry out cointegration tests.

5.5 COINTEGRATION

The analysis will be implemented using the Johansen procedure to establish whether a long run equilibrium relationship between price inflation and wage inflation exists. To implement the Johansen procedure, the order of integration must be determined among the variables and an optimal lag length must be chosen. Testing for cointegration between price inflation and wages inflation has always proved to be difficult for many researchers because too many cointegrating vectors may emerge.

To run a Johansen test, we must specify the lag length and the deterministic assumption for the VAR. As a follow up to the stationarity test, the Johansen tests will exclude the trend but will include a constant. As stated in the methodology, the optimal lag length will be chosen by both the Alkaike information criterion (AIC), the Schwarz Information Criterion (SIC) and the Hannan – Quinn Information Criterion (HQIC) together with theoretical *apriori*. Table 5.5 will be used to determine lag length and, since the data used in the study is annually, a maximum lag length from which the selection will be based is 4.

Table 5. 5; Lag order selection criteria

Lag	AIC	SIC	HQIC
0	-0.880	-0.7809	-0.767
1	-7.999	-0.77887	-9.9989
2	-7.777	-9.8798	-7.9890
3	-7.668*	-5.8788*	-5.7788
4	-10.77	-5.7708	-4.8789*

Where * indicates lag order selection.

The Alkaike Information Criterion and Schwarz Information Criterion suggest a lag length of 3 while the Hannan - Quinn information criterion suggests 4. The cointegration test will therefore be carried out under the assumption of no trend but a constant in the series and 4 lags for the VAR. Table 5.6 shows Johansen results based on the maximum Eigen value statistics.

Table 5.6 Johansen unrestricted Cointegration rank test (maximum Eigen value)

Eigen value	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.999788	463.6560	94.15	103.18	None **
0.980558	201.4311	68.52	76.07	At most 1 **
0.826152	79.28198	47.21	54.46	At most 2 **
0.421562	25.04512	29.68	35.65	At most 3
0.195105	8.074960	15.41	20.04	At most 4
0.042509	1.346615	3.76	6.65	At most 5

*(**) denotes rejection of the hypothesis at 5% (1%) significance level.

Maximum eigen value test indicates 3 cointegrating equation(s) at 5% significance level. The Johansen maximum eigen-value test assumes no cointegrating vectors under the null hypothesis. This assumption is rejected because the maximum eigen-value test statistic of 463.65 is greater than the critical value of 94.15 at the 5% level of significance. Using the same argument, the null hypothesis of (at most) 1 and 2 cointegrating vectors will also be rejected because their test statistics are greater than their critical values. The explored cointegration showed that the null hypothesis of three cointegration vectors cannot be rejected. The Johansen test has therefore

confirmed that r = 3 and according to theory the presence of cointegration is enough reason for estimating an error correction model.

5.6 Error Correction Model (ECM)

The error correction model to be estimated in this study will be based on cointegrating relationships and the number of lags obtained in the previous section. Granger representation theorem states that if a set of variables is cointegrated, then there exists an error correction model. The ECM will be used to capture short run dynamics of the system and to distinguish between the short run and the long run relationships between variables. The lagged residual of the ECM represents the speed of adjustment parameter. The absolute value of this term is normally 0 and -1 for the system to be stable. According to Islam (1999), the sign of the error correction term indicates the direction of adjustment, that is; whether there is divergence of convergence. The size of the parameter denotes the speed at which the variables adjust in the short run to their short run path.

5.7 Presentation and Estimation of Results

Before interpreting the results from the ECM, the true cointegrating relationships need to be identified. The table below shows the results of unrestricted ECMs.

Table 5.7; Error Correction Model Results

Variables	Coefficient	T-values
Constant	-88.69764	-9.692**
D(PI(-1))	0.517683	4.043**
D(WI(-1))	0.009479	5.042**
D(INT)	-0.890738	-2.888*
ER	-0.120811	-19.136**
MS	0.811391	22.6233**
D(PRO)	-0.051973	1.24931
EC_{t-1}	-0.694837	-8.0758**

Adjusted R^2 = 0.69887
F statistic = 39.577
Standard error of regression = 0.02189
Where * and ** indicates significance level at 1% and 5% respectively.

5.8 Analysis of Results

Results in Table 5.7 show the estimated inflation-wage model using the error correction model. The model has an adjusted R^2 of 66.88%. This means 66.88 % of variation in inflation is explained by the variables in the model. However, this leaves 33.21% of variability in inflation to be explained by outside factors. An F-value of 39.57 is statistically significant and this suggests that the model is a robust one. Before interpreting these results, some diagnostic tests need to be carried out on the model.

5.8.1 Diagnostic Checks

In this study, diagnostic checks were carried out to test for the properties and nature of the model; such tests will include residual autocorrelation, heteroskedasticity and normality. The table below summarizes results of these tests:

Table 5.8; Diagnostic Tests

Diagnostic Tests	Null hypothesis (H_0)	Test statistic	P-Value
J-Bera	Residuals are normally distributed	JB = 0.122	0.834
White	There is no conditional heteroskedasticity	0.068702	0.933757
Breush Godfrey	No second order autocorrelation	2.23	0.4877
Ramsey Reset	No misspecification	0.63738	0.430934

Jarque-Bera Normality Test

A normality test was carried out using the Jarque-Bera normality test. The test compares the third and fourth central moments of the residuals to those from the normal distribution. The Jarque-Bera normality test assumes, under the null hypothesis, that residuals are normally distributed. Results show a Jarque-Bera value of 0.122 and probability value of 0.834 and this shows that the residuals of the ECM are normally distributed. The normality assumption is a necessary condition for classical OLS to have valid t- and F- values. The null hypothesis of normal distribution will therefore not be rejected.

Autocorrelation Test

The Breusch Godfrey probability value of 0.4877 shows that there is not enough evidence to reject the null hypothesis of no autocorrelation. This shows that no important variable was excluded in the VECM and that the correct functional form for the model was used. Autocorrelation is defined as the relation between observations of a series ordered in time. It arises in cases where the data has a time dimension and where two or more consecutive error terms are related. In this case, the error term is subject to autocorrelation or serial correlation.

According to Gujarati (2003: 454), although OLS estimation will unbiased, its coefficients will be inefficient.

White Tests

The white tests checks for heteroskedasticity. The problem of heteroskedasticity arises if different error terms do not have identical variances, so that the diagonal elements of the covariance matrix are not identical. The null hypothesis under the White test assumes that there is no heteroskedasticity. A test statistic of 0.068 and a probability value of 0.9338 show that there is no sufficient evidence to reject the null hypothesis. The error terms are mutually uncorrelated while the variance of residuals may vary across observations. The consequence of using the usual testing procedures, despite strong evidence of heteroskedasticity, is that inferences may be very misleading.

Ramsey Reset Tests

This is a crucial stability test. Its null hypothesis assumes that the error correction model is correctly specified. A test statistic of 0.431 shows that the null hypothesis of no misspecification cannot be rejected in favor of the alternative hypothesis, hence the ECM is correctly specified.

5.8.2 Discussion of Results

Having passed the model adequacy and stability tests and other diagnostic tests, we now turn to the discussion of variables in the ECM whose coefficients are presented in Table 5.7.

Inflation

The previous year's inflation values have an influence on the current rate of inflation. The VECM shows that the one year inflation lag is statistically significant as shown by a t-value of 4.04. The coefficient is positive and is consistent with economic theory. The coefficient shows that a 1 percent increase in inflation will see future inflation rise by slightly more than 51% in the following year. This result is in line with empirical studies done by other economists such as Palley (1999); he investigated whether wage inflation granger-causes price inflation between 1963 and 1997 using Canadian data. Results showed that past values of inflation had a strong

influence in on current inflation values. However, this result contradicts Hess and Schweitzer's (2000) findings. Their study includes lagged values of inflation as an explanatory variable. Inflation lags were found to be statistically insignificant in influencing either current or future inflation levels.

Wages

The regression equation shows that wages are statistically significant in influencing inflation in Zimbabwe. The variable is significant at 5 % level as shown by a t-value of 5.04. The sign of the wage variable is positive and this is in line with economic theory which predicts a positive correlation between inflation and wage growth. The wage coefficient shows that a 1% increase in wages will result in a 0.94 % increase in price inflation. This is supported by Gordon (2005) who analyzed the role of wages in the inflation process. Gordon (2005) showed that lagged values of wages had a strong influence on inflation. These results are also in line with Emery and Chang (1996) who showed that wages always granger-cause price inflation irrespective of the price variable used. This result contrasts with that of Josson and Palmqvist (2004) who concluded that wage lags and current values were statistically insignificant in explaining price inflation.

Productivity

Although productivity has the right sign, as predicted by economic theory, a t-value of 1.2 makes it statistically insignificant at 5% level. This means productivity cannot be used as a variable to explain inflation in Zimbabwe. This result is in line with Mehra (1991) who discovered that productivity had little effect on price inflation in the United States. However, this result is in contrast with many studies, both in developing and developed countries, where productivity has been found to have a strong negative influence on price inflation.

Real Exchange Rate

Real exchange rate has the predicted negative sign and is statistically significant at both 1 and 5% level of significance as shown by a t-value of 19.33. The relationship between price inflation and real exchange rate is negative thereby confirming the economic theory. An increase in the exchange rate means that local currency is losing its value in relation to foreign currency. Results show that a 1% increase in the real exchange rate will see a 12 % decrease in inflation.

Interest Rate

The interest rate coefficient has a t value of -2.88 and is thus statistically significant. The interest rate coefficient shows that a 1% increase in interest rate will lead to a decrease in inflation by 89%. This contrasts with economic theory which suggests a positive relationship between interest rate and inflation. The inflation and the Fisher effect postulate that inflation erodes the purchasing power of money and real interest as nominal interest is adjusted for inflation. Based on Fisher's 1930 argument, the nominal interest rate ought to increase one for one with the increase in the expected rate of inflation. Therefore, it is implied that a high interest rate should be followed by high inflation and we thus expect a positive relationship between the two variables.

Money Supply

Money supply growth was statistically significant in influencing inflation as shown by a t-value of 22.6. The coefficient of 0.81 is positive which is consistent within economic theory. The coefficient implies that a 1% increase in money supply growth in the economy will lead to, approximately, an 81% increase in price inflation.

Error Correction Term (EC_{t-1})

The error correction term is negative and less than one as expected. A t-value of 8.07 shows that the error term is statistically significant at both 1% and 5% level. The error correction term coefficient is important because it shows the speed of adjustment to which variables adjust in the short run to its long run equilibrium, within a year. The coefficient shows that 69% of deviations in the long run will be eliminated in a year's time; this implies a faster and bigger adjustment to equilibrium.

5.9 Granger Causality Tests

The granger causality model will be used to test the direction of causality between wage inflation and price inflation. This test requires that variables must be stationary however, in our case, both wage and price inflation are integrated of the same order. Therefore, granger causality will be based on differenced wage and price inflation. This will, however, throw away very significant information about the causal relationship between inflation and wage growth. The granger

causality will be carried out in the context of the error correction model presented in Table 5.7. Granger-causality results are presented in Table 5.9.

Table 5.9; Granger Causality Tests

Null hypothesis (H_o)	**Observation**	**F-Statistics**	**Probability**
Wages does not granger cause inflation	31	12.445	0.0023
Inflation does not granger cause wages	31	7.2333	0.01227

The granger causality null hypothesis assumes that there is no causality between inflation and wage growth in Zimbabwe. The null hypothesis that wage growth does not granger-cause inflation with a p value of 0.0023 is rejected at the 5% level of significance. This rejection is in favor of the alternative hypothesis which implies wage inflation granger-causes price inflation. The granger causality test is done in the framework of the error correction model above. In addition, the null hypothesis that inflation does not granger-cause wages with a p value of 0.0123 is rejected at 5% level of significance. The rejection is in favor of the alternative hypothesis which implies that price inflation granger causes wage inflation.

Results from the granger-causality tests show that;

(i) Wage inflation granger causes price inflation and
(ii) Price inflation granger causes wage inflation.

These results imply that there is bidirectional causality between price inflation and wage growth in Zimbabwe. Most of the empirical studies show unidirectional causality. For example, results by Mehra (1991) show that price inflation granger causes wage inflation and not vice versa. This result was also obtained by Restrepo and Carlos (1999) and Zanetti (2005) using Chilean data.

However, some results showed that wage inflation granger-causes price inflation. Palley (1999) used a subsample, between 1973 and 1981, and results seem to show that wage inflation granger-causes price inflation.

5.10 Conclusion

This chapter gave an analytical framework of the relationship between wage inflation and price inflation. The augmented Dickey Fuller tests showed that only exchange rate and money supply were stationary in levels while the rest of the variables were integrated of order one. This called for the Johansen procedure to test for cointegration, and results showed the presence of at least 3 cointegrating equations. Evidence from cointegration advocated for the use of ECM. Diagnostic tests showed the normality and stability of the model. The ECM showed that wages have a strong influence on price inflation in Zimbabwe. Finally, the granger causality tests showed the presence of bidirectional causality between inflation and wage growth in Zimbabwe.

CHAPTER SIX

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Conclusion

This study has empirically addressed the controversy of whether wage growth granger caused the inflationary process in Zimbabwe. The main objective of the study was to establish the causal relationship between wage inflation and price inflation using time series data. The study hypothesized bidirectional causality, i.e. (i) wage growth granger causes price inflation and (ii) price inflation granger-causes wage inflation. The study begins by giving an overview of the Zimbabwean wage inflation and price inflation between 1970 and 2008. This background was subdivided into three sections, that is, the pre independence era, post independence era and the post ESAP era.

The literature review discussed inflation and wage growth theories. Particular attention was given to causes and the main force behind wage and price inflation. Cost push and demand pull theories of inflation, as well as the effect of labour unions on wage inflation, were also discussed. Wage determination was discussed under both perfect and imperfect market structures and under a powerful workers' union. Finally, the famous Phillips Curve which brings wage growth and price inflation together was also discussed.

In addition to empirical theories, many studies revealed that there are a number of variables that must be included in studying granger-causality between inflation and wage growth. Such literature was from both developed and developing countries. Factors such as productivity adjusted wages, inflation, interest rate, exchange rate, output gap, money supply growth were used as variables. Lags and dummies were included in some of the studies as explanatory variables. Granger causality results varied from one study to another. Some studies revealed unidirectional causality i.e. either (i) wages granger-cause price inflation or price inflation granger-causes wage growth. However, for some studies, there was bidirectional causality

between wage growth and price inflation. Very few studies seemed to show the existence of bidirectional causality.

Since time series data was used, it was a necessary condition to subject all series' to stationarity tests. The empirical model employed in the study used measures of the following variables: annual interest rate, money supply, interest rate, productivity exchange rate and wages. ADF and graphical stationarity tests showed that exchange rate and money supply were the only two variables which were stationary in levels. Otherwise, productivity price inflation, wage inflation, real interest rate and productivity were integrated of order one. To determine both the long and short run properties of the model, the Johansen procedure and error correction methods were performed. The Johansen procedure was chosen because of its advantages over other techniques. Cointegration tests provided evidence that there is a long run relationship between price inflation and wage changes in Zimbabwe.

Evidence of cointegration allowed the estimation of VECMs. The error correction parameter in VECM is also important. It measures the speed of adjustment to which variables adjust in the short run deviation to go back to its long run equilibrium path within a year. The model converges quickly to equilibrium, with over 69.48% of the discrepancy corrected in each period. This means that any disequilibrium between wage changes and price inflation will be fully adjusted in a one year period. Results from the error correction model also show that money supply, one year wage lags and one year inflation lags had a positive influence on inflation while exchange rate and interest rate had a negative influence on inflation. Productivity was insignificant. The estimated model was robust and passed the relevant diagnostic tests. Parts of these results conform to studies done in both developed and developing countries.

Thereafter, a granger-causality model between price and wage inflation was performed. The null hypothesis that wage inflation does not granger cause price inflation was rejected. This indicates that there is evidence to suggest that wage growth causes price inflation. The reverse null hypothesis that price inflation does not granger cause wage inflation was also rejected. These results lead to the conclusion that price inflation granger causes wage growth. This implies that

an increase in price inflation will also lead to wage inflation. Results showed that there is bidirectional causality between wage inflation and price inflation in Zimbabwe.

6.2 Policy Recommendations

The error correction model has established that there is a long run relationship between inflation and wage growth. Results from granger causality tests have revealed that there is bidirectional causality between wage inflation and price inflation. Past price inflation and wage values, interest rate money supply growth and exchange rate have been found to positively influence price inflation in Zimbabwe. These, combined with the results of the study, have a number of policy implications. The study suggests the following policy prescriptions for the Zimbabwean economy:

- Wage growth was found to be cointegrated with price inflation. The error correction model has also shown that wage lags have a positive influence on price inflation. The granger-causality tests seem to suggest that wage growth granger causes price inflation. This shows that wages are significant in helping to predict future inflation over the full sample period in Zimbabwe. It can therefore be concluded that cost push inflation exists in Zimbabwe. Given this positive relationship between price inflation and wage inflation, an optimal policy to fight inflation cannot, therefore, be fully effective without putting some emphasis on labour market activities. The study, therefore, recommends policies that reduce wage growth as a way to combat inflation. The government may achieve this by encouraging wage increases that are commensurate with productivity changes. Powerful trade and workers' unions must not always call for unjustified wage increases just for the sake of gaining popularity if inflation is to be maintained at low levels.

- Granger causality results also showed that price inflation granger-causes wage inflation. This seems to suggest the existence of a wage-price spiral in Zimbabwe. High inflation levels will see firms bidding against each other for labour, and workers through their workers' unions feel more confident in pressing wage claims if the inflationary pressure is too high; inflation starts spiraling upwards. Higher wages lead to higher prices and this will see workers demand an even higher wage and the process continues leading to

hyperinflationary environments. The government must, therefore, monitor price increases in all sectors of the economy to avoid a wage-price spiral. Government policy must be holistic; it must target both price and wage inflation.

- The effect of the interest rate on inflation was found to be statistically significant. The interest rate coefficient shows that 1% increase will reduce inflation by 89%; this shows that inflation is significantly interest rate elastic. Raising interest rates in Zimbabwe could be seen as an effective way of reducing inflation. However, this contrasts with economic theory which suggests a positive relationship between interest rate and inflation.

- Reducing money supply growth could also be seen as an effective and direct way of combating inflation. The coefficient of money supply was positive and statistically significant, and is consistent within economic theory. The money supply coefficient shows that price inflation is responsive to money supply growth.

6.3 Limitations of the Study

This study has achieved its objective of analyzing the causality between wage growth and price inflation. However, it has left some important gaps. Some important data for the research was unavailable. For example, productivity adjusted wages could not be obtained hence the study had to use wage growth and productivity as separate variables. Due to the unavailability of some data, some proxies that were used pose the risk of failure to reveal the actual impact that it would have had the correct variable proxies been used. The use of such proxies may lead to inconsistent results. The sample period for this study covered the hyperinflationary period (2002-2007), which suggests that most of the data obtained for this period may be inaccurate. This is evidenced by discrepancies in data from different sources during that inflationary period. The secondary data used in this study is obtained from diversified sources such as the International Monetary Fund (IMF), Central Statistical Office (CSO) and the World Bank (WB). Therefore, absolute reliability of the data may not be guaranteed. These problems are minor and may not significantly affect the findings of this study.

6.4 Areas for Further Research

Although the study examined the relationship between price inflation and wage inflation in Zimbabwe, more convincing results would have been obtained if a cross continental study of African countries could have been done. Results from such studies are more convincing than those from a single country.

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APPENDICES

Appendix 1: Data variables used

YEAR	PRO	EX	INFL	W	INT	M2
1975	810.5	0.0002	8.83	198	4.7	18
1976	812.7	0.0003	10.21	200	5.7	14.4
1977	812.8	0.0003	10.32	200.9	7.6	19.4
1978	820.44	0.0003	8.25	198	6.37	16.6
1979	870.65	0.0003	12.54	205.9	1.67	20.1
1980	917	0.0004	7.32	210	10.3	36.1
1981	1059	0.0004	13.80	260	4.98	13.4
1982	1086	0.0004	14.67	300	7.7	7.8
1983	949	0.0005	19.65	341	3	21.6
1984	746	0.0005	14.31	382.2	18.8	8.9
1985	637	0.006	11.40	435.4	10	16.3
1986	677	0.007	13.47	471.2	1.3	10.4
1987	709	0.007	9.94	527.9	5.7	11.8
1988	794	0.008	7.16	590.3	-3.5	28.5
1989	816	0.009	11.64	665.5	-4.2	19.5
1990	840	0.01	15.47	725.81	-2.6	27.6
1991	810.187	0.012	28.47	844.09	-11.6	23
1992	647.838	0.015	41.62	1008.23	-6.1	5.8
1993	607.85	0.018	28.15	1200.27	11.5	94.9
1994	617.881	0.021	22.24	1391.87	11.4	18.2
1995	620.515	0.023	22.52	1702.54	23	52.3
1996	735.461	0.029	21.62	2056.69	6.7	23.1
1997	762.558	0.035	20.06	2619.76	14.1	53.6
1998	532.692	0.048	46.66	3276.84	3.9	23.5
1999	488.015	0.075	56.90	4700.35	-5.8	34.7
2000	518.553	0.125	55.22	7351.14	7.7	53.4
2001	316.494	0.246	73.39	12823.7	-21.8	142.8
2002	201.128	0.605	133.22	1000.54	-38.9	170
2003	158.059	2.149	365.05	725.81	-58.7	485
2004	332.788	10.08	349.99	341	-21.3	228.6
2005	209.56	33.068	512.00	210	-0.7	552.6
2006	122.526	357.966	1281.11	109.67	-0.7	1323.3
2007	54.616	367991.4	10452.56	78.9	-0.7	66701