

Inflationary trends and control in Ghana

List of tables	
List of figures	
Acknowledgements	
Introduction	
Historical trends	
The pre-1983 era	
The post-1983 era	
Literature survey	
Economic analysis	
The model	
Empirical results	
Explanation of sources of inflationary pressures	
Demand (monetary) pressures	
Capital inflows (the 'NFA factor')	
Revaluation losses	
Government budget (the 'fiscal factor')	
Cocoa financing	
Financial system deficiencies	
Supply pressures	
Expectations	
Conclusion	
Notes	
Appendix	
References	

Nii K. Sowa

University of Ghana, Legon

and

John K. Kwakye

Bank of Ghana

AERC Research Paper 22

African Economic Research Consortium, Nairobi

September 1993

© African Economic Research Consortium, 1993

Edited and typeset by Centre for the Study of African Economies,
University of Oxford,
St Cross Building, Manor Road,
Oxford, OX1 3UL,
England.

for the African Economic Research Consortium,
P.O. Box 62882, Nairobi, Kenya.

Printed by Zakuna Printers Ltd.
P.O. Box 45804,
Nairobi, Kenya.

British Library Cataloguing-in-Publication Data.

A catalogue record for this book is available from the British Library.

ISBN 1-897621-16-7

Contents

List of tables	1
List of figures	2
List of variables and their descriptions	3
Acknowledgements	4
I Introduction	1
II Historical trends	4
The pre-1983 era	4
The post-1983 ERP era	7
III Literature survey	9
IV Econometric analysis	11
The model	11
Empirical results	12
V Explanation of sources of inflationary pressures	15
Demand (monetary) pressures	15
Capital inflows (the 'NFA factor')	15
Revaluation losses	16
Government budget (the 'fiscal factor')	18
Cocoa financing	19
Financial system deficiencies	20
Supply pressures	20
Food prices	21
Expectations	23
VI Conclusion	25
Notes	26
Appendices	27
References	31

List of tables

Table 1	Some economic indicators	2
Table 2	Ordinary least squares estimation	13
Table 3	Net external inflows, 1983-89	16
Table 4	Revaluation losses, 1983-90	17
Table 5	Government budget, 1985-90	18
Table 6	Production indices	21
Table 7	Relative prices of food: Ghana 1977-87	22

List of figures

Figure 1	Inflation and money growth	4
Figure 2	Inflation and output growth	12

List of variables and their descriptions

DUM:	Dummy variable (= 0, before 1983; = 1, after 1983)
Y:	Real GDP
M:	Money supply (M2)
P:	Consumer price index
IR:	Interest rate
BM:	Parallel exchange rate
ER:	Official exchange rate
Y1:	$\log(y)$
M1:	$\log(m)$
P1:	$\log(p)$
I1:	$\log(ir)$
B1:	$\log(bm)$
E1:	$\log(er)$
B2:	$dum*b1$
E2:	$dum*e1$
C1:	Intercept term

Acknowledgements

The authors wish to thank participants at the AERC Workshop in Nairobi in May 1991 for useful comments. The final version has benefitted from suggestions by Tony Killick, Clark Leith, William Steel and Ajay Chhibber. Financial support by AERC is gratefully acknowledged.

1967-71 with inflation below 10% per annum. Since 1972, however, inflation levels have remained generally high, ranging between 10% (1972) and 123% (1983), (see Table 1). The high rates of inflation have undermined the otherwise impressive macro performance since the introduction of the Economic Recovery Programme (ERP).

There is a general consensus that the pre-1983 inflation may be largely attributed to excessive demand pressure fuelled by monetary growth attendant upon fiscal deficit financing.¹ Price stabilization policies under the adjustment programme have, therefore, mostly involved policies directed at curbing increases in money supply. These have included the imposition of a 'credit squeeze' on the banking system and the elimination of fiscal deficits. In spite of these policies, inflation rates have continued to be above targets set within the programme, at 25% or more since 1986, although well below the rates during the decade 1973-83. Chhibber and Shaik (1990) conclude that monetary factors still dominate Ghanaian inflationary pressures.

The primary motivation for this study is to identify the sources of inflationary pressures in Ghana and to suggest ways to mitigate such pressures. Even though our interest is in explaining post-1983 inflation, the analysis extends to the pre-ERP period in order to allow useful comparisons.

The paper continues in Section II with an historical overview of inflation in Ghana. A review of the literature on inflation is in Section III. The formulation and estimation of an inflationary model is in Section IV. An explanation of the inflationary process, based on both the econometric estimation and actual occurrences, is provided in Section V. We conclude with suggestions for the control of inflation.

I Introduction

Inflation is one of the intractable problems the Ghanaian economy has faced for a very long time. Having registered low rates of inflation in the years immediately after independence, the country had its first taste of double-digit inflation in 1964. This was followed by a brief period of respite during 1967-71 with inflation below 10% per annum. Since 1972, however, inflation levels have remained generally high, ranging between 10% (1972) and 123% (1983), (see Table 1). The high rates of inflation have undermined the otherwise impressive macro performance since the introduction of the Economic Recovery Programme (ERP).

There is a general consensus that the pre-1983 inflation may be largely attributed to excessive demand pressure fuelled by monetary growth attendant upon fiscal deficit financing.¹ Price stabilization policies under the adjustment programme have, therefore, mostly involved policies directed at curtailing increases in money supply. These have included the imposition of a 'credit squeeze' on the banking system and the elimination of fiscal deficits. In spite of these policies, inflation rates have continued to be above targets set within the programme, at 25% or more since 1986, although well below the rates during the decade 1973-83. Chhibber and Shafik (1990) conclude that monetary factors still dominate Ghanaian inflationary pressures.

The primary motivation for this study is to identify the sources of inflationary pressures in Ghana and to suggest ways to mitigate such pressures. Even though our interest is in explaining post-1983 inflation, the analysis extends to the pre-ERP period in order to allow useful comparisons.

The paper continues in Section II with an historical overview of inflation in Ghana. A review of the literature on inflation is in Section III. The formulation and estimation of an inflationary model is in Section IV. An explanation of the inflationary process, based on both the econometric estimation and actual occurrences, is provided in Section V. We conclude with suggestions for the control of inflation.

Table 1 Some economic indicators (rates of change, %)

Year	Growth in real GDP	Growth in money (M2)	Interest rate	Exchange rate	Inflation rate	Food inflation
	Y	M	R	E	Pi	
1960	2.30	11.4	4.0	0.71	0.9	-2.30
1961	6.17	8.8	4.5	0.71	6.2	17.96
1962	4.83	14.9	4.5	0.71	5.9	2.34
1963	3.47	7.5	4.5	0.71	5.6	16.55
1964	2.15	37.2	4.5	0.71	15.8	12.33
1965	1.37	1.7	4.5	0.71	22.7	37.39
1966	0.09	5.0	7.0	0.71	14.8	17.56
1967	-3.00	1.3	6.0	0.84	-9.7	-14.94
1968	6.42	10.3	5.5	1.02	10.7	9.27
1969	5.88	10.5	5.5	1.02	6.5	8.04
1970	6.76	9.8	5.5	1.02	3.0	4.55
1971	5.56	11.2	8.0	1.03	8.8	11.86
1972	-2.49	40.6	8.0	1.32	10.8	10.95
1973	15.25	18.9	6.0	1.16	17.1	20.70
1974	3.39	26.6	6.0	1.15	18.8	16.36
1975	-12.86	38.0	8.0	1.15	29.8	31.52
1976	-3.52	37.2	8.0	1.15	55.4	66.55
1977	2.26	60.0	8.0	1.15	116.5	150.10
1978	8.48	68.6	13.5	1.51	73.1	57.57
1979	-3.17	15.8	13.5	2.75	54.5	66.06

Table 1 cont ...

Year	Growth in real GDP		Growth in money (M2)		Interest rate		Exchange rate		Inflation rate		Food inflation	
	Y		M		R		E		Pf			
1980	0.00		33.7		13.5		2.75		50.2		58.18	
1981	-1.79		51.5		19.5		2.75		116.5		108.00	
1982	-7.20		23.3		10.5		2.75		22.3		35.11	
1983	0.70		40.3		14.5		3.45		122.8		140.83	
1984	2.64		53.6		18.0		35.34		39.7		10.96	
1985	5.09		46.2		18.5		54.05		10.3		-9.51	
1986	5.20		47.9		20.5		89.29		24.6		20.31	
1987	4.79		53.3		23.5		147.06		39.8		36.93	
1988	6.23		46.3		26.0		200.00		31.4		33.00	
1989	5.10		54.7		26.0		270.27		25.2		25.08	

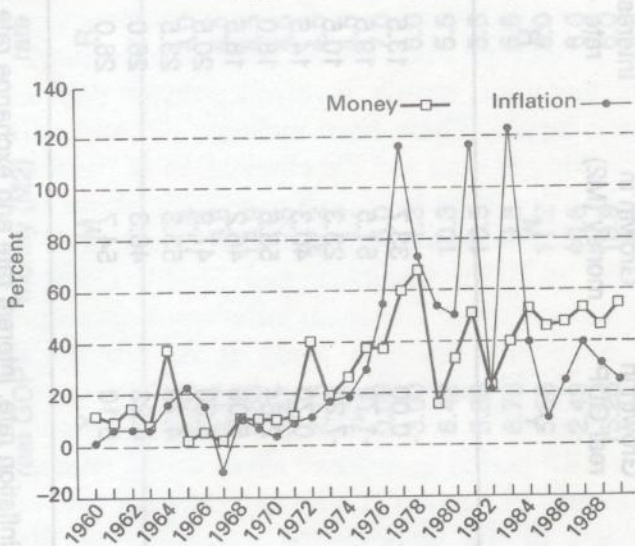
Note: inflation rate, interest rate and exchange rate are annual averages.

Source: computed from data from IMF, *International Financial Statistics, Yearbook, 1990*, World Bank, *World Tables*, Ghana Statistical Service, *Quarterly Digest of Statistics*.

II Historical trends

Figure 1 illustrates the inflationary trend in Ghana since independence. The period before 1973, on average, registered lower rates than the following period. Nevertheless, it is more appropriate to divide the analysis into two — pre- and post-ERP periods. This way, we shall be able to work out how policies within the ERP have acted on the inflationary trend. In the pre-ERP period, the analysis will also be sub-divided into regimes in order to clarify the effects of each regime's policies.

Figure 1 Inflation and money growth



The pre-1983 era

When Ghana became independent in 1957, the need to increase the level of economic development became pressing. To this end, a rather ambitious industrialization programme was adopted. Many import-substitution industries

were set up, relying heavily on imported raw materials and other inputs. They were owned and managed by the State, and over-protected through a highly cascaded tariff structure (high on output, low on inputs), tax rebates, low interest charges and government subsidies. In general, these industries performed poorly, due, in part, to inefficient management and to increasing difficulty over the years in supplying their input requirements in the face of foreign exchange scarcities. Other investments were concentrated on social overhead capital schemes — mainly infrastructural and social facilities — with long gestation periods and minimal contribution to economic growth in the short to medium term.

Thus, the rapid pace of investment activity that characterized the period from independence until 1965 showed more in demand pressure than in expansion of output. This exerted a strong upward pressure on prices. Until 1963, inflation was mitigated through the use of external reserves accumulated before independence to finance fiscal deficits and maintain import supplies. But as the reserves diminished and increased import duties failed to close the budget gap, the government had to resort to bank financing. This contributed to strong inflationary pressure during 1964-66 (Table 1). In 1964, money supply was increased by 37.2%, increasing inflation to 15.8%. Even though growth in money supply slowed down in the following years, the inflationary pressures which had been generated in 1964 persisted for at least three years. One of the factors which helped to sustain the pressure on prices was the increasingly serious foreign exchange constraint which led to shortages of most consumer items.

When the National Liberation Council (NLC) government took over the administration of the country in 1966, it took measures to lower the high pace of economic activity which characterized the preceding period. In particular, it cut back public spending and the use of bank financing. The extensive state involvement in the economy was curtailed and investments reduced, leading to large-scale economic retrenchment. Meanwhile, monetary policy was tightened through interest rate increases and credit restrictions, among other measures.

These steps were carried out in the context of an IMF-sponsored stabilization programme adopted in April 1966 (which included a devaluation of 30% in July 1967). The effect of the new policy measures was to contain inflation in 1967 (when prices actually dropped below the 1966 level) and 1968 (Table 1), although this was achieved at the cost of economic decline.

This period of stabilization was followed, during 1969-71, by a marked boost in economic activity under the civilian Busia administration. Government recurrent and investment outlays increased substantially, sustained, in part, by the use of foreign reserves and external borrowing. At the same time, private

participation in the economy increased. Tight monetary policy measures were introduced to ensure financial stability, including credit restrictions and upward revision of interest rates. This did not, however, significantly stem liquidity injection, which occurred in response to seasonal increases in bank lending for cocoa financing, and in loans to the private sector, following government legislation, to take over foreign trading assets.

Inflation was, however, contained during 1969-71 (Table 1), mainly as a result of a combination of domestic output growth and improved import supplies under a cocoa price boom in 1970, and a liberalized external trade policy. The latter policy, coupled with a down-turn in cocoa prices, put enormous strain on the balance of payments, necessitating another devaluation (by 44%) in December 1971.

The following decade, 1972-82, was characterized by the most expansionary phase of economic management in the country's history. This period witnessed a succession of regimes, largely military, which pursued expansionary fiscal programmes buttressed by monetary accommodation as widening budget deficits were financed from bank loans to government and parastatals. Extensive controls of prices, the exchange rate, and interest rates, were used to contain the resulting inflationary pressure. This led to distorted relative prices, economic stagnation and severe shortage of goods, with strong upward pressure (suppressed or otherwise) on prices. A brief stabilization effort, under IMF sponsorship from January 1979, failed in June that year as a victim of another military intervention.

Pervasive economic controls and restrictions from 1972 until 1982 bred a repertoire of malpractices, including smuggling, parallel market activities in goods and foreign currencies, and corruption. Despite the prevalence of price controls, however, inflation averaged as high as 50% per annum during 1972-82, with 1977 and 1981 recording the highest-ever rates of 117% each.² Clearly, pre-1983 inflation, especially during the period 1972-82, reflected excessive demand pressure sustained by fiscal expansion and consequent monetary growth. The problem was made worse by inadequate growth of output and supplies due to particular structural constraints faced by the economy.

Foreign exchange scarcity, due in large part to over-reliance on erratic cocoa earnings, was the most severe of these constraints. This scarcity constrained the capacity to supply essential imports for consumption and production, with potential inflationary consequences.

Another important constraint was inadequate food production and supply. This was due to a catalogue of factors including low productivity, poor storage and preservation facilities, unreliable weather conditions, inadequate marketing and distribution arrangements, fast-growing population and urbanization, and

policy measures were restrictions and upward significantly stem liquidity in bank lending for following government

Table 1), mainly as a and improved import eralized external trade in cocoa prices, put g another devaluation

the most expansionary This period witnessed d expansionary fiscal as widening budget ment and parastatals.

erest rates, were used to distorted relative s, with strong upward oilization effort, under at year as a victim of

1972 until 1982 bred a el market activities in e prevalence of price % per annum during r rates of 117% each.²

od 1972-82, reflected sion and consequent inadequate growth of straints faced by the

er-reliance on erratic traints. This scarcity for consumption and roduction and supply.

ductivity, poor storage inadequate marketing and urbanization, and

pricing policies aimed at keeping down food prices. by gaps in supply, also had inflationary effects on the

Inadequate performance of the manufacturing sector worsening inflation problem. The problems of the persistence of excess capacity (due to the lack of ac out-dated technologies and inefficient management consumer goods added to upward pressure on prices

For most of the period under consideration, p exchange rates were extensively used in an attempt this only led to suppressed prices and incentives at th removing the causes of inflationary pressures in removing distortions accentuated structural constraints in the domestic production. As a result, the economy was in declining income per capita, mounting external run-down social and economic infrastructure. This re-direction of economic management.

The post-1983 (ERP) era

Against this background of severe economic difficulties, inflationary pressures, the government of the Provisional Council (PNDC) launched the ERP in mid-1983. Supported by the World Bank, the main purpose of the programme was to liberalize the economy, minimize imbalances and establish a price system. To this end, far-reaching measures have been implemented including large exchange rate corrections, price liberalization, financial management reforms and the repair of social infrastructure.

Inflation control has been a key objective under the ERP. In the case of fiscal-deficit financing in pre-1983 inflation, efforts to reduce both budgetary deficits and recourse to bank financing improved markedly as a result of improved administration of the tax base through price de-regulation and exchange rate stabilization. As a result, fiscal deficits have been eliminated since 1983; however, monetary growth rates have continued to rise at 40% per annum during 1983-89, equal to the average rate of 40% per annum during 1972-82.³

The budget may still constitute an important source of inflationary pressure and demand pressure in the economy, because recurrent deficits have remained high. Moreover, if development projects

pricing policies aimed at keeping down food prices. Food price rises, caused by gaps in supply, also had inflationary effects on the country's economy.

Inadequate performance of the manufacturing sector also contributed to the worsening inflation problem. The problems of the sector included the persistence of excess capacity (due to the lack of adequate imported inputs), out-dated technologies and inefficient management. The erratic supply of consumer goods added to upward pressure on prices.

For most of the period under consideration, price controls and fixed exchange rates were extensively used in an attempt to contain inflation. But this only led to suppressed prices and incentives at the producer level without removing the causes of inflationary pressures in the economy. The price distortions accentuated structural constraints in the external trade sector and domestic production. As a result, the economy was in bad shape by 1982, with declining income per capita, mounting external deficits, and seriously run-down social and economic infrastructure. This led to a considerable re-direction of economic management.

The post-1983 (ERP) era

Against this background of severe economic difficulties, including strong inflationary pressures, the government of the Provisional National Defence Council (PNDC) launched the ERP in mid-1983. Supported by the IMF and the World Bank, the main purpose of the programme was to stem the slide in the economy, minimize imbalances and establish a path of sustainable growth. To this end, far-reaching measures have been implemented over the years, including large exchange rate corrections, price de-regulation, trade liberalization, financial management reforms and the rehabilitation of economic and social infrastructure.

Inflation control has been a key objective under the ERP. Given the role of fiscal-deficit financing in pre-1983 inflation, efforts have focused on reducing both budgetary deficits and recourse to bank financing. The revenue side has improved markedly as a result of improved administration and enlargement of the tax base through price de-regulation and exchange rate adjustments. As a result, fiscal deficits have been eliminated since 1986. In spite of this, however, monetary growth rates have continued to be high, averaging about 40% per annum during 1983-89, equal to the average growth rate recorded for 1972-82.³

The budget may still constitute an important source of liquidity injection and demand pressure in the economy, because recurrent expenditure levels have remained high. Moreover, if development projects (financed from external

project loans) were taken into account, large budgetary deficits would appear. Project loans, of course, constitute a potential source of liquidity injection and inflationary pressure, depending on how they are utilized.

Apart from the budget, other major potential sources of liquidity injection are foreign resource infusions under the ERP and 'losses' to the monetary authorities attendant upon exchange rate depreciation — the so-called 'revaluation losses'. Some of these sources will be fully discussed in the next section.

A year after the introduction of the ERP, the rate of inflation dropped from an all-time high of 123% to 40%. This remarkable achievement is usually attributed to the programme. However, since the programme did not really take off until 1984, and since agriculture began to recover from the drought of the previous year, it is doubtful that policy reforms alone could explain that feat. Nevertheless, to the extent that external inflows which followed the adoption of the programme eased the supply constraints, and liberalization enabled agricultural production to recover quickly, part of the credit may be given to the ERP.

The fact that supply constraints are important in Ghana's inflation was again made evident in 1985 when inflation dropped further to 10%. This was associated with an especially good harvest. Food prices actually fell by about 8%. Thus, the sources of inflation in Ghana cannot be limited only to demand factors, and supply factors must also be taken into account.

III Literature survey

Various models have been applied for the explanation of inflationary trends in both developed and developing countries. Variations in the models themselves usually stem from differences in the proposed sources of the inflation. Much of the literature is dominated by demand theories of inflation, partly because they are more amenable to quantitative assessment. The works of Cagan (1956), Harberger (1963), Azhar (1973), and de Silva (1977) were all basically in the monetary demand framework, with results largely confirming demand-pull inflation.

Cost (supply) factors have generally received less attention in the empirical literature. But, in general, in the few cases where they were investigated either independently or alongside monetary factors, they appeared to have less influence than the latter.

Argy's (1970) attempt to investigate structural inflation for some 22 LDCs, showed insignificant results for the structuralist indicators, but monetary factors used as 'controls' turned out to be significant. As Argy noted, one main problem is that structuralist hypotheses are very difficult to quantify, which limits their empirical assessment.

Studies on hyper-inflationary situations, particularly in Latin America, are of interest because of the lessons they provide on the stabilization policies adopted for such crises although Ghana itself has not suffered to the same degree.⁴ The Bolivian, Argentine and Brazilian plans all offer lessons in stabilization, both heterodox and orthodox, for handling inflationary pressures.

The causes of inflation prior to 1983 have never been in dispute. Studies by Lawson (1966), Ahmad (1970), Ewusi (1977), Steel (1979), and Kwakye (1981) of the pre-1983 period confirmed the predominance of demand factors. The main source of demand pressure was invariably traced to fiscal deficit financing. Lawson, Ewusi and Kwakye found some evidence of food prices influencing inflation in Ghana.

As far as the post-1983 inflation is concerned, little published work is available. A recent study by Chhibber and Shafik (1990) of the World Bank is probably the most important available for review. The study was part of

wider research into the inflationary effects of policy adjustments (especially exchange rate reforms) in Africa.

Chhibber and Shafik's approach attempted to integrate, in a single framework, three transmission mechanisms for inflation, the fiscal/monetary process, direct cost-push factors, and real factors. They specified a model incorporating a price-determination process, whereby prices were related to wage-push and exchange-rate-induced costs, and mark-ups over these costs. The mark-ups were made a function of excess demand in the economy which, in turn, was made (*à la* Walras Law) a function of excess money supply. The model also included relationships for exchange rate determination, monetary/fiscal sectors and the real sector to illustrate linkages to the price determination process. Their analysis included simulations to test certain issues. Some of the more important results of their study were as follows:

1. Monetary growth was instrumental in determining the pace of inflation. The expansion in money supply was fuelled largely by net foreign asset injections in recent years. Low financial intermediation was also partly to blame for the high money supply level;
2. Official exchange-rate-induced inflation was not significant, as prices had already adjusted to the parallel exchange rate. Rather, parallel exchange-rate-induced inflation was significant;
3. Wage-push inflation was insignificant, as real wages had declined steadily;
4. Fiscal policy had a limited role in current inflationary issues, as cuts in current expenditure would reduce monetary growth and inflation only to a limited extent.

It is our belief that Ghana's inflation is explained by more than just monetary factors, as Chhibber and Shafik's results indicate. A possible reason for these results may have to do with the way in which real factors are captured. By formulating the real factors as monetary factors (*à la* Walras), they lost the ability to isolate the real side and instead accentuated the effect of the monetary factors.

IV Econometric analysis

The model

An alternative model to specify all the possible causes of inflation and test them econometrically can be set up. Using the known sources of inflation (i.e., monetary factors, real factors, and expectations) we specify the simple model in (1):

$$(1) \quad P = f_1(M, Y, E, P^e)$$

Equation (1) specifies that inflation (P) is dependent on growth in money (M) and output (Y), the rate of exchange (E) defined as the domestic price of foreign currency, and price expectations (P^e). A change in money supply feeds into price changes with a lag. Similarly, shortages in output generally precede inflationary peaks (see Figure 2: 1976-77, 1980-81 and 1982-83). Up to 1983, the fixed exchange rate regime did not allow wide swings in the exchange rate to affect price formation. With the introduction of the ERP, the exchange rate devaluations have been feeding into the inflation rate. A slope dummy is attached to the exchange rate to account for the massive devaluations since 1983. Price expectation is assumed to be formed adaptively. Thus, the relevant equation for estimation is:

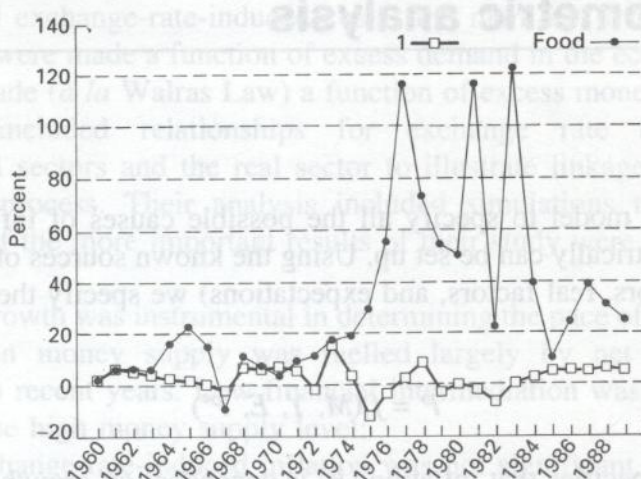
$$(2) \quad P = a_0 + a_1M_{-1} + a_2M_{-2} + a_3Y + a_4Y_{-1} + a_5E + a_6E1 + a_7P_{-1} + U$$

where all variables are as defined before and are in logs, $E1$ is product of the dummy variable and the exchange rate, and U is an error term, assumed to be normally and independently distributed.

An increase in money supply or exchange rate is expected to generate inflationary pressure; hence their parameter estimates should be of positive signs. On the other hand, the parameter estimates for the output coefficient must be negative, since output shortages are likely to lead to inflationary pressures. It is also expected that a high inflationary rate for a previous year may be built into negotiations and thus result in an inflationary spiral.

Therefore, the sign of the coefficient of the lagged inflation rate should be positive.

Figure 2 Inflation and output growth



Empirical results

Using data computed from IMF *International Financial Statistics*, World Bank *World Tables*, and Ghana Statistical Service *Quarterly Digest of Statistics*, an ordinary least squares (OLS) technique was used to estimate Equation 2. Data on the exchange rates on the parallel market rate was obtained from data in May 1985. The equation is specified in logs and levels of values used for the estimation. Because of a suspicion of serial correlation, a Cochrane-Orcutt technique was applied to the data and the result is reported in Table 2 below.

The high F indicates the joint significance of the explanatory variables at the 1% significance level; while 99.80% of the variations in the inflation rate is explained by variations in the explanatory variables. This high \bar{R}^2 is expected since Equation 1 specifies almost all the theoretically known causes of inflation. Most of the parameters are individually significant at the 5% significance level. Exchange rate (the parallel rate) changes do not seem to have had significant effects on inflation prior to 1983. With the exception of the coefficient of the exchange rate variable (B1), all the other parameters have the expected signs. In the case of the exchange rate, the right sign is obtained

Table 2 Ordinary least squares estimation

Dependent variable is P1

28 observations used for estimation from 1962 to 1989

Regressor	Coefficient	Standard error	T-Ratio
C1	2.2989	1.0660	2.1566
M1(-1)	0.6176	0.2344	2.6351
M2(-2)	0.5434	0.2952	1.8408
Y1	-1.1711	0.1723	-6.7951
Y1(-1)	-0.0563	0.0280	-2.0137
B1	-0.0707	0.0986	-0.7168
B2	0.1229	0.0297	4.1414
P(-1)	-0.0003	0.0001	-2.6080
R ²	0.9985	F-statistic F(7,20)	1902.5
R ²	0.9980	S.E. of regression	0.1162
Residual S.Sq.	0.2702	Mean of dependent variable	3.4194
S.D. of dep. var.	2.5835	Maximum of log-likelihood	25.2390
DW statistic	1.5552		

with the introduction of a slope dummy to account for a significant shift in policy from a system of controls to rapid devaluations.

The parallel rate was used in the above estimation since that rate reflects better the cost of obtaining foreign exchange. An alternative estimation was done with the parallel rate replaced by the official exchange rate. A non-nested hypothesis testing performed, favoured the former model against the latter model. See Appendix II.

The regression result in Table 2 indicates that supply constraint is the strongest force behind Ghana's inflationary push. A 1% slump in production, keeping all other variables constant, leads to a 1.17% increase in the rate of inflation. It is further observed that lag effects of slumps in production, though significant, are not very pronounced. This may be due to the fact that food, a perishable product, exerts an immediate effect on price levels. (Food accounts for over 50% of the CPI.) In Figure 2, it can be observed that prior to 1978 inflationary peaks have been preceded by output slumps. The high peaks of 1977, 1981 and 1983 seem to have longer output lags. This may be an indication that other factors are at play in Ghana's inflationary spiral. In

Monetary pressures are the next strongest force behind Ghana's inflation. Unlike Chhibber and Shafik (1990), this study finds output stronger than monetary pressures. As explained above in Section III, by modelling the real factors as excess demand for real balances, Chhibber and Shafik over-emphasize the monetary pressures. As will be further explained below, monetary pressures are still at play in the ERP era since there are still huge increases in money supply, albeit from another source.

One year's lag in monetary expansion appears to have a greater effect on prices than a two-year lag. A slope dummy, introduced to illustrate the large monetary expansions which began in 1973, did not appear significant. See Appendix IV.

The exchange rate devaluations appear to have a significant effect on inflation, contrary to Chhibber and Shafik's finding. Of course, this may be due to the fact that by having one extra observation, we are able to capture the effect missed by Chhibber and Shafik, since their data ended in 1988. Price expectations, though significant, carry the wrong sign and seem to exert little pressure on inflation.

	Empirical results
QW statistic	1.5552
S.D. of dep. var.	2.5835
Maximum of log-likelihood	25.2399
Mean of dependent variable	3.4184
S.E. of regression	0.9860
R ²	0.9860

V Explanation of sources of inflationary pressures

Demand (monetary) pressures

Monetary expansion has long played a major role in determining the course of inflation in Ghana. To understand its inflation, therefore, it is necessary to identify the factors behind rapid monetary growth and excess liquidity supply.

Since the early 1970s, monetary growth rates have, on average, been fairly high. During the decade 1972-82, narrow money supply rose by an average of 40% per annum. Under the ERP (1983-89), money supply grew by approximately the same average. This has happened despite efforts to control monetary expansion through fiscal and monetary measures.

However, whereas in the pre-1983 era money supply was driven predominantly by government deficit financing, under the ERP, monetary growth has been influenced by a mix of factors of which the budget is only one. Major determinants of the rapid monetary expansion and excessive liquidity under the ERP include capital inflows, revaluation losses, the budget, cocoa financing and financial system deficiencies.

Capital inflows (the 'NFA factor')

The ERP has been buttressed by a substantial inflow of external resources. These have included grants and loans in support of the various projects and programmes. The main inflows have come from the IMF (as balance-of-payments support) and the World Bank (mainly as sectoral adjustment credits). Other inflows have come from other multilateral agencies as well as bilateral sources.

The external inflows have gone to bolster the national reserves and, thus, its capacity to increase domestic liquidity (which influence may be termed the 'net foreign asset (NFA) factor'). A substantial portion of the inflows, indeed, result in direct cedi-counterpart payments to domestic entities — government, public and private organizations, individuals — leading directly to enlargement

of domestic liquidity, without a corresponding direct increase in the supply of imports.

During 1983-90, gross external inflows averaged more than \$650 million per annum (Table 3). This constituted a major source of liquidity injection, demand pressure and inflation in the economy. Added to the official inflows were private remittances which have grown markedly under the ERP to more than \$200 million a year by 1990. This has been aided by the more flexible exchange rate policy and more liberal exchange arrangements. Such remittances, however, may ease inflationary pressure by generating more imports if the foreign exchange is not held as a store of value.

Table 3 Net external inflows¹ (\$m), 1983-89

Year	1983	1984	1985	1986	1987	1988	1989
Net inflows	119.5	369.2	227.0	258.0	580.6	551.3	748.2

Note: 1. Includes long and medium-term loans, grants, IMF facilities.
Source: IMF, *International Financial Statistics*, 1990 Yearbook, and Ghana Statistical Service, *Quarterly Digest of Statistics*, September 1990.

Thus, unlike the pre-ERP era when Ghana faced severe foreign exchange shortages, under the ERP it has been inundated with capital inflows. The irony, however, is that it now seems to be having too much of a good thing, as the inflows constitute a major source of liquidity injection, demand pressure and inflation in the economy. Without appropriate measures to regulate the inflows, including sterilization where possible (for example by investing them abroad), or to expedite their utilization, the problem will continue to plague the economy.

Revaluation losses

Revaluation losses comprise losses to government arising from revaluation (following exchange rate depreciation) of accrued external commitments — oil bills, dividends awaiting transfer, current payment arrears, repurchases to the

IMF, other outstanding loans, etc. Instead of being charged to the account of government, whose liability they were, the losses were allowed to accumulate in the books of the Central Bank where a 'pseudo-asset' was created in the form of long-term government debt. This, in reality, implied indirect extension of credits by the Central Bank to government. And like any other such credits, they constituted liquidity injections into the economy.

With the massive exchange rate depreciation from 2.75 cedis to the US dollar in 1983, to more than 350 cedis in 1990, the losses increased substantially, reaching some 311 billion cedis by September 1990, compared with a total (narrow) money supply figure of about 180 billion cedis at the same time.

Aside from their liquidity implications, another dimension of the revaluation losses was that they seriously eroded the financial standing of the Central Bank. Long-term securities were issued by government to the Central Bank to cover accrued losses as of September 1990. Only interest payments, nominally fixed at 4%, would be charged to the government budget.⁵ Since then, revaluation losses have been rightly treated as credits to government and charged directly to government account, implying direct additions to domestic liquidity.

Thus, the revaluation losses, whether treated as long-term government debt in Central Bank books, as before, or whether directly charged to government account as credits, as at present, constitute an important source of liquidity injection and, therefore, of inflationary pressure in the economy. Only a programmed phasing out of accumulated losses (through redemption of issued securities) coupled with appropriate macroeconomic measures to stabilize exchange rates (to avoid further excessive losses) can provide the needed remedy.

Table 4 Revaluation losses 1983-90 (cedi billion)

Year	1983	1984	1985	1986	1987	1988	1989	1990 ¹
Annual losses	-	16.1	1.0	15.1	17.9	89.6	62.1	109.3
Cumulative losses	-	16.1	17.1	32.1	50.0	139.6	201.7	311.0

Note: 1. September figure.

Source: Bank of Ghana.

Government budget (the 'fiscal factor')

Prior to the ERP, the main-spring of liquidity injection into the economy was government budget deficit financing as budgetary over-runs were financed from the banking system, especially the Central Bank. Under the ERP, the policy has been to reduce deficits and use bank financing.

As a result of price de-regulation, a more flexible exchange rate policy, and improved tax administration, the revenue side of the budget has shown marked improvements. Thus, since 1986, the budget has shown successive surpluses, enabling net repayments to the banking system.

It needs to be pointed out that only a narrow coverage of the budget shows these surpluses. This coverage excludes expenditure on development projects financed from external project loans. A broader coverage including these items shows large deficits (see Table 5). The project loans which form financing items then constitute an important source of liquidity injection into the economy.

Table 5 Government budget, 1985-90 (cedi billion)

	1985	1986	1987	1988	1989	1990
(a) Narrow coverage¹						
Total revenue and grants	40.3	73.6	111.0	142.7	207.0	269.2
Total expenditure and net lending	47.9	73.3	107.0	138.8	197.0	251.4
Surplus (+) / deficit (-)	7.6	0.3	4.1	3.9	10.0	17.8
(b) Broad coverage						
Total revenue and grants ²	42.4	81.1	124.8	157.9	230.5	309.3
Total expenditure and net lending ³	52.7	98.1	142.8	185.2	271.4	355.3
Surplus (+) / deficit (-)	-10.3	-17.0	-18.0	-27.3	-40.9	-46.0

Notes: 1. Narrow coverage excludes capital expenditure financed through external project aid and the corresponding grants and loans.

2. Including external project grants.

3. Including capital expenditure financed through external project aid.

Source: IMF Staff Report, 1990.

Thus domestically financed deficits which characterized the pre-ERP period and formed the basis of monetary growth have been replaced under the ERP by externally financed deficits. This new mode of financing entails a new channel of liquidity injection into the economy. Thus, in spite of the surpluses declared since 1986 from the narrow budget coverage, the government budget may still form a significant source of demand pressure and inflation. Another possibility is that, since external financial support may generate more imports, it may ease supply and inflationary pressure.

Cocoa financing

Every year, large amounts of liquidity are injected into the economy through cocoa financing, increasing demand and inflation pressure. To purchase the year's cocoa crop and fund its operational costs, the Cocoa Board (COCOBOD) issues cocoa bills to the Central Bank, commercial banks and the non-bank public for discounting and provision of funds. In the pre-ERP period, most of the cocoa bills were picked up by the Central Bank. Furthermore, during that period external cocoa proceeds were often inadequate to cover the total cost of cocoa financing, because of a grossly over-valued exchange rate and excessive operational costs of COCOBOD. This led to a massive build-up of Central Bank overdrafts to COCOBOD.

Under the ERP, it has been the policy to shift cocoa financing to the non-bank public, with commercial banks (and the Central Bank, where necessary) picking up any residual bills. Now that there have been large exchange rate adjustments and a reduction of COCOBOD operational expenses, external proceeds are more than adequate to cover costs, i.e., the cocoa sector is ultimately self-financing. Nevertheless, cocoa financing continues to add liquidity to the economy, regardless of the source of initial funding, whether from banks or the non-bank public.

Although other exports may add liquidity to the economy, cocoa is unique because of the magnitude of these injections. With the current producer price of 240,000 cedis per metric tonne, and a crop volume of the order of 300,000 metric tonnes, payments to producers will amount to some 72 billion cedis, which may be compared with a money stock level of about 188 billion cedis (November 1990). This may lead to a substantial increase in demand pressure in the economy which can be particularly harmful if it coincides with periods of lean supply of goods.

Financial system deficiencies

The deficiencies of the financial system have contributed to the excessive build-up of liquidity outside the banking arena and to inflationary pressure in the economy in general. Over the years, the intermediation role of banks has declined, with low deposit mobilization on one hand, and inadequate scope for channelling resources to support productive activity on the other. The banks were persistently saddled with excess liquidity owing to the limited avenues for investment (due to credit ceilings and lack of financial investment opportunities). There was therefore little incentive for them to mobilize deposits from the public. Large portions of bank loans, both to state-owned enterprises (SOEs) and the private sector, remained uncollected (due, amongst others, to management, institutional and regulatory inadequacies). This had compounded the excessive liquidity supply outside the banking system. By September 1990, these bad loans amounted to about 50 billion cedis. Government issued bonds in 1990 to banks to cover bad loans, in order to restore their financial standing. These stocks, redeemable over five years (SOE loans) and ten years (private sector loans), were designed to bring interest of 12% and 7.4% respectively.

Although external funding was obtained for the exercise under the Financial Sector Adjustment Programme (FINSAP), the funds have been kept in blocked accounts as only interest payments are currently charged to the budget. The Non-Performing Assets Recovery Trust (NPART) has been set up to recover and manage the bad loans. NPART has picked the non-performing assets off the balance sheets of the banks with the support of external aid. This injected more liquidity into the economy and might form a substantial source of demand pressure and inflation.⁶

The FINSAP is meant to address many of the inadequacies of the financial system in order to enhance the intermediation role of banks. When this has been achieved, it is hoped that there will be more scope for avoiding further build-up or reducing existing liquidity within and outside the banking system.

Supply pressures

Supply pressures have always played a role in fuelling inflation in Ghana. This is quite evident from the graph in Figure 2. Inflationary peaks have usually been preceded by output slumps. This is especially so with food production.

Food prices

The extent to which the food price index drives the general index is proved by the weight it is given in the latter. In the calculation of the Consumer Price Index, food is assigned a weight of 0.492, based on 1977 household survey data. This is a gross understatement for the 1980s. The more recent 1987-88 Ghana Living Standard Survey shows that, on the average, food accounts for about 66.4% of total expenditure. Thus, fluctuations in food prices should have an even greater weight than is presently accounted for in the general price index.

Table 6 indicates that per capita food production started declining from the early 1970s, reaching its nadir in 1983; apart from a brief recovery in 1984, food production has still remained low. Whereas the low indices in 1981-83 can be explained by the drought which hit the whole of the Sahel region in the early 1980s, the subsequent stagnation of food production after 1984 may be linked to the switch from the production of food to tradable goods, particularly cocoa.

Table 6 Production indices, 1970-87 (1979-81 = 100)

Year	Agricultural	Food	Non-food	Food/capita
1970	118	118	132	158
1971	125	124	151	162
1972	117	117	162	149
1973	116	116	134	144
1974	129	129	129	156
1975	124	123	163	145
1976	109	108	167	123
1977	97	97	125	107
1978	96	96	100	103
1979	101	101	97	104
1980	101	101	103	101
1981	98	98	100	94
1982	94	94	100	88
1983	88	87	105	79
1984	116	116	110	102
1985	114	114	87	97
1986	119	120	76	98
1987	118	119	88	94

Source: World Bank, *World Tables*, Stars Disk, 1990.

Since 1984, exchange rate and trade liberalization policies introduced under the ERP have made farm inputs available. However, the same policies have made it more lucrative for farmers to be in the tradable sector than in food production. Table 7 shows the terms of trade between food and non-food consumer items, and also relative prices of food to cocoa. Since 1984, the terms of trade have moved against food production. Adjustments in the producer price of cocoa have also caused cocoa farmers to compete effectively with food farmers for farm inputs.

Table 7 Relative prices of food: Ghana 1977-87 (1977=100)

	1977	1980	1981	1982	1983	1984	1985	1986	1987
Terms of trade of food/non-food	100	96	91	112	138	86	60	57	55
Relative prices of food/cocoa production	100	131	92	125	184	136	64	51	42

Source: Loxley (1988), Table 10.

Shortages in food production are usually accentuated by rigidities in the transport and distribution network in the country. Data from the Ministry of Agriculture suggest that transport alone accounts for 50% of food costs to consumers in Ghana.⁷ Increases in the costs of fuel and spare-parts, and the lack of good feeder-roads, are easily translated into inflationary pressures.

Recent adjustments to the exchange rate, coupled with the removal of subsidies, have caused massive increases in the price of petroleum products. Between 1984 and 1990, petrol (super) prices have risen from 53.54 cedis to 1,000 cedis per gallon. These increases exert diametrically opposing pressures on the inflationary spiral. While the removal of subsidies lessens the budgetary pressures on government, inflationary pressures are reintroduced through cost factors. The removal of petrol subsidies increases transport costs and generates inflationary pressures, though these pressures have only a one-time impact.

Other distributional factors have also influenced the inflationary situation in the country. Lack of feeder roads has at times caused food to rot in the villages while there were shortages in the cities and towns. Though the situation has improved slightly since the road rehabilitation works started in

the ERP period, the lack of good roads is still a source of variability in inflation. A market survey conducted by the authors in 1990 in three cities (Accra, Tema and Takoradi) showed that prices of commodities are affected by location of market and seller concentration. Prices are generally lower in Accra than in any of the other cities, indicating that Accra generally acts as the focal point for distribution. Prices in other cities are therefore affected by their distance from Accra.

The survey also indicated that some product groups exhibit wider price variability than others, such as maize, a staple diet for most Ghanaians. Items sold in fixed units, such as balls of kenkey and bottles of beer, have very little price variability. The variability of prices is influenced by supply inelasticities of the product as well as seller concentration of the commodities. Distributional bottlenecks such as transport difficulties and inadequate flow of information influence the variability of prices. Note, however, that the variability of prices gives us a cross-sectional behavioural pattern, but offers very little information as far as the dynamics of inflation is concerned.

Expectations

From the early 1960s until 1983, the Ghanaian economy could be said to have operated under a 'controlled' regime. It was a period during which most prices, exchange rates and rates of interest were fixed by government. During that period, price expectations played very little role in the inflationary process. After the introduction of the ERP, price controls were removed, interest rates were liberalized, and the exchange rate was allowed to be determined by market forces.

Expectations in the foreign exchange market seem to influence price formation a great deal. Sellers usually build into their mark-ups their expectations about rates of depreciation of the cedi. At the start of the foreign exchange auction in September 1986, the spread between the marginal rate determined at the auction and the parallel rate was quite significant. Most imports, especially of consumer goods, were brought in through the parallel market and hence the auction rate had very little influence on price expectations. By 1988 when the government licensed individuals to operate forex bureaux for the sale and purchase of foreign exchange, the spread between the two rates closed. Importers started paying closer attention to the auction rate, speculations about which then started to affect the general price level. Speculation on the foreign exchange market was further intensified with the 'unification' of the parallel and auction rates in June 1990. To the extent that these speculations feed into the local price system, the recent devaluations

in Ghana might have had some effect on the inflation in the country. The econometric results of both Chhibber and Shafik (1990), and our own estimation above, failed to capture recent foreign exchange adjustments because of data limitations.

Expectations did not feature much in the determination of wages in Ghana. Since the ERP, government has had a policy of keeping the wage bill around 5% of GDP.⁸ Little room is allowed for price expectations to be included in contract negotiations. It has become customary for the government to begin wage negotiations at least three months after reading the annual budget. This may be a conscious policy to prevent wage-push inflation, but the social and political consequences of such wage repression may be more traumatic than inflation.

VI Conclusion

Inflation in Ghana was the result of both real and monetary shocks to the economy. Though monetary factors played a significant role in pre-ERP inflation, supply factors which had always offered a push came to the fore during the ERP period. Our econometric results point out that supply factors constitute a much stronger inflationary force than monetary factors. Measures to control inflation must therefore emphasize enhancing production and supply, especially of food. It is also imperative that efforts be made to improve distribution and road networks to reduce costs.

Though a lot of efforts have been made to curb domestic credit expansion, a new source of growth in the money supply has been found in the changes in net foreign assets. With the capital inflows since the ERP, growth in money supply has been at about the same average as before the ERP. Monetary expansion will need to be controlled through more disciplined financial management to counteract potential externally generated liquidity injections. The fiscal restraint which started with the ERP should be continued to prevent another source of monetary expansion.

Exchange rate adjustments, although showing no strong influence in our study, could still be a potential source of inflation, especially from 1990. The auction and parallel rates have now virtually merged and hence all the economic rents previously enjoyed have been eliminated. Thus, further devaluations of the cedi may cause cost-push inflation.

Thus, the inflationary problem in Ghana is a multi-faceted issue with many causes. Inflationary control should therefore aim at policies directed to both real and monetary factors. Structural factors could not be well captured in our model because of measurement difficulties. There may be a need for further research on the structural causes of inflation. Further econometric work may also be necessary to provide more information on the post-ERP inflationary situation in Ghana, using quarterly or monthly data. In addition, a disaggregated model showing the effect of food *vis à vis* non-food may explain inflation more effectively.

Note: 1. Budget surplus.

Source: computed from data from IMF, *International Financial Statistics Yearbook*, 1988 and August 1989 issues.

in Ghana might have had some effect on the inflation in the country. The econometric results of both Chhibber and Shahik (1990), and our own estimation above, failed to capture recent foreign exchange adjustments because of data limitations.

Expectations did not feature much in the determination of wages in Ghana. Since the ERP, government has had a policy of keeping the wage bill around 10% of GDP. Little room is allowed for price expectations.

Notes

1. See literature review below.
2. It is quite evident that if inflation had been calculated on actual rather than official prices, the rates would have been much higher.
3. It must, however, be pointed out that during 1983-89 output grew while the decade of 1972-82 saw output stagnate or shrink.
4. Cagan (1956) defines a hyper-inflationary situation as one in which the monthly rates of inflation are greater than 50%.
5. This, of course, amounts to a real transfer to government since it is a negative real interest rate.
6. This, more or less, explains the transmission mechanism rather than a new source of inflation. The inflationary pressure is already explained.
7. See *National Food Review Economic Research Service* NFR 37, 1987 and Policy Planning, Monitoring and Evaluation, Ministry of Agriculture, 1988. A market survey carried out in 1990 by the authors puts the average share of transport in the cost of food at 30%. These costs account for only 5% in the US.
8. World Bank (1989) p. 52.

Appendix I

Indicators of fiscal performance, 1965-88 (Ratios)

Year	Financing as ratio of GDP			Financing as ratio of deficit		
	Revenue	Expenditure	Deficit	Internal Loans	From Bank of Ghana	External loans
1	2	3	4	5	6	7
1965	0.19	0.26	0.06	0.88	n.a.	0.03
1966	0.15	0.20	0.05	0.87	n.a.	0.34
1967	0.17	0.23	0.06	0.76	n.a.	0.19
1968	0.18	0.24	0.06	0.71	n.a.	0.27
1969	0.17	0.20	0.03	0.65	n.a.	0.41
1970	0.19	0.22	0.02	0.90	n.a.	0.96
1971	0.18	0.22	0.04	0.82	n.a.	0.27
1972	0.15	0.21	0.06	0.49	0.08	0.51
1973	0.11	0.17	0.05	0.90	0.83	0.10
1974	0.13	0.17	0.04	1.01	0.94	0.01
1975	0.15	0.23	0.08	1.00	1.51	0.00
1976	0.13	0.25	0.11	1.00	0.88	0.00
1977	0.10	0.20	0.09	0.99	1.36	0.01
1978	0.07	0.16	0.09	0.91	0.22	0.04
1979	0.10	0.17	0.07	1.00	0.21	-
1980	0.07	0.11	0.04	0.84	1.78	0.16
1981	0.05	0.11	0.06	0.92	0.38	0.08
1982	0.06	0.11	0.06	0.91	0.14	0.08
1983	0.06	0.08	0.03	0.78	0.09	0.20
1984	0.08	0.10	0.02	0.63	0.49	0.37
1985	0.12	0.14	0.02	0.53	0.27	0.46
1986	0.14	0.14	0.00	17.78	0.60	18.78
1987	0.15	0.14	0.01	0.32	0.66	0.13
1988	0.15	0.14	0.01 ¹	0.62	0.64	0.23

Note: 1. Budget surplus.

Source: computed from data from IMF, *International Financial Statistics Yearbook*, 1988 and August 1989 issues.

Appendix II

Alternative tests for non-nested regression models

Dependent variable is P1;

28 observations used from 1962 to 1989

Regressors for model M1: C1, M1(-1), M1(-2), Y1, B1, B2, P1(-1)

Regressors for model M2: C1, M1(-1), M1(-2), Y1, E1, E2, P1(-1)

Test statistic	M1 against M2	M2 against M1
N-test	1.0761	-2.5767
NT-test	1.0119	-0.9665
W-test	1.0594	-0.9267
J-test	0.2740	2.9560
JA-test	-2.6688	1.0026
Encompassing	F(2,19) = 3.5750	F(2,19) = 4.7010

Model M1: DW = 1.3584; \bar{R}^2 = 0.9975; Log-likelihood = 21.5331

Model M2: DW = 1.2854; \bar{R}^2 = 0.9973; Log-likelihood = 20.3765

Model M1+M2: DW = 1.7442; \bar{R}^2 = 0.9980; Log-likelihood = 26.0048

Akaike's Information Criterion of M1 versus M2 = 1.1565 favours M1;

Schwarz's Bayesian Information Criterion of M1 versus M2 = 1.565 favours M1

Appendix III

Ordinary least squares estimation

Dependent variable is P1;

28 observations used for estimation from 1962 to 1989

Regressor	Coefficient	Standard error	T-Ratio
C1	3.9169	0.9344	4.1920
M1(-1)	0.6501	0.2605	2.4952
M1(-2)	0.4058	0.3243	1.2512
Y1	-1.3910	0.1651	-8.4232
B1	-0.0579	0.1096	-0.5281
B2	0.0798	0.0293	2.7228
P1(-1)	0.0389	0.0282	1.3824
R ²	0.9980	F-statistic F(6,21)	1787.8
\bar{R}^2	0.9975	S.E. of regression	0.1295
Residual s.sq.	0.3521	Mean of dependent variable	3.4194
S.D. of dep. var.	2.5835	Maximum of log-likelihood	21.5331
DW-statistic	1.3584	Durbin's h-statistic	1.7168

Appendix IV

Ordinary Least Squares Estimation

Dependent variable is P1
28 observations used for estimation from 1962 to 1989
Regressors for model M2: C1, M1(-1), M1(-2), Y1, E1, E2, P1(-1)

Regressor	Coefficient	Standard error	T-Ratio
C1	1.9285	1.1633	1.6579
M1(-1)	0.6322	0.2369	2.6689
M1(-2)	0.5201	0.2988	1.7407
M2	0.2101	0.2531	0.8304
Y1	-1.1084	0.1894	-5.8533
Y1(-1)	-0.0546	0.0283	-1.9306
B1	-0.0542	0.1013	-0.5354
B2	-0.3608	0.5833	-0.6185
P(-1)	-0.0002	0.002	-1.6100

R ²	0.9986	F-statistic F(8,19)	1639.0
\bar{R}^2	0.9979	S.E. of regression	0.1172
Residual s. sq.	0.2608	Mean of dependent variable	3.4194
S.D. of dep. var.	2.5835	Maximum of log-likelihood	25.7381
DW-statistic	1.5696		

References

- Ahmad, N., 1970, *Deficit Financing, Inflation and Capital Formation: the Ghanaian Experience, 1960-65*, Weltforum Verlag, Munich.
- Argy, V., 1970, 'Structural inflation in developing countries', *Oxford Economic Papers*, Vol. 22, No. 1, pp. 73-85.
- Azhar, B.A., 1973, 'An econometric analysis of price behaviour in Pakistan', *Pakistan Economic Review*.
- Bruno, M. et al., 1988, *Inflation Stabilization: the Experience of Argentina, Brazil, Bolivia and Mexico*, MIT Press, Cambridge MA.
- Cagan, P., 1956, 'The monetary dynamics of hyper-inflation', in M. Friedman (ed.), *Studies in the Quantity Theory of Money*, University of Chicago Press, Chicago, pp. 25-117.
- Chhibber, A. and N. Shafik, 1990, 'Exchange reform, parallel markets, and inflation in Africa: the case of Ghana', World Bank Working Paper, WPS 427, World Bank, Washington DC.
- de Silva, K.E.A., 1977, 'Money supply, inflation and the balance of payments in Sri Lanka (1959-74)', *Journal of Development Studies*, Vol. 13, No. 2, January.
- Domberger, S., 1987, 'Relative price variability and inflation: a disaggregated analysis', *Journal of Political Economy*, Vol. 95, No. 3, pp. 547-59.
- Dornbusch, R. and S. Fisher, 1986, *Stopping Hyperinflation Past and Present*, NBER Working Paper, No. 1810.
- Ewusi, K., 1977, 'The determinants of price fluctuations in Ghana', ISSER Discussion Paper, Legon, December.
- Harberger, A., 1963, 'The dynamics of inflation in Chile', in Christ et al. (eds) *Measurement in Economics: Studies in Mathematical Economics and Econometrics in Memory of Yehuda Grunfeld*, University of Chicago Press, Chicago, pp. 215-96.
- Herrick, B.H. and C.P. Kindleberger, 1983, *Economic Development*, 4th edn, McGraw-Hill, New York.
- Johnson, H.G., 1966, 'Is inflation the inevitable price of rapid development or a retarding factor in economic growth?', *Malayan Economic Review*, Vol. 11, pp. 21-28.

- Johnson, O., 1984, 'On growth and inflation in developing countries', *IMF Staff Papers*, 31(4), pp. 636-59.
- Kwakye, J.D., 1981, *An Econometric Analysis of Price Behaviour in Ghana*, M.Sc. thesis, University of Ghana, Legon, January.
- Lawson, R.M., 1966, 'Inflation in the consumer market in Ghana', *Economic Bulletin of Ghana*, Vol. X, No. 1.
- Loxley, J., 1988, *Ghana: Economic Crisis and the Long Road to Recovery*, North-South Institute, Ottawa.
- May, E., 1985, 'Exchange controls and parallel market economies in Sub-Saharan Africa: focus on Ghana', World Bank Staff Working Paper, No. 711, World Bank, Washington DC.
- Oliveira Campos, R. de, 1964, 'Economic development and inflation with special reference to Latin America', in *Development Plans and Programs: Some Case Studies and Experiences*, OECD Studies in Development No. 1, pp. 127-41.
- Ram, R., 1985, 'Level and variability of inflation: time-series and cross-section evidence from 117 countries', *Economics*, 52, pp. 209-23.
- Solimano, A., 1989, 'Inflation and the costs of stabilization: country experiences: conceptual issues, and policy lessons', PPR Working Paper, 226, World Bank, Washington DC.
- Sowa, N.K., 1991, 'Monetary control in Ghana: 1957-88', Overseas Development Institute Working Paper, No. 45, ODI: London.
- Sowa, N.K., C. Jebuni and K.A. Tutu, 1991, *Exchange Rate Policy and Macroeconomic Performance in Ghana*, AERC Research Paper No. 6, Nairobi.
- Steel, F., 1979, 'Hyperinflation in Ghana', *Legon Observer*, pp. 308-12.
- Turvey, R., 1951, 'Some aspects of the theory of inflation in a closed economy', *Economic Journal*, September.
- World Bank, 1989, *Ghana: Structural Adjustment for Growth*, World Bank, Washington DC.