REAL MONEY BALANCES, DOMESTIC OUTPUT ADJUSTMENT AND THE IMPLICATIONS OF A CREDIT POLICY IN KENYA. //

By:
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Research Paper presented to the Department of Economics in partial fullfilment of the degree of Master of Arts of the University of Nairobi.

DECLARATION

This Research Paper is my original work and has not been presented for a degree in any other University.

N dii M. D.

This Research Paper has been submitted for examination with our approval as University Supervisors.

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My deep felt gratitude goes to Prof. Godfrey Muriuki, who despite the multitude of demands and responsibilities upon him as Dean of the Faculty of Arts, becaume a crusader for my cause.

My teachers and classmates in the M.A programme's comments suggestions and criticisms have made the paper a lot better than it would have been. I thank them all.

And on the social scene, I single out, though unfair to many others, Judy and "Uncle Simon" who constantly have had to defy the "Pareto Optimal" (helping out even when it leaves them worse off).

None of these people however, and any of the many others not mentioned are responsible for any mistakes that have remained. Those ones are solely my own.

Ndii, M. D.,
April, 1989.

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To my parents, Miriam Wangari and Langford Mwangi.

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ABSTRACT

The domestic credit component of the money supply is an important tool of monetary and fiscal policies in Kenya. Empirical studies in Kenya have centered largely on the well defined relationship between money supply and the balance of payments.

This study is an attempt to investigate the less explicit, albeit equally important relationship between money supply and the real side of the economy i.e domestic output. Of particular interest is to establish the dominant transmission mechanism of the effect of real money balances on domestic output.

The study uses annual kenyan data from 1968 to 1988 to estimate sectoral output equations deriving from a monetary model of the Kenyan economy.

On the basis of our results, we find a predominantly supply side transmission mechanism- where money balances' major effects are on current production decisions.

The major conclusion is that the conduct of monetary policy to stabilize the balance of payments must take into account the output implications of changes in domestic credit.

CHAPTER ONE.

1.0 Introduction.

The last three decades have seen monetarism grow in the third world. Institutions such as the International Monetary Fund(IMF) and the World Bank have adopted monetary and other policies to manage the economic crises of third world economies. These policies are the basis of the stabilization and structural adjustment programmes prescribed to the third world economies.

This phenomena coincides with Kenya's independent history. The economy's performance has ranged from good to bad during the period, with the general trend of growth and balance of payments performance being downwards. Here too, the monetarist approach has been used to analyze the economy. The models employed explain the balance of payments very well. The government, through the Central Bank, is increasingly using monetary tools to manage the domestic economy. The country has made use of the IMF's "higher conditionality" facilities such as upper tranche credits standby credits and the Extended Fund Facility (EFF)[1]. The continued use of these facilities is subject to the fulfilment of certain "performance criteria" (conditionality). These criteria are mainly short and medium term demand management policies- ceilings on domestic credit is a major criterion. The World Bank and the

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[1] Upper tranche stand-bys are IMF balance of payments assistance loans over and above a country's reserve tranche. The reserve tranche generally equals to the difference between a member's quota and Fund holdings of a members currency. The credits are extended over a period of one year. The EFF is a three year loan facility.

United Nations Development Programme(UNDP) have cited Kenya as one of the adherents and beneficiaries of their recovery programmes which also include monetary restraint among their pre-conditions for adjustment assistance (World Bank/UNDP;1989)

In such a situation then, it seems monetary policy is poised to become an important tool for economic management in Kenya. And to use the policy effectively, its implications on all the aspects of the economy must be well understood. This study investigates one such implication.

1.1 Kenya: A Brief History of Monetary and Fiscal Policies[2]

Prior to 1967, Kenya's monetary policy was determined by the East African Currency Board. This board was created in 1919 and charged with the responsibility of regulating monetary developments in British East Africa. It issued an East African currency which was backed by, and fully convertible to the Sterling Pound. Other than converting the currency, the Board had very little leeway for independent action. It could hold only small amounts of government debt, and had no control over the commercial banks operating in the region.

The newly independent East African countries decided to have

[2] Analytical histories of Kenya's fiscal and monetary policy in Grubel & Ryan (1979), Brough & Curtin(1981) and Killick(1984)

autonomous central banks in 1965. The three banks were to be coordinated by the newly formed East African Community. The Central Bank of Kenya (CBK) was formed in 1966. From this year, the Kenya government acquired full control over its monetary policy.

The government's main fiscal objective at this time was to reduce, with the aim of eliminating, the dependence of its recurrent budget on British government grants. By 1969, the recurrent budget was financed fully from local sources. Up to 1970, the government pursued a balanced budget policy- abstaining totally from domestic borrowing from the money market.

The decade beginning 1970 was a period of major events in the economy. On the assumption of idle capacity in the economy, the government abandoned the balanced budget in favour of expansionary Keynesian policies. Increases in government expenditure were financed in part by issues of Treasury Bills and borrowing directly from the Central Bank. This Keynesian budget was followed by severe balance of payments problems in the period 1972-1974. Some economists have spent considerable energy trying to apportion blame for the crisis between the budget and the oil prices which were already on the rise.

Probs

Because of persistent balance of payments, the major concern of monetary and fiscal policy after 1973 became the foreign reserves position. The government first sought balance of payments assistance from the IMF in 1975 and since then, the Fund has become a major player in the country's fiscal and monetary policies. Rising coffee and tea prices in 1976/77 created new optimism for more expansionary budgeting. The combined effects of increases in reserves that were not sterilized and expansionary budgeting again culminated into major reserve losses- reaching an all time low in 1978.

Since 1980, fiscal and monetary policy has been formulated to address the problems learned from the experiences of the turbulent 70's. A new direction was taken with the publication of Sessional Paper No. 4 of 1980. The sessional paper also reflected the increased influence of donor agencies, mainly the IMF and the World Bank, on the country's macro-policy. This was particularly evident in the domain of fiscal and monetary policy. The major features included the governments commitment to improvement in tax revenues, a real reduction in government recurrent and development spending and an increase in credit to the private sector. The government also expressed interest to depart from keeping a lid on interest rates to developing them into a policy instrument.

These have been the guiding principles of fiscal and monetary policies throughout the 80's. However, the perfomance of these policies in stabilising the economy has yet to be studied.

1.1 Identification and statement of the problem

Since the neutrality of money argument remains unproven, macro-policy makers continue to use monetary variables to stimulate and/or stabilize economies. To this end, knowledge on the precise relationships between money and economic variables such as inflation, employment, balance of payments, output e.t.c is very important.

As it will become~~s~~ evident in the literature review, studies on these relationships in Kenya are few. The existing studies, inspired by the advent of the monetary approach to the balance of payments have addressed the foreign reserves implications of money supply. Other monetary relationships which are crucial to stabilisation policies remain unknown.

The problem identified here is the relationship between money supply and domestic output. Of the two components of money supply i.e foreign reserves and domestic credit, domestic credit is the immediate monetary policy variable. This is because foreign reserves are determined by the external trade position and the capital inflows both of which domestic policy makers have little or no control over. Since policy implications are an important objective of this study, it will lay much emphasis on the impact of domestic credit on output and the implications of a credit policy for output.

1.2 Objectives of the Study.

This study investigates the nature and strength of the relationship between changes in real money balances and changes in domestic output. We analyze the following relationships;

(i) impact of changes in the two components of the money supply on total domestic output and its component sectoral outputs.

(ii) Relative impacts of credit to government and credit to the private sector on domestic output.

(iii) to determine the dominant transmission mechanism between money and domestic output in the Kenyan economy.

On the basis of the findings, we explore the implications of a credit policy on domestic output and make some policy recommendations.

1.3 Justification and significance of the study.

As mentioned in the problem statement, the precise relationships between monetary variables and other economic variables are crucial to effective intervention (stimulating or stabilizing) in the economy, the intervention itself necessary to attain specific welfare goals.

The relationship between money supply and output is one such relationship. It has not been studied effectively and the precise relationship remains largely unknown. That notwithstanding, credit policy is a major component of our monetary policy and has been adopted with intent to influence the level of output. For example, commercial banks have been instructed to allocate more credit to agriculture and particularly small scale agriculture. Yet, there is no clear evidence on the output responsiveness of the priority sectors viz a viz the effect of reallocation on the output of the industrial sector.

Kenya has adopted the IMF's stabilization and the World Bank's structural adjustment programmes. Both these programmes require that a country reduce the rate of monetary expansion by reducing domestic credit to improve their foreign reserves. Indeed, King(1979) gave similar advice. He said that the only safe rule for credit expansion in Kenya is that none should be undertaken at all. However, he added that there would be scope for credit expansion to the extent that this is offset by reductions in private credit. Structuralist macro-economists resist the bank and fund's programmes on the basis of an argument well documented by Taylor (1983)

> Tight money drives up interest rates on loans to firms for working capital and investments, and thus increases costs. The normal business response would be to cut back on activity and attempt to pass increased costs through higher prices. Even if the aggregate demand falls under monetary constraint, aggregate supply may fall by more, so that excess demand on commodities (demand minus supply) goes up. Further inflationary pressure results...monetary restraint may be stagflationary in the short run, increasing prices and causing output contraction if interest rate cost push is strong enough. (1983:193)

Such sentiments have been expressed with respect to short-term macro economic management in the late seventies and early eighties;

> But to those who might take a strict monetarist view and argue that the influence of imported inflation, as well as the more domestic factors, could have been neutralized by a more effective monetary policy, we would reply that fiscal and monetary policy so severely deflationary as to offset completely the effect of rising import prices would surely have imposed economic costs larger than the costs of the inflation itself. (Killick;1984)

This controversy has, in many developing countries eroded credibility of the fund's programmes. Despite Kenya being cited as a beneficiary of the programmes, we cannot evaluate their full impact without adequate knowledge on their full implications. Some economists have already identified this dearth of knowledge.

> There are further difficulties concerning the transmission mechanism between deficit financing on one hand, and the indicators it is intended to influence on the other: The GDP growth rate, the balance of payments and the price level. For one thing, variations in government indebtedness to the banks may be offset by contra-variations in credit to the private sector, as tended to happen in 1974, 1975 and 1978. It is thus necessary to look at the total credit scene.(Killick;1984)

Clearly then, these relationships need to be studied in reasonable detail.

Previous studies on monetary relationships in Kenya have been heavily constrained on the number of observations they could use for analysis. The period after 1980 has hardly been analyzed. We have the advantage of being able to consider a longer period (1969-

1988) and therefore make conclusions that can be generalised more confidently as describing the kenyan economy.

CHAPTER TWO.

2.0 Literature Review

The literature review traces the theoretical and empirical developments in the economic analysis of money supply and presents;

(i) An overview of money supply economics i.e the tenets of monetary theory with respect to relationships between money and real economic variables.

(ii) Empirical literature giving an insight into the relationships that have been studied and how they have been studied.

(iii) The existing literature on Kenya's money supply. This literature could well fit into the previous section but is reviewed separately to give it more prominence.

Friedman's(1968,1970) "Theoretical Framework for Monetary Analysis" set up a framework for systematic analysis of money in the quantity theory tradition.[3] He developed a simplified aggregate model for a closed economy with a passive government "that encompasses both a simplified quantity theory and a simplified income-expenditure theory as special cases."

The model has six equations; a consumption function, an investment

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[3] This is not the beginning of monetary analysis but as the author says, is a response that his previous work(Friedman and Shwartz, 1963) did not make the theoretical framework explicit.

function, an income identity or adjustment equation, a money demand equation, a money supply equation and an adjustment equation for the monetary sector. He termed the determinants of nominal money supply proximate determinants of the money stock. These are;

> (1) the amount of high powered money- for any one country, this is determined by the balance of payments under an international commodity standard, by monetary authorities under a fiduciary standard;(2) the ratio of bank deposits to bank holdings of high powered money- this is determined by the banking system subject to whatever requirements imposed on them by the monetary authorities; and(3) the ratio of the public's deposits to its currency holdings- this is determined by the public. (1970:202)

This framework has become almost standard in monetary analysis.

Tobin(1965,1969,) and Lehvari and Patinkin(1968) presented two different approaches to analyzing the role of money supply in growth models. Tobin uses a general portfolio model to analyze the effects of increasing money supply. In his analysis, increase in money supply increases the demand for capital stock through two distinct effects; the portfolio allocation effect and the wealth effect (real balance or Pigou effect). In the former, the transmission mechanism is through interest rates. If the stock of money is increased, the supply price of capital falls and to achieve a new portfolio equilibrium, asset owners attempt to increase their holdings of physical capital. The resultant increase in investment will affect the level of output. In the latter effect, the transmission mechanism is through an increase in net wealth which in turn creates an increase in planned consumption, inducing a supply response.

The Tobin analysis holds that changes in money supply are not uniquely important. They are less important than changes in other non-money assets in the portfolio with significant wealth and substitution effects on expenditure and demand for physical capital like government bonds. This analysis is representative of the Keynesian school.

Lehvari and Patinkin propound the view that money is uniquely important. They argued that if introducing money in the economy reduces the rate of capital accumulation, then there is no rationale for introducing it. They treat money as a consumer and producer good. As a producer good they introduce money into the production function i.e

$Y = f(K,L,M/p)$ assumed to be homogenous in all the variables.

They argued that production is a function of fixed capital(K), labour(L) and working capital represented by real money balances(M/p). Money's contribution to production is efficiency. It saves effort(labour and physical capital) that would otherwise be required to achieve the multitude of "double coincidences" on which successful barter is based. Sinai and Stokes(1972) tested it empirically by including real money balances in the production function of the U.S economy and found the money coefficient statistically significant using the three definition of money. They concluded that real money balances is a mistakenly omitted variable in the production function. The conclusion sparked off an "omitted variable debate." The validity of the methods used in the analysis and the interpretation of the results were criticized.[4]

The rational expectations school was inspired by Muth's (1961) article on rational expectations and the theory of price movements. He advanced the hypothesis that the expectations of firms tend to be distributed, for the same information set, about the prediction of the theory.

From this hypothesis, Lucas(1975) and Sargent and Wallace(1975) presented elaborate models to show that anticipated changes in money will affect prices with no real effect on output. Empirical tests on this proposition produce conflicting results because of the computational difficulties of modelling expectations.[5]

Literature on developing countries is mainly addressed to monetary policy alternatives for stabilization, inspired by Mckinnon's financial repression hypothesis.(Mckinnon:1973)

The "Mckinnon Thesis" is that there is a considerable time lag between effecting control on interest rates and the inducement of

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[4] for the "omitted variable" debate, see Prais 1975:a,b, Niccolli:1975, Ben Zion and Rutta:1975, Khan and Khouri:1975 and Sinai and Stokes:1975.

[5] For some empirical tests on the neutrality of anticipated money balances, see Lucas (1973), Barro (1977,78) and Sargent (1976)

an appreciable decline in the rate of inflation. In the meantime, the rate of monetary expansion declines and the flow of real credit flows below equilibrium levels. Since commercial banks are the most important sources of external funding for productive enterprises, determining the level of working capital, this reduction may constrain the capacity of productive enterprises to hold working capital and may reduce real output.

Kapur(1972) presented a one sector model for stabilization of LDC economies given financial repression. The model incorporated a commercial banking system and treats growth of real output as endogenous. Based on short run dynamics of the model he proposed a combination of an initial increase in the nominal deposit rate paid on money holdings to induce a decline in inflation and subsequently, an increase in the rate of monetary expansion as alternative stabilization policies.

Galbis (1979) modelled a two-sector financially repressed economy. The two sectors are a backward low productivity sector and a modern high productivity sector. He shows that given repressed interest rates, money balances will be misallocated into the backward sector. This will happen if interest rates do not induce producers in the backward sector to save with the banks. They reinvest their money balances in their low productivity enterprises.

Keller(1980) explores the implication of credit policies for output and the balance of payments. He formulates a theoretical model that links credit, domestic output and the current account of the balance of payments. He identifies three channels through which credit policies can affect production in the economy;

> (i)The indirect link between credit and overall aggregate demand in a Keynesian set-up of unused capacities and unemployment.
> (ii)The direct link between working capital availability and current production.
> (iii)The link between credit, investment and future production. (1980:452)

He demonstrates that credit used to finance investment on one hand and working capital on the other have different impact on the current account. His analysis concludes;

> (i)An increase in credit for working capital initially generates additional demand for factor inputs but not for produced goods: therefore, there is no initial impact on absorption and hence on the current account,...As marginal savings propensities in the private and public sectors are positive, an expansion of production and income through an increase in credit for working capital will lead to an unambiguous improvement on the current account.(1980:470)
>
> (ii)For very short time horizons, increased fixed capital formation results in an equally sized current account deterioration, reflecting the increased absorption level...In the long run, the current account effect of the increased productive investment will be unambiguously be positive.(1980:470)

He extended the model to analyze the effect of credit on a traded and non-traded goods sectors, with no change in the fundamental results.

Other relevant analyses come under the International Monetary

Fund's monetary approach to the balance of payments. They are primarily concerned with explaining the foreign sectors of open developing economies and assume output to be exogenously determined. The theory of the monetary approach to the balance of payments assumes lack of alternative financial assets to money in developing countries. Portfolio adjustment is between real assets and money. Consequently, excess money balances leak out of the domestic economy through imports and capital outflows.

Aghelvi and Khan applied the monetary approach to thirty nine developing countries. They concluded that since the approach was highly explanatory of the balance of payments, which in turn depends on, and determines the domestic economies,its practical relevance is not restricted to the balance of payments.[6]

The studies conducted by the fund are usually highly aggregative, using cross sectional data from many countries and therefore cannot be used for individual country analysis.

In empirical studies investigating the link between money supply and real economic variables, money supply is a highly explanatory variable. This applies to developing as well as developed countries. Gray(1963) tested the Polak model in Nigeria and

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6 The major contributions to the monetary approach to the balance of payments are collected in an IMF publication "The Monetary Approach to The Balance of Payments" including papers of Polak(1957),Polak and Boissoneault(1960), Fleming and Boissoneault(1961), Prais(1961), Rhomberg(1975), Argy(1969),Polak and Argy(1971), Khan(1977) and Aghelvi and Khan(1978).

oncluded that imports and income can be controlled by controlling he money stock and showed how control of the money stock can be ncorporated in the Nigerian six-year development plan. chotta(1966) and Baker and Falero(1971) tested income etermination models for Mexico and Peru respectively. They found hat monetary models explained the economies better than income odels. And Aghevli and Rodriguez(1979) set up a model trade induced changes in money supply explain the short run adjustment of Japans output. Short run adjustments are measured by the ratio of actual output to potential output, where potential output is measured by the level of excess capacity in the economy. They tested the model and found it highly explanatory and the money supply coefficient highly significant.

Monetary analyses of Kenya's economy are few. Those addressing money supply explicitly are even fewer. King(1979), Grubel and Ryan (1978) and Nganda(1985) have set-up and tested monetary models on the Kenyan economy.

In their studies, King (1979) and Grubel and Ryan (1978) analyzed the relationship between monetary variables and the balance of payments. King focused his analysis on the period 1963-1973. He used simulations on his model to asses the possible effects of expanding credit to government and concluded that its expansion led to a depletion of foreign reserves and inflation without any positive effects on domestic output. Grubel and Ryan aimed at testing the robustness of the theory of the monetary approach to the balance of payments. Using a monetary model, they derived a single equation for the determinants of the growth of foreign reserves. The reserves were explained as a function of income, prices, interest rates(proxied by the Nairobi Stock Exchange Index) and high powered money. Only high powered money was significant with a coefficient of -1.427.

Nganda called his study "An economic analysis of Monetary Relationships in Kenya." He analyzed the relationships by estimating four equations viz. a price equation, a currency to money ratio equation, an import equation and a supply of output equation. The supply of output equation explains output of the monetary sector as a function of price level,nominal wages, stock of money and output in the previous period. The variables explained 99.8% of output and all coefficients were statistically significant.

Muiru(1977) and Mwega and Ngola(1988) studied Kenya's domestic credit. Muiru attempted to asses the controllability of domestic credit by the central bank. He concluded that quantitative controls were more effective than selective controls. Mwega and Ngola investigated the causal directions between domestic credit and changes in net foreign reserves using the Granger test of causality. The study is an attempt to resolve a divergence of opinions arising from two different groups of studies in Kenya.

hey are divergent on the direction of causality in this elationship. Their results show that flow of total domestic redit caused changes in net foreign reserves without significant eedback effects for the period covered by the data.

ther studies on the monetary aspects of the Kenyan economy nclude; Bolnick (1975) on the behavior of the proximate eterminants of money. He found that the money multiplier in Kenya s highly unstable due to the instability of its component ariables. He concluded that the central bank's ability to control oney supply was limited because of this instability and the fact hat it has no control over the currency base. Ndua(1982) on the ehavior of the currency ratio in Kenya. He found that the urrency ratio was decreasing with time and was mainly influenced y the spread of banking activities, level of income and government xpenditure. Pathak(1981) estimated the demand for money and found ncome and interest rates as significant determinants.

:.0.1 Summary of the Literature Review.

'he major issue arising, and of direct relevance to this paper concerns the theoretical issues on the role of money in output determination within the framework of monetary analysis and important notes when the analysis is extended to developing economies. From the literature on Kenya, we would like to establish the scope for conduct of monetary policy.

The basic framework for monetary analysis, as advanced by Friedman and others, is within a closed economy. And those who have extended the analysis to an open economy tend to restrict it to the foreign sector.

The link between money and domestic output we infer from the analysis of the role of money in growth models. Three approaches emerge.

One is the Keynesian transmission mechanism. It proposes that increases in the money supply depress interest rates and hence the supply price of physical capital. Lower interest rates induce increased investment and consequently an increase in output.

The second approach treats money as a consumer and producer good. As a producer good, money balances are a factor of production whose contribution in the production process is productive efficiency. The prediction of the theory is that money balances have a positive effect on output. Empirical studies, conducted by including money balances in the production function support this prediction. Although the methods used and the interpretation of the econometric results have been criticized, no criticism has been levelled on the prediction itself.

The third, the rational expectations school's hypothesizes that money is neutral in the short run and in the long run. This proposition has not been tested extensively because of the computational difficulties of modelling expectations this way.

For developing economies, the problem is the conduct of monetary policy in financially repressed economies. There is no consensus on the effect of financial repression on the effectiveness of monetary policy, because different people have considered different characteristics and distortions of developing economies. We sample some of the hypothesized effects.

Given the dualistic nature of developing economies, and their repressed interest rates excess money balances will be misallocated into the backward and less productive sectors because of inadequate incentive to deposit money in financial institutions.

Such is the conclusion reached by Galbis (1977)

And Kapur (1972) by analyzing a scenario in which commercial banks dominate financial intermediation paints a grim picture where given reppressed interest rates, monetary expansion induces a high rate of inflation and yet is required to achieve stabilization. His solution is in itself a difficult linear programming problem to determine the right rate and timing of monetary expansion. Its formulation and solution is at best a potentially interesting academic exercise.

A third, and widely adopted conclusion is that reached under the monetary approach to the balance of payments. The hypothesis is that where adjustments of the money portfolio is between money and real assets, excess money balances leak out of the domestic economy through imports and capital outflows, with accompanying depletion of foreign reserves. On the strength of this hypothesis, and a few highly aggregative cross country studies that support it, the IMF requires of countries aspiring to benefit from its programmes, a contraction of domestic credit.

We note important research findings on domestic credit and money supply in general.

The study of the proximate determinants of money in Kenya suggests that the Central Bank has little scope for controlling the money stock because of the instability of the money multiplier, and the banks inability to control the currency base. This inability arises because the bank has no control over the level of foreign reserves and government borrowing from it, the two main sources of high powered money. The bank however is empowered to control credit created by commercial banks using both quantitative and selective controls. Muiru's (1977) study on the this subject suggests that the Central Bank can control this component of domestic credit and more effectively by use of quantitative controls. We can conclude therefore that an effective credit policy can be pursued by a combination of Central Bank control and fiscal policies determining the size and sources of government deficit financing. The desirability of such a credit policy would be determined by knowledge of how domestic credit impacts on the major economic variables.

The relationship between domestic credit and foreign reserves seems well established. Changes in total domestic credit cause changes in net foreign reserves with no significant feedback effects. (Mwega and Ngola:1987) Credit expansion to the government has only a small and temporally effect on prices and economic activity. Its permanent effect is on the foreign reserve position. This is King's conclusion after analyzing data for the period 1963-1973.

2.1 Links Between Money Balances and Domestic Output.

This study is based on the existence of a causal relationship running from money supply to domestic output. The principal hypothesis is that the relationship is significant. It may well prove useful to show in reasonable detail, the transmission mechanism of this relationship.

There are two main paths through which disturbances in money balances may be transmitted to domestic output; an indirect link and a direct one.

The indirect link is a Keynesian transmission mechanism where monetary expansion as one of the factors that affect final demand in the economy, indirectly induces an output response to aggregate demand. An output response will only be forthcoming where capacities to expand output in the short run and to increase capital stock in the long run exist.

The direct link is the role availability of credit and foreign exchange plays in financing current production. Firms' production decisions such as employment levels and size of inventory are determined to a large extent, by the level and terms of credit and availability of foreign exchange. Working capital creates productive efficiency. The extent to which working capital is financed by credit in the economy is the extent to which credit directly affects output. It is on the basis of this link that working capital, represented by money balances has been inserted into the production function in addition to capital and labour. This method of analysis is deficient in so far as it looks at the effect of money balances on output in isolation from other variables like prices and the balance of payments.

CHAPTER THREE.

3.0. Methodology.

The methodology employed entails the use of an econometric model to investigate the existence, nature and extent of causal relationship between domestic output adjustment and real money balances.

In the previous section, we have hypothesized a causal relationship running from money supply to output but with significant feedback effects. This relationship is not an isolated phenomena but part of a more complex transmission mechanism running from monetary variables including money supply and money demand to economic variables including inflation, output and the balance of payments and vice versa. This dictates that we specify a simultaneous equation monetary model for the whole economy.

It is beyond the scope of this paper to estimate such a model. The time and resource constraints necessitate a choice between estimating the complete model and give little attention to the money output relationship or putting the money/output relationship in detail and leaving most of the other relationships to other researchers and future times. The latter alternative lends itself best to the paper's stated objectives. The rest of this section is devoted to developing a model within a model and its estimation techniques.

3.1 Model Specification.

The model to be estimated is derived from the output equation of a monetary model for the Kenyan economy. The equation is disaggregated to meet the requirements of this study.

The Output Equation:

$$\Delta Y_t = b_0 + b_1[M_t - M_{t-1}] + b_2[Y^*_t - Y_{t-1}] \qquad \text{(i)}$$

$$b_1 > 0, \quad b_2 > 0$$

Capacity Output:

$$(Y^{*t} - Y_{t-1}) = b_3 + b_4\ FR + b_5\ DC \qquad \text{(ii)}$$

$$b_4 > 0, \quad b_5 > 0$$

Money Supply:

$$M_t - M_{t-1} = 0(M_t) \qquad \text{(iii)}$$

$$M_t = FR_t + DC_t \qquad \text{(iv)}$$

Where;

ΔY = change in real output.

M = real money balances.

Y^*= capacity output.

FR = Foreign reserves

DC = Domestic Credit

and t denotes time period, denotes change, b_0 is a constant and b_1 and b_2 are parameters.

(i) is an output adjustment equation. The change in output is positively related to the change in stock of real money balances and the output gap, defined here as the difference between normal capacity output and actual output of the previous period. (ii) is the equation that endogenises capacity output growth. The output gap is specified as a function of changes in stock of money balances. (iii) is a money balances adjustment identity where the real money balances is equal to changes in money supply. And (iv) is a money supply identity expressing changes in stock of money balances as comprising of changes in the foreign reserve component and changes in the domestic credit component.

By substituting (iv) into (iii) and subsequently (iii) and (ii) into (i), the output adjustment equation is specified as a function of changes in stock of real money balances only such that we derive the relationship;

$$\Delta Y_t = b_0 + b_1(\Delta FR + \Delta DC) + b_2(b_3 + b_4\Delta FR + b_5\Delta DC) \qquad \text{(v)}$$

which equals

$$Y_t = b_0 + (b_1\Delta FR + b_1\Delta DC) + (b_2b_3 + b_2b_4\Delta FR + b_2b_5\Delta DC) \qquad \text{(vi)}$$

The first part of the equation represents a demand side transmission mechanism where we expect the parameter for foreign reserves and domestic credit to be equal i.e the effect of money on aggregate demand is independent of whether the change arises from foreign reserves or domestic credit. The second part represents a supply side transmission. Here, we expect the size of the parameters b_4 and b_5 to be different i.e. the effect of a change in money balances to production will depend on the source of the change.

By estimating the equation;

$$Y_t = c_0 + c_1\Delta FR_t + c_2\Delta DC_t + u_t \qquad \text{(vii)}$$

Where u is a random error term, $c_0 = b_0 + b_2b_3$, $c_1 = b_1 + b_2b_4$ and $c_2 = b_1 + b_2b_5$ and from c_1 and c_2 we infer which transmission mechanism is dominant and analyze the policy implications.

Subsequent estimating equations are obtained by breaking down Y_t into its individual components. We have dissagregated Y_t into the various component sectors as classified by the Central Bureau of Statistics. We have also disaggregated domestic credit into credit to government credit (DCG) and credit to the private sector (DCP) and estimated the model using this domestic credit specification.

3.2 Estimation Techniques

The estimation techniques employed address two major problems arising with the model as specified; simultaneous equation bias and the problem of systematic errors across equations.

The feedback effects running from output to the monetary variables are captured by the full structural model (appendix). OLS estimation would yield biased estimates of the coefficients. To arrest the feedback effects, we use the independent and lagged dependent variables of the full model as instruments to construct proxy output and money supply variables and obtain more reliable estimators of the coefficients in the model.

The other problem arises because of the disaggregation of the variables in the model. We have disaggregated changes in total domestic output to the component changes in sectoral outputs. Since the shares of output sum up to unity, we expect non-zero covariances between the error terms in different equations i.e systematic errors across equations. These errors violate the homoscedasticity (constant variance) requirement of efficient OLS estimation. Zellner's Seemingly Unrelated Equation Estimation (SURE) is a single equation estimation technique[7] that provides a feasible estimation process for such equations. Consequently, the SURE technique cannot be used together with instrumental variable estimation.

A technique that combines both instrumental variable estimation and computes homoscedastic non-autocorrelated residuals for systems of equations is the Zellner-Theil[8] Three Stage Least Squares Estimation (3SLS). 3SLS estimates each equation by 2SLS and then proceeds to compute GLS estimators using the SURE method. This technique addresses both of the principal estimation problems of our model. The technique is however, not without limitations. It is a full information , or complete system estimation technique. To be more efficient than 2SLS, full information techniques (3SLS

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7 SURE obtains GLS estimates by first estimating each equation individually using OLS and then using the results to estimate variances of a homoscedastic variance matrix of the error term.

8 The original paper is A. Zellner and H. Theil (1962) "Three Stage Least Squares: Simultaneous Estimation of Simultaneous Equations." Econometrica, Vol. 30. See also Johnston, J.(1987).

and Full Information Maximum Likelihood (FIML)) require that the complete model be correctly specified. Correct specification of a model becomes more difficult as it becomes larger and more elaborate. To this effect, no model can be said to be fully correctly specified as there are many non-economic factors difficult to capture in econometric models.

We proceed to use 3SLS to estimate our model on the strength that it addresses both the principal estimation problems raised by the model, and that since the model is small, the specification error involved is not large enough to be restrictive. If however, the specification error be large, we stand to loose only 3SLS's marginal efficiency over 2SLS.

CHAPTER FOUR.

4.0 Model Estimation and Presentation of Results.

The Gross Domestic Product data prepared by the Central Bureau of Statistics is classified into four major categories; the traditional economy, product of enterprises & non-profit making institutions (private sector economy), private households (domestic services) and general government. Except for domestic services, each of the other main sectors of the economy are further sub-divided into their component sectors.

From this, we have generate the following real domestic output variables:

QTRAD total output of the traditional economy.

private sector economy.

QAGR	agriculture
QFOR	forestry
QFISH	fishing
QMIN	mining and quarrying
QMANF	manufacturing output
QCON	building and construction
QELEC	electricity and water
QTCOM	transport, storage and communications
QHOT	trade and hotels
QFIN	banking, insurance and real estate
QDWEL	ownership of dwellings
QPRIV	total output of the private economy
QDOM	private households (domestic services)
QGOV	general government
QXPT	exported output
QNXPT	domestically consumed output
QTOT	total domestic output

The real output variables are generated by deflating the nominal output data by using the middle income consumer price index (1975=100) and then computing changes in the variables in the first difference form.

The central Bank of Kenya's monetary survey, published in the bank's Quarterly Economic Report compiles data on the different sources of money supply. For this study, we generate the variables;

CDC	change in real domestic credit
CFR	change in real foreign reserves (the foreign reserves component of the money supply)
DCP	changes in domestic credit to government
DCG	change in domestic credit to the private sector

where

DCP + DCG = CDC

The real variables are generated using the same method as the output variables.

The list of instrumental variables includes the exogenous variables and the lagged dependent variables specified in the full model. These are:

XRATE	exchange rate (Sterling pound rate of the Kenya Shilling)
FPI	foreign price index of imports
GDPT	a trend value of real GDP
CCPI	the rate of inflation
GOV	nominal government expenditure
RMON	real money balances
QTOT	real income

CCPI, RMON and QTOT are endogenous variables lagged one period. The trend value of GDP is generated by estimating the real GDP as a

function of a trend variable and taking the fitted values as its trend value.
The model was estimated using data for the period between 1969 and 1988 - a total of 20 observations. Coverage of previous periods was constrained by the availability of data. Data series on the required monetary variables unavailable for the period before 1968. It is from this year that the Central Bank of Kenya was able to operate independently of the East African Currency Board and record monetary transactions for the kenyan economy. Computing annual changes in the first difference form loses the observation of the beginning period.

Software limitations constrained the estimation of the whole model as one system. MicroTSP[9] requires that a system of equations have no more than 41 different coefficients to be estimated. We have therefore estimated the model in four exhaustive sets of equations, presented here as Models 1, 2, 3 and 4. Model 1 includes all the sectors under the private sector economy and the total output of that sector as a function of CDC and CFR.

Model 2 includes the outputs of the four main sectors and their sum total, total domestic output as a function of the same money balances variables.

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[9] MicroTSP(Time Series Processor)(1983) by David M. Lilien, Quantitative Micro Software, Irvine California.

Model 3 estimates the same equations in Model 2 using the dissagregated domestic credit variables and foreign reserves i.e DCP, DCG and CFR. Model 4 estimates the equations for exports and dmestically consumed output (QXPT and QNXPT) as functions of the same variables.

In each of the models, the individual coefficients of all components output equations are summed for comparison with the coefficients of the aggregate. Ideally, the sum of coefficients and the coefficient of the aggregate variable should be the same. The evident discrepancies are the likely result of errors in measurement, which are bound to be very pronounced when the observations are few.
The results of the 3SLS estimation are presented below.

MODEL 1.

EQs.	c	cdc	cfr	D-W
1.QAGR	206496.09	0.729*	0.996**	2.40
	(0.055)	(1.408)	(2.101)	
2.QFOR	11458.2**	-0.009*	0.002	1.97
	(2.3)	(-1.334)	(0.35)	
3.QFISH	25592.57**	0.0003	-0.001	2.341
	(1.831)	(0.143)	(-0.359)	
4.QMIN	-2250.86	0.001	0.003	3.028
	(-0.083)	(0.261)	(0.804)	
5.QMANF	1176592.2**	-0.004	0.139*	2.736
	(1.747)	(-0.049)	(1.661)	
6.QCON	1110707.1**	0.125*	0.051	1.923
	(1.998)	(1.661)	(0.745)	
7.QELEC	181868.4**	-0.21*	0.004	1.196
	(1.925)	(-1.643)	(0.298)	
8.QTCOM	26356.75	0.058*	0.065**	2.606
	(0.094)	(1.506)	(1.853)	
9.QHOT	721889.361*	0.033	0.112*	2.647
	(1.607)	(0.477)	(1.651)	
10.QFIN	181468.41***	-0.08**	0.032	2.628
	(4.608)	(-1.76)	(0.771)	
12.QOTHR	-34605.16	0.045*	0.02	1.822
	(-0.152)	(1.419)	0.688)	
sum	4106153.5	0.96	1.422	
13.QPRIV	5287140.8*	0.56	1.376***	2.21
	(1.623)	1.191)	(3.11)	

MODEL 2

EQ.	c	cdc	cfr	D-W
1.QTRAD	676468.72	0.0387	0.114**	2.06
	(1.271)	(0.537)	(1.746)	
2.QPRIV	7148953.0	0.395	1.38***	2.05
	(1.973)	(0.805)	(3.115)	
3.QDOM	119457.09***	0.004	0.01**	2.47
	(2.995)	(0.732)	(2.012)	
4.QGOV	1828107.5***	-0.074	0.123*	2.006
	(2.556)	(-0.763)	(1.407)	
coeff.	3338925.9	0.497	1.511	
6.QTOT	3889656.6	0.786	1.426**	2.84
	(1.149)	(1.715)	(3.448)	

_notes.
1. T-statistics are in parentheses.
2. The lower and upper significance limits are 1.1 and 1.573 respectively.
3. *, **, *** mark, respectively, the 10%, 5% and 1% significant limits for the coefficients. The significance limits for the F-statistic has been omitted (see text)

MODEL 3

Eq.	c	dcp	dcg	cfr	D-W
QTRAD	233423.48	0.216**	0.007	0.069	2.18
	(0.385)	(1.776)	(0.09)	(0.963)	
QPRIV	3943173.9	1.678***	0.165	1.056***	2.14
	(1.249)	(2.606)	(0.41)	(2.808)	
QDOM	96126.11**	0.013**	0.002	0.007	2.258
	(2.925)	(2.606)	(0.544)	(0.047)	
QGOV	1261386.2***	0.153*	-0.115*	0.066*	2.66
	(2.925)	(1.983)	(-1.384)	(1.904)	
Coeffs.		2.06	0.59	1.197	
QTOT	33686236.6	0.994*	0.748*	1.374***	2.783
	(0.958)	(1.387)	(1.674)	(3.282)	

MODEL 4

Eq.	c	dcp	dcg	cfr	D-W
QNXPT	-340377.4	1.376*	0.853*	0.827**	2.14
	(-0.078)	(1.708)	(1.698)	(1.752)	
QXPT	6839001.0***	-0.381	-0.105	0.547**	2.34
	(2.802)	(-0.766)	(-0.338)	(1.884)	
coeff.		0.995	0.748	1.347	

notes.

1. 0.998 and 1.669 are the lower and upper limits of the D-W statistic. (All other notes above apply).

4.1 Analysis of the Results.

The results follow a more or less expected pattern in most respects. All except three of the statistically significant coefficients of both the domestic credit and foreign reserve variables have a positive sign as postulated in the model.

The R^2 statistic has not been included in the results because it is not a very meaningful test of the goodness-of-fit of a model when instrumental variables are used in the estimation. This is because the distribution of the statistic is not bounded between zero and one. Instead, its value lies between negative infinity and one. (Hossain;1987) This also renders the F-statistics meaningless (since $F = R_2 / 1-R_2$). A more meaningful test of the goodness-of-fit of the model is the simulation experiment (see next section).

The coefficients for the constant term are significant for most of the equations (the size of the constant term coefficient appears very large because the figures used have been converted from the K£ millions used in the Statistical Abstracts to Ksh. Million)

The impact of foreign reserves is felt significantly in the individual sectors of agriculture, manufacturing, transport, storage & communications and hotels & trade. A one shilling increase in foreign reserves induces an almost equivalent increase in agricultural output, a sh. 0.139 increase in manufacturing output, an increase of 65 cents in the output of the transport sector and an increase of sh. 0.112 in the output of hotels & trade.

Total domestic credit induces a decline in the outputs of forestry, electricity & water and the financial services sector. A one shilling increase in total domestic credit induces decreases of sh. 0.004, sh. 0.21 and sh. 0.08 in the outputs of forestry, electricity & water and financial services respectively. A possible explanation for both forestry and electricity & water is that increases in domestic credit favour expansion of the outputs of competing sectors in the complex inter-industry relationships that are best captured by analysis of detailed input-output analysis. This result cannot therefore be pursued further here. But this possibility is implausible for output of the financial sector. This result is explored more later.

Only foreign reserves seems to exert a significant influence on the output of the whole of the private sector economy. A one shilling increase in foreign reserves induces an increase of sh. 1.378 in the output of the private economy. This increase, as expected, is in close proximity to the sum of individual coefficients of all its component sectors. Although the individual coefficients of some of the component sectors may be too small to be picked up by the econometric model, this shows that the private sector is more sensitive to changes in foreign reserves than to changes in the total domestic credit.

The results of Model 2 present a broader picture. The constant term coefficient is significant for changes in the outputs of private sector economy, domestic services sector, and output of government. Changes in foreign reserves are significant for every sector grouping. A one shilling change in foreign reserves induces increases of sh. 0.114 in traditional economy output, a sh. 1.38 increase in the private sector's output, a one cent increase in the output from domestic services, a sh. 0.123 increase in government output and a sh. 1.427 increase in aggregate domestic output. Significant influence of foreign reserves on the traditional economy may appear to be intriguing. It ceases to be so when one looks at the simulation results. After 1975, real money balances became a good predictor of the trend of output changes in the sector- suggesting that the hitherto traditional economy has became well integrated into the mainstream monetary economy and hence responds to monetary stimuli as well as the rest of the economy. Even the Central Bureau of Statistics has recently substituted the name "traditional" with "semi-monetary" in its sector definitions. Domestic credit is however insignificant for all the sector groupings except for the total domestic output, a situation which changes dramatically when we use a different specification of the model in Model 3.

Domestic credit to the private sector becomes significant in four of the equations estimated. A one shilling increase in credit to the private sector induces output increases of sh. 0.216 in the traditional economy, sh. 1.678 for the output of the private sector, sh 0.153 for the output of government, sh. 0.013 in domestic services and sh. 0.994 in the whole of the monetary economy. Domestic credit to government is insignificant in all the equations except that of government output itself.

Foreign reserves are significant in three out of five equations. A one shilling increase in foreign reserves induces output increases of sh. 1.056 in the total private sector output, a small sh. 0.007 increase in domestic services, sh. 1.374 in the total domestic output. The constant term is only significant for government output and domestic services.

In Model 4, all three explanatory variables are significant for QNXPT, domestically consumed output. One shilling increases in credit to the private sector, credit to government and foreign reserves induce increases of sh. 1.376, sh. 0.853 and sh. 0.827 in domestically consumed output respectively. Only changes in foreign reserves have significant influence on changes in exports. A one shilling increase in foreign reserves induces an increase of s. 1.884 shillings in exports.

We have re-estimated the output of financial services equation individually using the Model 3 specification with the following results;

$$QFIN = 817186.96^{***} + 0.088DCPRIV^{**} - 0.053DCGOV^{**} - 0.01CFR$$
$$(3.491) \quad (1.895) \quad (-1.49) \quad (-0.27)$$
$$D\text{-}W = 1.82$$

We estimated the equation using TSLS. Although the technique should estimate efficient coefficients, there might be nonetheless, slight differences with the coefficients of a systems estimation. Comparison is therefore reasonable but not exact.
Both DCPRIV and DCGOV are significant at the 5%. CFR is insignificant.

A one shilling increase in private sector borrowing induces a sh. 0.088 increase in the sectors output. An equal increase in credit to government decreases the sectors output by sh. 0.053. Evidently, it is credit to government that exerts negative influence on the sectors output.

The appropriate test statistic for equality of coefficients is the F-ratio for the subset of coefficients under test. One way of computing this ratio is to re-estimate the model subject to a linear restriction, where the restriction is the hypothesis to be tested. The partial F-ratio is equivalent to the difference in residual sum of squares between the restricted and unrestricted model expressed as a ratio of the residuals of the unrestricted model i.e

$$F_{q,n-k} = (e_*'e_* - e'e)/\ e'e$$

Where the $_*$ denotes the residuals of the restricted model.

q(number of coefficients under test) and n-k are the degrees of freedom for the numerator and denominator respectively. This ratio, tested against a preselected critical F value tests whether there are any significant differences between the errors generated by the residuals of the two model. Insignificant differences imply that the two model specifications are the same. This test however, may not be a decisive criterion on the relative sizes of the coefficients in this study. This is because the residual sum of squares (e'e) generated by systems estimation, like the R^2 statistic is not very meaningful (see Bassman;1962, Khan & Knight;1981). A heuristic comparison of the coefficients turns out to be necessary to infer about the relative sizes. In Model 1, equations 2, 6, 7, 10, and 12, the coefficients for domestic credit are significantly greater than zero. That of foreign reserves is effectively zero- the coefficients are obviously different. The same holds for equations 5, 9 and 13 where the foreign reserves coefficient is significant and domestic credit is effectively zero. The bulk of the evidence therefore indicates that the coefficients are of different sizes. This is corroborated by Model 2 where domestic credit is insignificant in all the sector equations and foreign exchange is significant.

In Model 3, credit to government is only significant for government output whereas private sector credit is significant in equations 1, 2, 3, and 5 and foreign reserves in equations 2, 3 and 5. The following argument leads to the same conclusion. Equality of the coefficients implies a demand side transmission mechanism where an extra shilling of real money balances has the same aggregate demand effects on the economy. Then, credit to government has the effect of increasing aggregate demand and its effect on output should not be restricted entirely to the government sector. In this case where the effect of an extra shilling of real money balances is so distinct depending on where it is used, only the alternative impact is plausible-"The indirect link between credit and working capital availability and current production."(Keller;1980)

4.2 Simulation Results.

The purpose of the simulation experiment is to test the goodness-of-fit of the model in the absence of meaningful R^2 statistics. We have therefore conducted a historical simulation experiment (i.e simulation over the actual estimation period.)

The results are presented in the appendix. The graphs compare the actual values of the output variables and those predicted by Models 2 and 3. The actual predicted values also appear in the data appendix.

There in no single universal standard for evaluating simulation results. The basis for evaluating the goodness of fit is the size of the prediction error and the ability of the model to predict turning points in the predicted variable. Other criteria, such as sensitivity to starting points of the simulation experiment and sensitivity to changes in the time paths of the exogenous variables can be used in more rigorous evaluation of simulation experiments. Such rigor is especially necessary fro forecasting models. In our case, the first two are adequate.

Two types of indices are used for measuring the prediction error (or the goodness of fit) of a simulation; The Root Mean Square (RMS) and Mean Simulation Error indices. The Mean Simulation Error indices have a major shortcoming in that the negative and positive errors cancel out, such that the actual index may be close to zero. This leaves the RMS indices as the more telling of the two.

The Root Mean Square is a measure of the deviation of the simulated variable from its actual time path. This can be computed in absolute or in percentage terms. We have computed the latter because the index is independent of the actual values. This is computed as:

$$RMS_{(\%\ error)} = \sqrt{1/T \sum_{t=1}^{T} (Y^{ts} - Y_t^a / Y_t^a)^2}$$

Where,

Y_t^s = simulated value of Y_t

Y_t^a = actual value of Y_t

T = number of time periods

The RMS indices for the simulations are;

Eqs.	Mod.2	Mod.3
QTRAD	3.82	1.61
QPRIV	3.01	2.54
QDOM	1.424	1.864
QGOV	2.056	1.608
QTOT	2.533	2.308

Page (xi) of Appendix Two shows the actual percentage errors for each of the predicted output variables for each of the years. The prediction errors are very low- less than 5% for all the values simulated. The actual and predicted trends (see graphs) predict most of the turning points fairly well.

The gap between the actual and predicted values declines over time, a trend that is consistent with the process of economic development where the economy become more and more money dependent. This applies also to the output of the traditional sector, showing the increasing intergration of the traditional sector into the modern monetary economy.

CHAPTER 5

5.0 The Output Implications of Credit Policy

Previous studies have addressed the implications a credit policy on the monetary account position of the balance of payments (King;1979, Grubel & Ryan;1978). On the basis of a strong inverse relationship between credit expansion & foreign reserves position, they have favoured restraint on domestic credit expansion.

This is consistent with the IMF and World Bank's position, institutions that have had extensive influence on Kenya's macro-economic management. Ceilings on credit imposed by the IMF have been one constant source of conflict in negotiating for BOP assistance (the IMF cancelled 3 stand-by credits between 1979 and 1982 on account of the government exceeding the credit ceilings (Killick;1984, Hecox;1988).

Our findings are largely consistent with this position. Credit to government has no significant effects on the output of any other sector except that of government itself. Only in so far as credit to government is an increase in high-powered money, and hence increases commercial banks' ability to lend, it may have significant output effects.

Domestic credit to the private sector has a significant effect on output in the economy. Monetary restraint that is bound to reduce nt of this credit will have negative effects on aggregate ly. King has suggested that "some room for safe borrowing from monetary system [indeed] would be created" if the government ld borrow from the banking system at the same terms with the vate sector. Evidently, this competitive borrowing inevitably ds to reductions in credit to the private sector.

> Over the past several years, between one third and one half of all bank credit has gone to finance budget deficits. If the private sector is to play its role in renewing economic growth, it is important that the government does not absorb an excessive share of financial reserves. (Sessional Paper No. 1, 1986;34)

r study confirms what, as we see, the government has already cognised- the only "safe" recourse then for government borrowing borrowing from non-bank sources.

ur findings have implications on the government's monetary policy f "providing adequate credit on a selective basis to support rowth of productive activities" (Sessional Paper No.1;1980). This olicy has been pursued consistently, with the principal objective of channelling more credit to agriculture.

Changes in credit have larger impacts on the output of some sectors than others. They impact heavily on the output of agriculture, but have no significant effect on the output of manufacturing. This outcome should not however be interpreted as reflective exclusively of the relative importance of credit in sectoral outputs. It reflects also, the distributional aspect of the changes in credit.

credit allocation has been biased against agriculture. The significance of credit in changes in agricultural output shows also that agriculture is a residual recipient of credit- bearing the brunt of fluctuations in credit availability. Its insignificance in manufacturing reflects the sector's privileged position in the allocation of credit- hardly affected by the fluctuations.

As mentioned, foreign exchange reserves are the effective constraint in manufacturing and exports. This has important implications in several aspects of economic policy. Policies that improve the foreign reserves position of the country (such as restraint on monetary expansion) also enhance manufacturing (which is primarily import substituting) and production of exports. They therefore enhance the country's ability to further save and earn more foreign exchange.

There are many problems associated with the policy issues raised here. The most formidable is the controllability of government borrowing. Killick (1984) analyzed eight government budgets from 1973/4 to 1980/81 to compare actual and predicted budgets. He found large variations between predicted and actual budget outcomes. This discrepancy inevitably leads to bank borrowing by the government after all the other non-inflationary sources of financing have been exhausted. Despite the governments commitment to non-bank borrowing, public response to undertake government debt is still poor;

> the government has attached increasing importance to attracting funds from the non-bank sector [over the last year]. The issue of shs. 3 billion of Treasury bonds at fixed interest rates in early 1988 was very successful in this respect. Bond sales through auctions have been less successful however. This is surprising, given that the government has now clearly indicated the willingness to pay market interest rates on its debt sales. (Central Bank of Kenya;1988;21)

The governments ability to use some arm twisting with banks and non-bank financial institutions ensures certainty in meeting its budget shortfalls. Systematic reduction of bank borrowing becomes very difficult when it depends on variables as exogenous as non-bank borrowing.

Another problem is the ability to influence private sector borrowing. The most effective short-term tool is direct credit controls by the central bank- and then, only to limit the amount of credit. Short of moral suasion, no feasible technical monetary tools exist to influence the sectoral allocation of credit. In the past, the government has been improving disbursement of credit in agriculture by direct involvement through its own agencies. First, there is the question whether sectoral allocation of credit is consistent with other of the governments intended liberalisation objectives;

> Credit, like any other resource is a scarce resource and must be allocated to those areas where it is most useful. In general, those borrowers who can afford to pay the highest rates (in risk adjusted terms) because of the high productivity of their investments should get access to loans. If interest rates can, in this way play a more active role in

allocating credit to the most profitable areas of investment, then the whole economy will benefit. (Central Bank of Kenya;1988;21)

The moral of the story is that credit policy is not the panacea for agriculture's unfortunate place in the credit market. The ultimate solution lies outside credit policy: in the improvement of the sectors creditworthiness.

5.1 Conclusion

We set out to explore the output effects of real money balances. Of particular interest has been the implications of the domestic credit component, perceived as the policy instrument of the two components of money supply. The thrust of the study was to shed light on the exact transmission mechanism of these effects, and its consequent policy implications, in view of the structuralist/monetarist controversy (outlined in section 1.2) over the macro-economic effects of tight money policies.

On the basis of our econometric model, we find a predominantly supply side relationship, where money balances affect the current production decisions. Our findings do not however absolve inflationary borrowing by government on account of output losses- credit to government has no other significant output effects except on the output of government itself. The existence of a basically pro-structuralist money/output relationships does not invalidate the "tight money policies" identified with the IMF and World Bank and other donor agencies- in so far as tight money is applied to bank borrowing by government.

We also find differential sectoral impact of credit over the study period. This we do not attribute entirely to the relative importance of credit in the respective sectors but also to the institutional characteristics that make some sectors, notably agriculture, residual recipients of credit. Interventionist redress of this "anomaly" is inconsistent with overall macro-economic policy and the permanent solution lies in policies aimed at improving the culprit sectors' creditworthiness. This is our conclusion after looking at the other objectives of monetary policy.

It is foreign reserves other that credit availability which is the effective constraint to production in manufacturing ad also in the production of exports. This implies that policies that improve the foreign reserves position have a snowball effect; they remove a constraint to further saving and generation of foreign exchange.

We have tried as much as it was possible to point out the shortcomings of the study as they arose in the respective sections The model we have specified, as already pointed out, is a "trade off" necessitated by the time constraint. It allows for deeper insights into the money balances/output relationship but independent of other endogenous relationships. An estimation of the full structural model would certainly be an improvement on both the estimated parameters and in presenting a kind of "panoramic view" of the macro-economy.

The model is specified to capture short term effects. To this end, annual data may not be the most appropriate since it does not capture intra-year fluctuations in both money supply and output (especially in non-agricultural output). Quarterly data would have been more appropriate for the study. Unfortunately, comprehensive quarterly data on output is not available.

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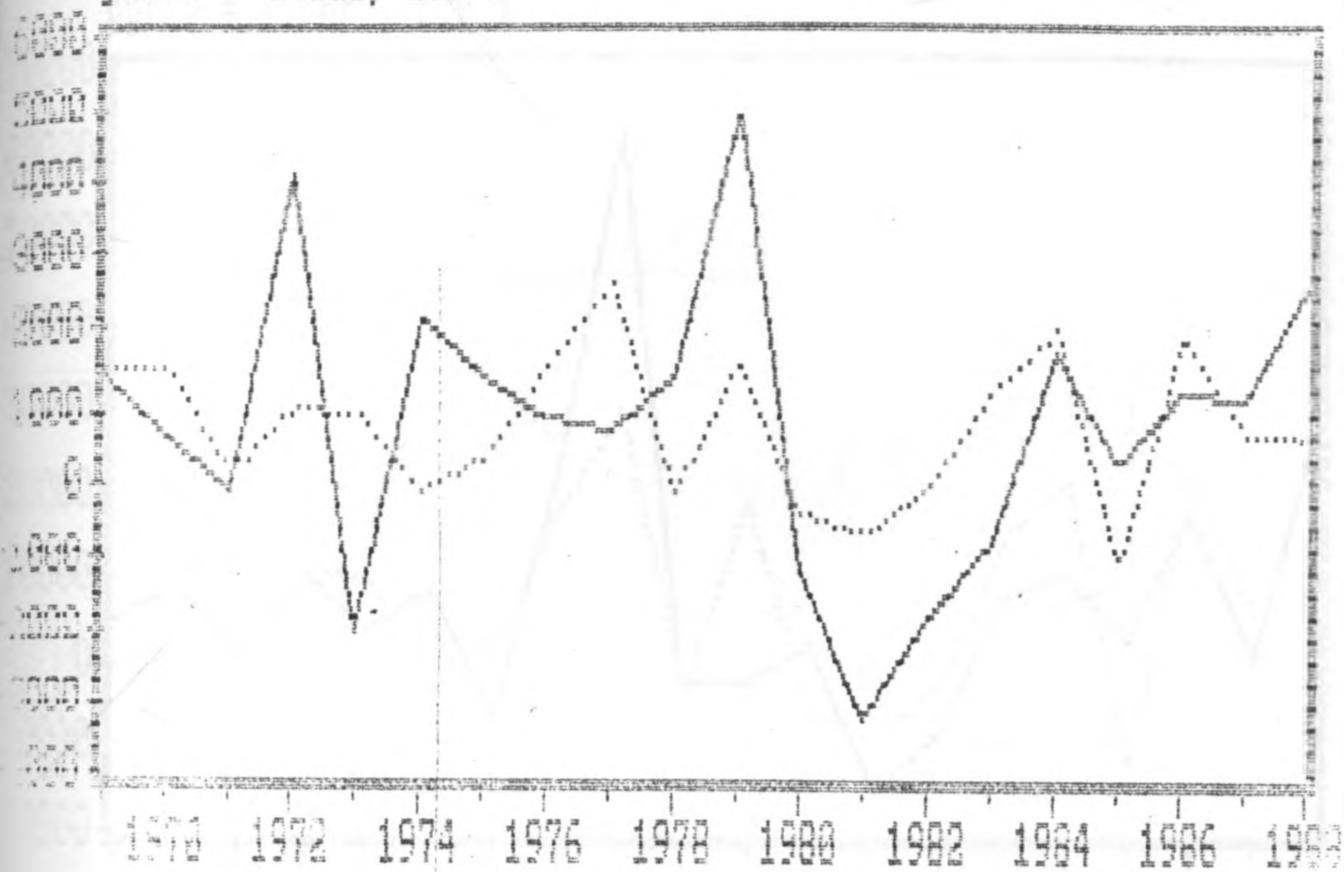
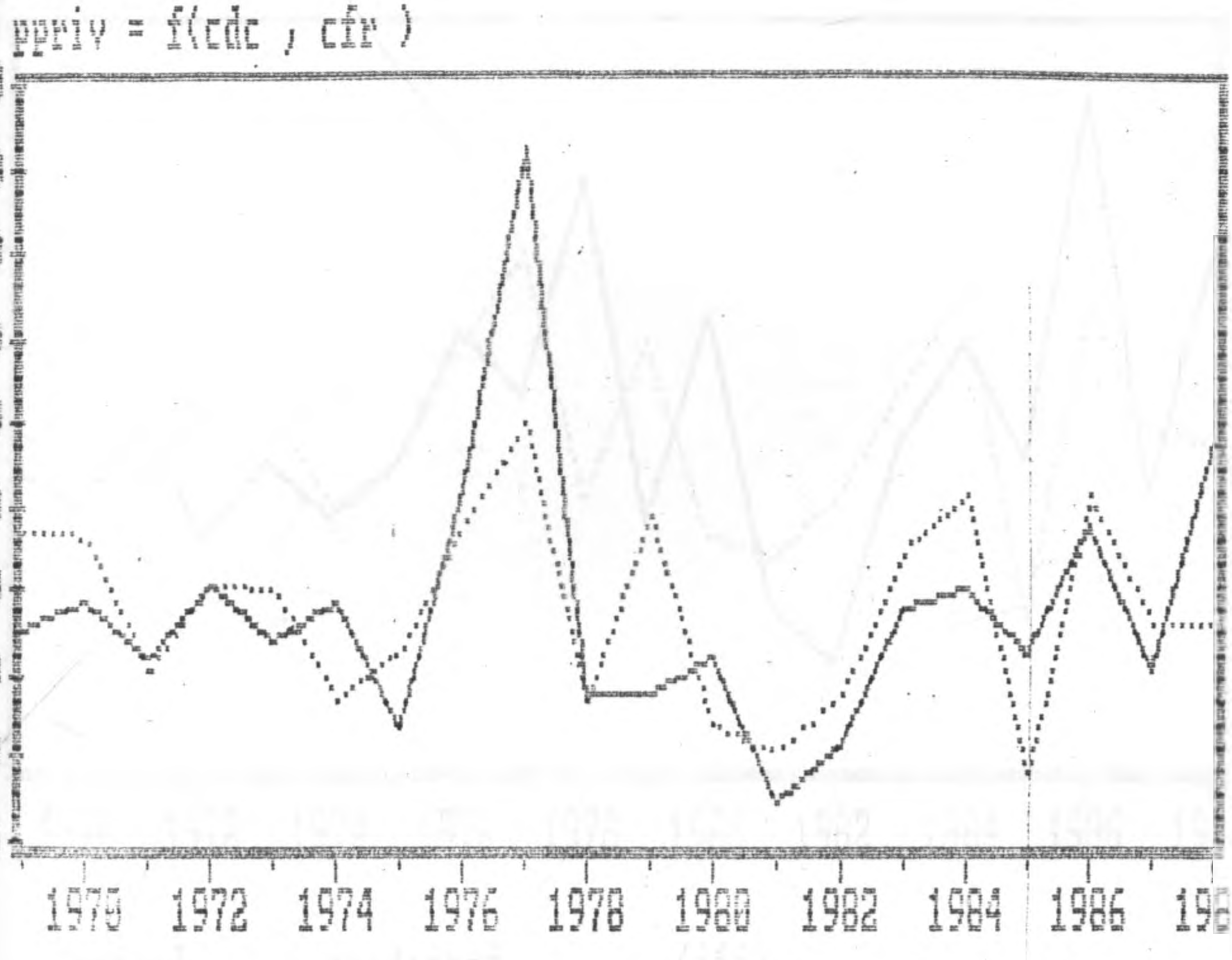
APPENDIX ONE : SIMULATION RESULTS.

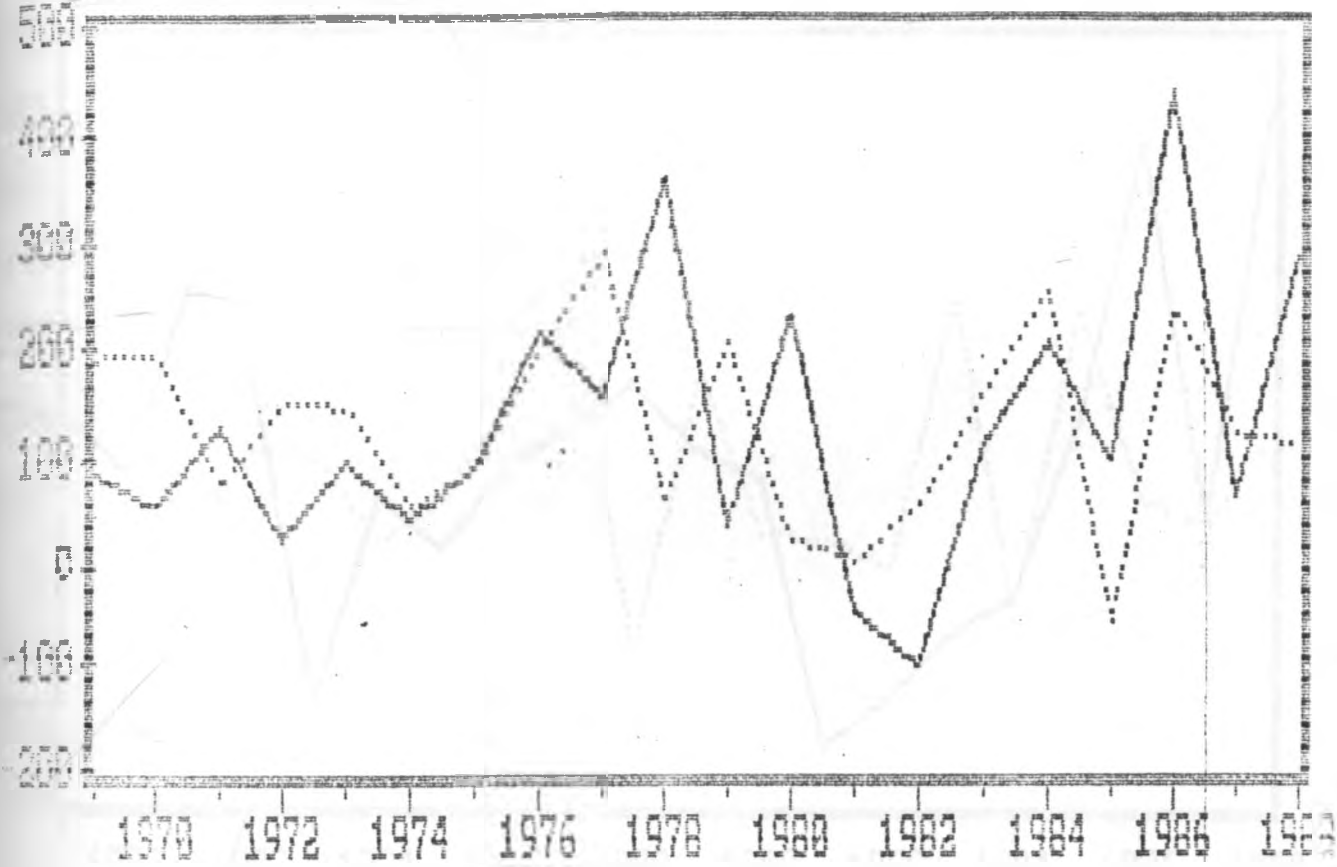
gtrad = f(cdc, cir).



___actual ......predicted (i)

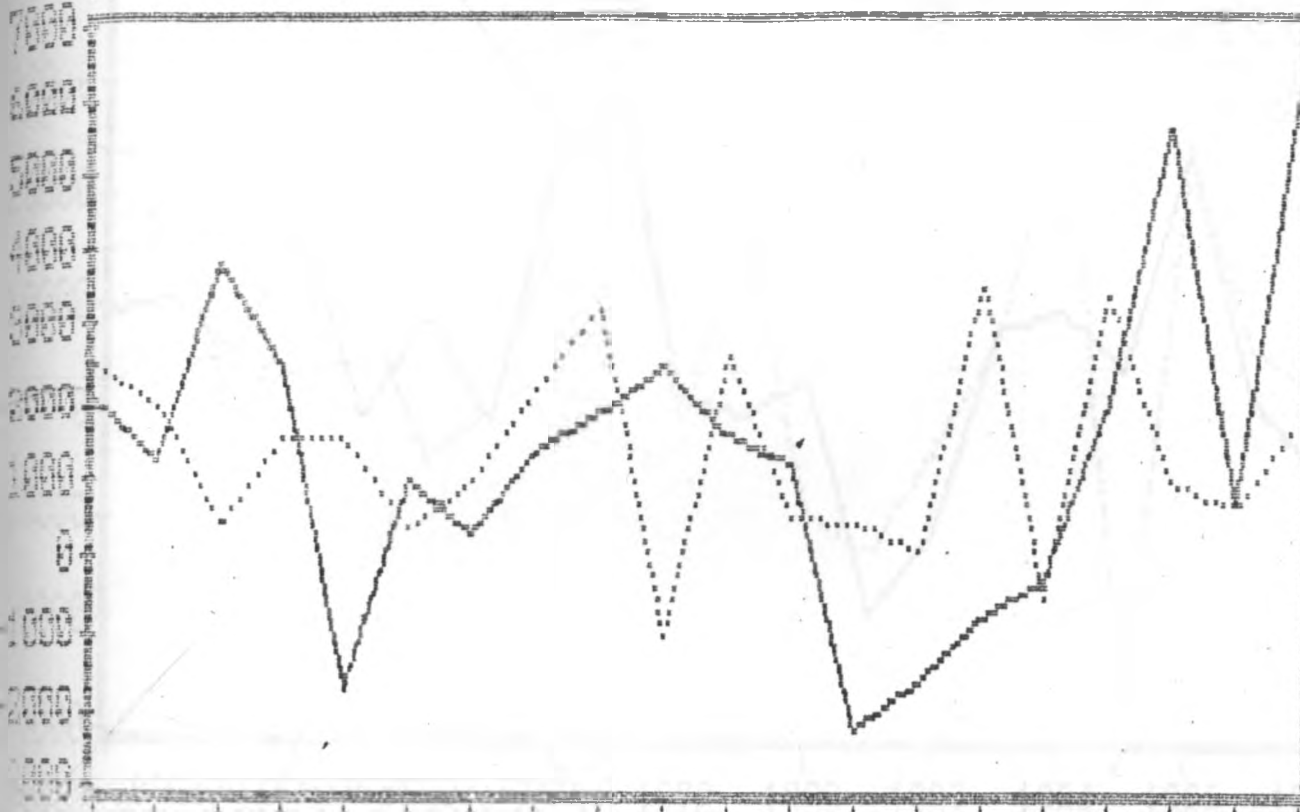

ppriv = f(cdc , cfr)
70000
60000
50000
40000
30000
20000
10000
0
1970
1972
1974
1976
1978
1980
1982
1984
1986
____actual ......predicted
(ii)

ydom = f(cdc, cfw)



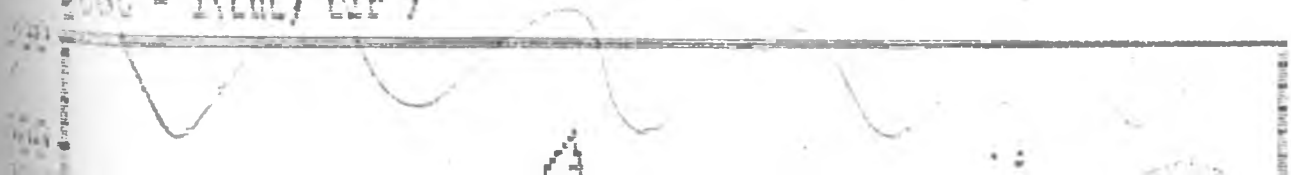
——actual ......predicted (iii)

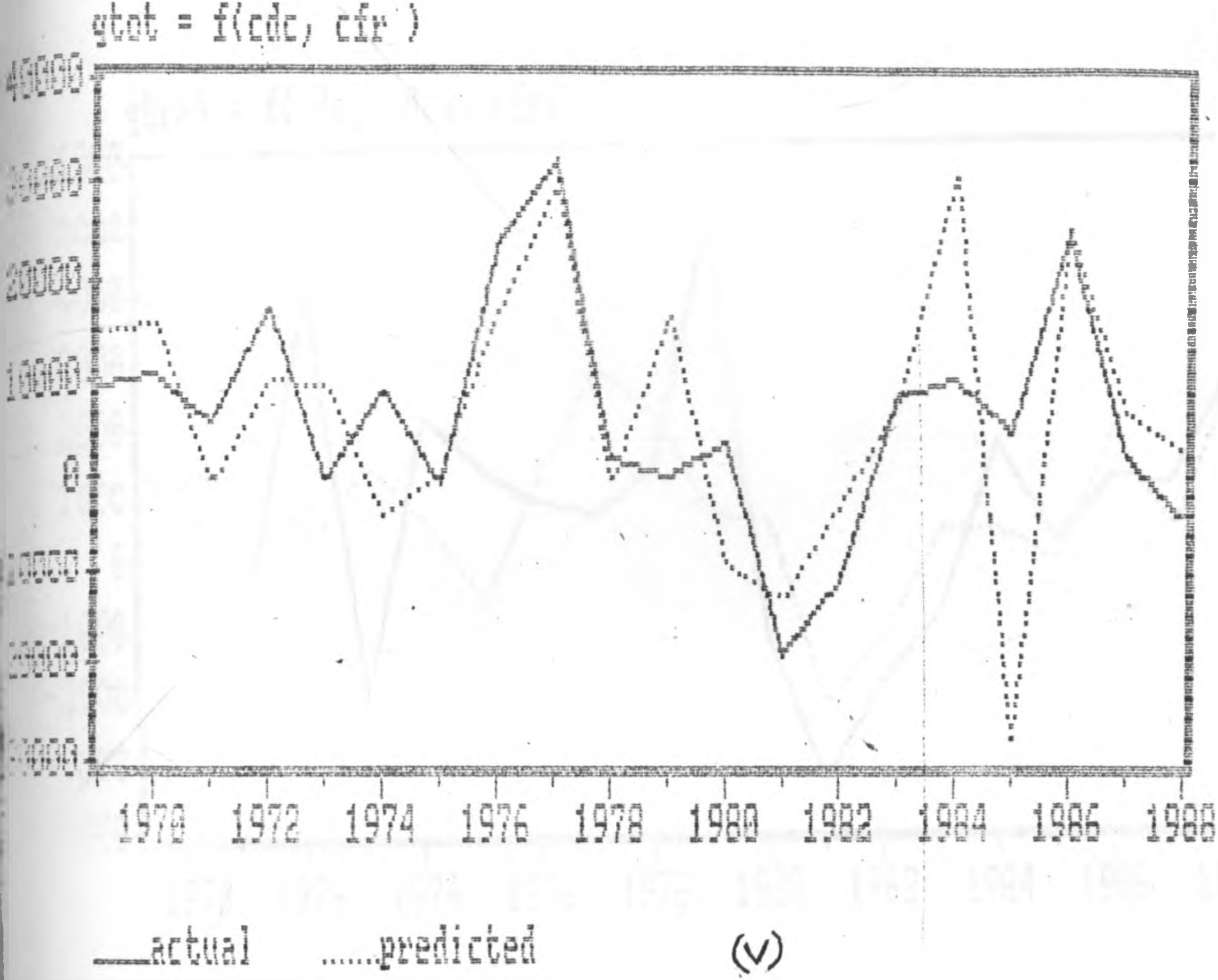
ggov = f(cdc, cfr)



___actual ......predicted (iv)

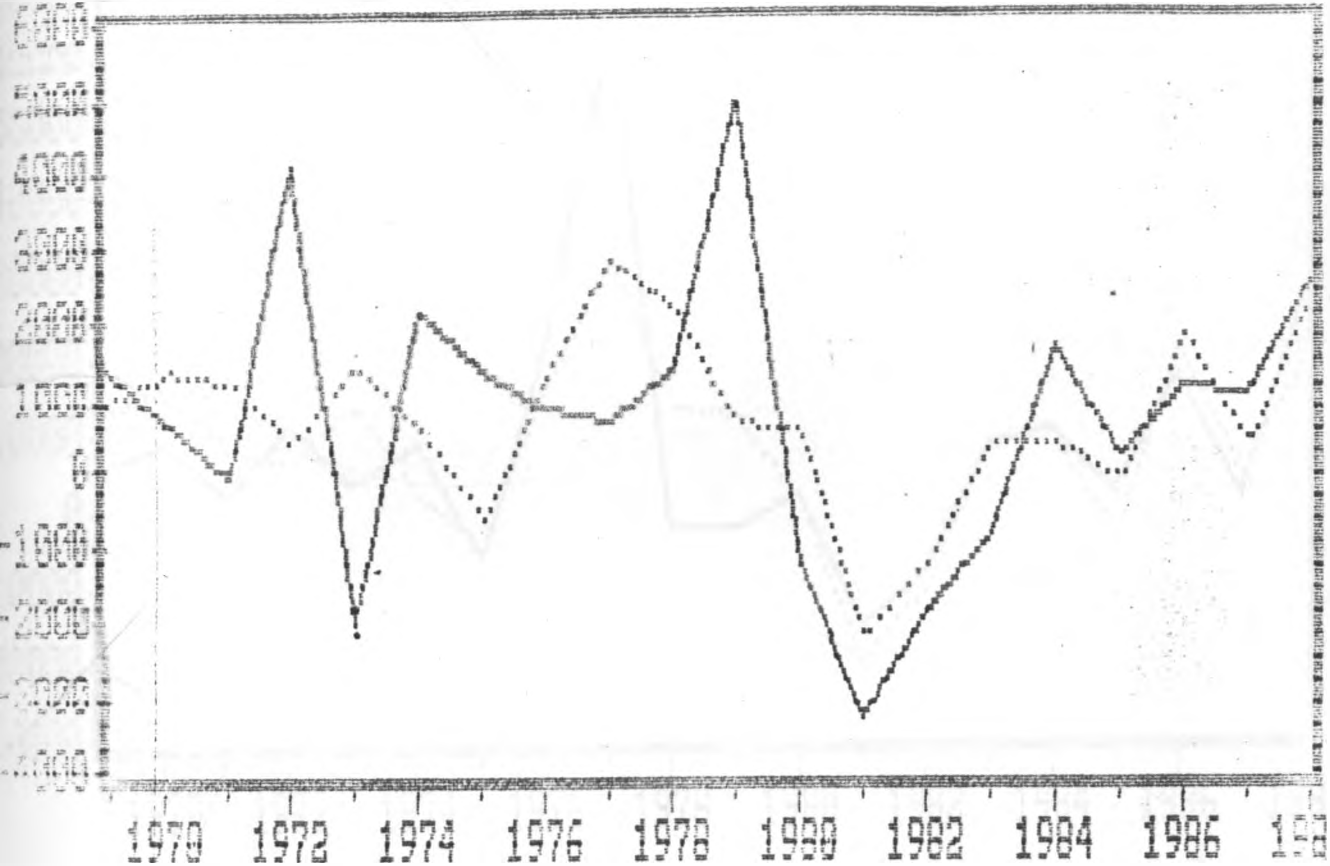
ctot = f(cdc, rfr)



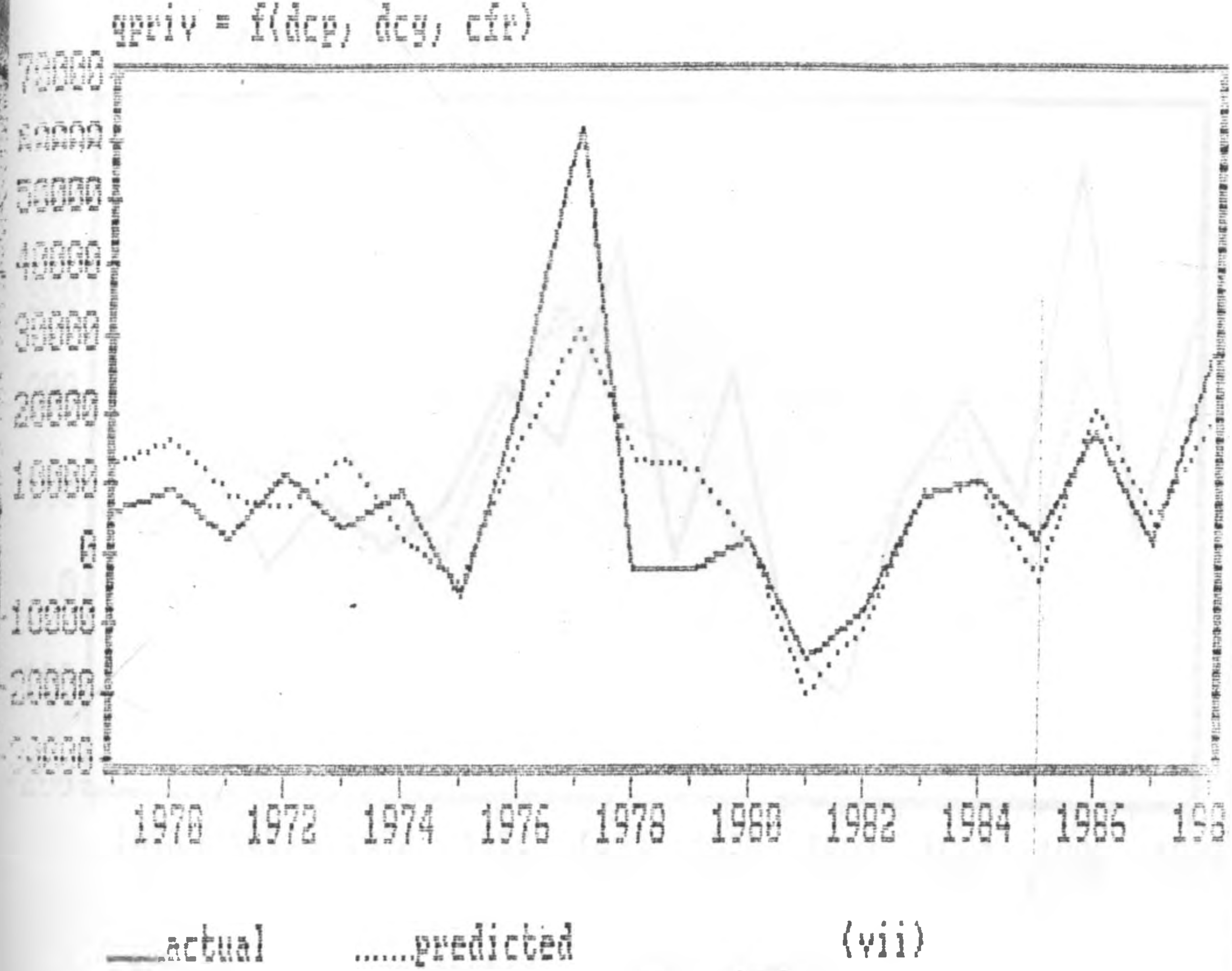

gtot = f(cdc, cfr)
40000
30000
20000
10000
0
-10000
-20000
-30000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
actual
predicted

(v)

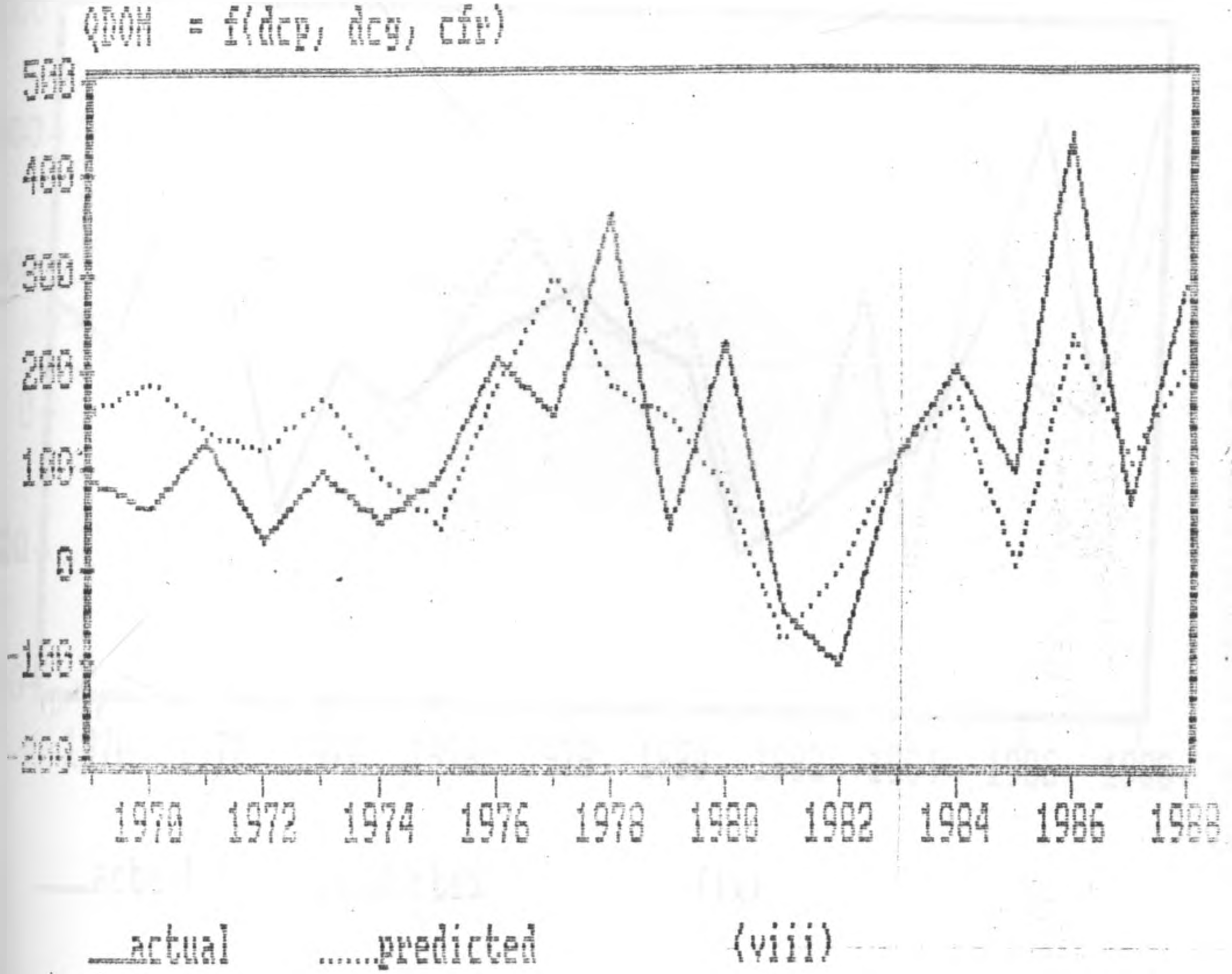
gtrad = f(dcp, dcg, cfr)



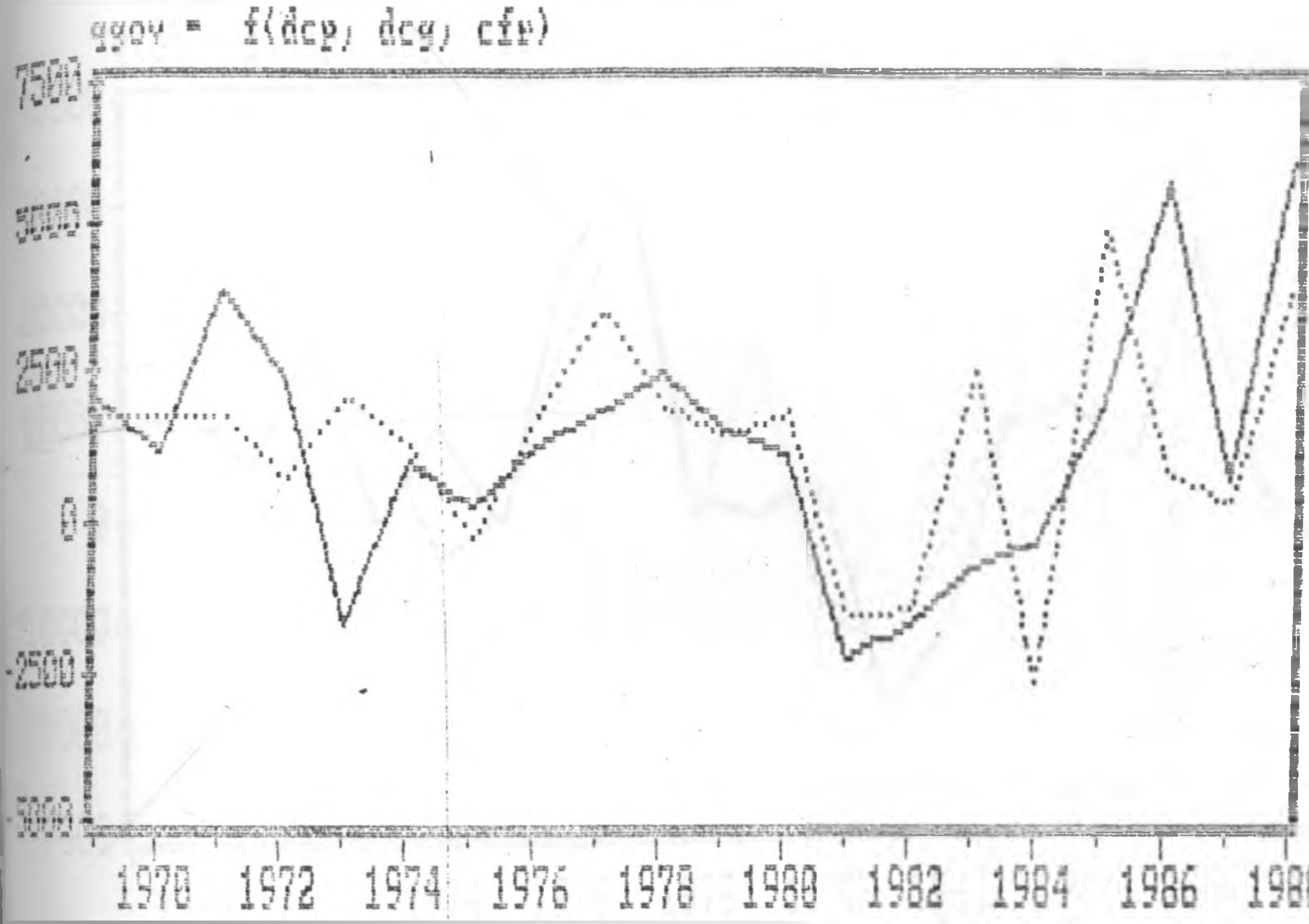
__actual ....predicted (vi)


qpriv = f(dcp, dcg, cfr)
70000
60000
50000
40000
30000
20000
10000
0
-10000
-20000
1970
1972
1974
1976
1978
1980
1982
1984
1986
____actual
......predicted

(vii)

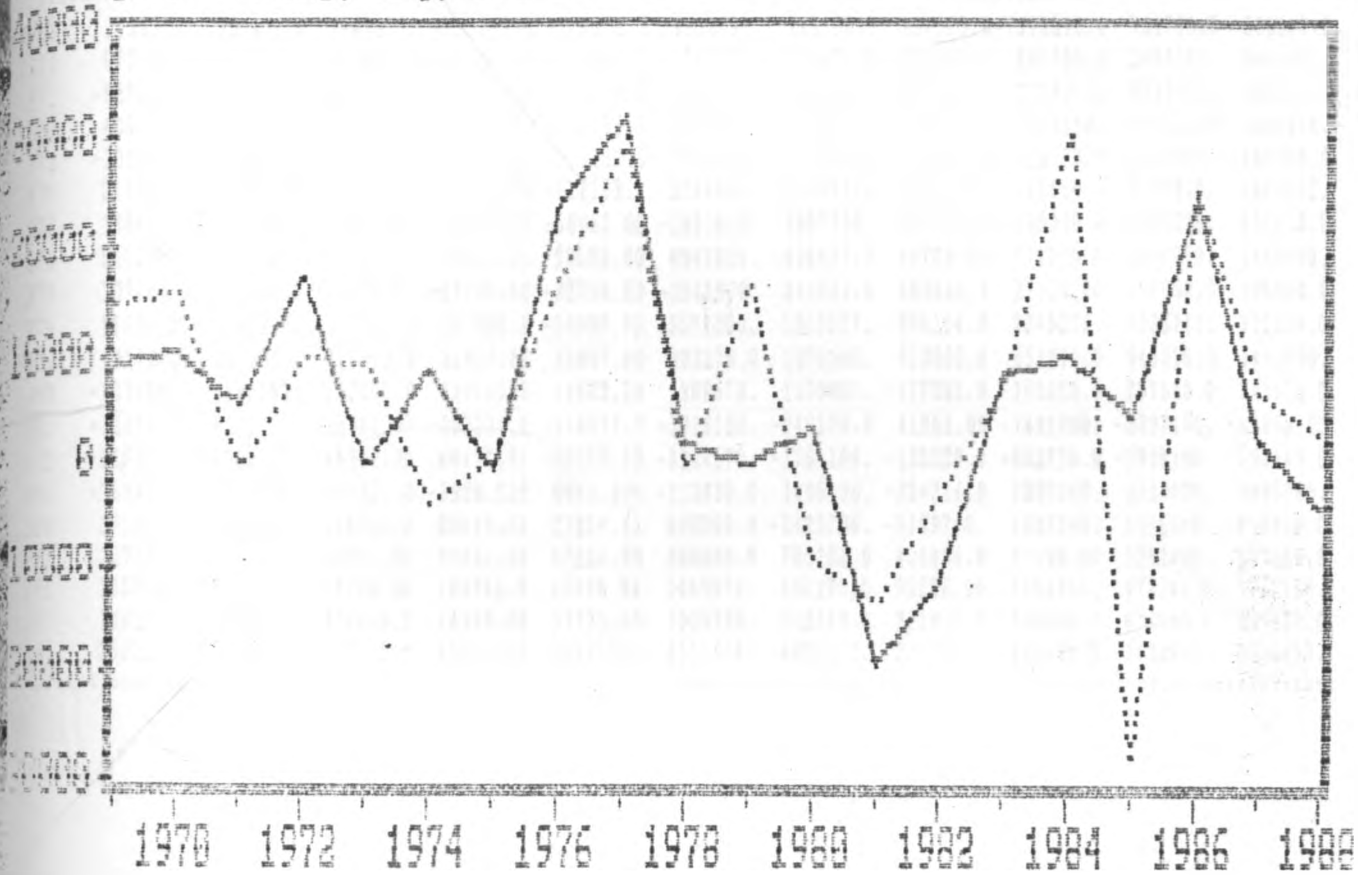

QDOM = f(dcp, dcg, cfr)
500
400
300
200
100
0
-100
-200
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
__actual
......predicted

(viii)


ggov = f(dcy, dcg, cfr)
7500
5000
2500
0
-2500
-5000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988

——actual ......predicted (ix)

gtot = f(dcp, dcg, cfr)



——actual ......predicted (x)

APPENDIX THREE : DATA

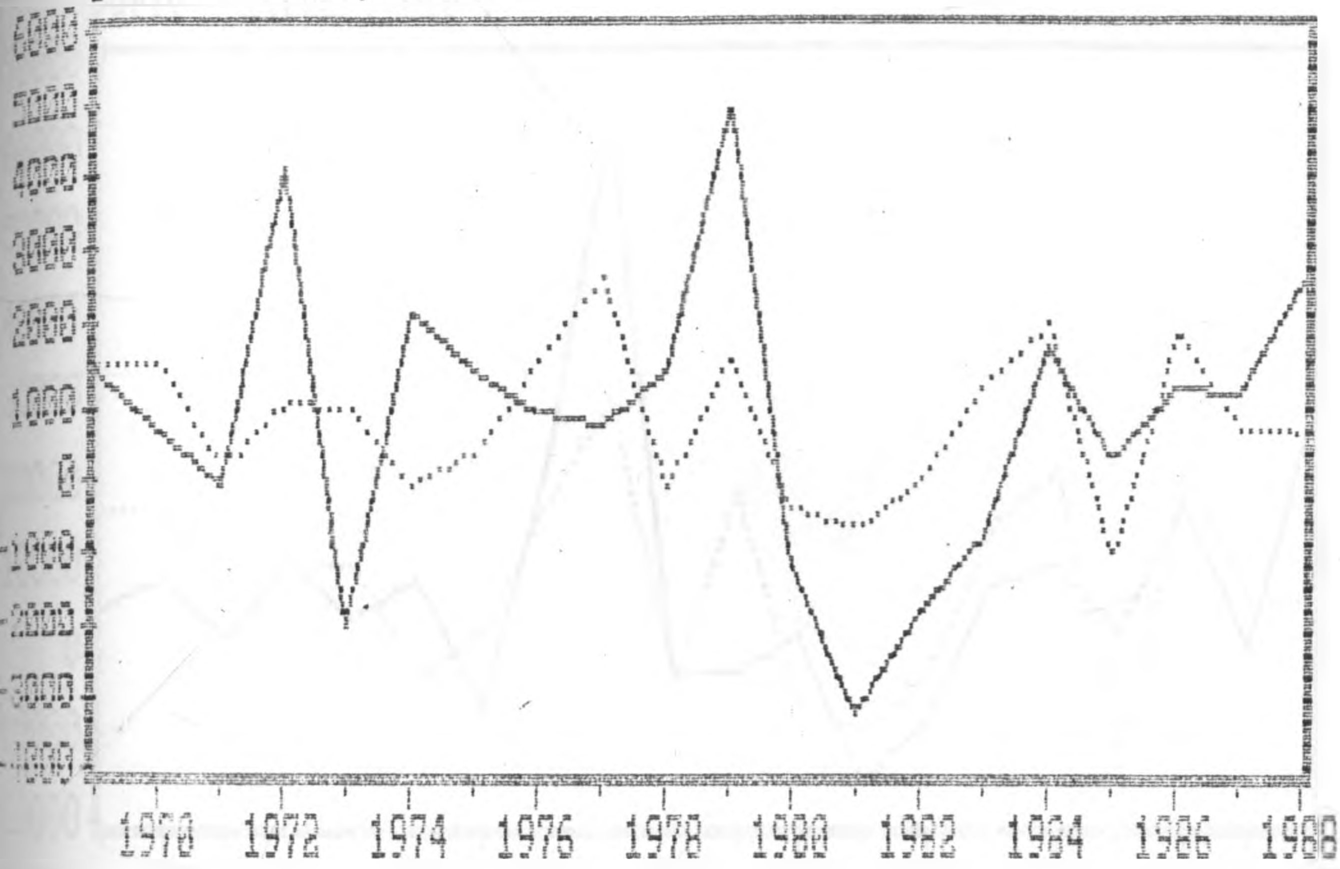
obs	QTRAD	QAGR	QFOR	QFISH	QMIN	QMANF	QCON	QELEC	QTCOM	QHOT	QFIN
1969	1437368.	903430.0	79448.13	-723.6875	-100932.2	1938050.	115186.0	134595.0	393210.0	701750.0	609239.0
1970	673132.0	2016630.	363864.0	4002.500	106342.8	1240120.	355006.0	223593.0	665700.0	2450360.	960708.0
1971	-82720.00	-1191590.	-212631.0	-10176.69	108204.3	1645450.	299453.0	-27553.00	23180.00	653900.0	358532.0
1972	4055520.	5228060.	-183167.0	-3102.625	-232328.4	922130.0	4534067.	106472.0	-1612380.	598030.0	1924558.
1973	-2037326.	371050.0	71389.00	-18825.29	175037.9	1781790.	-357371.0	-172913.0	415760.0	1529030.	-186398.0
1974	2148910.	-64760.00	113031.0	-19472.72	-117189.1	2284500.	-230921.0	-64910.00	585550.0	5137910.	1562612.
1975	1454643.	-1197630.	-58846.00	-3647.500	-56063.00	-1891040.	-1057735.	227118.0	-725310.0	-2195110.	151510.0
1976	920230.0	12457470	-26621.00	96505.31	93588.00	4947920.	-405417.0	-40179.00	571280.0	1956000.	1438170.
1977	707460.0	64224060	-45079.00	-53430.00	-82796.69	-1541960.	231231.0	589635.0	21730.00	104660.0	885400.0
1978	1403510.	-10429970	151762.0	141928.8	-14038.75	3511060.	1213517.	208154.0	2245270.	1606740.	921230.0
1979	4927060.	-3633760.	445953.0	-24017.81	21867.00	963270.0	1079946.	613605.0	551940.0	641010.0	1461600.
1980	-1210240.	-8980352.	152807.0	29054.69	13882.13	1968678.	1570860.	-117385.0	-105350.0	737680.0	548570.0
1981	-3222370.	-6203840.	-89382.00	102237.2	-114817.7	-3718123.	-949170.0	41951.00	-1491700.	-2897470.	-48600.00
1982	-1833520.	-2308016.	45343.00	44470.75	-29855.22	-1244170.	-1764166.	-135928.0	-602710.0	-1938190.	562140.0
1983	-768410.0	2271168.	140821.0	-9928.125	6643.594	-113430.0	1436196.	-324214.0	1207240.	3713470.	1495080.
1984	1756500.	6442184.	-114736.0	20440.81	21214.13	506560.0	-2429704.	-1199740.	1227240.	1016640.	-446930.0
1985	267330.0	-1703624.	46756.00	32481.56	27864.88	266900.0	785301.0	408464.0	71100.00	1252440.	853960.0
1986	1153040.	8799872.	17584.00	124743.9	48938.94	3243270.	234170.0	95338.00	1563050.	972540.0	1742550.
1987	1142510.	-2898560.	136488.0	44358.06	33231.00	1036790.	942143.0	221835.0	296600.0	631580.0	831980.0
1988	2532210.	[illegible]	197555.0	406.0000	4464.500	4351468.	4051930.	335175.0	642580.0	3428960.	3506890.

obs	QDWEL	QPRIV	QDOM	QGOV	QXPT	QNXPT	QTOT	CDC	CFR	DCPRIV	DCGOV
[illegible]	306219.0	5687576.	86939.00	2071870.	2562871.	6720825.	9283696.	1858470.	6715820.	1060220.	808254.9
[illegible]	132092.0	9697632.	55580.00	1191230.	3419273.	7188427.	10607700	6566500.	5022030.	3660870.	2905631.
[illegible]	24055.00	2107304.	123998.0	3877620.	1183346.	4847854.	6031200.	7498242.	-7245930.	7079620.	418613.0
[illegible]	[illegible]	[illegible]	-21361.00	2469300.	5867795.	11922630	17796420	5893668.	1119670.	215060.0	5662621.
[illegible]	[illegible]	2716900.	100842.0	-1705760.	11715720	-11531720	84000.00	5830180.	586130.0	5599000.	291170.0
[illegible]	[illegible]	2330298.	45382.00	1001770.	11304490	-2391194.	9013296.	5723920.	-8744140.	4443608.	1236260.
[illegible]	[illegible]	-1555400.	39451.00	250190.0	-2532953.	2097262.	-435696.0	4372040.	-4436691.	-2766266.	7142290.
[illegible]	115035.0	21630990	216511.0	1319530.	13019150	5171049.	24190190	5360768.	6309311.	3104060.	2256710.
[illegible]	[illegible]	62179406	158820.0	1894950.	23076610	8133290.	31816900	5624696.	15163910	7369630.	-1744980.
[illegible]	[illegible]	-2238096.	358592.0	2517798.	-14536100	16637200	2041104.	17416240	-12693920	13180410	4235830.
[illegible]	[illegible]	-2367008.	41285.00	1601464.	2062356.	-1768366.	294003.0	1822752.	7946580.	-349080.0	2171840.
[illegible]	[illegible]	2306704.	232452.0	1212060.	11707250	-3041754.	3666096.	1148682.	-9976620.	5074952.	-3926260.
[illegible]	[illegible]	-15364100	[illegible]	-2222934.	1355578.	-20973770	-18583130	-421344.0	-11678150	-7633350.	7212010.
[illegible]	[illegible]	-3445290.	-100733.0	-1650418.	2557519.	-14109520	-11252000	3231744.	-9278744.	-4116060.	12407790
[illegible]	[illegible]	2361033.	117691.0	-753152.0	2410153.	2275735.	8565883.	-10503090	8694384.	-1506740.	-8396332.
[illegible]	[illegible]	1937100	208284.0	-330178.0	7582412.	2564692.	10254110	33471650	486595.2	-393232.0	33864830
[illegible]	[illegible]	2253104.	101045.0	1959778.	1229592.	3401609.	4691290.	-30777950	-5207328.	1518872.	-32296830
[illegible]	[illegible]	17468190	442038.0	5663320.	3591237.	15135960	24727200	19427250	4390253.	5819800.	13607490
[illegible]	[illegible]	922016.0	65544.00	678812.0	-3857760.	12667670	2809888.	10309300	-3638232.	1306780.	8501000.
[illegible]	[illegible]	27669180	283956.0	6131820.	7523057.	-11695950	-4172896.	-196600.0	-532583.0	10573810	-10770690

obs	XRATE	FPI	GDPT	CCPI	GOV	RMON	QTOT
[illegible]	17.14900	32.60000	1.53D+08	0.570002	104973.0	42691980	9283696.
[illegible]	[illegible]	33.90000	1.63D+08	1.489993	121464.0	54290512	10607700
[illegible]	[illegible]	31.32000	1.63D+08	4.040001	156808.0	54532920	6031200.
[illegible]	[illegible]	35.20000	1.87D+08	2.840004	180522.0	61536152	17796420
[illegible]	[illegible]	42.00000	1.97D+08	8.599997	[illegible]	65012464	54000.00
[illegible]	[illegible]	66.20000	1.99D+08	11.90000	301582.0	64992240	9013296.
[illegible]	[illegible]	86.20000	1.96D+08	13.80000	373109.0	64936632	-495695.0
[illegible]	14.15000	100.0000	2.20D+08	9.900003	409794.0	76608256	24190190
[illegible]	[illegible]	108.0000	2.52D+08	15.49999	590390.0	97416960	31816900
[illegible]	15.05900	114.0000	2.54D+08	10.60001	6976100.	1.02D+09	2041104.
[illegible]	16.35500	132.0000	2.54D+08	14.70000	7813200.	1.12D+08	294000.0
[illegible]	18.06100	173.0000	2.58D+08	17.60001	9621100.	1.03D+08	3666096.
[illegible]	19.97700	220.0000	2.39D+08	43.00000	1114410.	90976096	-18888190
[illegible]	20.62700	252.8000	2.27D+08	39.59999	1190693.	89989104	-11252000
[illegible]	20.05900	323.5800	2.35D+08	25.80002	1254730.	89789428	8685888.
[illegible]	18.40100	337.9800	2.46D+08	30.89999	1534660.	90148872	10254110
[illegible]	[illegible]	340.0000	2.51D+08	35.79999	1651820.	86153360	4691200.
[illegible]	[illegible]	379.7600	2.78D+08	20.20001	2134220.	1.10D+08	24727200
[illegible]	[illegible]	375.6700	2.79D+08	36.89999	2214690.	1.17D+08	2809888.
[illegible]	[illegible]	379.7600	2.74D+08	10.00000	3008230.	1.18D+08	-4172396.

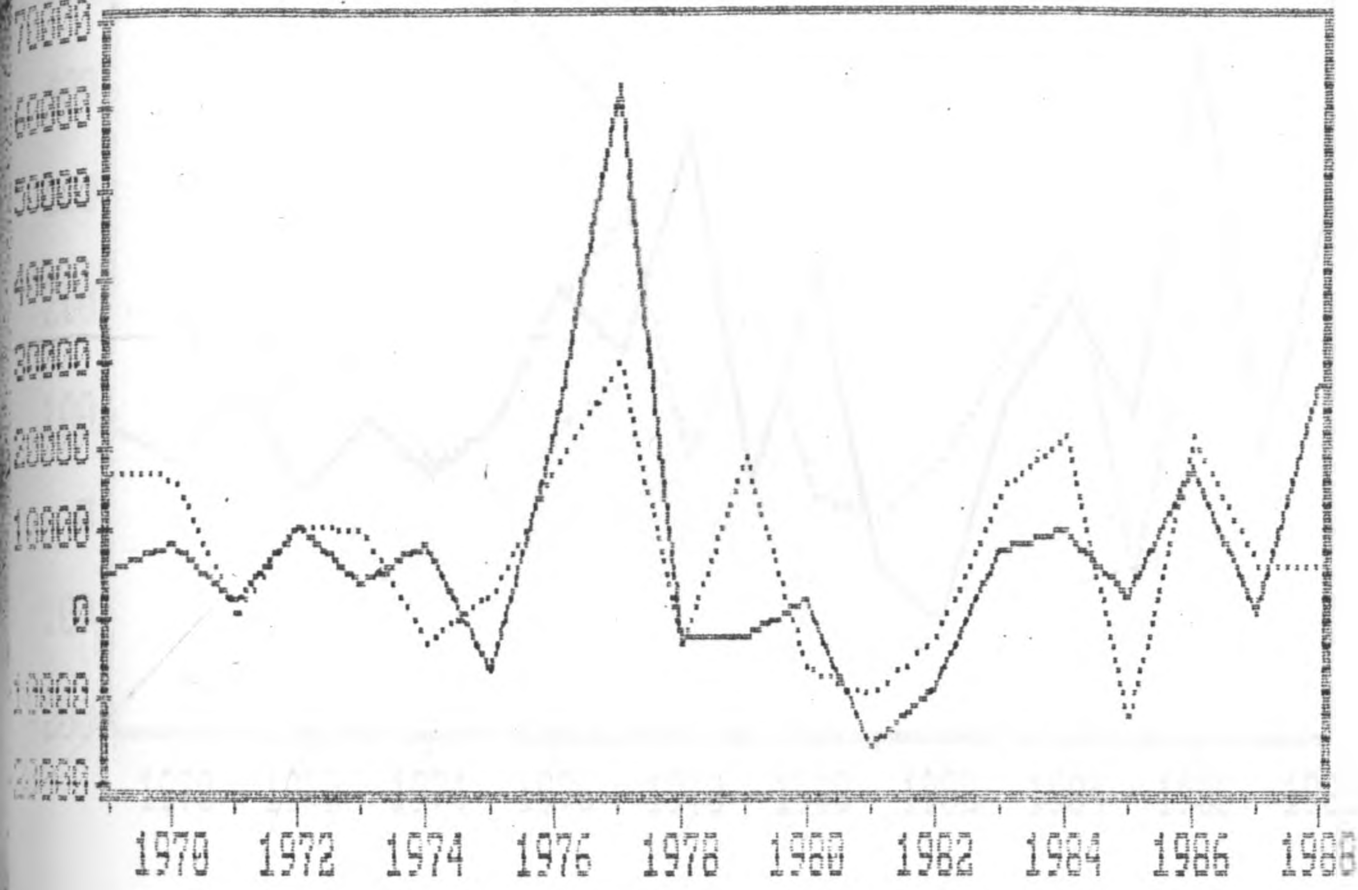
APPENDIX ONE : SIMULATION RESULTS.

gtrad = f(cdc, cfr).

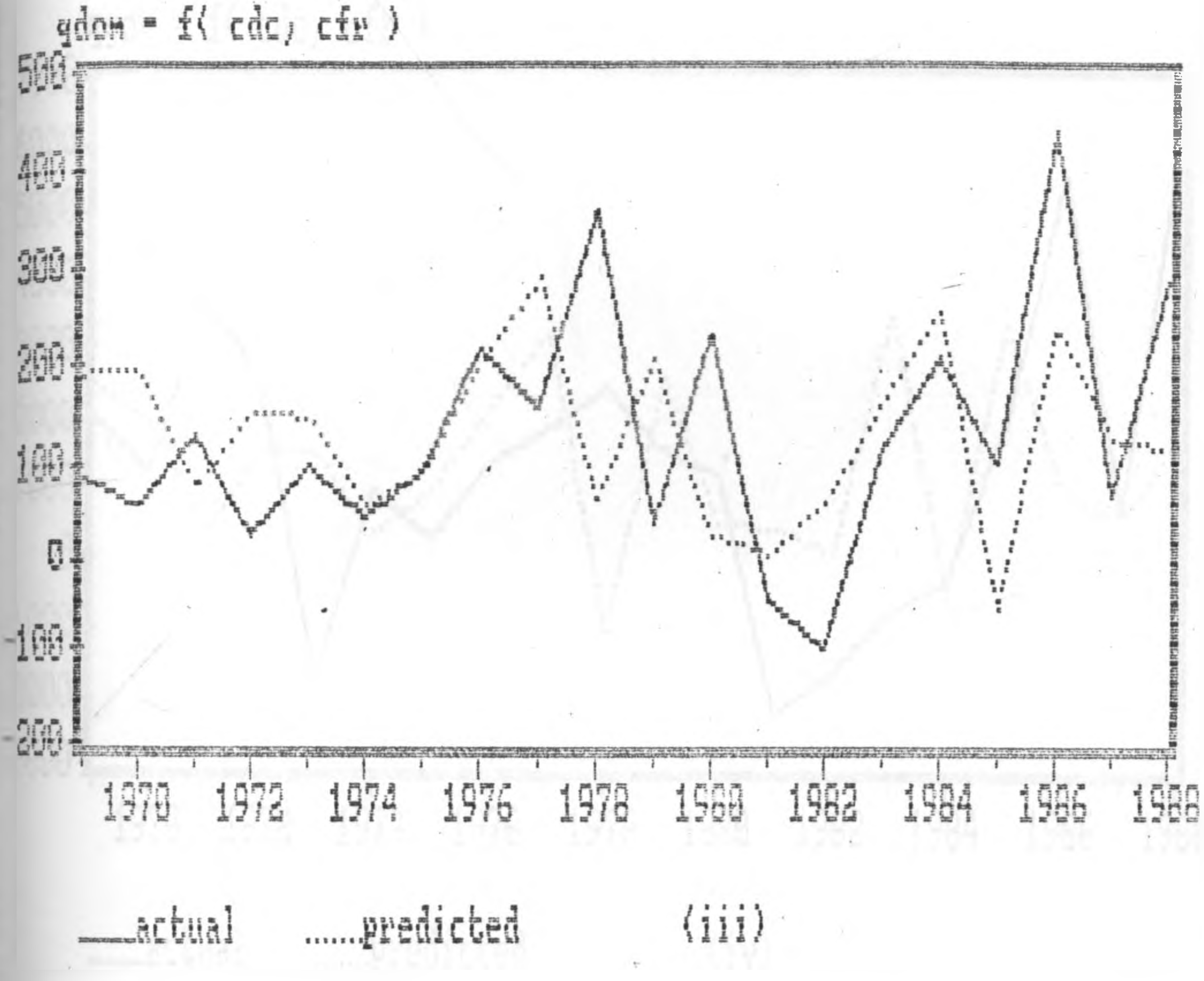


___actual ......predicted (i)

pprv = f(cdc , cfr)



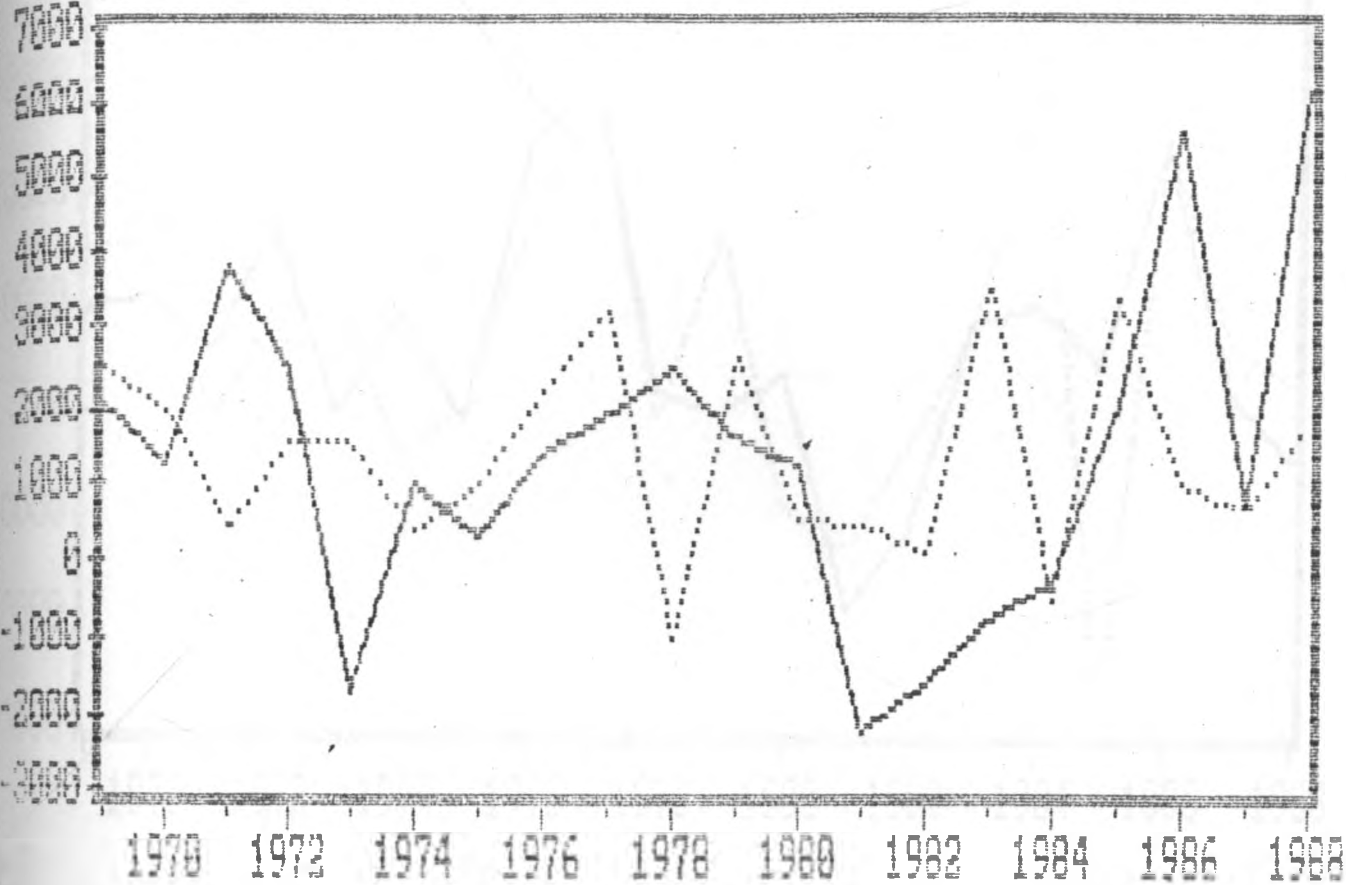
(ii)



ydom = f(cdc, cfr)
500
400
300
200
100
0
-100
-200
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
___actual
......predicted

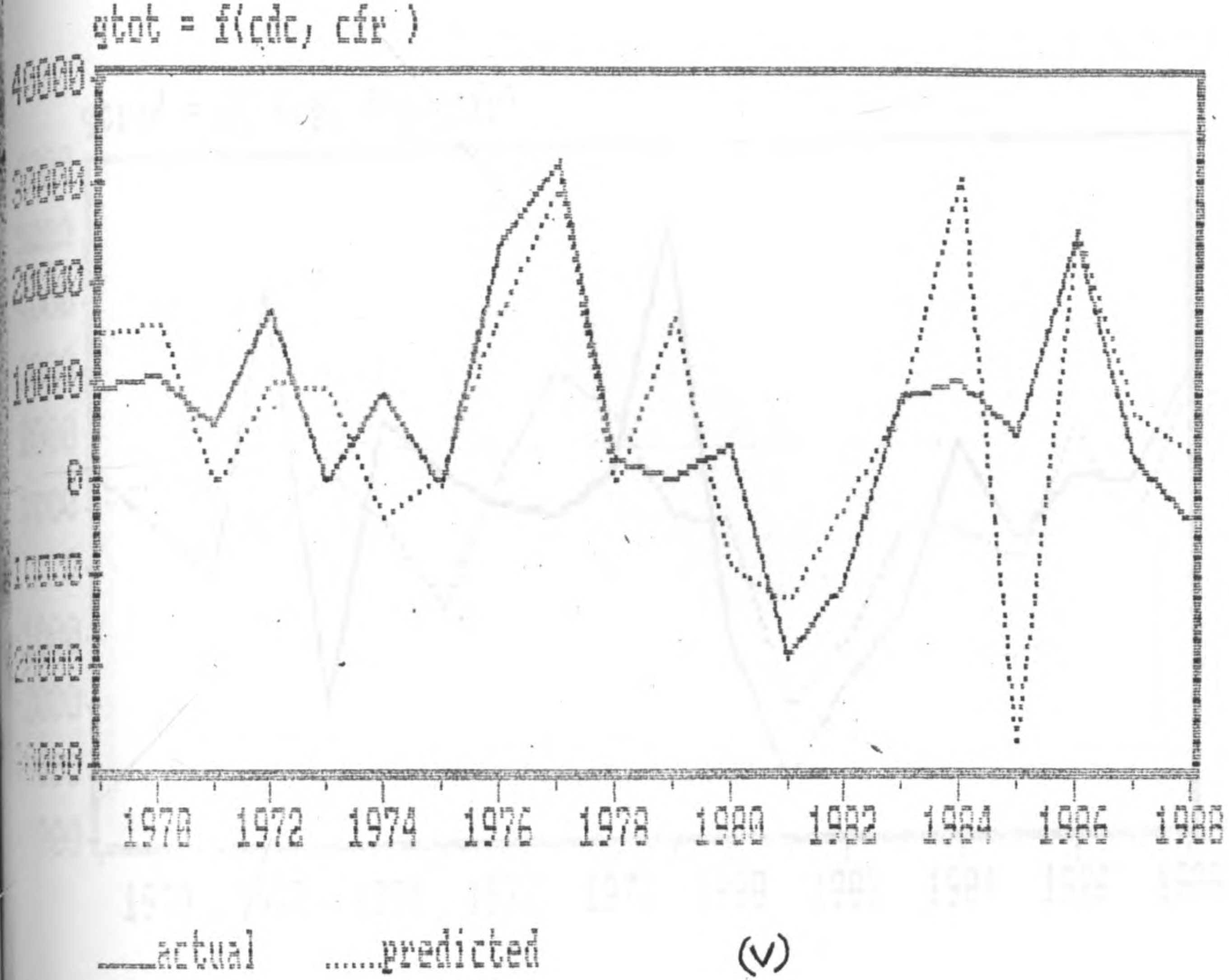
(iii)

ggov = f(cdc, cfr)



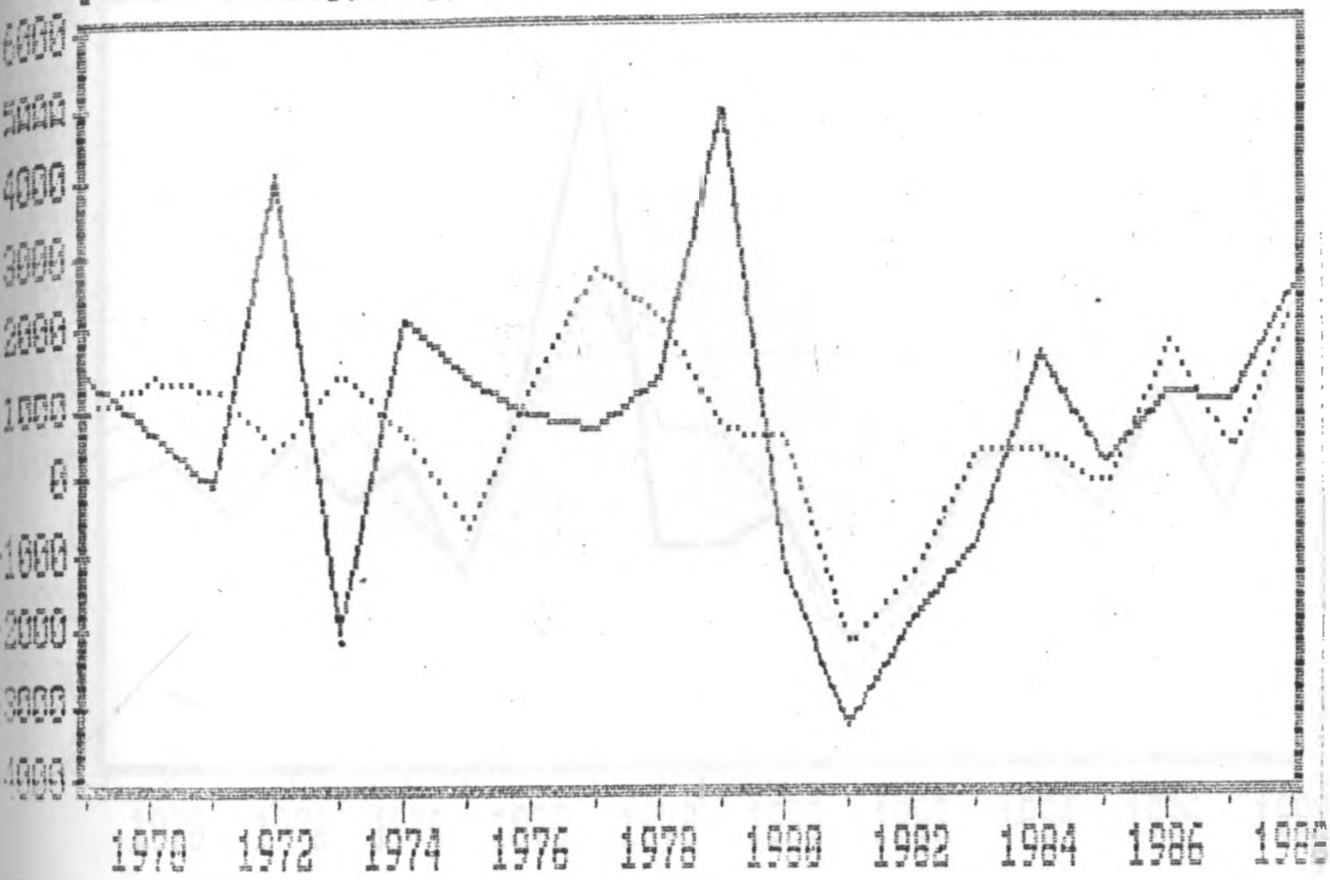
___actual ......predicted (iv)

gtnt = f(cdc, cfr)

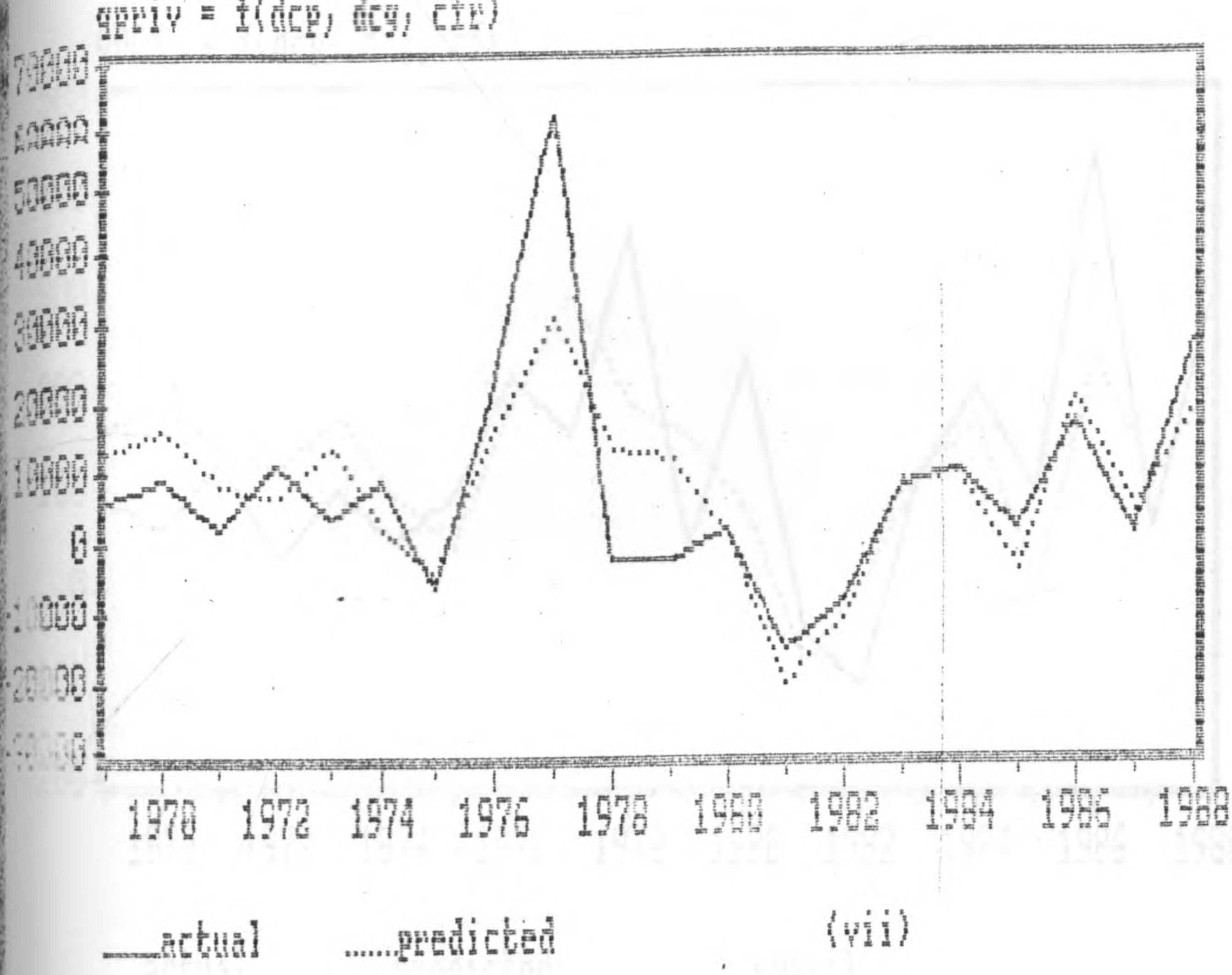

gtot = f(cdc, cfr)
40000
30000
20000
10000
0
-10000
-20000
-30000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
___actual
......predicted

(v)

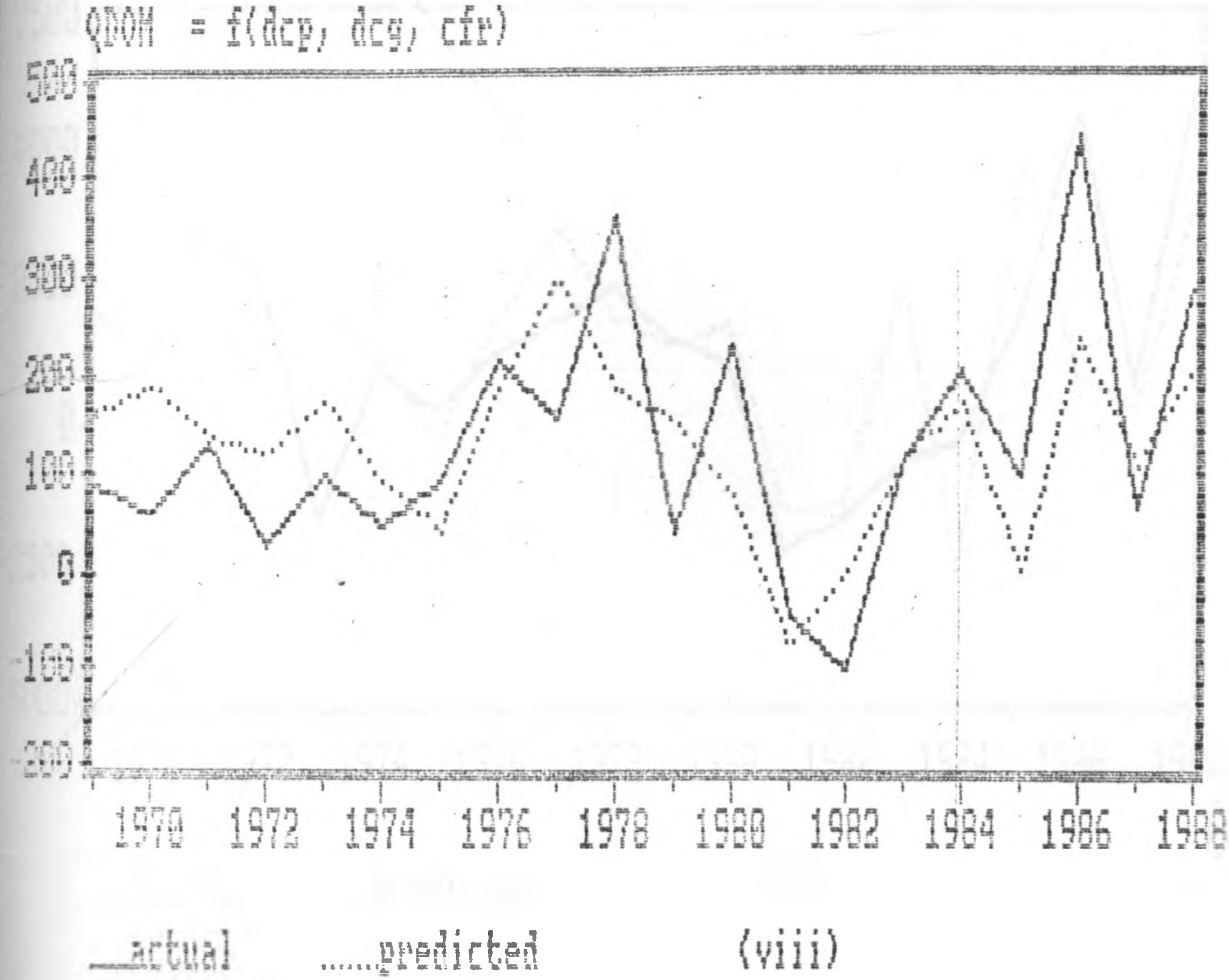
gtrad = f(dcp, dcg, cfr)



__actual ....predicted (vi)

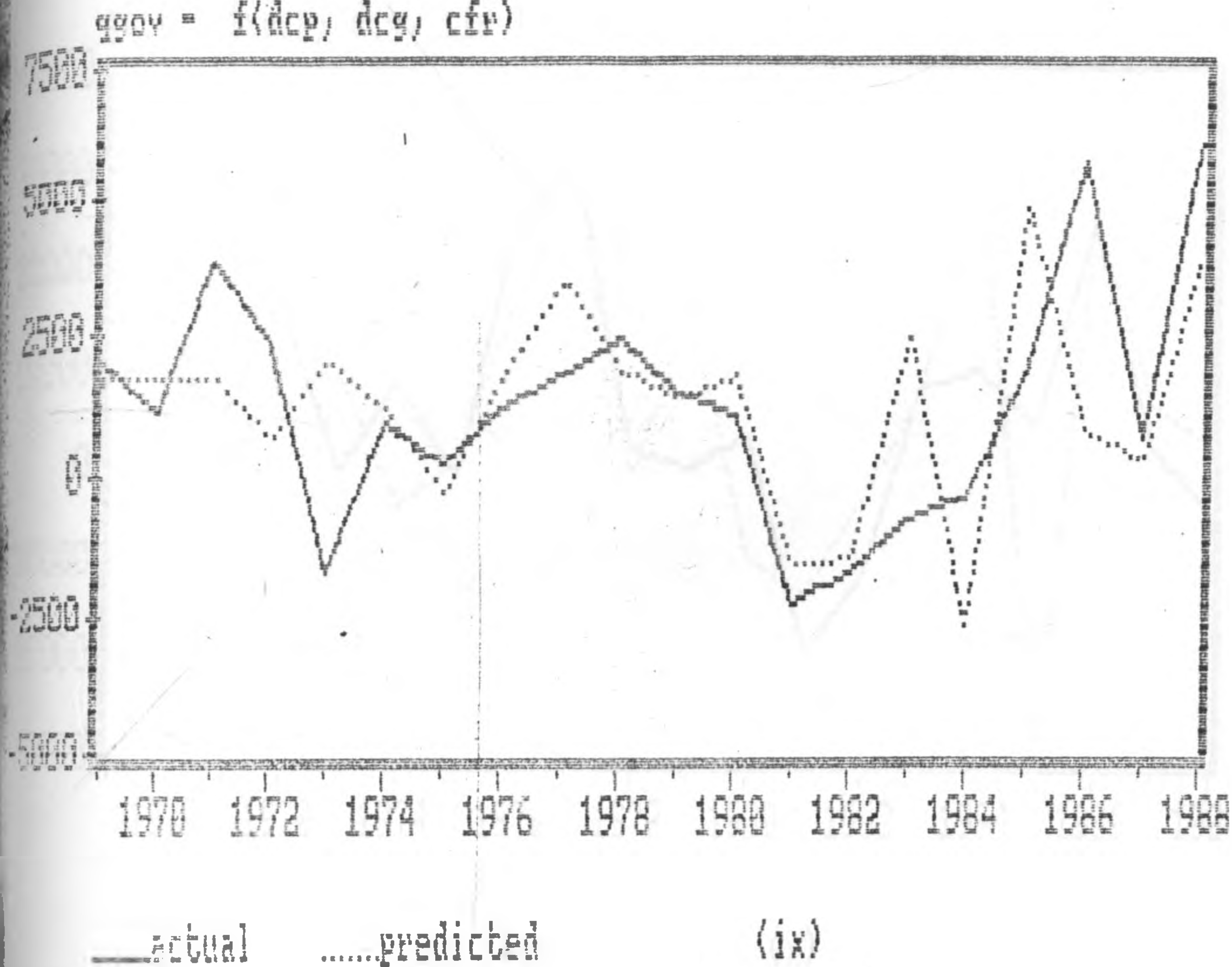

qpriv = f(dcp, dcg, cfr)
70000
60000
50000
40000
30000
20000
10000
0
-10000
-20000
-30000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
actual
predicted

(vii)

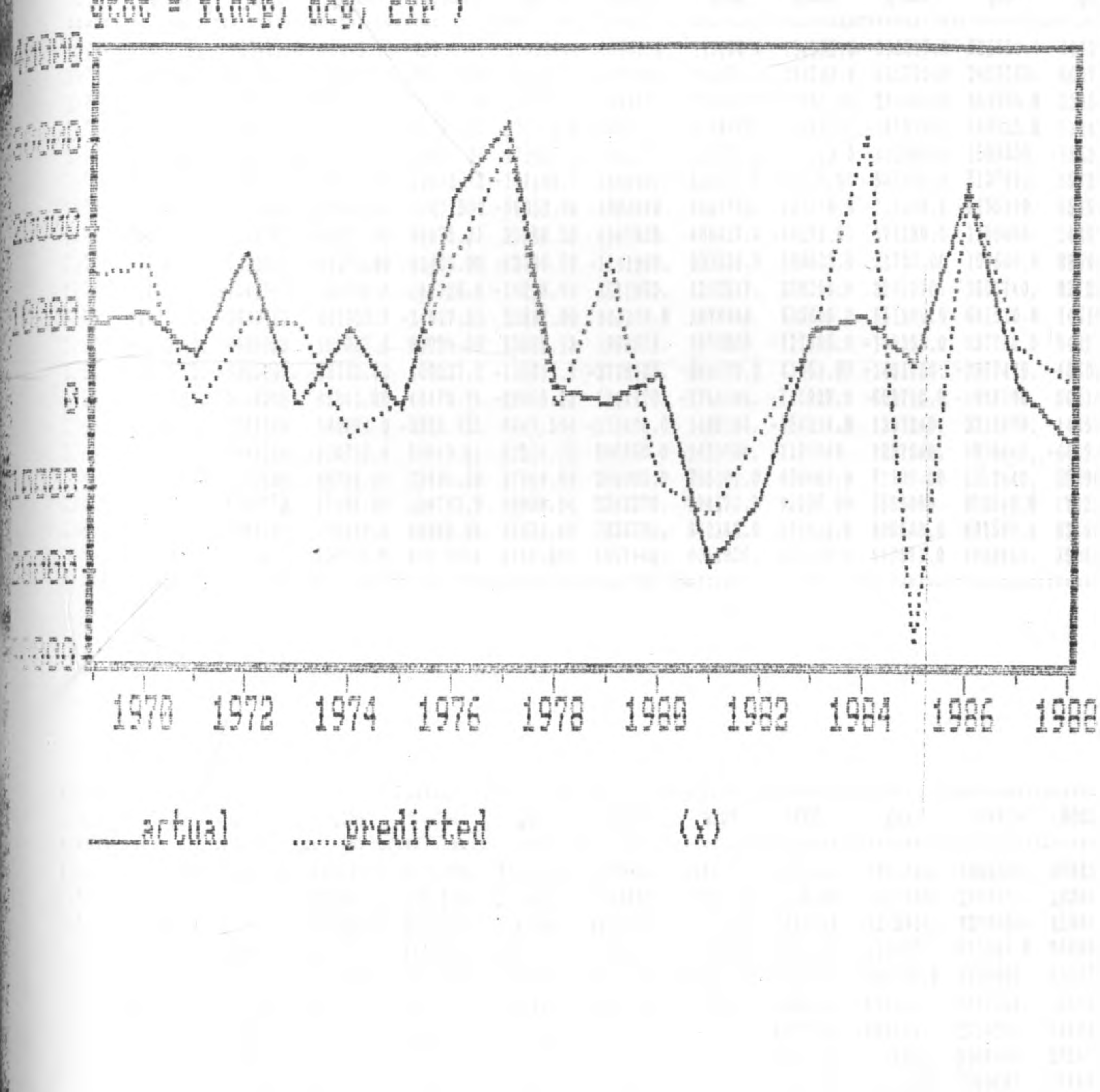


QDOM = f(dcp, dcg, cfr)
500
400
300
200
100
0
-100
-200
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
actual
predicted

(viii)


ggov = f(dcp, dcg, cfr)
7500
5000
2500
0
-2500
-5000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
actual
predicted

(ix)


ytot = f(dcp, dcg, cfr)
40000
30000
20000
10000
0
-10000
-20000
-30000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
____actual
......predicted
(x)

APPENDIX THREE : DATA

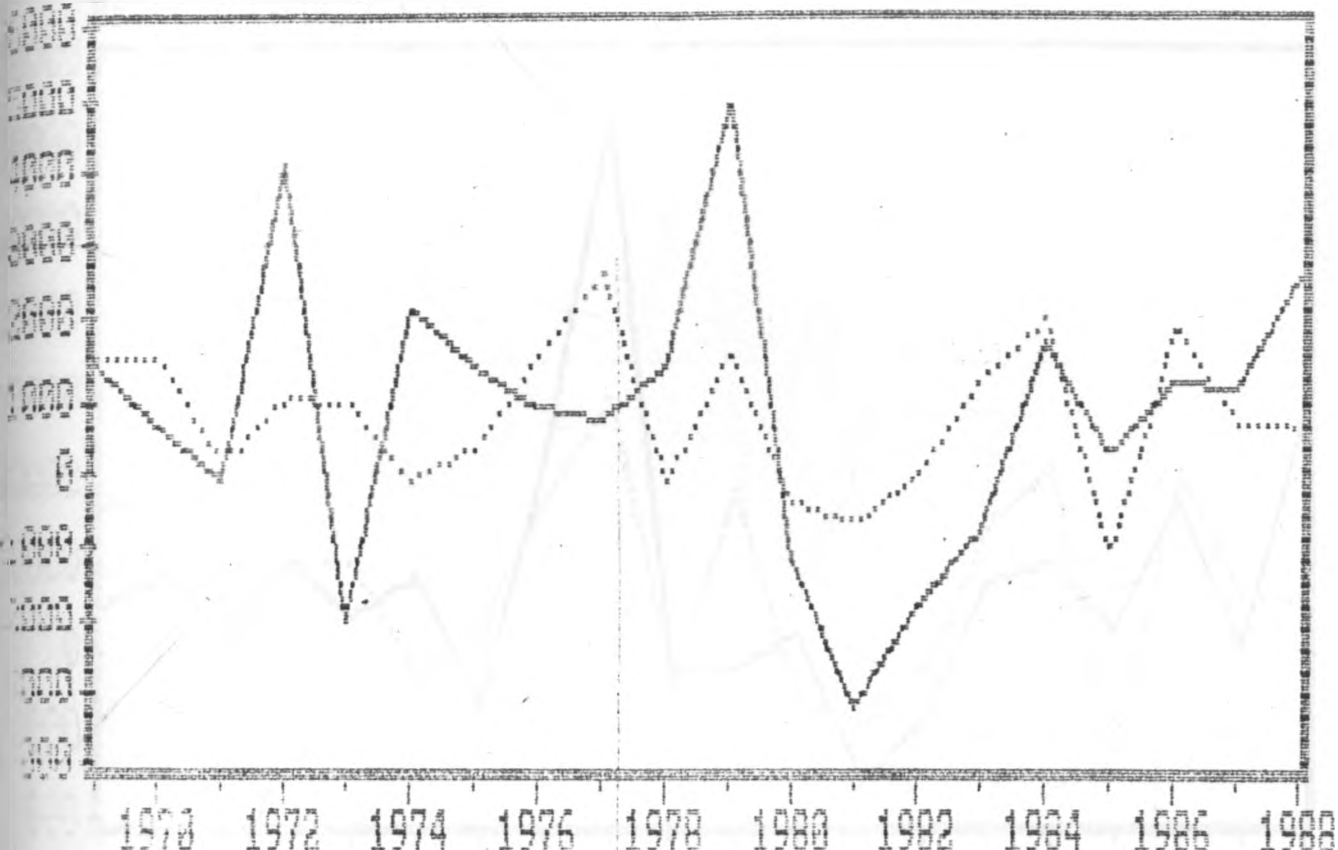
[illegible]	QTRAD	QAGR	QFOR	QFISH	QMIN	QMANF	QCON	QELEC	QTCOM	QHOT	QFIN
[illegible]	1437[illegible].	903430.0	79448.13	-723.6875	-100932.2	1998050.	115186.0	134595.0	393210.0	701750.0	609239.0
[illegible]	673[illegible]2.0	2016630.	363864.0	4002.500	106342.8	1240120.	355006.0	223533.0	665700.0	2450350.	960702.0
[illegible]	-82721.00	-1191593.	-212631.0	-10176.69	108204.3	1645450.	293453.0	-27553.00	23180.00	653900.0	358532.0
[illegible]	4955520.	5228060.	-183167.0	-3102.625	-232328.4	922190.0	4534067.	106472.0	-1612380.	598030.0	1924[illegible].
[illegible]	-2007[illegible].	371050.0	71359.00	-18825.28	175037.9	1781790.	-357371.0	-172913.0	415760.0	1529030.	-186398.0
[illegible]	2143310.	-64760.00	113081.0	-19472.72	-117189.1	2284500.	-230921.0	-64910.00	585550.0	5137910.	1562612.
[illegible]	1454[illegible].	-1197630.	-58846.00	-3647.500	-56063.00	-1891040.	-1057735.	227118.0	-725310.0	-2195110.	151510.0
[illegible]	[illegible]	12457470	-26621.00	96505.31	90588.00	4947920.	-405417.0	-40179.00	571280.0	1956000.	1438170.
[illegible]	707460.0	64224000	-45079.00	-53430.00	-82796.69	-1541960.	231231.0	589635.0	21730.00	104660.0	885400.0
[illegible]	1403510.	-10429970	151762.0	141928.8	-14038.75	3511060.	1213517.	208154.0	2245270.	1606740.	921230.0
[illegible]	4927060.	-3633760.	445953.0	-24017.81	21867.00	983270.0	1079946.	613605.0	551940.0	641010.0	1461600.
[illegible]	-1210240.	-8980352.	152807.0	29054.69	13882.13	1968678.	1570860.	-117385.0	-105350.0	737680.0	548570.0
[illegible]	-3222270.	-6203840.	-89362.00	102237.2	-114817.7	-3718128.	-949170.0	41951.00	-1491700.	-2897470.	-48600.00
[illegible]	-[illegible]	-2308016.	45343.00	44470.75	-29855.22	-1244170.	-1764166.	-135928.0	-602710.0	-1938190.	562140.0
[illegible]	-703411.0	2271168.	140821.0	-9928.125	6643.594	-113430.0	1436196.	-324214.0	1207240.	3713470.	1495080.
[illegible]	[illegible]	6442184.	-114766.0	20440.81	21214.13	506560.0	-2429704.	-1199740.	1227240.	1016640.	-446930.0
[illegible]	267030.0	-1703624.	46756.00	32481.56	27864.88	266900.0	785301.0	408464.0	71100.00	1252440.	853960.0
[illegible]	1150049.	8739372.	17584.00	124743.9	48938.94	3243270.	294170.0	95398.00	1563050.	972540.0	1742550.
[illegible]	1142510.	-2298560.	130488.0	44358.06	33231.00	1036790.	942143.0	221835.0	296600.0	631580.0	831980.0
[illegible]	2592250.	7770992.	197555.0	406.0000	4464.500	4351408.	4051930.	335175.0	642580.0	3428960.	3506890.

[illegible]	[illegible]	QPRIV	QDOM	QGOV	QXPT	QNXPT	QTOT	CDC	CFR	DCPRIV	DCGOV
[illegible]	398219.0	5687576.	86939.00	2071870.	2562871.	6720825.	9283696.	1868470.	6715820.	1060220.	808254.9
[illegible]	[illegible]	8597632.	55580.00	1181230.	3419273.	7188427.	10607700	6566500.	5022030.	3660870.	2905631.
[illegible]	24[illegible].00	2107304.	129938.0	3877620.	1183346.	4847854.	6031200.	7498242.	-7245930.	7079620.	418613.0
[illegible]	[illegible]	11249730	-21961.00	2469300.	5857795.	11928630	17796420	5883668.	1119670.	215060.0	5668621.
[illegible]	-[illegible]	3716830.	100842.0	-1705760.	11715720	-11631720	84000.00	5890180.	586130.0	5599000.	291170.0
[illegible]	[illegible]	5800298.	45382.00	1001770.	11904490	-2891194.	9013296.	5729920.	-8744140.	4443668.	1238260.
[illegible]	[illegible]	-3555400.	93461.00	250190.0	-2592959.	2097263.	-495696.0	4376040.	-4436691.	-2766253.	7142230.
[illegible]	[illegible]	21633930	216511.0	1313830.	18019150	6171040.	24190190	5360768.	6309911.	3104060.	2256710.
[illegible]	[illegible]	62173405	158826.0	1894950.	23078610	8138290.	31316900	5624696.	15183310	7369680.	-174492[illegible].
[illegible]	[illegible]	-2238096.	358508.0	2517796.	-14596100	16637200	2041104.	17416240	-12693320	13180410	423560.
[illegible]	[illegible]	-2307603.	41283.00	1601464.	2062366.	-1768366.	294000.0	1822752.	7946580.	-349080.0	2171640.
[illegible]	[illegible]	2356754.	232452.0	1212060.	11707850	-8041754.	3666096.	1148688.	-9376620.	5074952.	-3926260.
[illegible]	-[illegible]	-15364110	-47270.00	-2222984.	1965578.	-20873770	-18588190	-421344.0	-11678150	-7633360.	7212010.
[illegible]	[illegible]	-3445295.	-100739.0	-1650443.	2357519.	-14109520	-11252000	8231744.	-9278744.	-4115060.	12407720
[illegible]	[illegible]	8361032.	117591.0	-753152.0	6410153.	2275735.	8595888.	-10503030	8694384.	-1506740.	-8996[illegible].
[illegible]	[illegible]	10371600	202284.0	-330178.0	7583412.	2664632.	10254110	33471650	426595.2	-393232.0	338649.0
[illegible]	-[illegible].0	2353104.	101045.0	1909775.	1229592.	3461608.	4691200.	-30777950	-5207328.	1518872.	-3229[illegible]
[illegible]	[illegible].0	17468190	442638.0	5603320.	9591237.	15135960	24727200	19427250	4390253.	5619800.	13607[illegible]
[illegible]	-7[illegible].0	922016.0	66544.00	678812.0	-9857760.	12667670	2809888.	10309800	-3638232.	1808780.	8501060.
[illegible]	2144200.	27669190	283956.0	6131820.	7523057.	-11695950	-4172896.	-196800.0	-532583.0	10573810	-10770690

[illegible]	XRATE	FPI	GDPT	CCPI	GOV	RMON	QTOT
[illegible]	17.14800	32.60000	1.53D+08	0.670002	104979.0	42691980	9283696.
[illegible]	17.09500	33.80000	1.63D+08	1.439998	121464.0	54280512	10607700
[illegible]	19.23200	31.32000	1.69D+08	4.040001	156808.0	54532820	6031200.
[illegible]	16.77200	35.20000	1.87D+08	2.840004	180522.0	61536152	17796420
[illegible]	16.[illegible]	42.00000	1.87D+08	8.[illegible]97	230166.0	65012464	54000.00
[illegible]	16.75400	68.20000	1.96D+08	11.90000	301582.0	64998240	9013296.
[illegible]	16.70000	86.20000	1.96D+08	13.30000	373103.0	64936632	-435696.0
[illegible]	14.15000	100.0000	2.20D+08	3.500003	403794.0	76508256	24190190
[illegible]	15.20700	108.0000	2.52D+08	15.49999	590390.0	97416880	31816900
[illegible]	15.05900	114.0000	2.54D+08	10.50001	6976100.	1.02D+08	2041104.
[illegible]	16.35500	132.0000	2.54D+08	14.70000	7813200.	1.12D+08	294000.0
[illegible]	18.32200	173.0000	2.58D+08	17.60001	3621100.	1.03D+08	3666096.
[illegible]	19.67700	220.0000	2.39D+08	43.00000	1114410.	90976096	-18888190
[illegible]	20.62700	252.8000	2.27D+08	39.59999	1190693.	69989104	-11252000
[illegible]	20.05900	323.5800	2.36D+08	25.80002	1254730.	89789488	8585888.
[illegible]	13.40100	337.9800	2.46D+08	30.89999	1534660.	90148872	10254110
[illegible]	23.49000	340.0000	2.51D+08	35.79999	1651820.	86153360	4591200.
[illegible]	23.58000	379.7600	2.76D+08	20.20001	2134220.	1.10D+08	24727200
[illegible]	30.68500	375.6700	2.79D+08	36.69999	2214690.	1.17D+08	2809888.
[illegible]	33.30200	379.7600	2.74D+08	10.00000	3008230.	1.18D+08	-4172396.

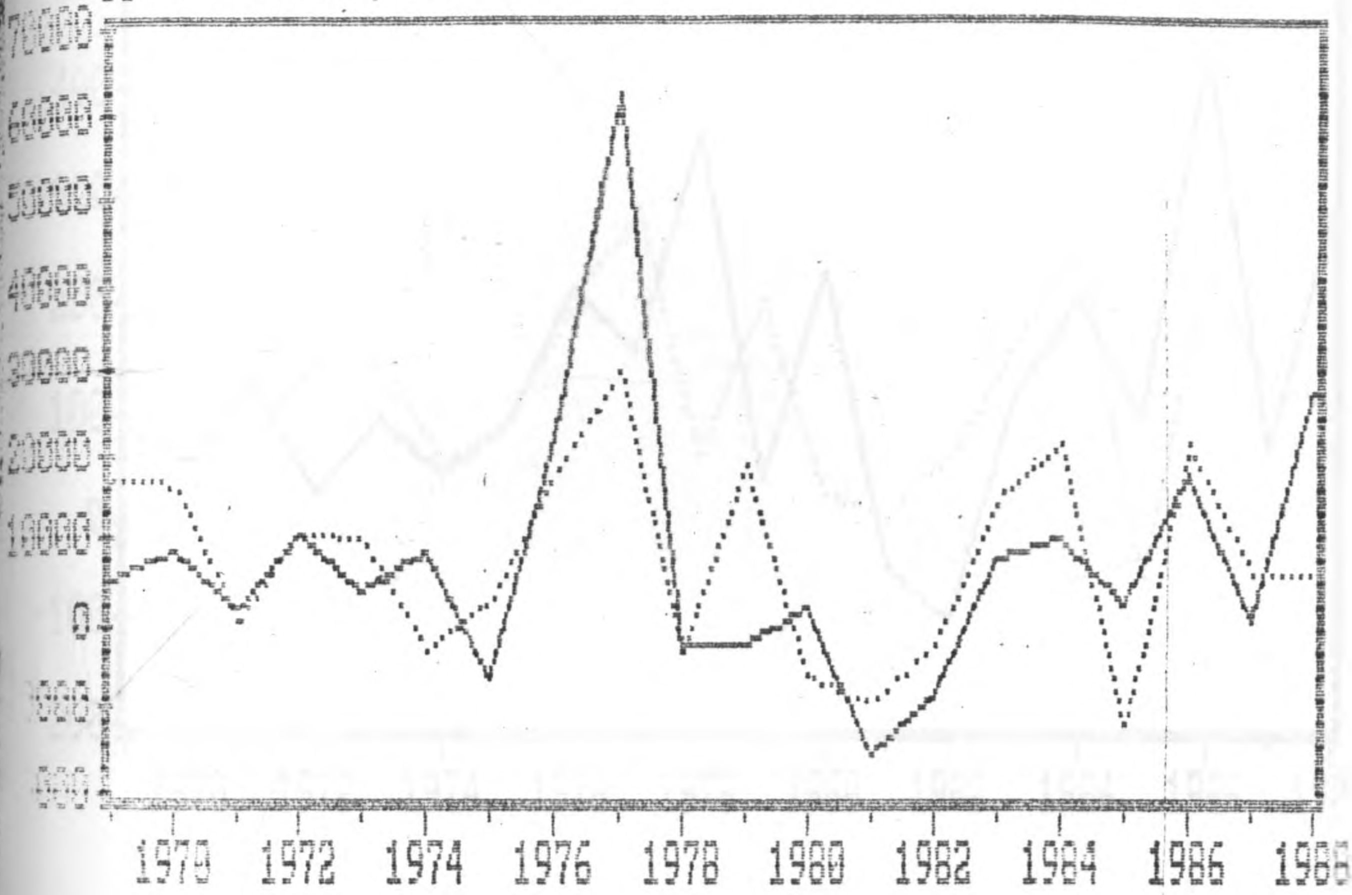
APPENDIX ONE : SIMULATION RESULTS.

gtrad = f(cdc, ctr).



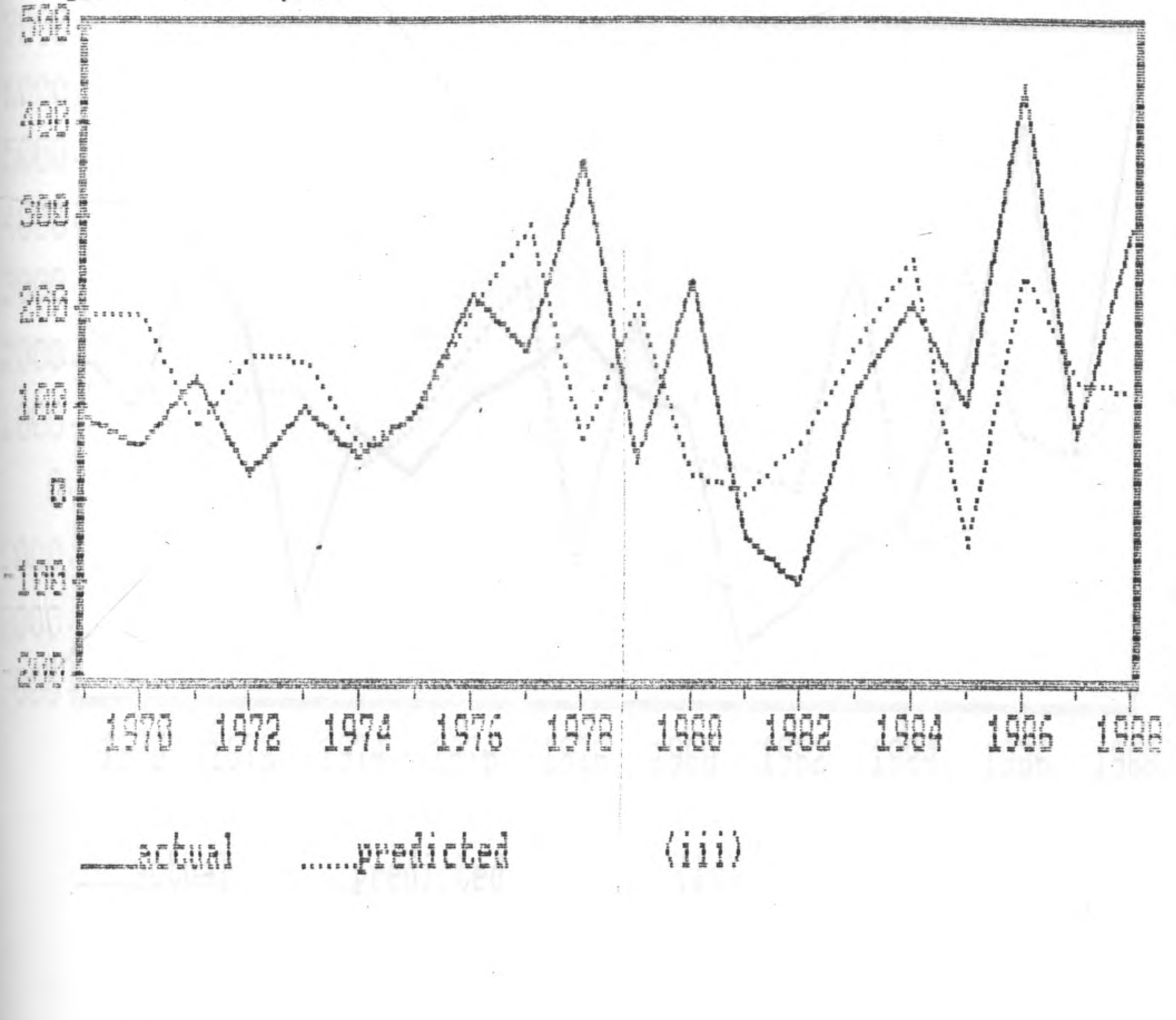
——actual ......predicted (i)

ppriv = f(cdc , cfr)



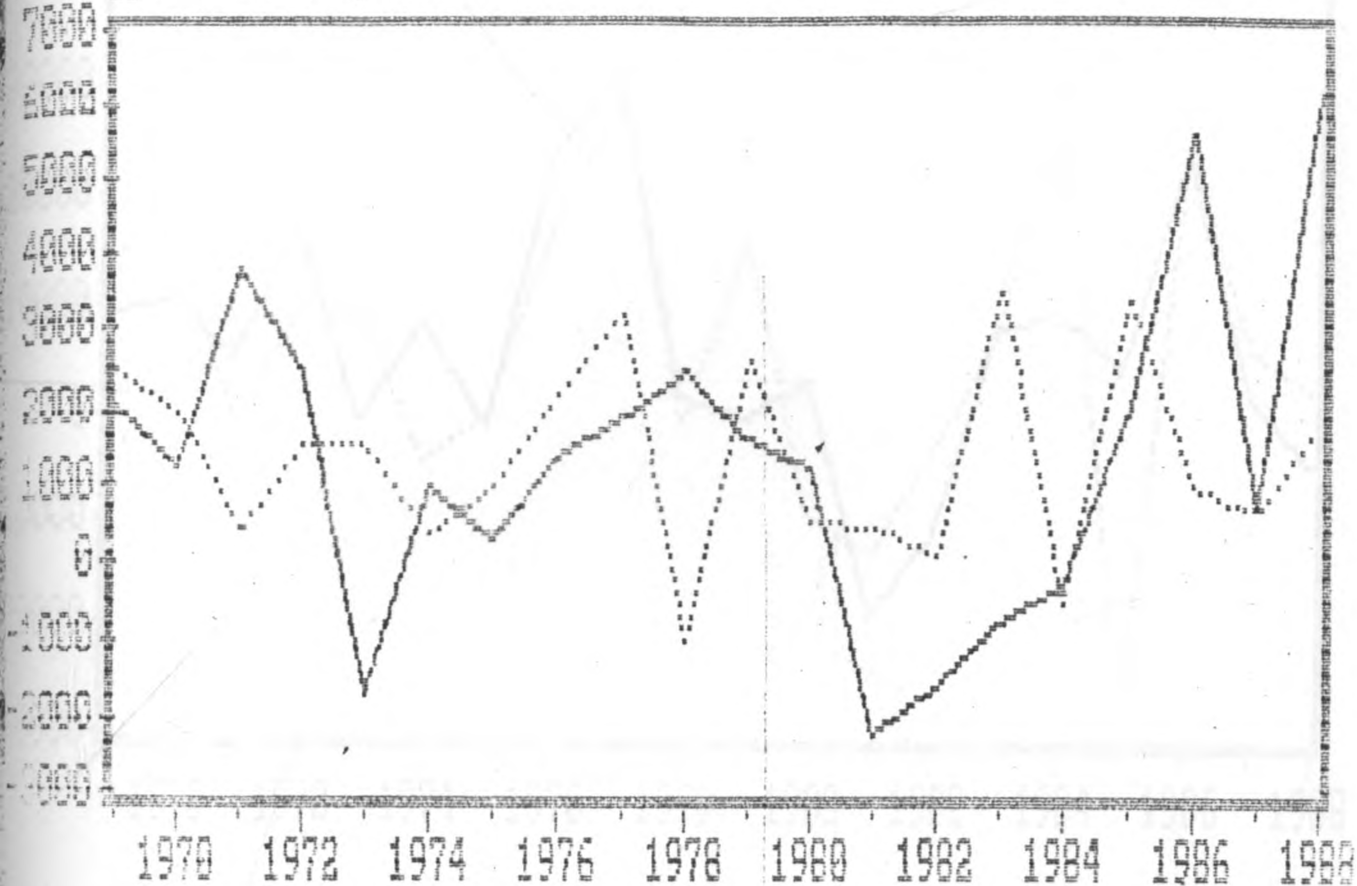
___actual ......predicted (ii)

gdom = f(cdc, cfr)



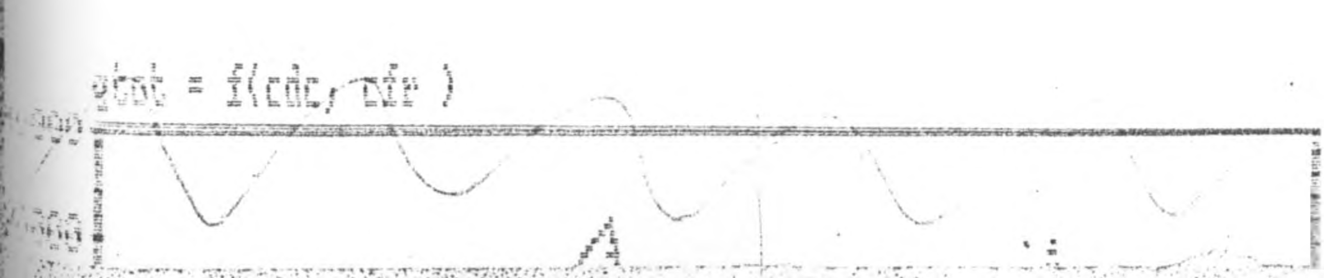
___actual ......predicted (iii)

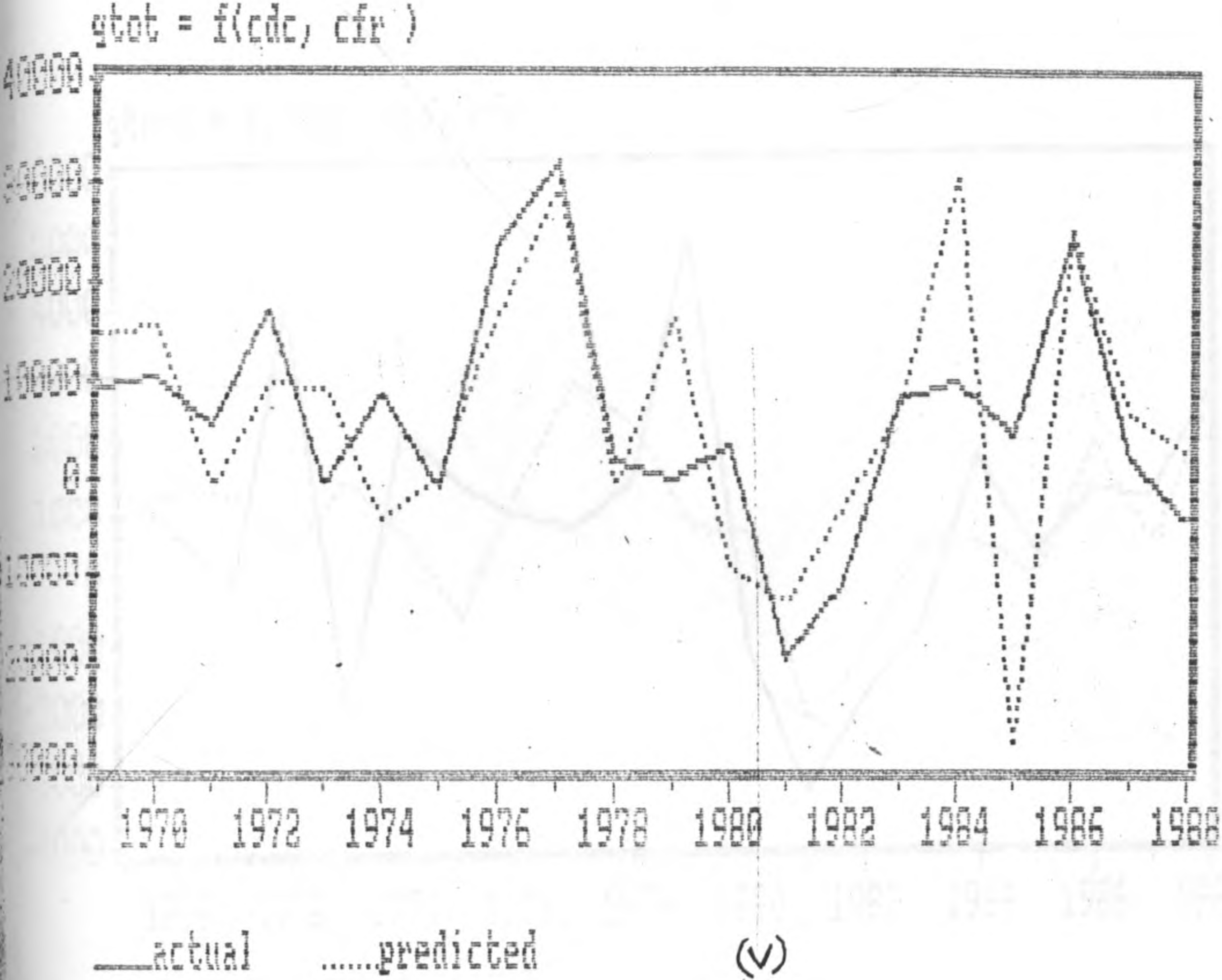
ggov = f(cdc, cfr)



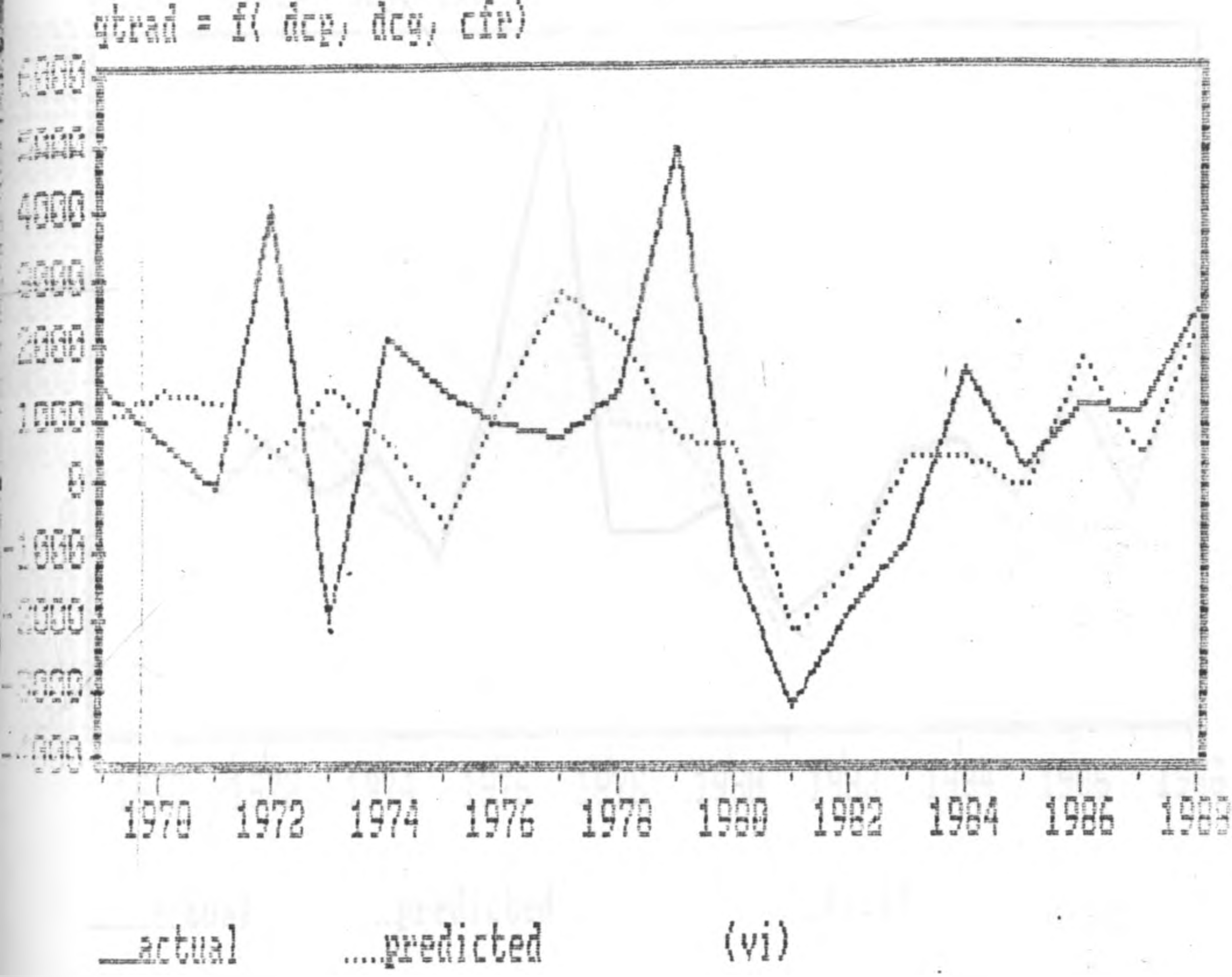
___actual ......predicted (iv)

gcnt = f(cdc, cfr)



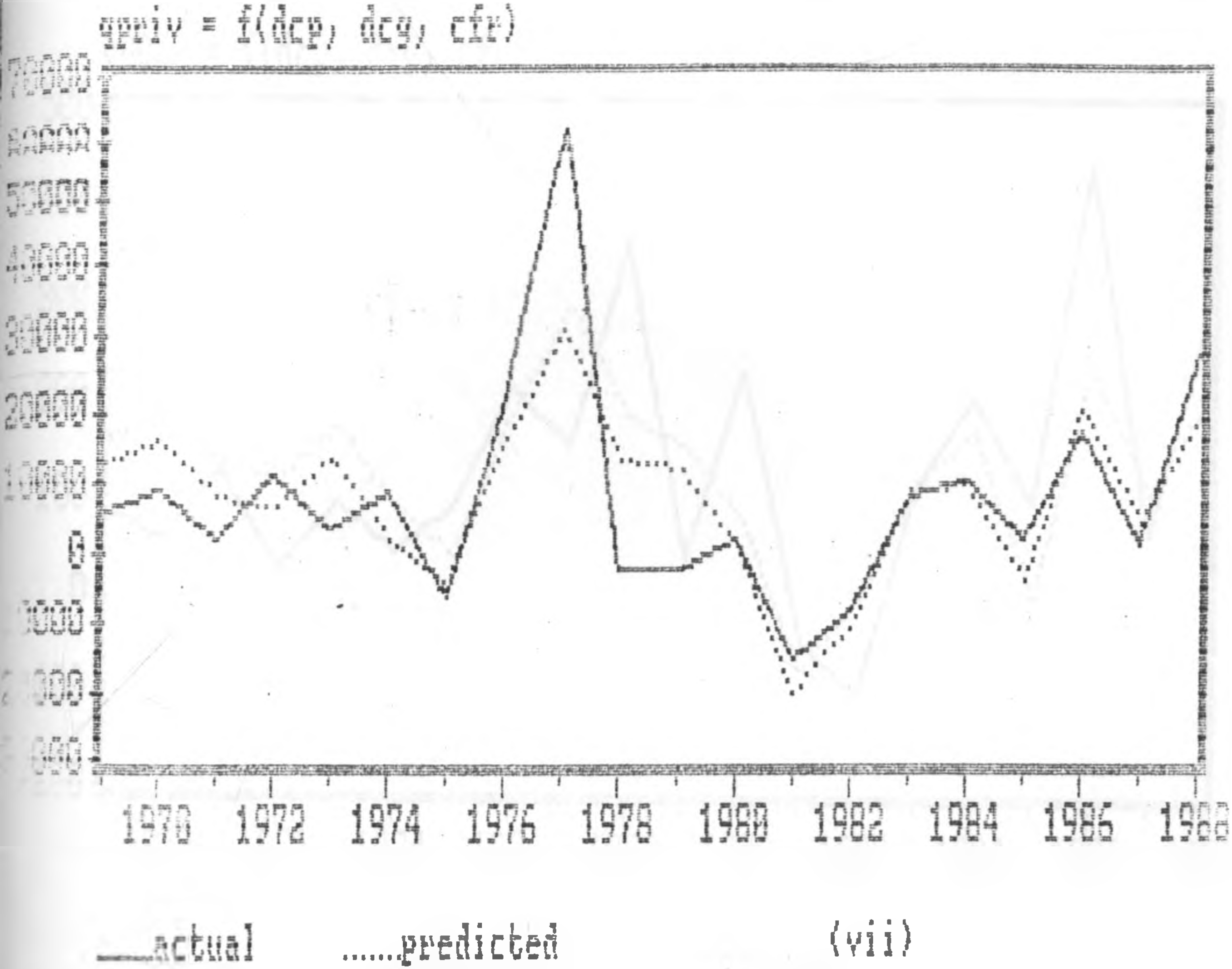

gtot = f(cdc, cfr)
40000
30000
20000
10000
0
-10000
-20000
-30000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
___actual
......predicted

(v)



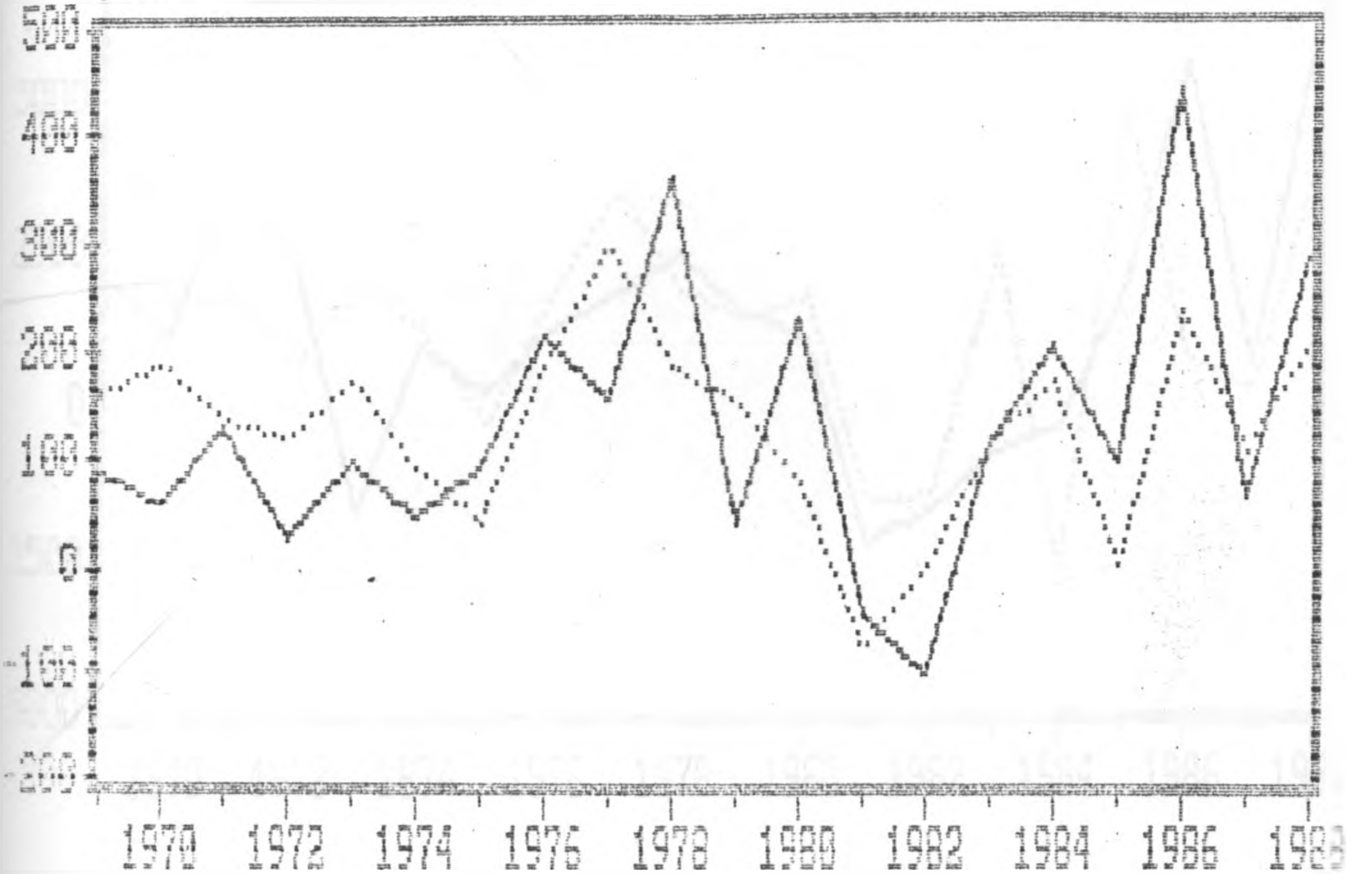
gtrad = f(dcp, dcg, cfr)
5000
4000
3000
2000
1000
0
-1000
-2000
-3000
-4000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
___actual
....predicted

(vi)


gpriv = f(dcp, dcg, cfr)
70000
60000
50000
40000
30000
20000
10000
0
1970
1972
1974
1976
1978
1980
1982
1984
1986
___actual
......predicted

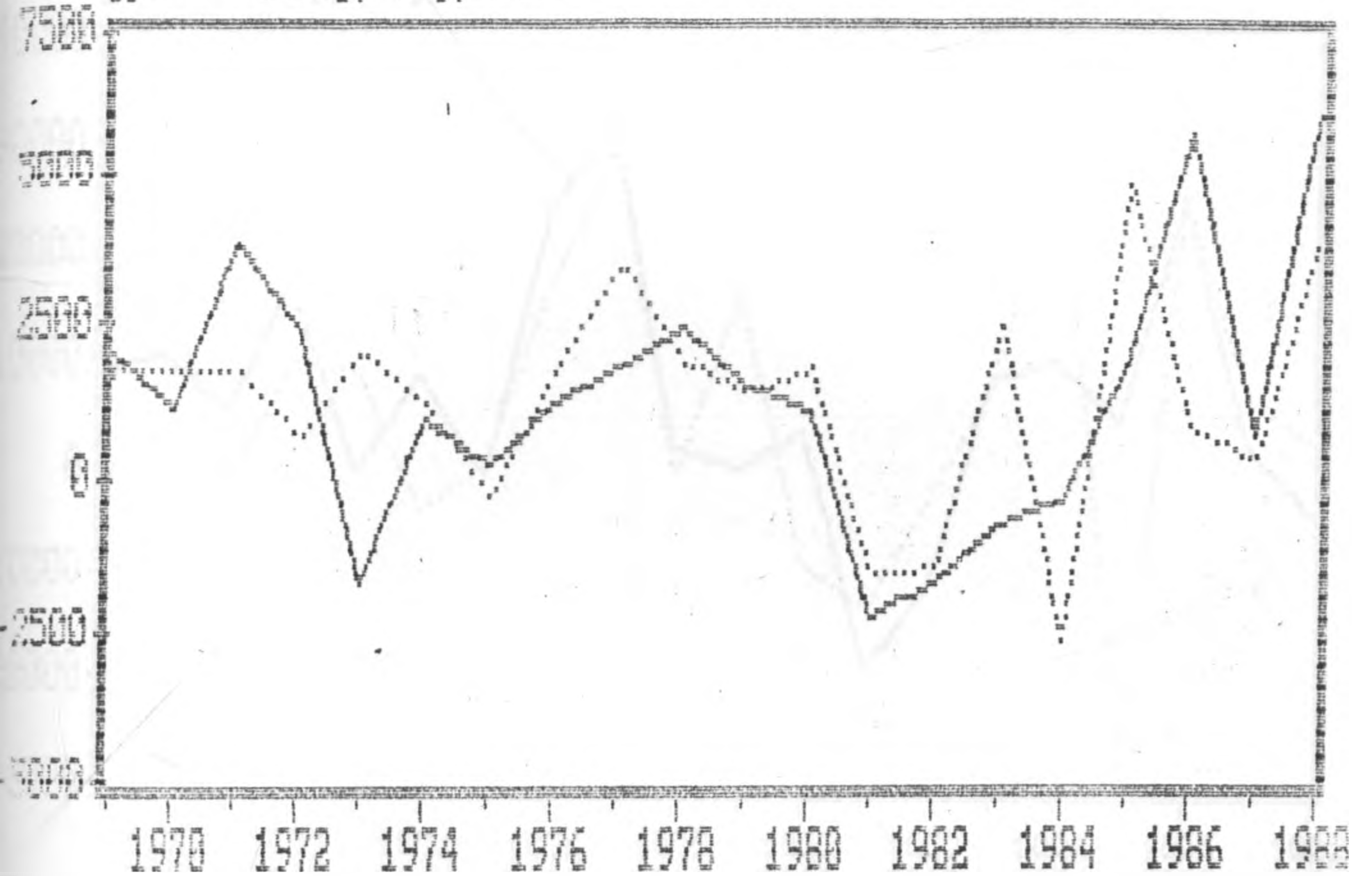
(vii)

QDOM = f(dcp, dcg, cfr)



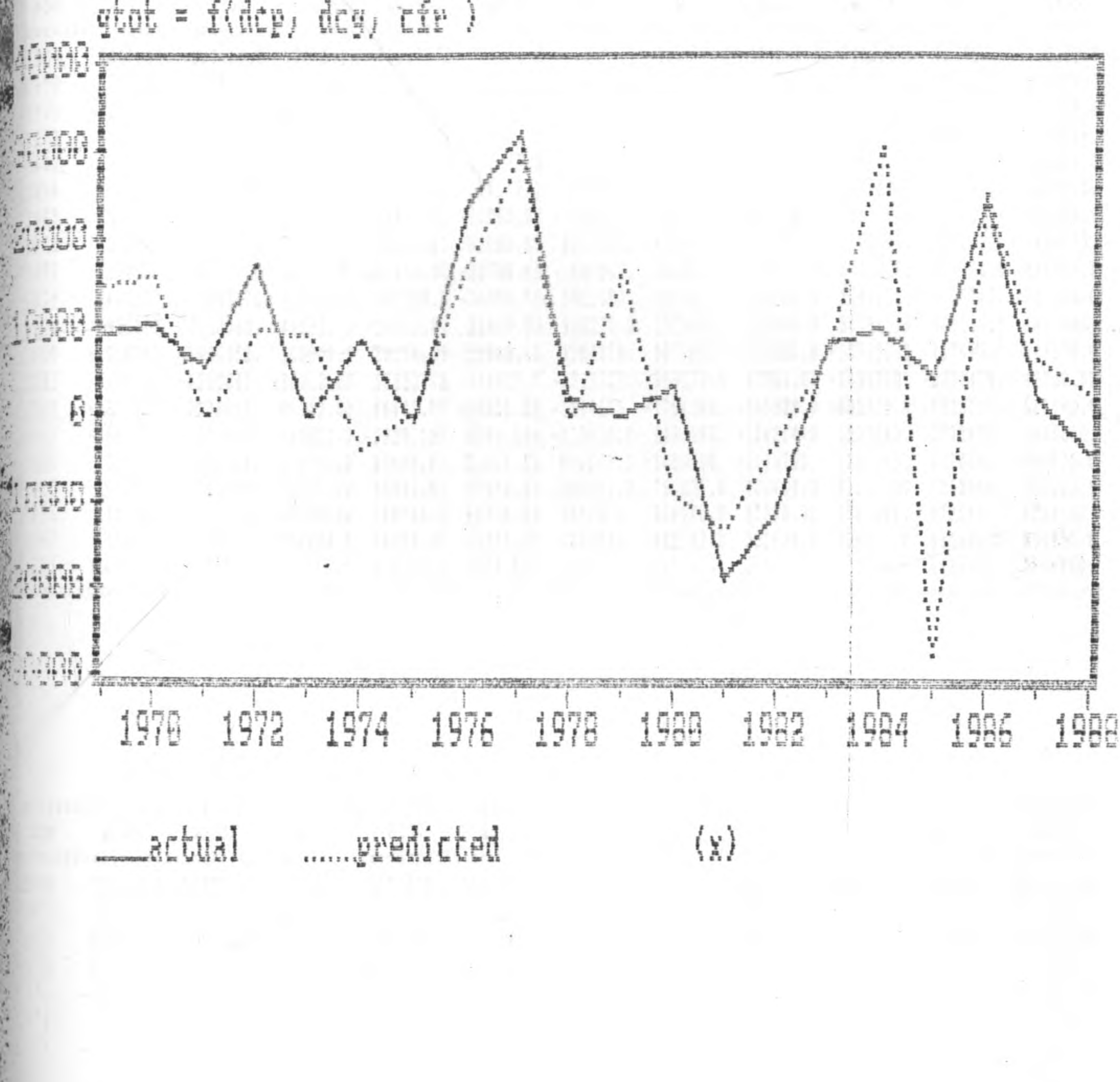
___actual ......predicted (viii)

ggov = f(dcp, dcg, cfr)



___actual ......predicted

(ix)


gtot = f(dcp, dcg, cfr)
40000
30000
20000
10000
0
-10000
-20000
-30000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
actual
predicted
(x)

APPENDIX THREE : DATA

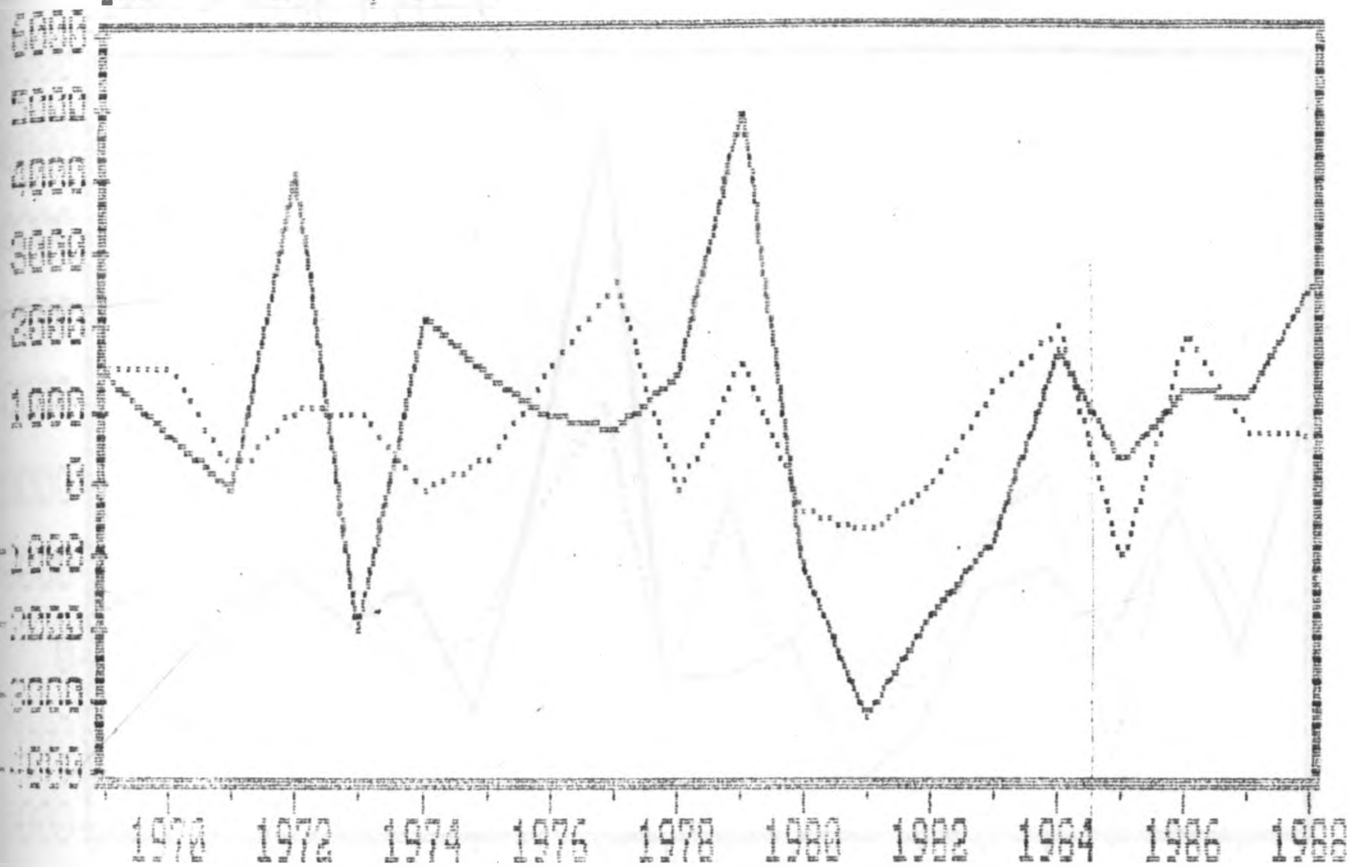
obs	QTRAD	QAGR	QFOR	QFISH	QMIN	QMANF	QCON	QELEC	QTCOM	QHOT	QFIN
1969	1437355.	903430.0	73449.10	-723.6375	-100922.2	1398050.	115136.0	134535.0	393210.0	701750.0	609239.0
1970	673192.0	2016830.	363664.0	4062.500	106342.8	1240120.	355000.0	223523.0	665700.0	2450380.	960708.0
1971	-82720.00	-1191590.	-212501.0	-10170.00	106204.3	[illegible]	223453.0	-27550.00	23170.00	653900.0	358532.0
1972	4055520.	5228060.	-183107.0	-3102.025	-232023.4	[illegible]	4554767.	106472.0	-1612150.	593030.0	1924558.
1973	-2037320.	371050.0	71359.00	-18225.29	175037.9	1781790.	-357031.0	-172913.0	415720.0	1529030.	-156393.0
1974	2145310.	-54760.00	113031.0	-19472.72	-117139.1	2234500.	-233921.0	-64210.00	585050.0	5137910.	1562612.
1975	1454549.	-1197630.	-53845.00	-3647.500	-56063.00	-1321040.	-1057735.	227116.0	-725310.0	-2195110.	151510.0
1976	320230.0	12467470	-28621.00	96505.21	90588.00	4947920.	-405417.0	-49173.00	571230.0	1956000.	1438170.
1977	707450.0	64224000	-45079.00	-53430.00	-82796.69	-1542960.	231231.0	569035.0	21730.00	104660.0	885400.0
1978	1403510.	-10429970	151762.0	141928.3	-14033.75	3511060.	1210517.	209154.0	2245270.	1506740.	921230.0
1979	4927000.	-3633760.	445353.0	-24017.81	21867.00	953270.0	1073345.	613505.0	551940.0	641010.0	1461600.
1980	-1210240.	-8980352.	152807.0	23054.69	13882.13	1368673.	1570860.	-117385.0	-105350.0	737080.0	548570.0
1981	-3222370.	-6203840.	-89302.00	102237.2	-114817.7	-3718130.	-943170.0	41951.00	-1491700.	-2897470.	-49600.00
1982	-1893520.	-2208016.	45343.00	44470.75	-29855.22	-1244170.	-1764166.	-135228.0	-602710.0	-1938190.	562140.0
1983	-756410.0	2271168.	140921.0	-3923.125	6643.594	-113400.0	1435196.	-224214.0	1207240.	3713470.	1495080.
1984	1756500.	6442184.	-114736.0	20440.61	21214.13	[illegible]	-2429704.	-1139740.	1227240.	1016640.	-446930.0
1985	267330.0	-1703624.	46755.00	32481.56	27954.33	290300.0	755301.0	405464.0	71100.00	1252440.	853950.0
1986	1153043.	8799372.	17584.00	124743.9	48938.94	3240271.	394179.0	35398.00	1563050.	972540.0	1742550.
1987	1142510.	-2898560.	126488.0	44359.00	33231.00	1035730.	942143.0	221935.0	296600.0	631580.0	831980.0
1988	2532210.	-7770992.	197555.0	496.0000	1464.500	[illegible]	4051300.	356175.0	642560.0	3428960.	3506890.

obs	QDWEL	QPRIV	QDOM	QGOV	QXPT	QNXPT	QTOT	CDC	CFE	DCPRIV	DCGOV
1969	306213.0	5087575.	86939.00	2071870.	2563371.	6720325.	9223096.	1698470.	6715820.	1060220.	808254.9
[illegible]	132092.0	6697632.	55590.00	1131230.	3419273.	7159427.	13607700	6566500.	6022300.	3660270.	2305631.
[illegible]	24055.00	2107304.	129998.0	3977620.	1183340.	4547654.	[illegible]	7438242.	-7245330.	7079620.	415613.0
[illegible]	3327255.	11249700	-21901.00	2463300.	5607725.	11322100	17730400	5560066.	1119070.	215060.0	5068621.
[illegible]	[illegible]	3716890.	100842.0	-1705755.	[illegible]	[illegible]	[illegible]	539018.	586150.0	5599000.	231170.0
[illegible]	[illegible]	[illegible]	45352.00	1001770.	1190443.	-2231134.	[illegible]	[illegible]	[illegible]	4443853.	1236200.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4079040.	[illegible]	-2762208.	7142200.
[illegible]	[illegible]	[illegible]	[illegible]	1019000.	15019100	[illegible]	2412719.	[illegible]	[illegible]	3104460.	2256710.
[illegible]	[illegible]	62179408	158220.0	1234950.	23076810	[illegible]	[illegible]	5024696.	[illegible]	7369683.	-1744927.
[illegible]	[illegible]	-2238096.	[illegible]	2517798.	-14560100	[illegible]	2941104.	17410240	[illegible]	13180410	4235830.
[illegible]	[illegible]	-2367085.	41255.00	1001464.	2062065.	[illegible]	2240000.0	1622752.	7940037.	[illegible]	2171840.
[illegible]	[illegible]	2336794.	232452.0	1212080.	11707660	[illegible]	3626056.	1145682.	[illegible]	5074352.	-3926260.
[illegible]	[illegible]	-15304100	-47270.00	-2022981.	1365574.	[illegible]	-13356100	-420544.0	[illegible]	-7633350.	7212610.
[illegible]	[illegible]	-2445296.	-100739.0	[illegible]	3247512.	[illegible]	[illegible]	2521744.	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	2561078.	117891.0	-700152.4	3410150.	[illegible]	[illegible]	[illegible]	[illegible]	-1508741.	[illegible]
[illegible]	[illegible]	10371200	202254.0	[illegible]	7602412.	[illegible]	[illegible]	10471050	482555.2	[illegible]	[illegible]
[illegible]	[illegible]	2353104.	101745.0	1959775.	1229532.	[illegible]	[illegible]	-20777850	[illegible]	[illegible]	[illegible]
[illegible]	246250.0	17463190	442603.0	5650320.	3591237.	[illegible]	[illegible]	19429250	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	922016.0	63644.00	676312.0	-9357750.	[illegible]	2603638.	[illegible]	-3035212.	1305780.	5501000.
[illegible]	2141200.	27669180	263556.0	[illegible]	7526067.	-11626900	-4172595.	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	XRATE	FPI	GDPT	CCPI	GOV	RMON	QTOT
[illegible]	17.14300	32.60000	1.53D+08	0.670002	104979.0	42691980	9283696.
[illegible]	17.09800	33.80000	1.63D+08	1.489998	121464.0	54280512	10607700
[illegible]	18.23200	31.32000	1.69D+08	4.040001	156308.0	54532820	6031200.
[illegible]	16.77200	35.20000	1.87D+08	2.840004	180522.0	61536152	17796420
[illegible]	16.[illegible]	42.00000	1.87D+08	8.699997	230166.0	68012464	54000.00
[illegible]	16.75400	69.20000	1.96D+08	11.80000	301582.0	64998240	9013296.
[illegible]	16.70000	96.20000	1.96D+08	13.80000	373109.0	64936632	-435696.0
[illegible]	14.15600	100.0000	2.20D+08	9.800003	409794.0	76608256	24130190
[illegible]	15.20700	105.9000	2.52D+08	15.49999	590390.0	97416880	31816900
[illegible]	15.05300	114.0000	2.54D+08	10.60001	6976100.	1.02D+08	2041104.
[illegible]	16.35500	132.0000	2.54D+08	14.70000	7813200.	1.12D+08	294000.0
[illegible]	18.08100	173.0000	2.58D+08	17.60001	9621100.	1.03D+08	3666096.
[illegible]	19.67700	220.0000	2.39D+08	43.00000	1114410.	90976096	-18888190
[illegible]	20.62700	252.8000	2.27D+08	39.59999	1190693.	89989104	-11252000
[illegible]	20.05900	323.5800	2.36D+08	25.80002	1254730.	89789488	8695888.
[illegible]	18.40100	337.9800	2.46D+08	30.89999	1534660.	90148872	10254110
[illegible]	23.46600	340.0000	2.51D+08	35.79999	1651820.	86153360	4691200.
[illegible]	23.56600	373.7600	2.75D+08	20.20001	2134220.	1.10D+08	24727200
[illegible]	30.69500	375.6700	2.79D+08	36.89999	2214690.	1.17D+08	2809888.
[illegible]	33.30200	379.7600	2.74D+08	10.00000	3008230.	1.18D+08	-4172896.

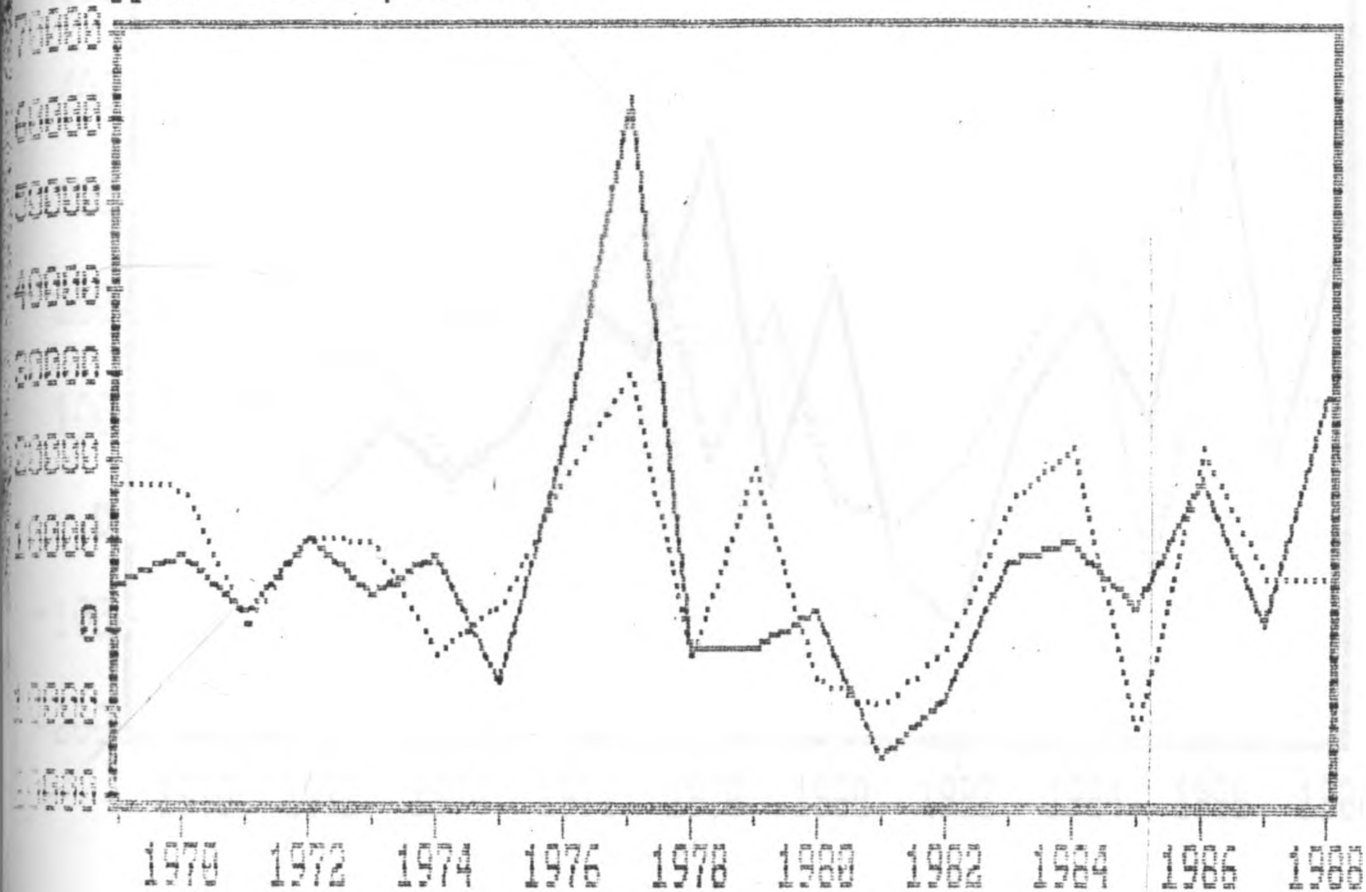
APPENDIX ONE : SIMULATION RESULTS.

gtrad = f(cdc, cir),

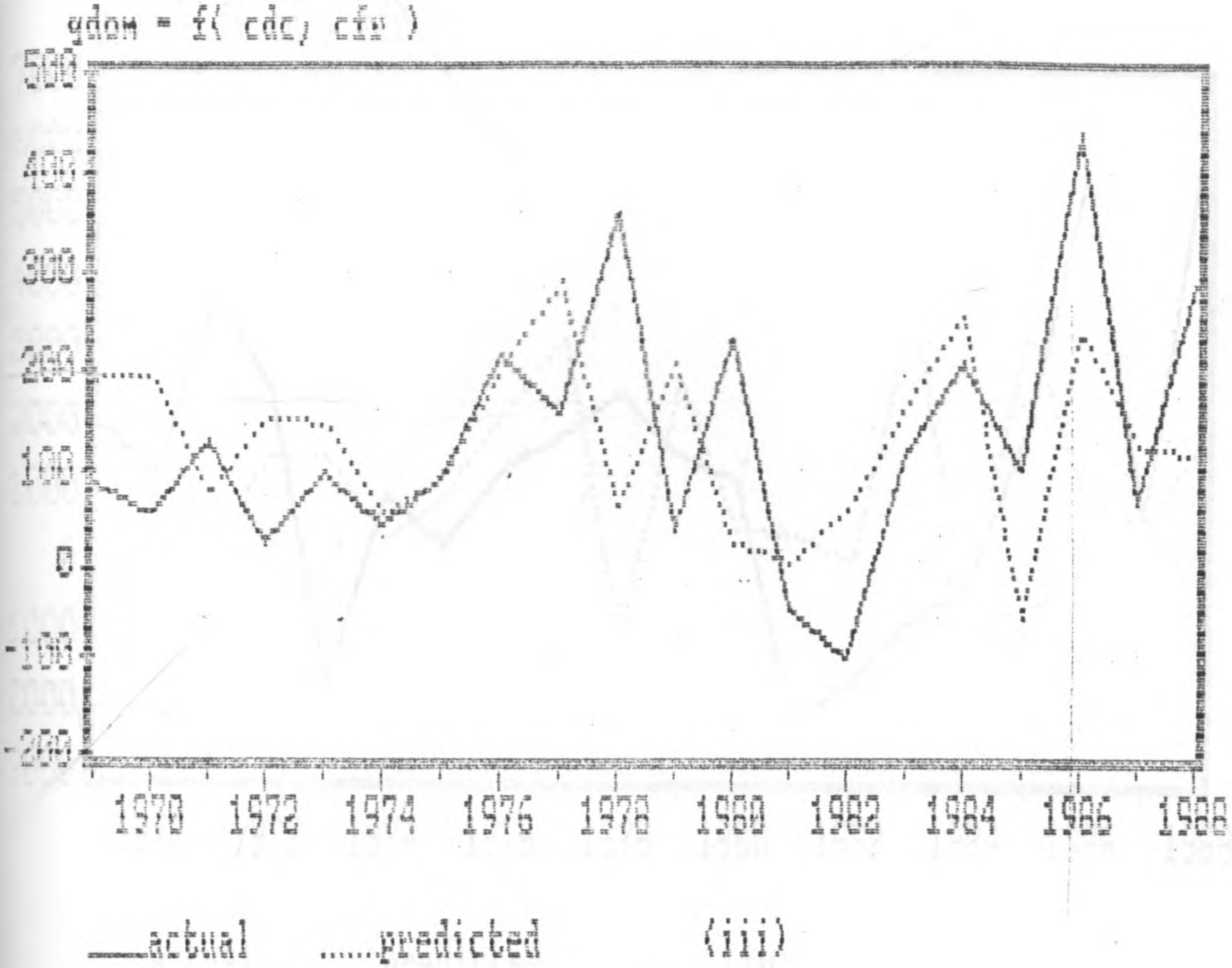


____actual ......predicted (i)

pprivy = f(cdc , cfr)

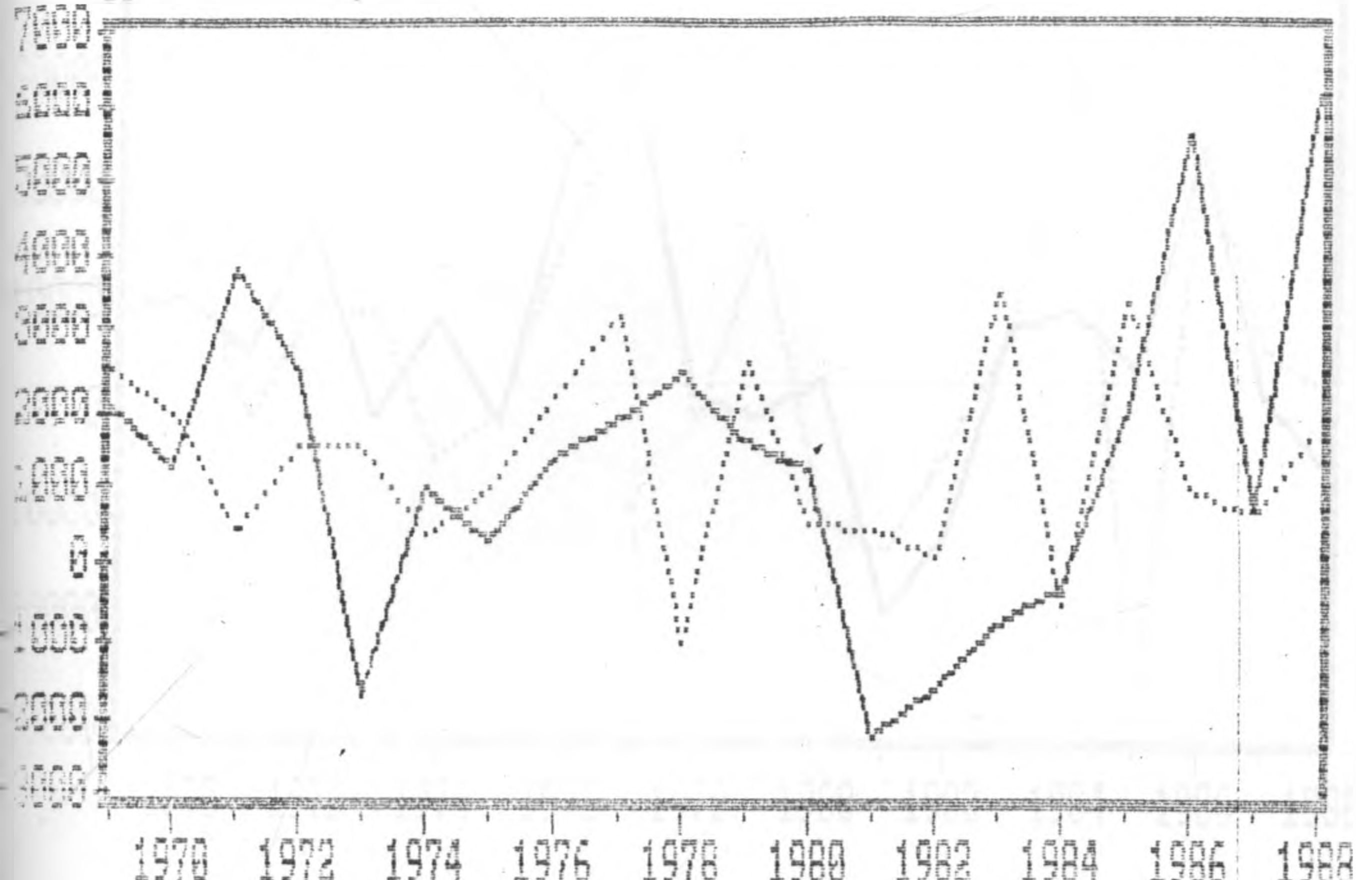


(ii)


gdom = f(cdc, cfr)
500
400
300
200
100
0
-100
-200
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
actual
predicted

(iii)

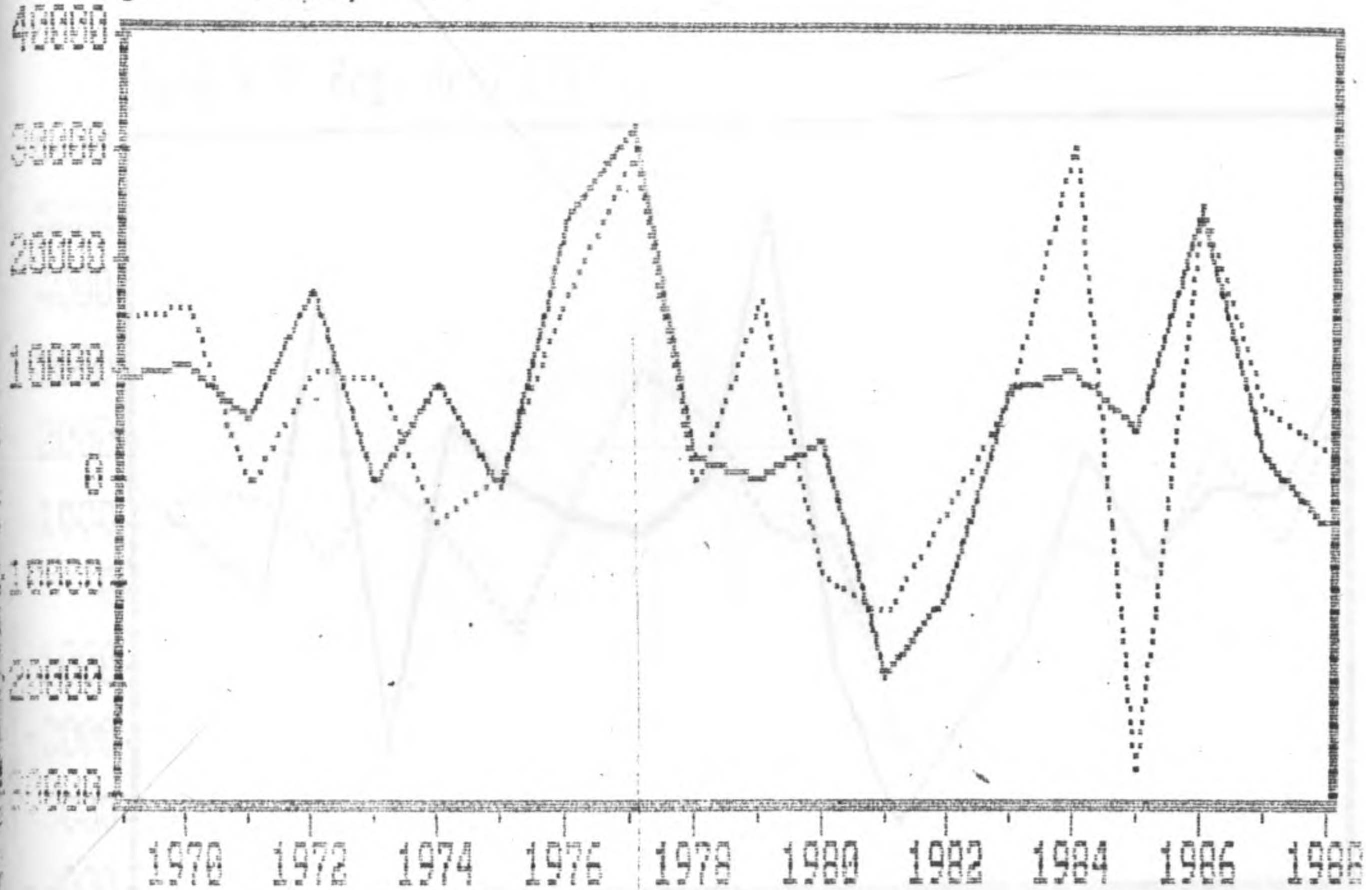
ggov = f(cdc, cir)



____actual ......predicted (iv)

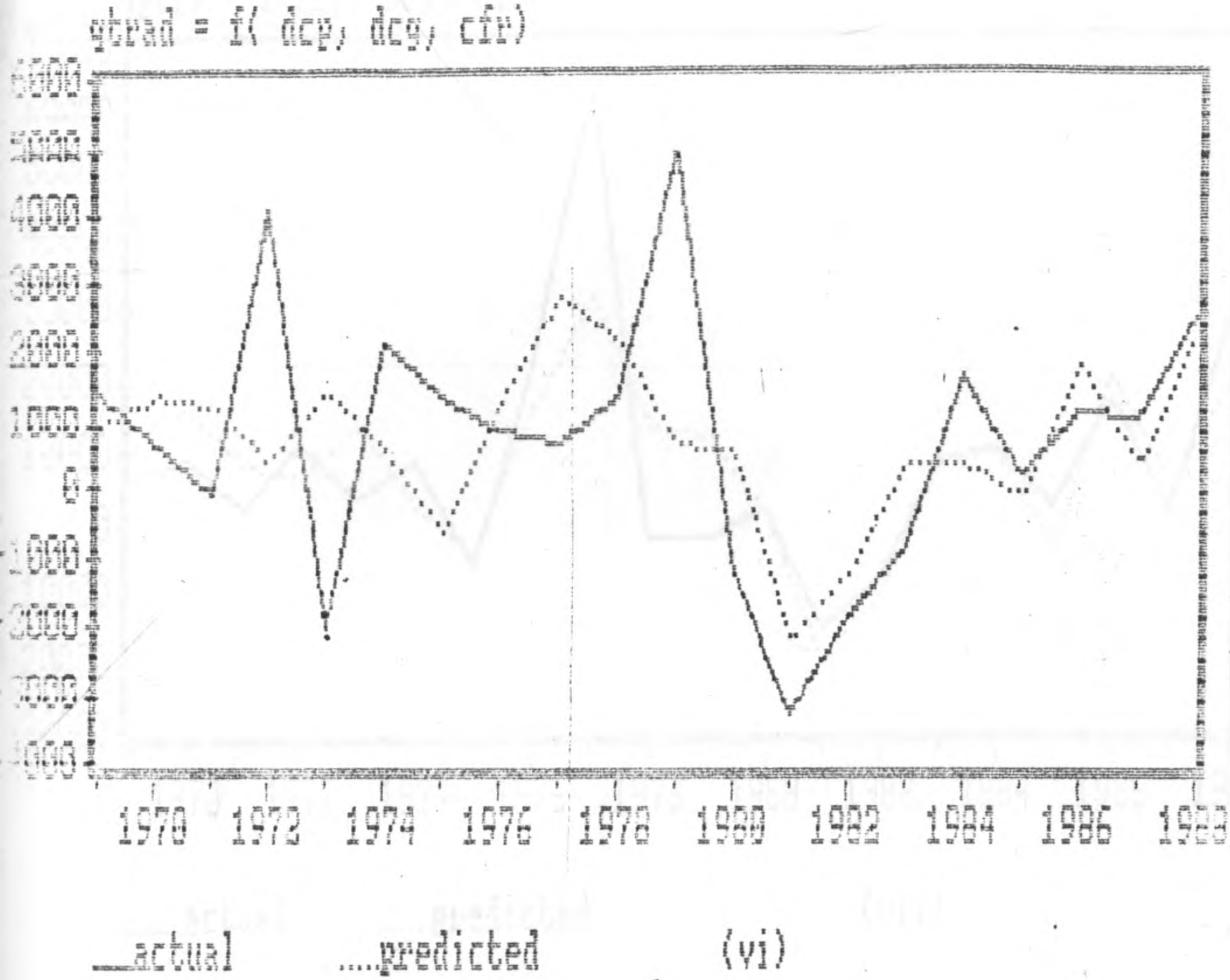
gtot = f(cdc, cir)

gtot = f(cdc, cfr)



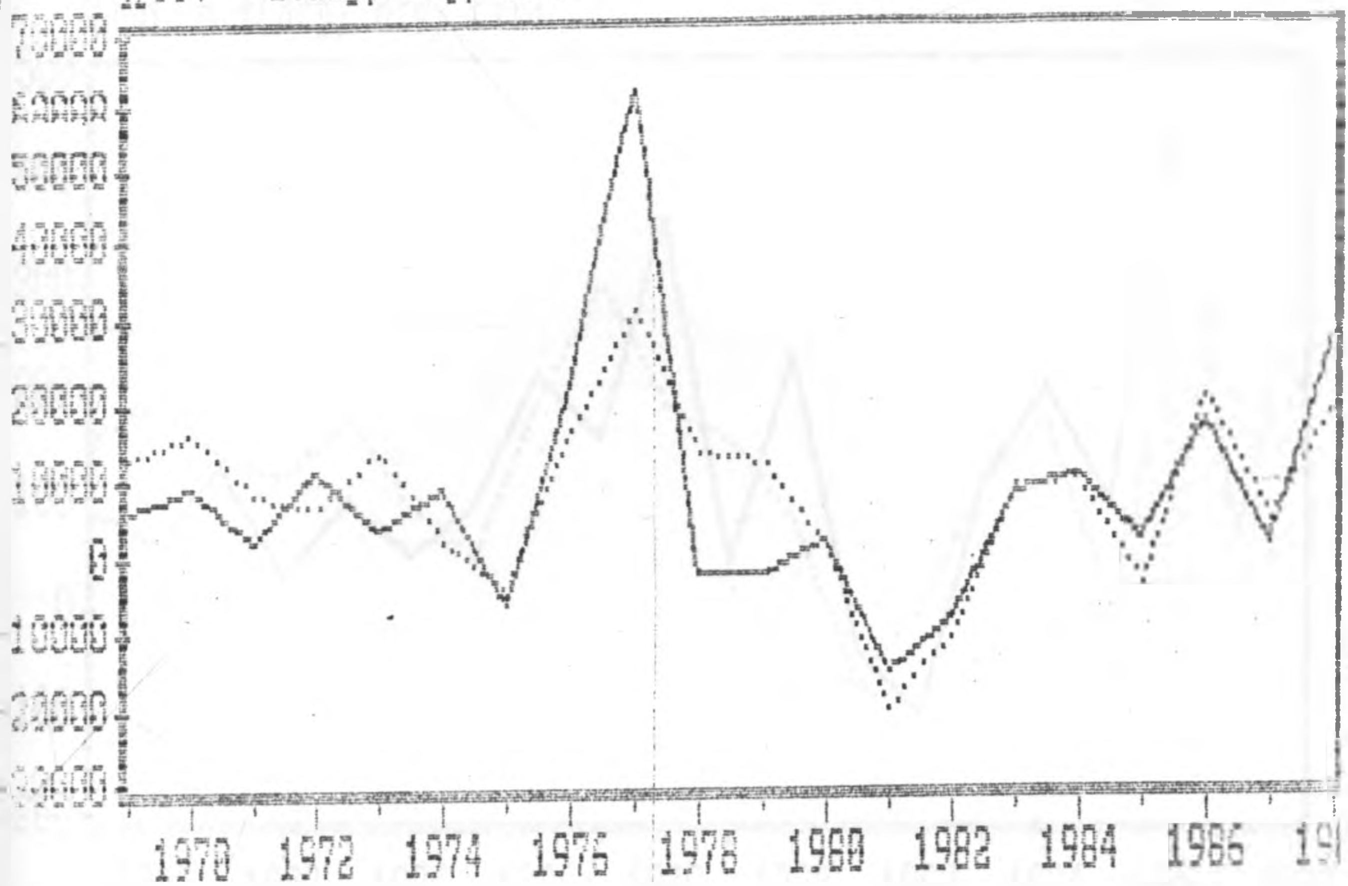
——actual ......predicted

(v)

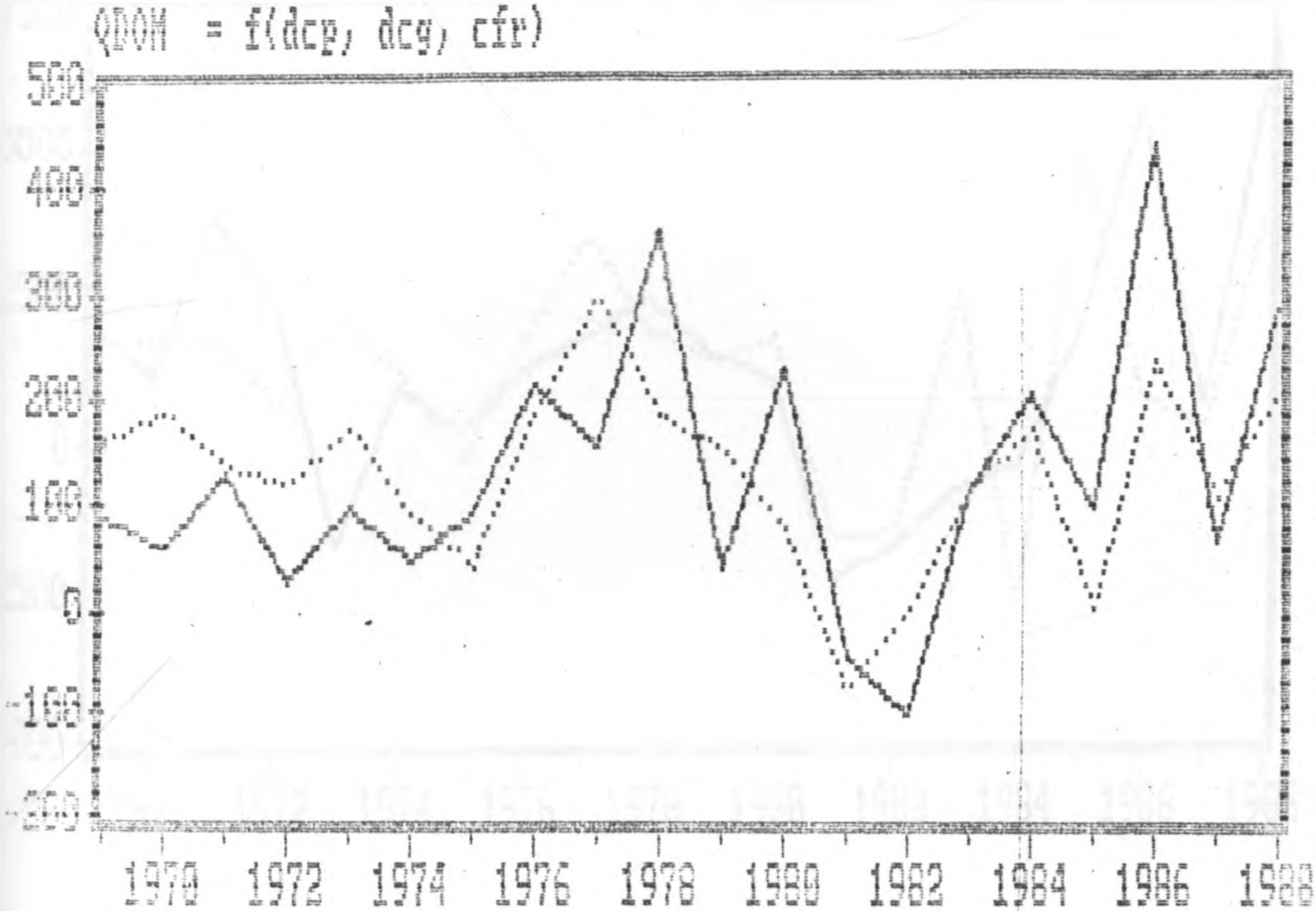


gtrad = f(dcp, dcg, cfr)
5000
4000
3000
2000
1000
0
-1000
-2000
-3000
-4000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
__actual
.....predicted
(vi)

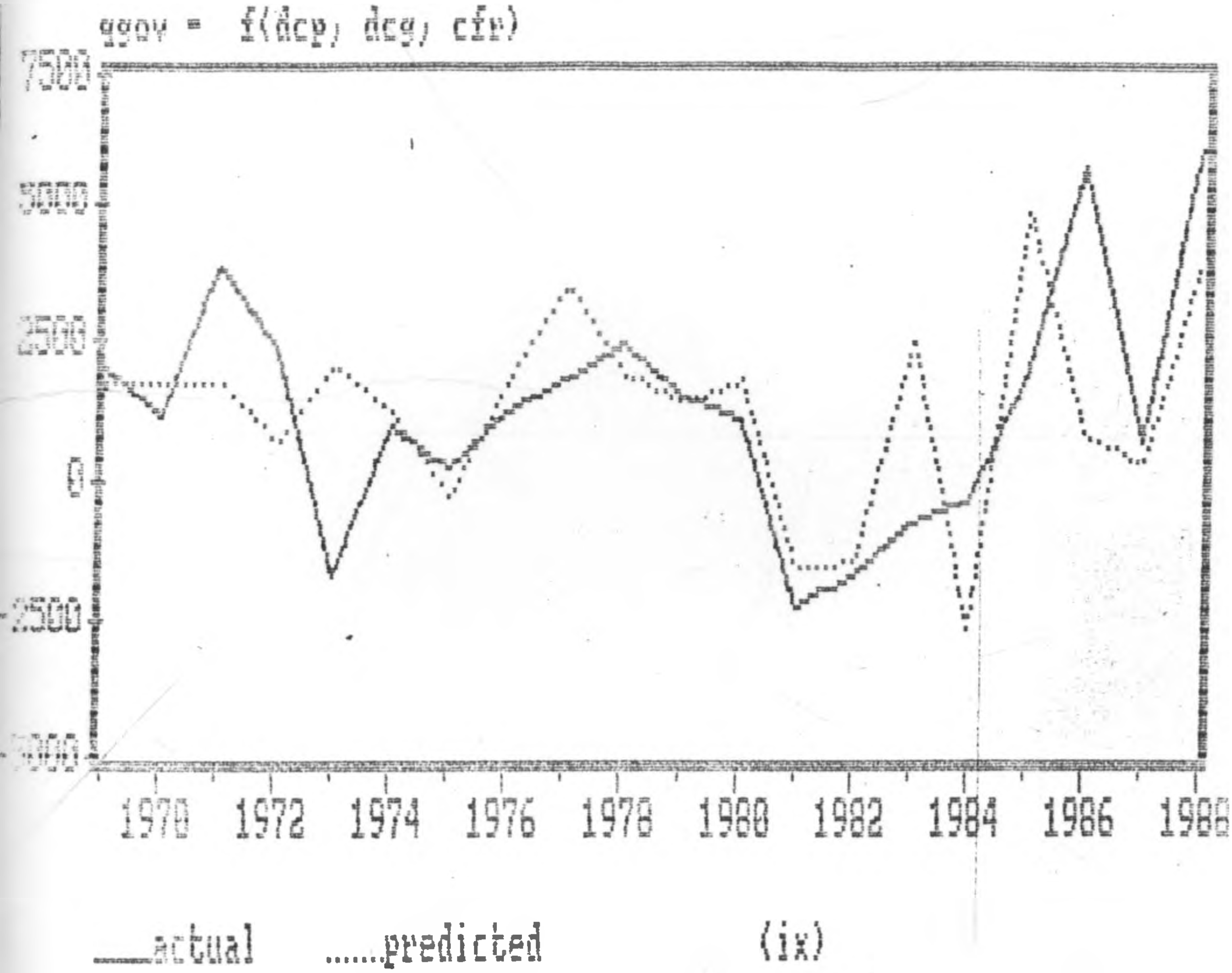
qpriv = f(dcp, dcy, cfr)



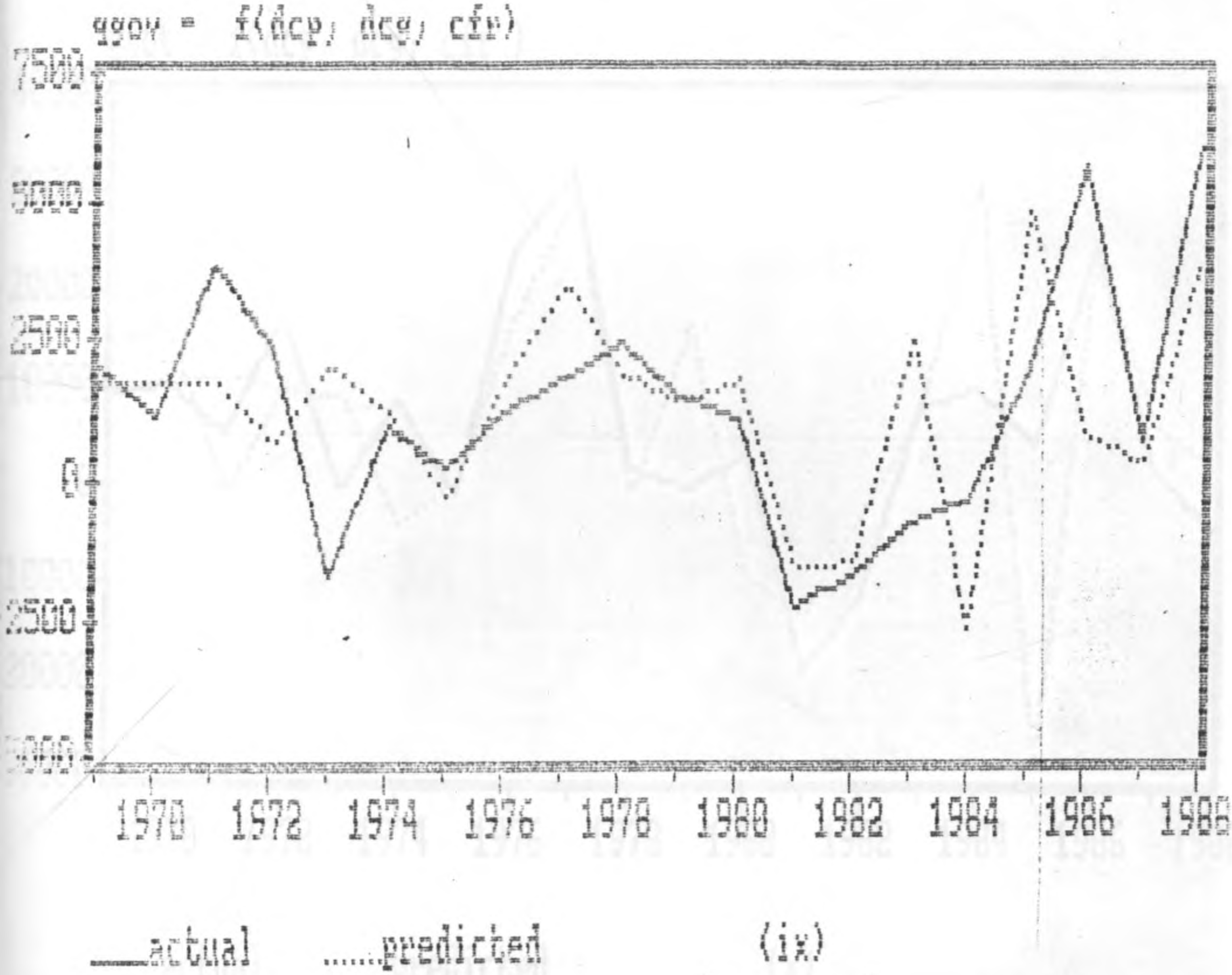
____actual ......predicted (vii)

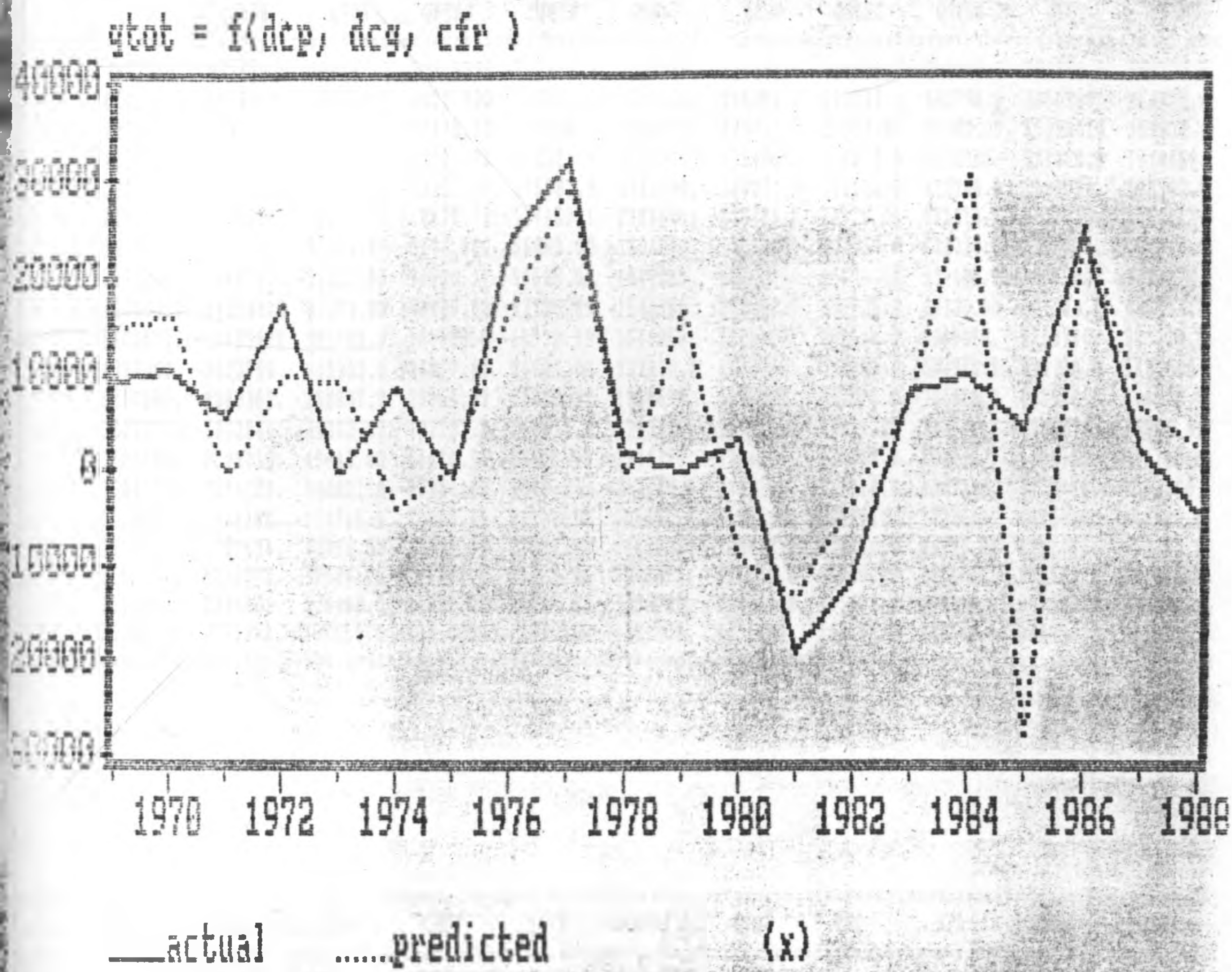


___actual ......predicted (viii)


ggov = f(dcp, dcg, cfr)
7500
5000
2500
0
-2500
-5000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
___actual
......predicted

(ix)


ggov = f(dcp, dcg, cfr)
7500
5000
2500
0
-2500
-5000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
___actual
......predicted
(ix)



gtot = f(dcp, dcg, cfr)
40000
30000
20000
10000
0
10000
20000
30000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
actual
predicted

(x)

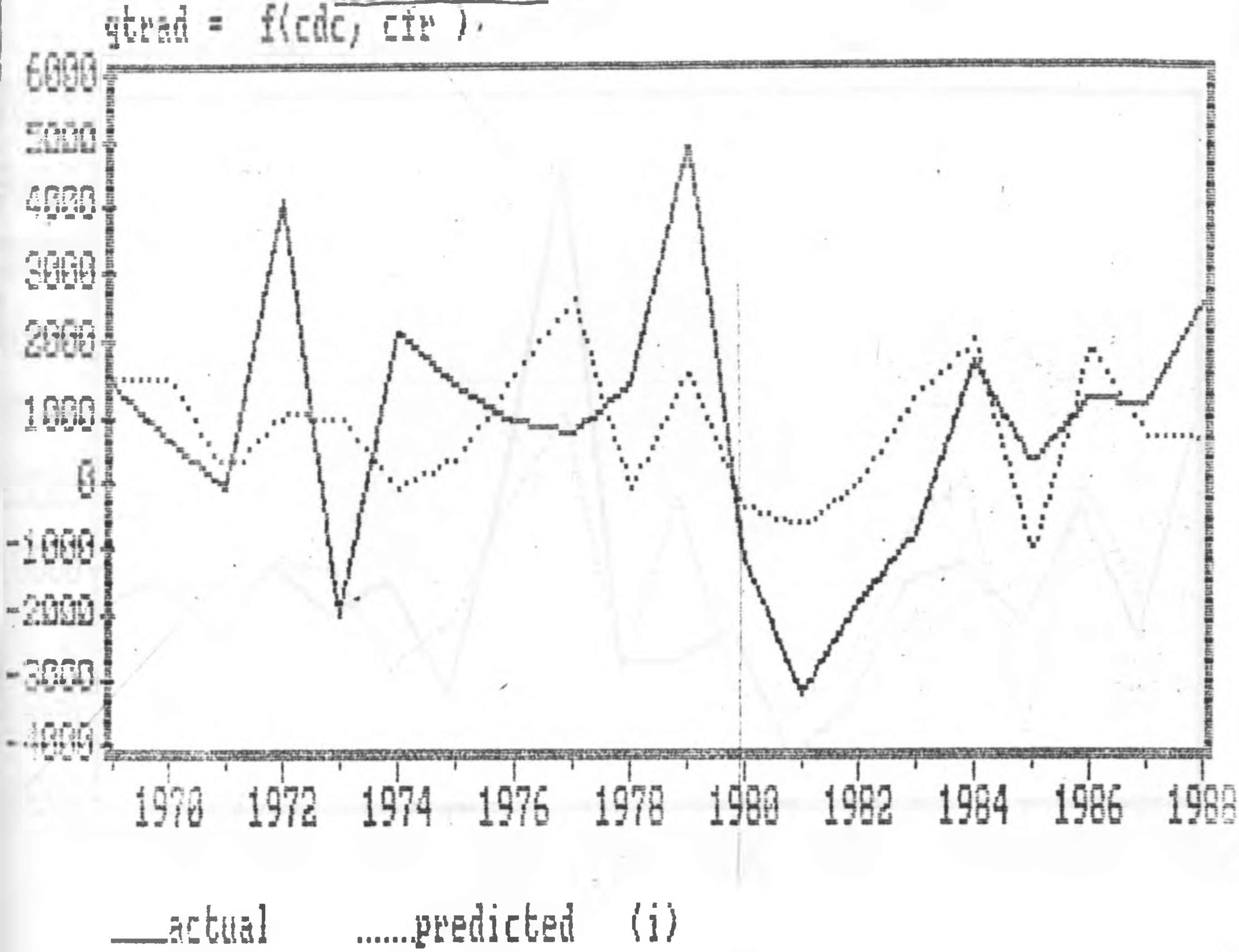
APPENDIX THREE : DATA

obs	QTRAD	QAGR	QFOR	QFISH	QMIN	QMANF	QCON	QELEC	QTCOM	QHOT	QFIN
1969	1437358.	903430.0	73448.13	-723.6875	-100932.2	1998050.	115186.0	134595.0	393210.0	701750.0	609239.0
1970	673192.0	2016630.	363864.0	4002.500	106942.8	1240120.	355006.0	223533.0	665700.0	2450360.	960708.0
1971	-82720.00	-1191590.	-212531.0	-10176.63	108204.3	1645450.	299453.0	-27553.00	23180.00	653900.0	358532.0
1972	4955520.	5228060.	-183167.0	-3102.625	-232323.4	922190.0	4534067.	106472.0	-1612330.	598030.0	1924558.
1973	-2037320.	371050.0	71383.00	-18825.23	175087.9	1781790.	-357371.0	-172913.0	415760.0	1529030.	-186398.0
1974	2143310.	-64760.00	113081.0	-19472.72	-117189.1	2284500.	-230921.0	-64910.00	585550.0	5137910.	1562612.
1975	1454643.	-1197630.	-53846.00	-3647.500	-56063.00	-1891040.	-1057735.	227118.0	-725310.0	-2195110.	151510.0
1976	920230.0	12467470	-26621.00	96505.31	90588.00	4947920.	-405417.0	-40179.00	571280.0	1956000.	1438170.
1977	707458.0	64224000	-45079.00	-53430.00	-82796.69	-1541960.	231231.0	589635.0	21730.00	104660.0	885400.0
1978	1403510.	-10423970	151762.0	141328.8	-14038.75	3511060.	1213517.	208154.0	2245270.	1606740.	921230.0
1979	4927000.	-3633760.	445353.0	-24017.81	21867.00	983270.0	1073945.	613605.0	551940.0	641010.0	1461600.
1980	-1210240.	-8980352.	152807.0	29054.69	13882.13	1968678.	1570860.	-117385.0	-105350.0	737680.0	548570.0
1981	-3222370.	-6203840.	-33362.00	102237.2	-114817.7	-3718128.	-949170.0	41351.00	-1491700.	-2897470.	-48600.00
1982	-1893520.	-2308016.	45343.00	44470.75	-29855.22	-1244170.	-1764166.	-135928.0	-602710.0	-1938190.	562140.0
1983	-768410.0	2271163.	140921.0	-9928.125	6643.594	-113430.0	1436196.	-324214.0	1207240.	3713470.	1495080.
1984	1756500.	6442184.	-114786.0	20440.81	21214.13	506560.0	-2429704.	-1199740.	1227240.	1016640.	-446930.0
1985	267330.0	-1703624.	46756.00	32481.56	27864.88	266900.0	785301.0	403464.0	71100.00	1252440.	853960.0
1986	1153040.	8799872.	17584.00	124743.9	48938.94	3243270.	234170.0	95338.00	1563050.	972540.0	1742550.
1987	1142510.	-2899560.	136488.0	44358.06	33231.00	1036790.	942143.0	221835.0	296600.0	631580.0	831980.0
1988	2592213.	7773392.	197555.0	406.0000	4464.500	4351408.	4051930.	335175.0	642580.0	3428960.	3506890.

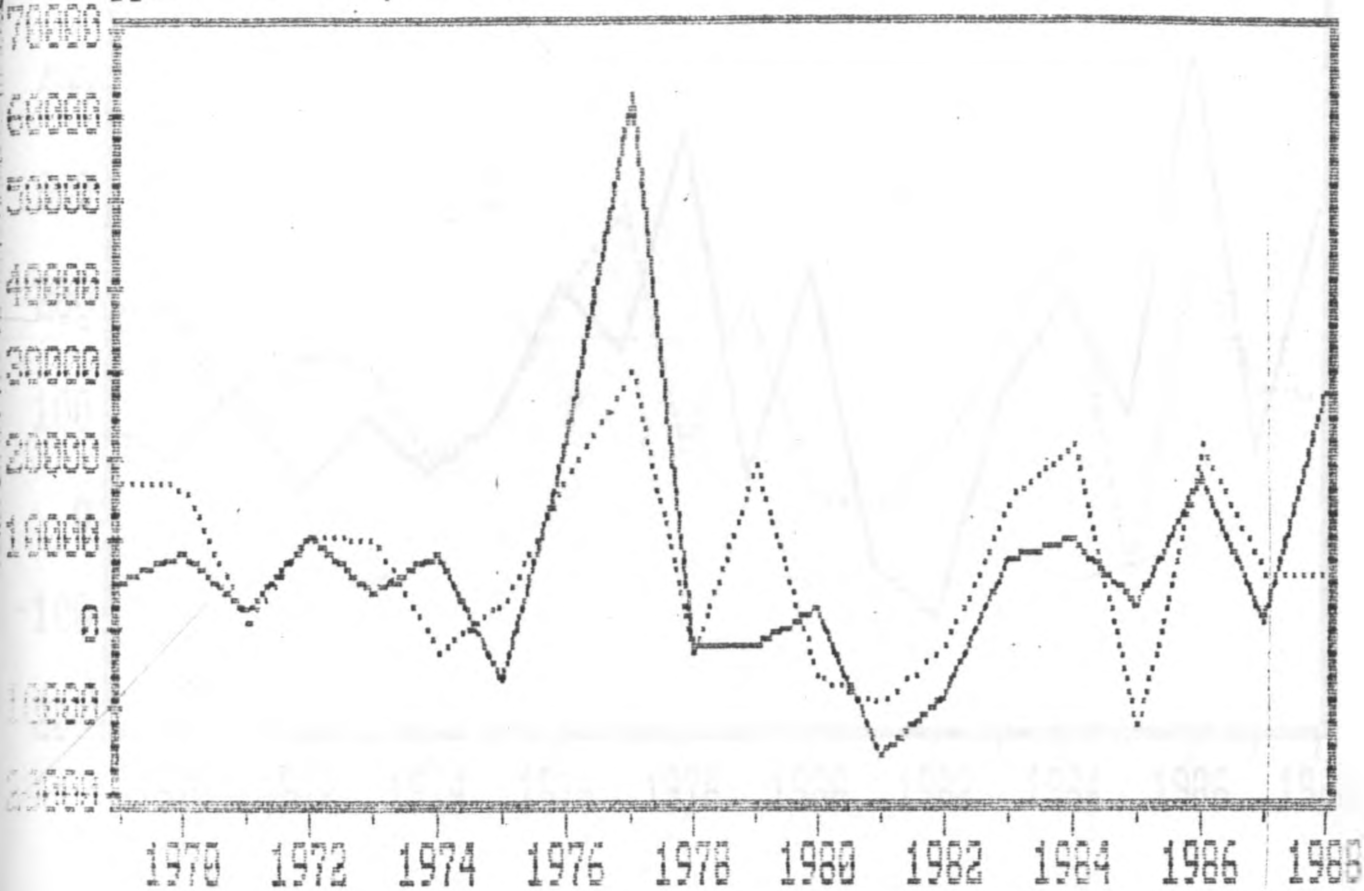
obs	QDWEL	QPRIV	QDOM	QGOV	QXPT	QNXPT	QTOT	CDC	CFR	DCPRIV	DCGOV
1969	336213.0	5687576.	86939.00	2071870.	2562871.	6720825.	9283696.	1868470.	6715820.	1060220.	808254.9
1970	132092.0	8597532.	55580.00	1181230.	3419273.	7188427.	10607700	6566500.	5022030.	3660870.	2905631.
1971	24055.00	2107304.	123938.0	3877620.	1183346.	4847854.	6031200.	7498242.	-7245930.	7079620.	418613.0
1972	2327257.	11249700	-21961.00	2463300.	5867795.	11923630	17736420	5883668.	1113670.	215060.0	5668621.
1973	-34233.00	3716900.	100842.0	-1705760.	11715720	-11631720	84000.00	5890180.	586130.0	5599000.	291170.0
1974	[illegible]	3803236.	45382.00	1001770.	11904490	-2391134.	9013236.	5723920.	-8744140.	4443668.	1286260.
1975	[illegible]	-3555400.	93461.00	250190.0	-2532353.	2097263.	-435096.0	4376040.	-4436691.	-2766263.	7142290.
1976	[illegible]	21633990	216511.0	1313830.	19019150	5171040.	24190190	5360768.	6389911.	3104060.	2256710.
1977	[illegible]	62179406	155526.0	1894950.	23678610	8138290.	31816900	5624696.	15163310	7369680.	-1744980.
1978	[illegible]	-2238035.	358508.0	2517798.	-14536100	15537200	2041104.	17416240	-12693320	13180410	4235830.
1979	[illegible]	-2367009.	41285.00	1601464.	2062366.	-1765366.	294000.0	1822752.	7946589.	-349080.0	2171840.
1980	[illegible]	2306704.	232452.0	1212080.	11707250	-3041754.	3666096.	1148688.	-9376620.	5074952.	-3926260.
1981	[illegible]	-15364100	-47270.00	-2222984.	1965573.	-20873770	-13688190	-421344.0	-11678150	-7633350.	7212010.
1982	[illegible]	-3445236.	-100739.0	-1650443.	2957519.	-14109520	-11252000	8231744.	-9278744.	-4116060.	12407730
1983	[illegible]	8361033.	117531.0	-753152.0	6410153.	2275735.	8635683.	-10503030	8694334.	-1506740.	-8996332.
1984	[illegible]	10371000	208284.0	-330178.0	7583412.	2564698.	10254110	33471650	486595.2	-393232.0	33864880
1985	[illegible]	2353104.	101045.0	1969778.	1229592.	3461608.	4691200.	-30777950	-5207328.	1518872.	-32296830
1986	245230.0	17463190	442638.0	5663320.	9591237.	15135960	24727200	19427250	4390253.	5819800.	13607430
1987	971590.0	922016.0	66544.00	678812.0	-9857780.	12667670	2809888.	10309300	-3638232.	1808780.	8501000.
1988	2144200.	27669180	283956.0	6131820.	7523057.	-11695950	-4172896.	-196800.0	-532563.0	10573810	-10770690

obs	XRATE	FPI	GDPT	CCPI	GOV	RMON	QTOT
[illegible]	17.14800	32.60000	1.53D+08	0.670002	104979.0	42691980	9283696.
[illegible]	17.09900	33.80000	1.63D+08	1.489993	121464.0	54280512	10607700
[illegible]	15.23200	31.32000	1.69D+08	4.040001	156808.0	54532820	6031200.
[illegible]	16.77200	35.20000	1.87D+08	2.340004	180522.0	61536152	17796420
[illegible]	[illegible]	42.00000	1.87D+08	8.699997	230166.0	69012464	54000.00
[illegible]	16.75400	68.20000	1.96D+08	11.80000	301582.0	64998240	9013296.
[illegible]	16.79000	86.20000	1.96D+08	13.80000	373109.0	64936632	-495696.0
[illegible]	14.15000	100.0000	2.20D+08	9.800003	409794.0	76608256	24190190
[illegible]	15.20700	105.0000	2.52D+08	15.49999	590390.0	97416880	31816900
[illegible]	15.05900	114.0000	2.54D+08	10.60001	6976100.	1.02D+08	2041104.
[illegible]	16.35500	132.0000	2.54D+08	14.70000	7813200.	1.12D+08	294000.0
[illegible]	18.02100	173.0000	2.58D+08	17.60001	9621100.	1.03D+08	3666096.
[illegible]	19.67700	220.0000	2.39D+08	43.00000	1114410.	90976096	-18888190
[illegible]	20.62700	252.8000	2.27D+08	39.59999	1190693.	89989104	-11252000
[illegible]	20.05900	323.5800	2.36D+08	25.80002	1254730.	89789488	8685888.
[illegible]	18.40100	337.9800	2.46D+08	30.89999	1534660.	90148872	10254110
[illegible]	23.46600	340.0000	2.51D+08	35.79999	1651820.	86153360	4691200.
[illegible]	23.58600	373.7600	2.76D+08	20.20001	2134220.	1.10D+08	24727200
[illegible]	30.68500	376.6700	2.79D+08	36.69999	2214690.	1.17D+08	2809888.
[illegible]	33.30200	379.7600	2.74D+08	10.00000	3008230.	1.18D+08	-4172896.

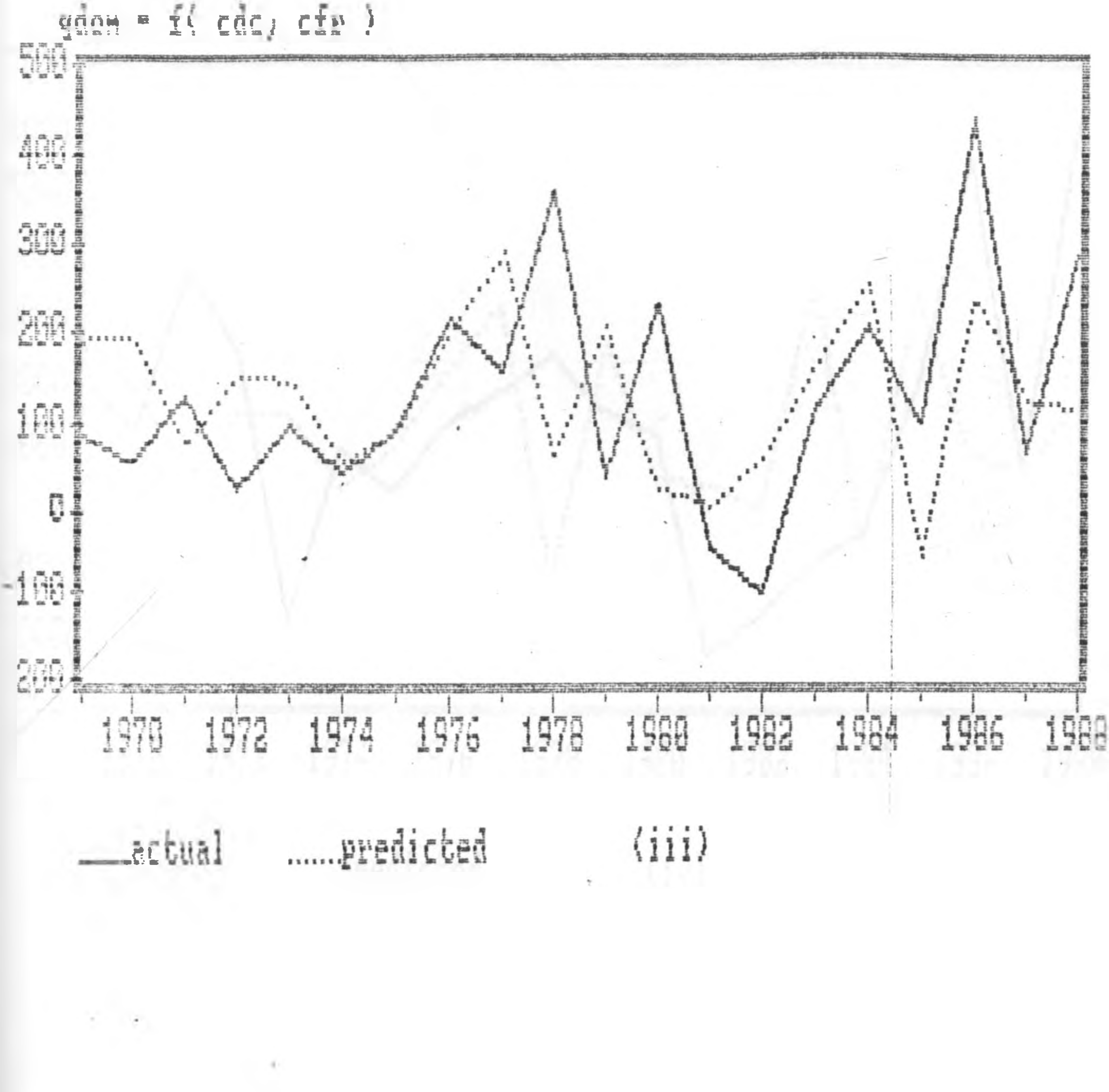
APPENDIX ONE : SIMULATION RESULTS.



pprív = f(cdc , cfr)

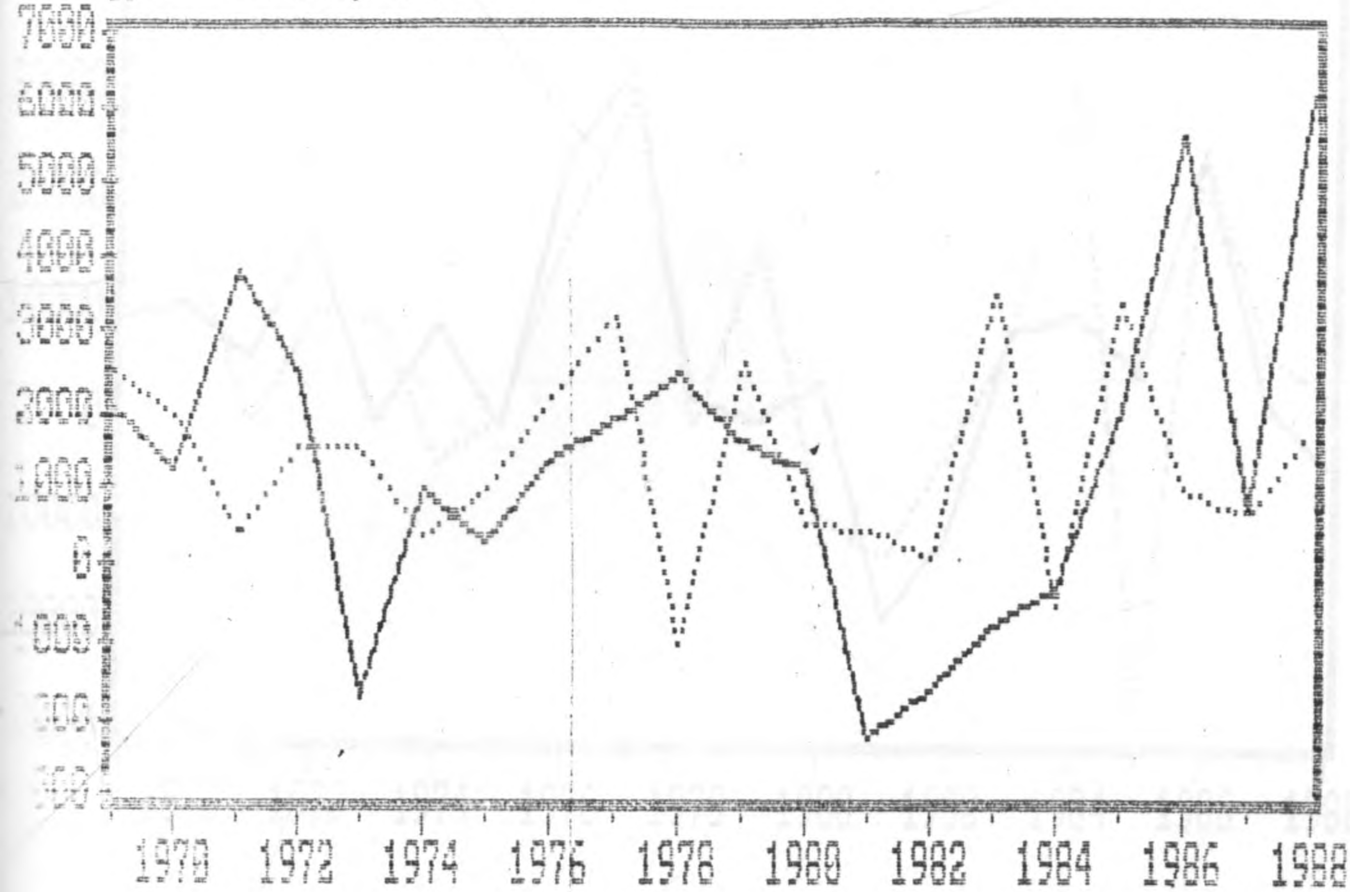


___actual ......predicted (ii)


gdom = f(cdc, cfe)
500
400
300
200
100
0
-100
-200
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
___actual
......predicted

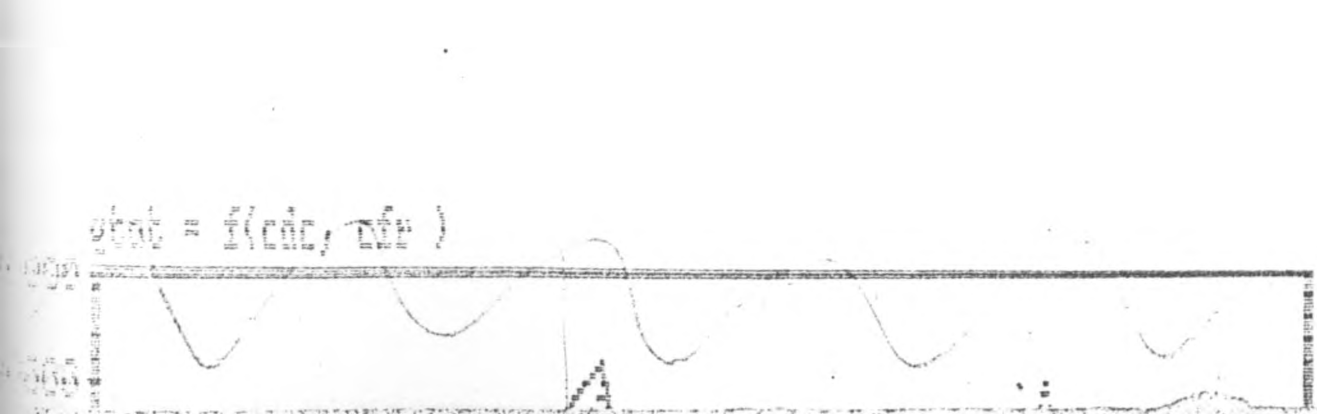
(iii)

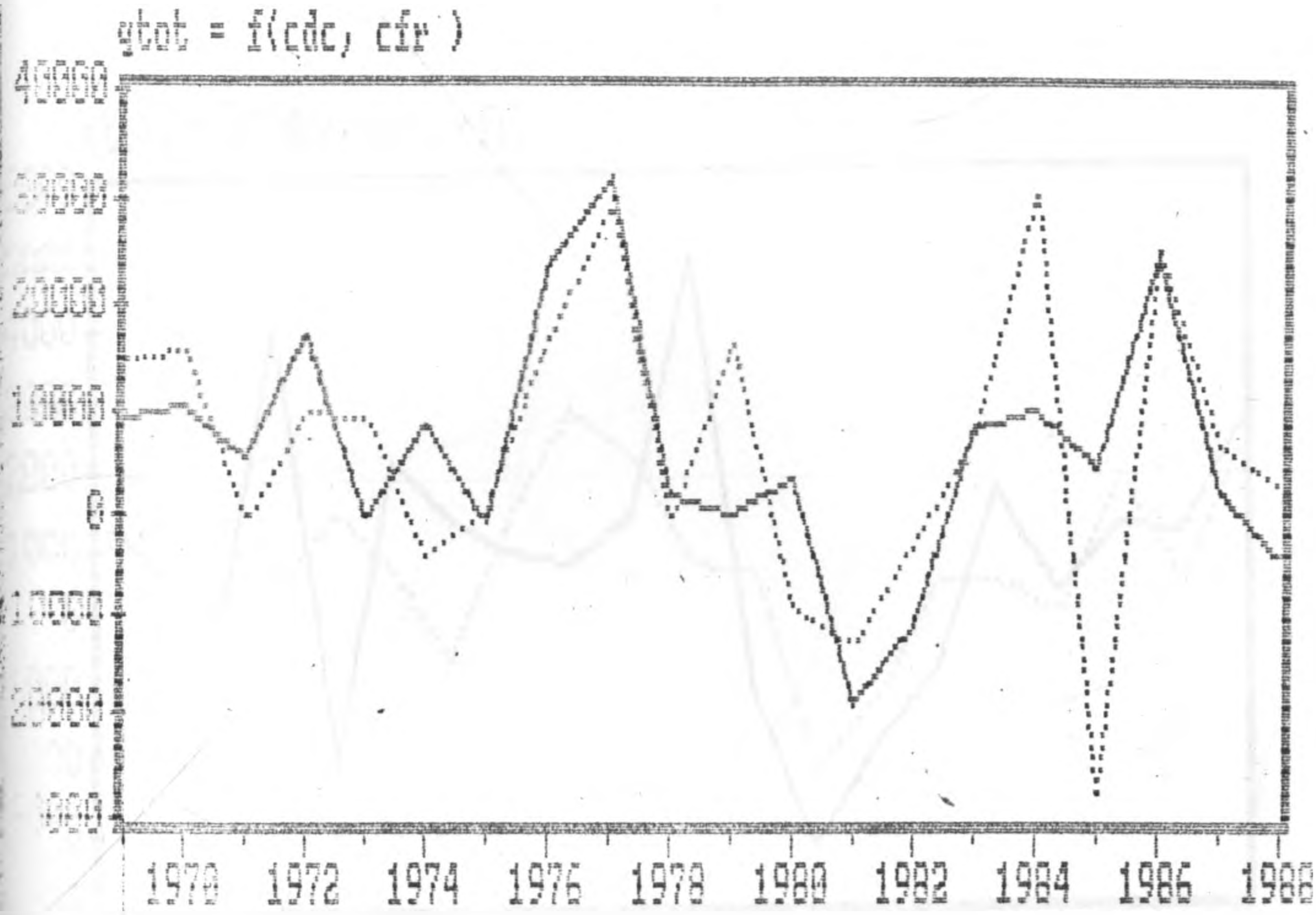
ggov = f(cdc, cfr)



___actual ......predicted (iv)

gtot = f(cdc, cfr)

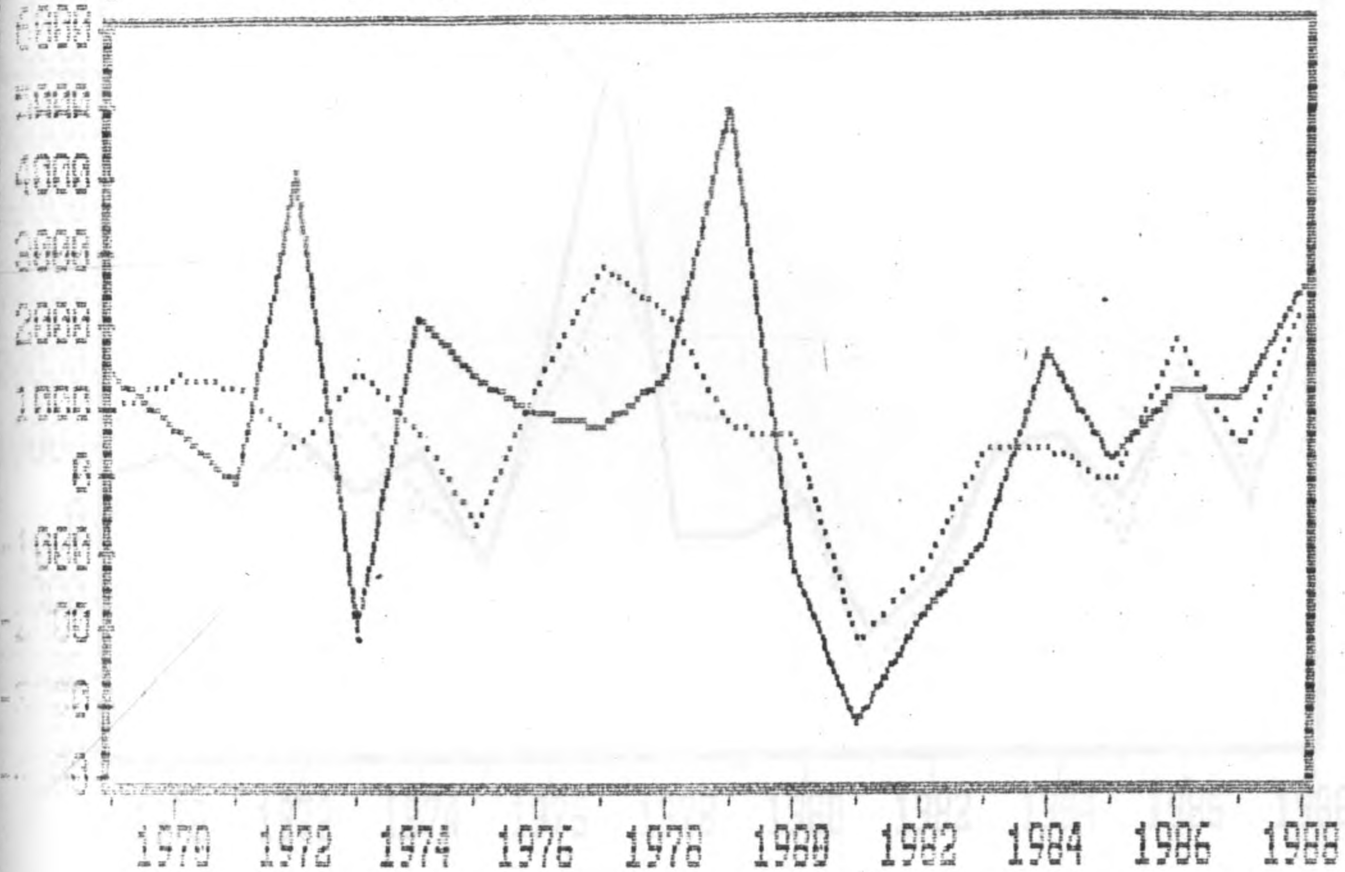




___actual ......predicted

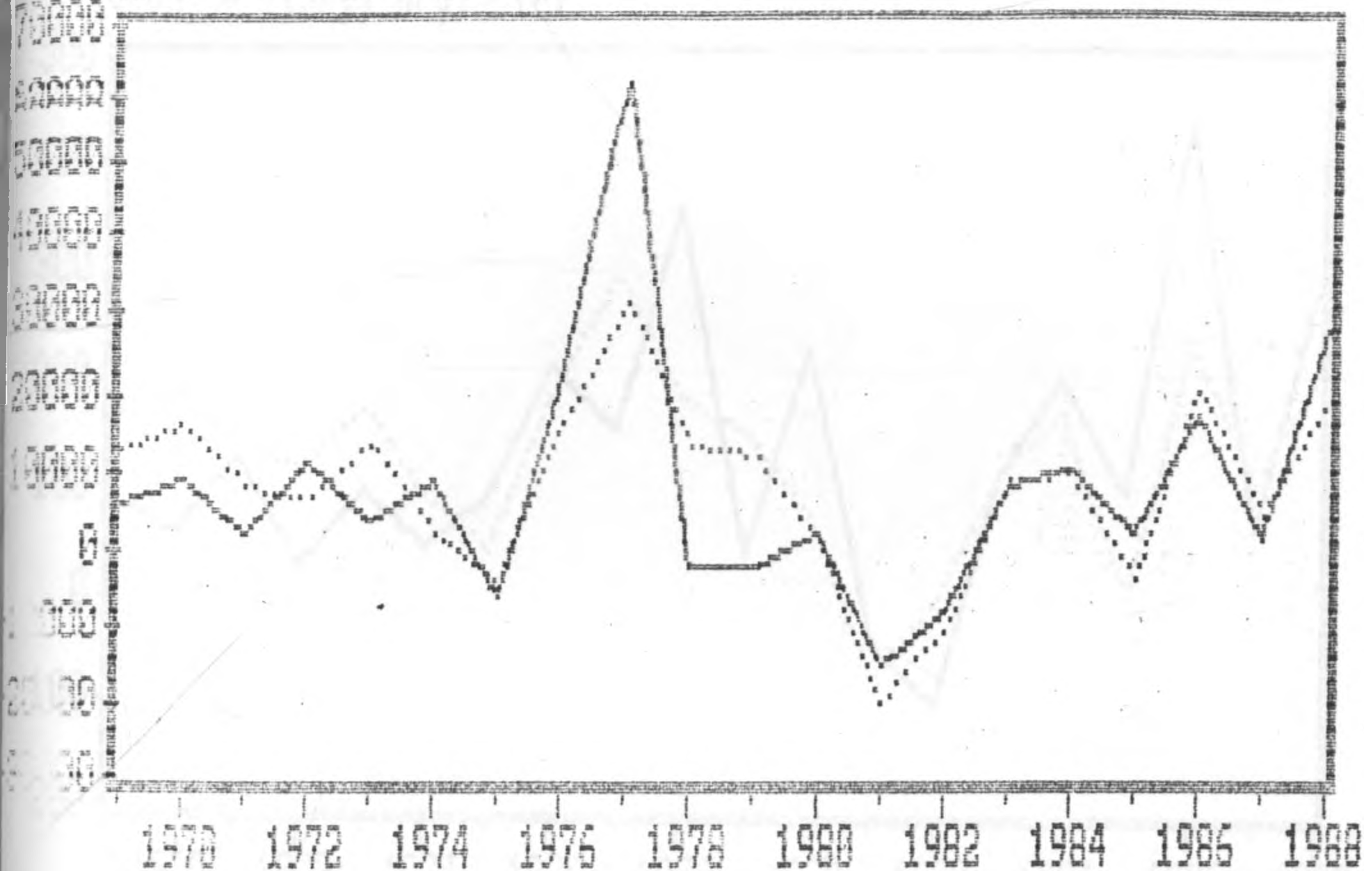
(v)

gtrad = f(dcp, dcg, cfr)

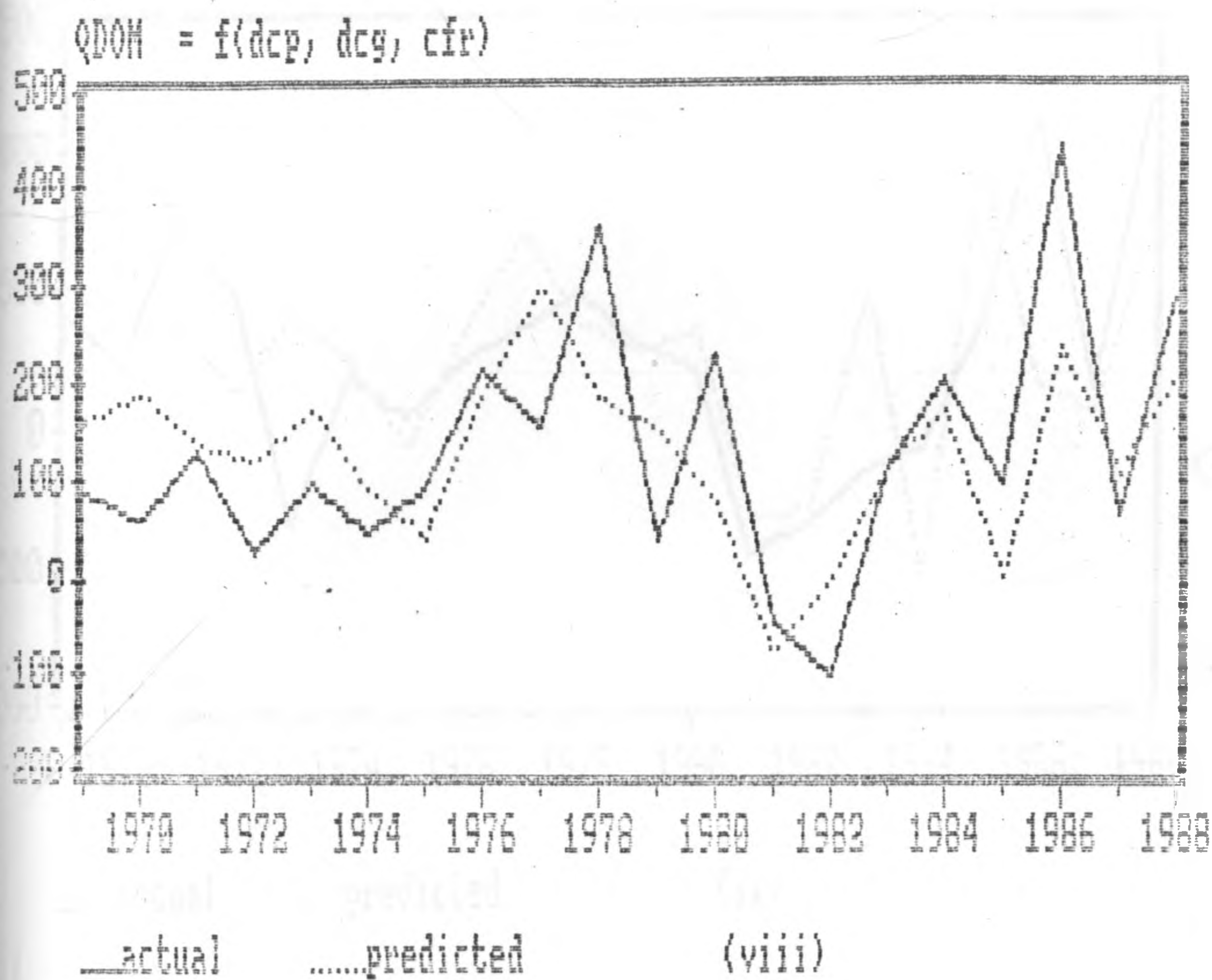


(vi)

qpriv = f(dcp, dcg, cfr)

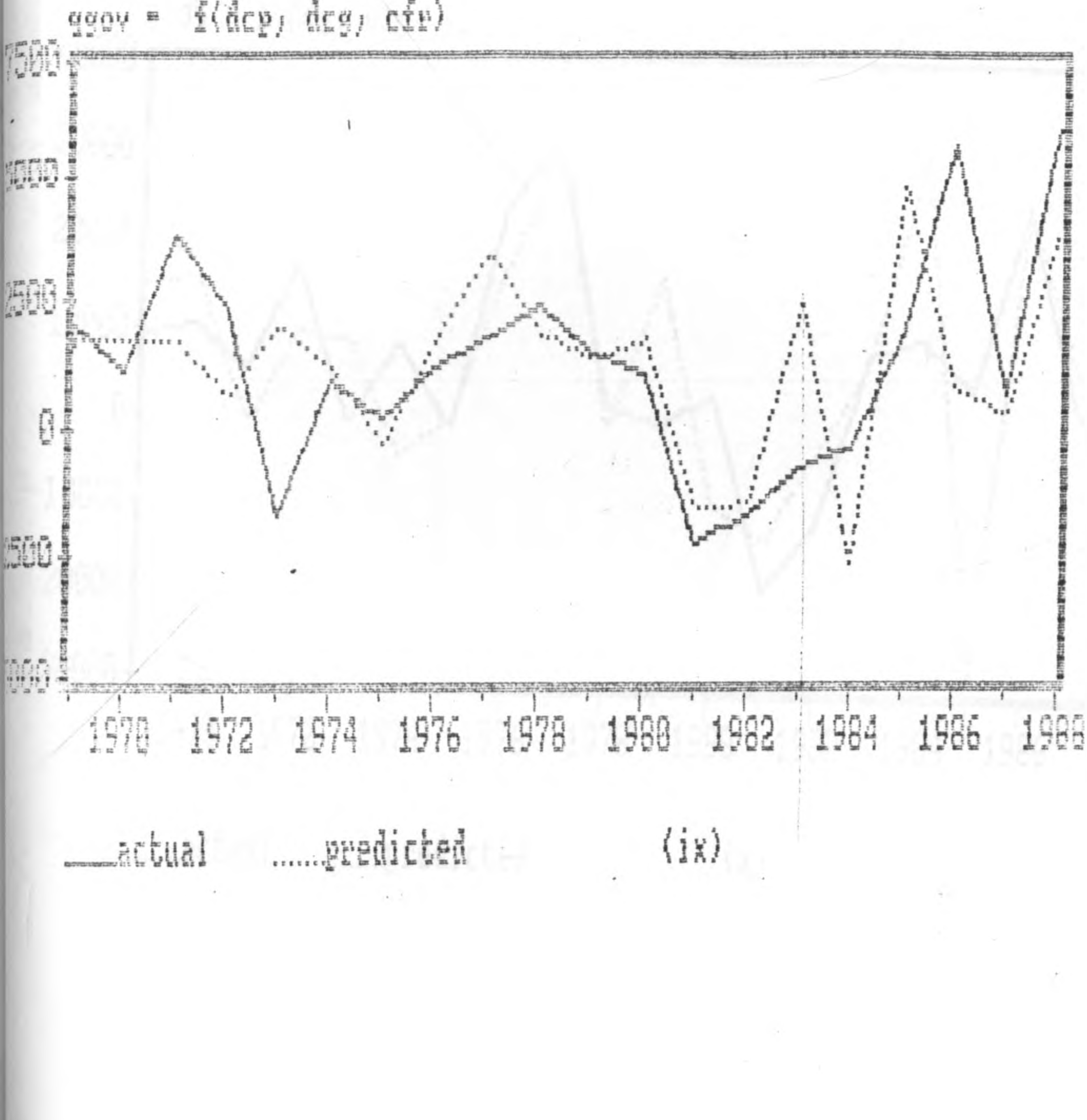


____actual ......predicted (vii)

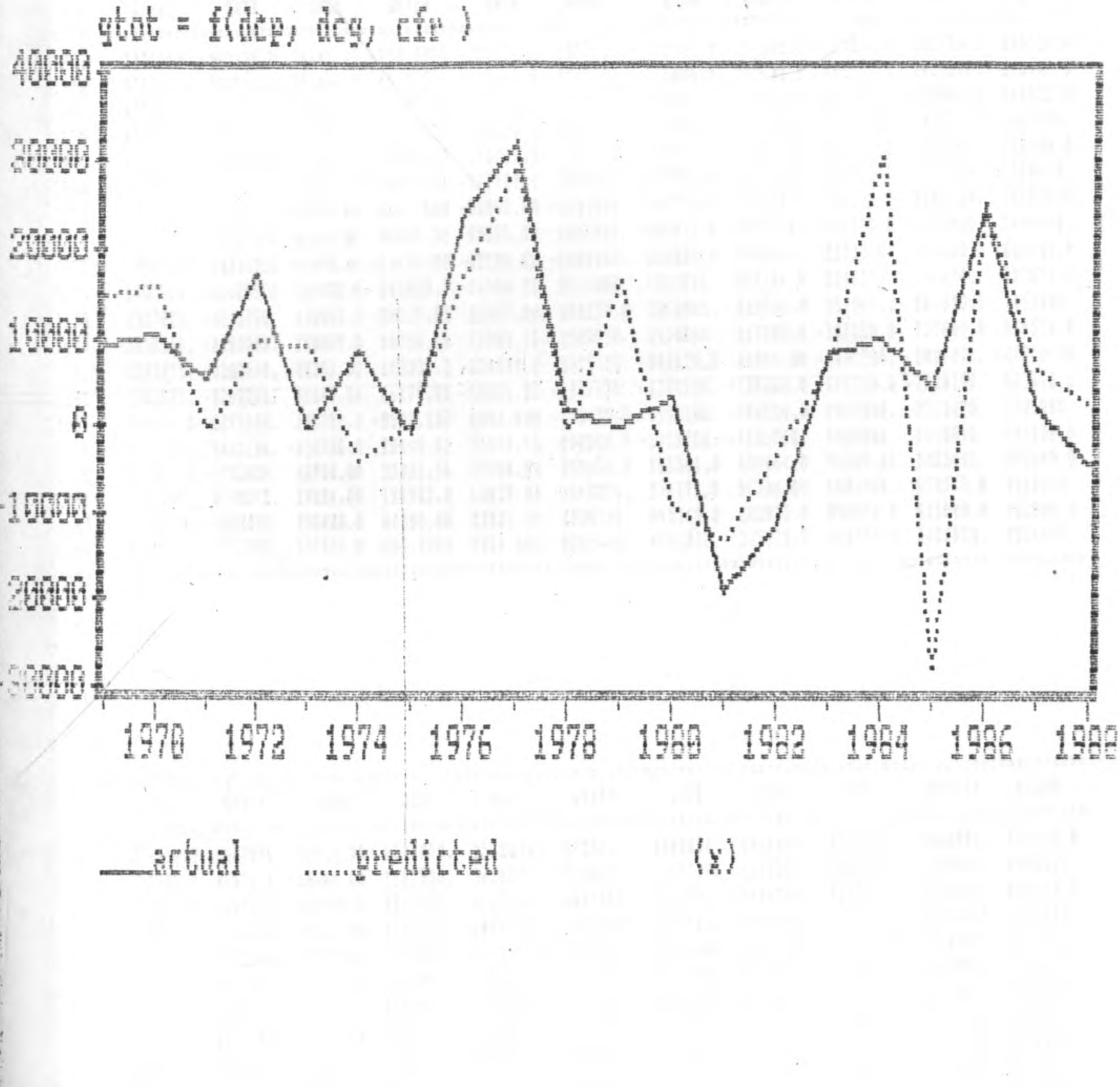


QDOM = f(dcp, dcg, cfr)
500
400
300
200
100
0
-100
-200
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
actual
predicted

(viii)


ggov = f(dcp, dcg, cfr)
7500
5000
2500
0
-2500
-5000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
___actual
......predicted

(ix)



qtot = f(dcp, dcg, cfr)
40000
30000
20000
10000
0
-10000
-20000
-30000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
___actual
......predicted
(x)

APPENDIX THREE : DATA

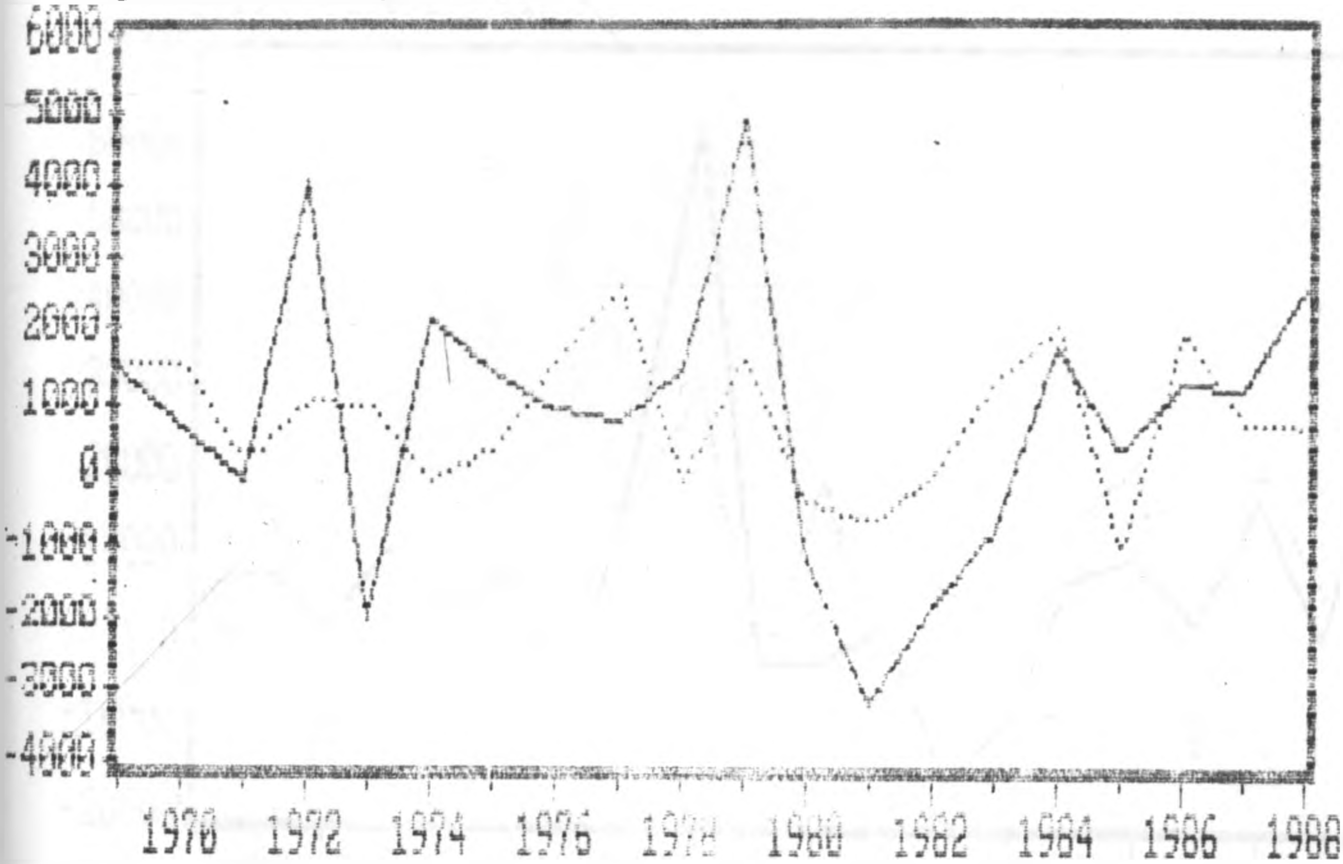
obs	QTRAD	QAGR	QFOR	QFISH	QMIN	QMANF	QCON	QELEC	QTCOM	QHOT	QFIN
1969	1437358.	903430.0	79448.13	-723.6875	-100932.2	1938050.	115186.0	134595.0	393210.0	701750.0	609239.0
1970	673132.0	2016630.	363864.0	4002.500	106942.8	1240120.	355006.0	223593.0	665700.0	2450360.	960708.0
1971	-82720.00	-1191590.	-212631.0	-10176.63	108204.3	1645450.	299453.0	-27553.00	23180.00	653900.0	358532.0
1972	4055520.	5228060.	-193167.0	-3102.625	-232328.4	922190.0	4534067.	106472.0	-1612390.	598030.0	1924558.
1973	-2037920.	371050.0	71389.00	-18825.28	175087.9	1781790.	-357371.0	-172913.0	415760.0	1529030.	-186398.0
1974	2148910.	-64760.00	113081.0	-13472.72	-117183.1	2284500.	-230921.0	-64910.00	585550.0	5137910.	1562612.
1975	1454649.	-1197630.	-58846.00	-3647.500	-56063.00	-1891040.	-1057735.	227118.0	-725310.0	-2195110.	151510.0
1976	920230.0	12467470	-26621.00	96605.31	90588.00	4947920.	-405417.0	-40179.00	571280.0	1956000.	1438170.
1977	707450.0	64224000	-45079.00	-53430.00	-82796.69	-1541960.	231231.0	589635.0	21730.00	104660.0	885400.0
1978	1403510.	-10429970	151762.0	141928.8	-14038.75	3511060.	1213517.	208154.0	2245270.	1606740.	921230.0
1979	4927060.	-3633760.	445953.0	-24017.81	21867.00	963270.0	1079946.	613605.0	551940.0	641010.0	1461600.
1980	-1210240.	-8980352.	152807.0	29054.69	13882.13	1968678.	1570860.	-117385.0	-105350.0	737680.0	548570.0
1981	-3222870.	-6203840.	-88362.00	102237.2	-114817.7	-3718128.	-949170.0	41951.00	-1491700.	-2897470.	-48600.00
1982	-1833520.	-2308016.	45843.00	44470.75	-29855.22	-1244170.	-1764166.	-135928.0	-602710.0	-1938190.	562140.0
1983	-768410.0	2271166.	140821.0	-9928.125	6643.594	-113430.0	1486196.	-224214.0	1207240.	3713470.	1495080.
1984	1756500.	6442184.	-114786.0	20440.81	21214.13	506560.0	-2429704.	-1199740.	1227240.	1016640.	-446930.0
1985	267330.0	-1703624.	46756.00	32481.56	27864.88	266900.0	785301.0	408464.0	71100.00	1252440.	853960.0
1986	1153040.	8799872.	17584.00	124743.9	48938.94	3243270.	294170.0	95338.00	1563050.	972540.0	1742550.
1987	1142510.	-2899560.	136488.0	44358.06	33231.00	1036790.	942143.0	221835.0	296600.0	631580.0	831980.0
1988	2592210.	7773932.	197555.0	406.0000	4464.500	4351408.	4051930.	335175.0	642580.0	3428960.	3506890.

obs	QDWEL	QPRIV	QDOM	QGOV	QXPT	QNXPT	QTOT	CDC	CFR	DCPRIV	DCGOV
1969	306213.0	5687575.	86939.00	2071870.	2562871.	6720825.	9283696.	1868470.	6715820.	1060220.	808254.9
1970	132892.0	3597532.	55580.00	1181230.	3419273.	7188427.	10607700	6566500.	5022030.	3660870.	2905631.
1971	24055.00	2107304.	128938.0	3877620.	1183346.	4847854.	6031200.	7498242.	-7245930.	7079620.	418613.0
1972	[illegible]	11249700	-21961.00	2469300.	5867795.	11928630	17796420	5853668.	1119670.	215060.0	5662621.
1973	[illegible]	3716900.	100842.0	-1705760.	11715720	-11631720	84000.00	5590180.	586130.0	5599000.	291170.0
1974	[illegible]	8208296.	45382.00	1001770.	11904490	-2891194.	9013296.	5723920.	-8744140.	4443652.	1286260.
1975	[illegible]	-3555400.	93461.00	250190.0	-2592959.	2097263.	-495696.0	4376040.	-4436691.	-2766268.	7142230.
1976	115695.0	21633930	216511.0	1313830.	18019150	6171040.	24190190	5360768.	6309911.	3104060.	2256710.
1977	[illegible]	62179415	159826.0	1894950.	23676610	8139290.	31216900	5624696.	15183310	7369680.	-1744980.
1978	[illegible]	-2232990.	358508.0	2517798.	-14596100	16637200	2041104.	17416240	-12598320	13180410	4235830.
1979	[illegible]	-2367009.	41285.00	1601464.	2062355.	-1769366.	294000.0	1222752.	7946580.	-349080.0	2171640.
1980	[illegible]	2306704.	232452.0	1212060.	11707250	-8041754.	3666096.	1143682.	-9976620.	5074952.	-3926260.
1981	[illegible]	-15364100	-47270.00	-2222934.	1985578.	-23873770	-18868190	-421344.0	-11678150	-7633350.	7212010.
1982	[illegible]	-6447298.	[illegible]	-1650448.	2957519.	-14109520	[illegible]	8231744.	-9278744.	-4116060.	12407730
1983	[illegible]	8361055.	117591.0	-753152.0	6410153.	[illegible]	8035333.	-10600090	9694334.	-1506740.	-8996332.
1984	[illegible]	10371001	208264.0	-330178.0	7689412.	2064692.	[illegible]	33471650	486595.2	-393232.0	33864880
1985	-195546.0	2353304.	101045.0	1969776.	1229592.	3461509.	4891200.	-30777950	-5207328.	1518872.	-32296830
1986	245530.0	17469199	442638.0	5663320.	3591237.	15135960	24727200	19427250	4390253.	5819800.	13607420
1987	771591.0	922016.0	65544.00	678812.0	-9857780.	12667670	2309838.	10309800	-3638232.	1808780.	8501000.
1988	2144230.	27669180	283956.0	6131820.	7523057.	-11695950	-4172898.	-196800.0	-532583.0	10573810	-10770630

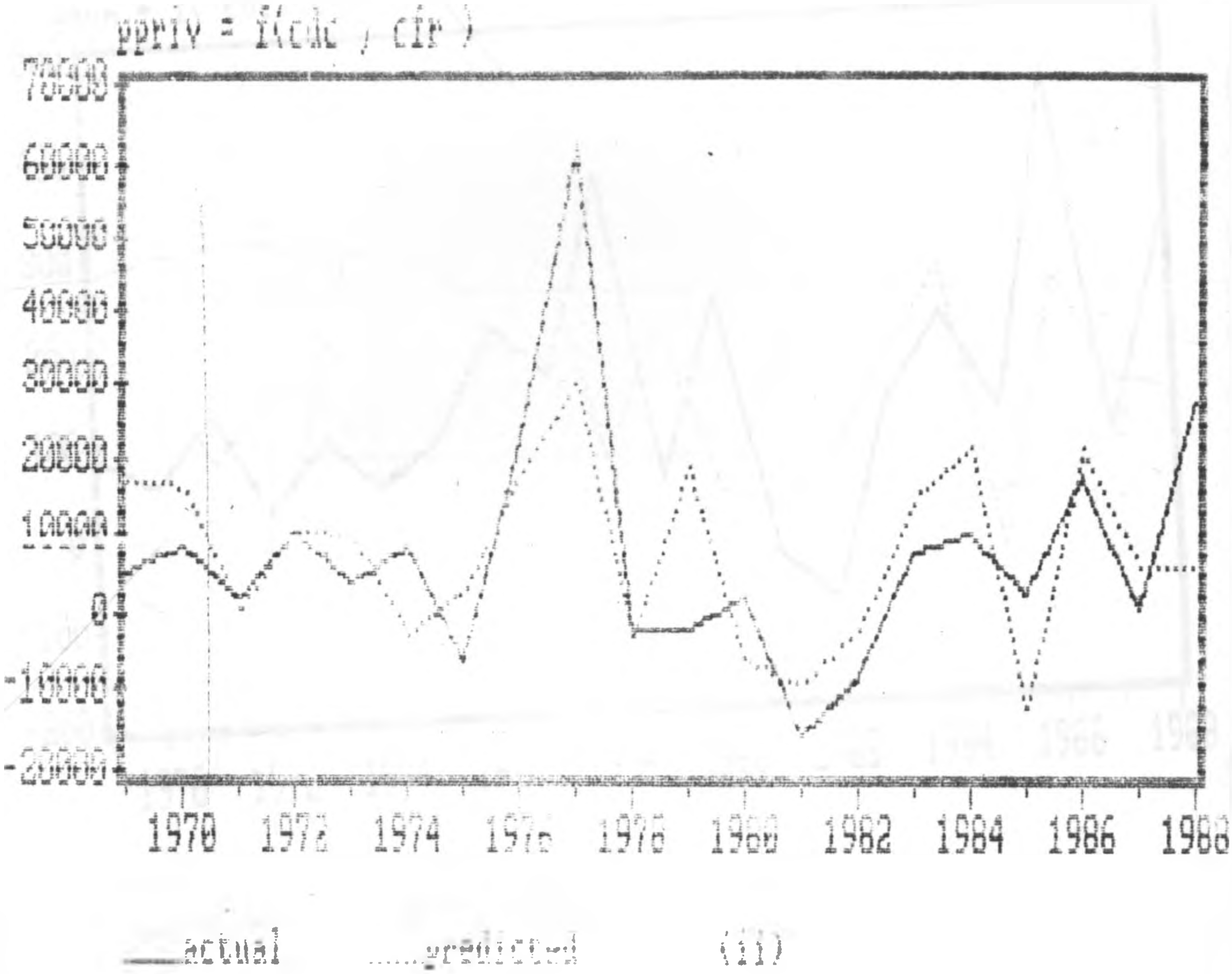
obs	XRATE	FPI	GDPT	CCPI	GOV	RMON	QTOT
969	17.14900	32.60000	1.53D+08	0.670002	104979.0	42691980	9283696.
970	17.09900	33.80000	1.63D+08	1.489998	121464.0	54290512	10607700
971	18.23200	31.32000	1.69D+08	4.040001	156308.0	54532920	6031200.
972	16.77200	35.20000	1.87D+08	2.340004	180522.0	61536152	17796420
973	16.63000	42.00000	1.97D+08	8.639997	230166.0	69012464	64000.00
974	16.75400	69.20000	1.96D+08	11.90000	301582.0	64998240	9013296.
975	16.70000	86.20000	1.96D+08	13.90000	373109.0	64936632	-495695.0
976	14.15600	100.0000	2.20D+08	9.800003	409794.0	76608256	24130130
977	15.20700	109.0000	2.52D+08	15.49999	590390.0	97416880	31816900
978	15.05900	114.0000	2.54D+08	10.60001	6976100.	1.02D+08	2041104.
979	16.35500	132.0000	2.54D+08	14.70000	7813200.	1.12D+08	294000.0
980	18.08100	173.0000	2.58D+08	17.60001	9621100.	1.03D+08	3666096.
981	19.67700	220.0000	2.39D+08	43.00000	1114410.	90976096	-18888190
982	20.62700	252.8000	2.27D+08	39.59999	1190693.	89989104	-11252000
983	20.05900	323.5800	2.36D+08	25.80002	1254730.	89789488	8585888.
984	18.40100	337.9800	2.46D+08	30.89999	1534660.	90148872	10254110
985	23.46600	340.0000	2.51D+08	35.79999	1651920.	86153360	4691200.
986	23.56600	379.7600	2.76D+08	20.20001	2134220.	1.10D+08	24727200
987	30.63500	375.6700	2.79D+08	36.89999	2214690.	1.17D+08	2809888.
988	33.30200	379.7600	2.74D+08	10.00000	3008230.	1.18D+08	-4172896.

APPENDIX [illegible] : SIMULATION RESULTS.

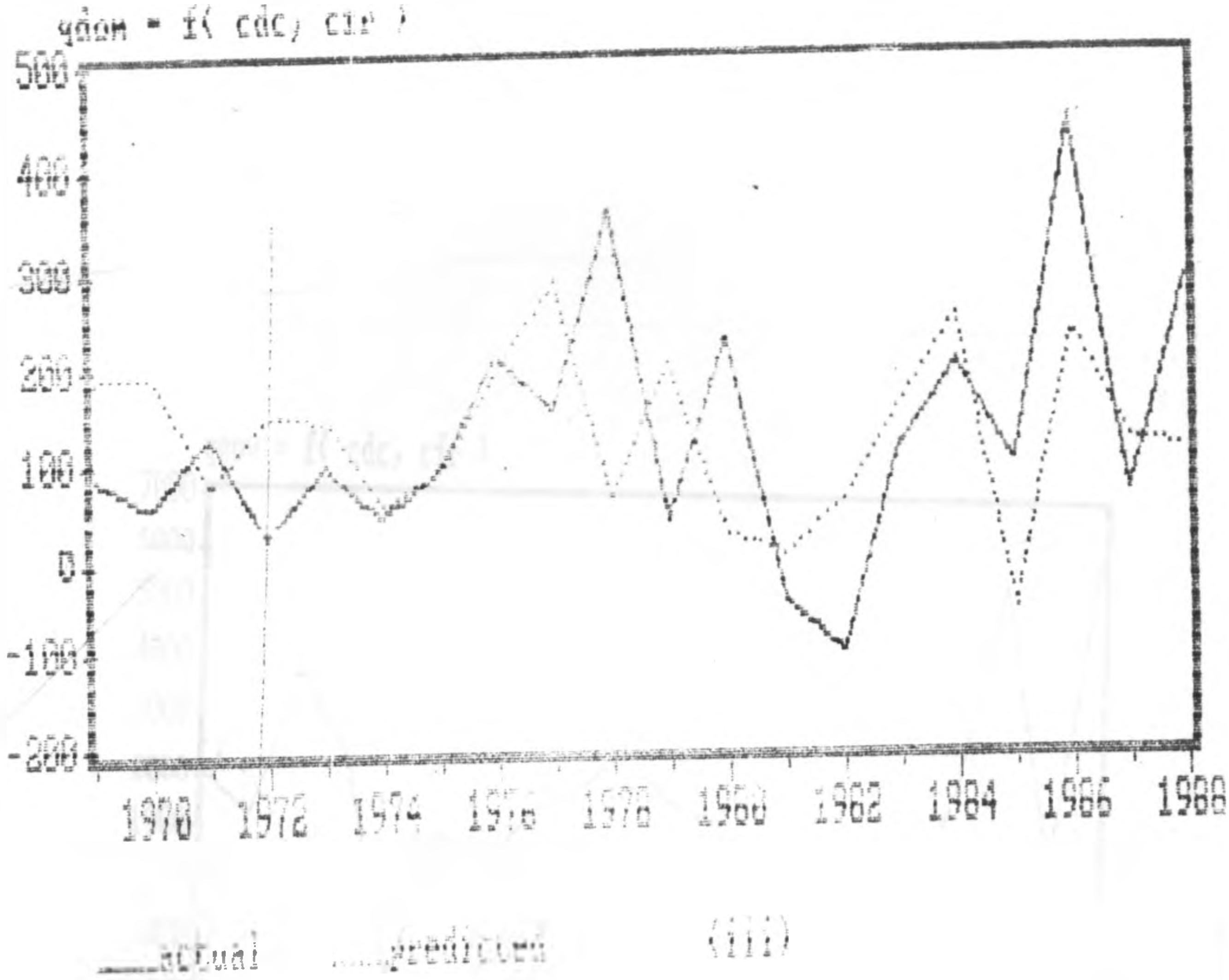
gtran = f(cdc, cir)



____actual ......predicted (f)



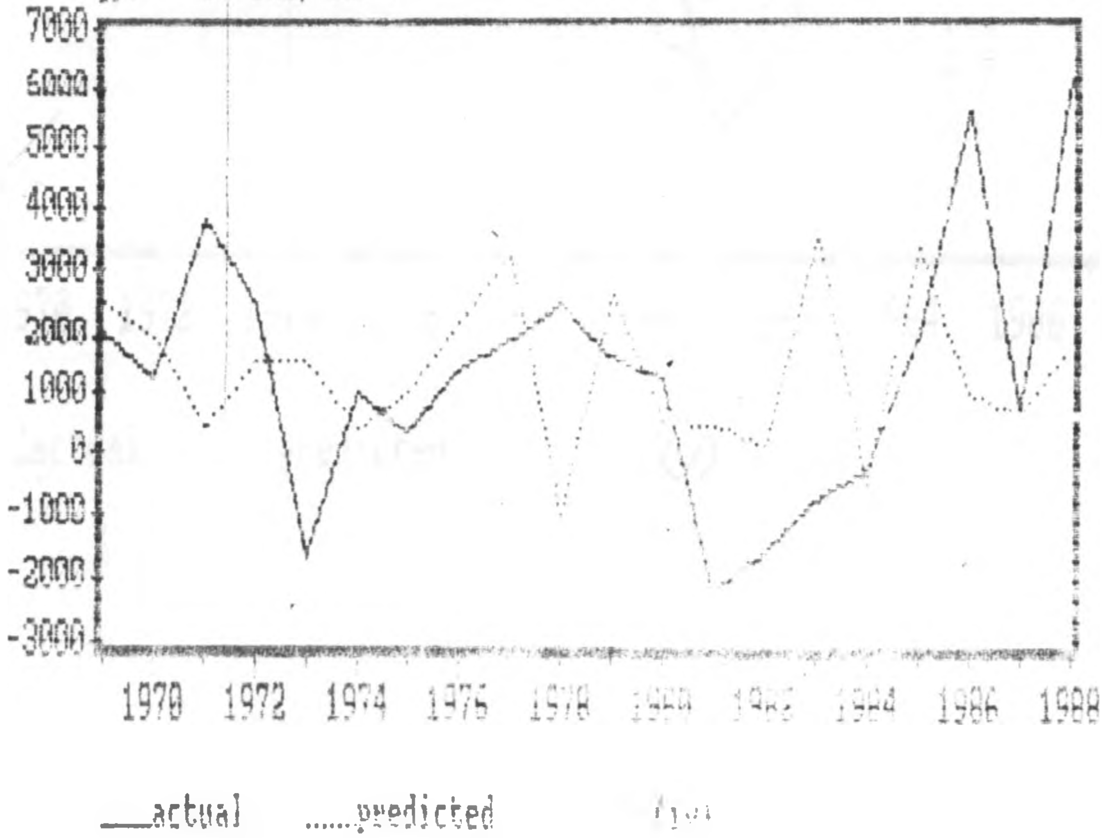
ppriv = f(cdc , cir)
70000
60000
50000
40000
30000
20000
10000
0
-10000
-20000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
actual
predicted
(ii)



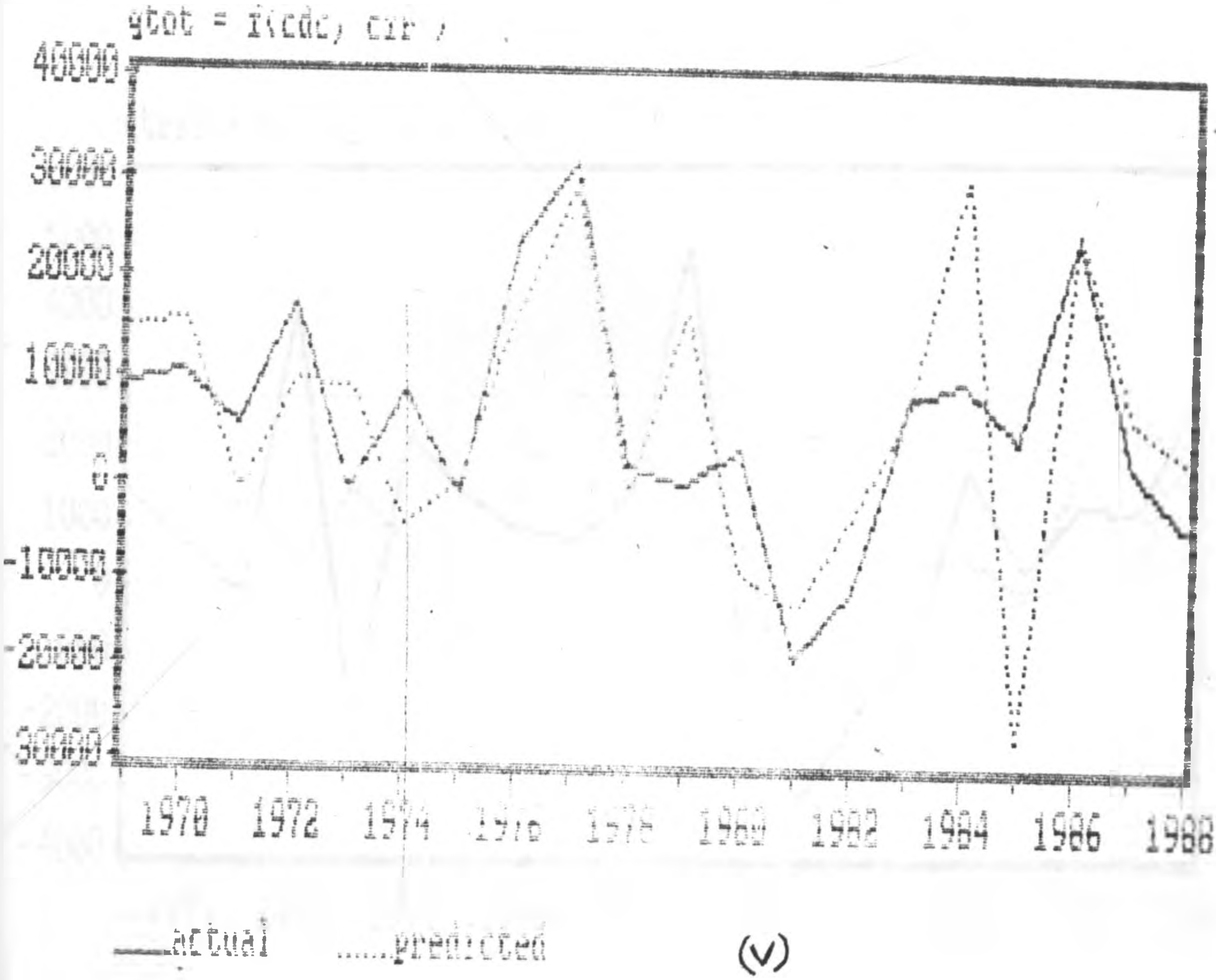
qdom = f(cdc, cir)
500
400
300
200
100
0
-100
-200
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
___actual
....predicted

(iii)

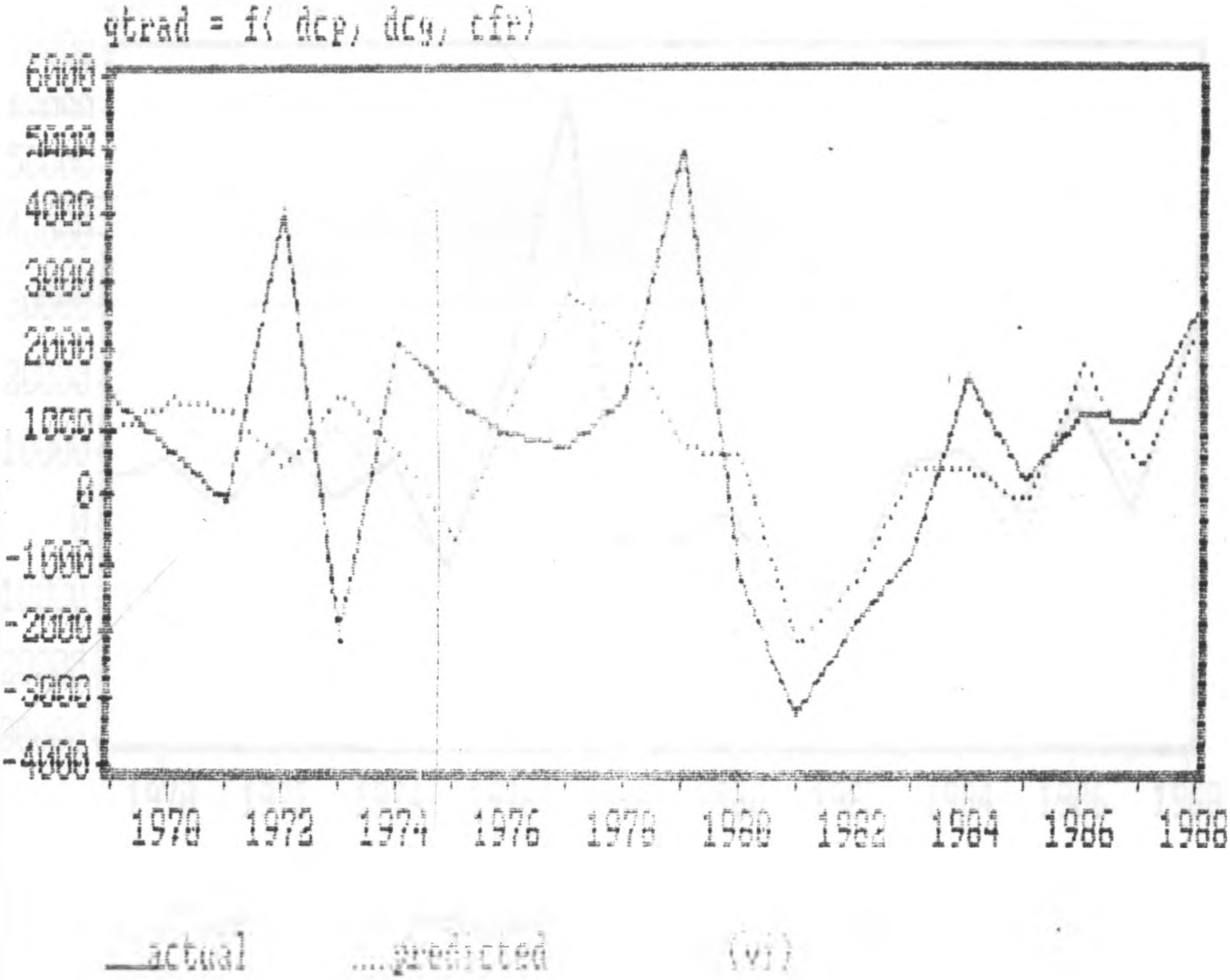
ggov = f(cdc, cfr)



gtot = f(cdc, cfr)

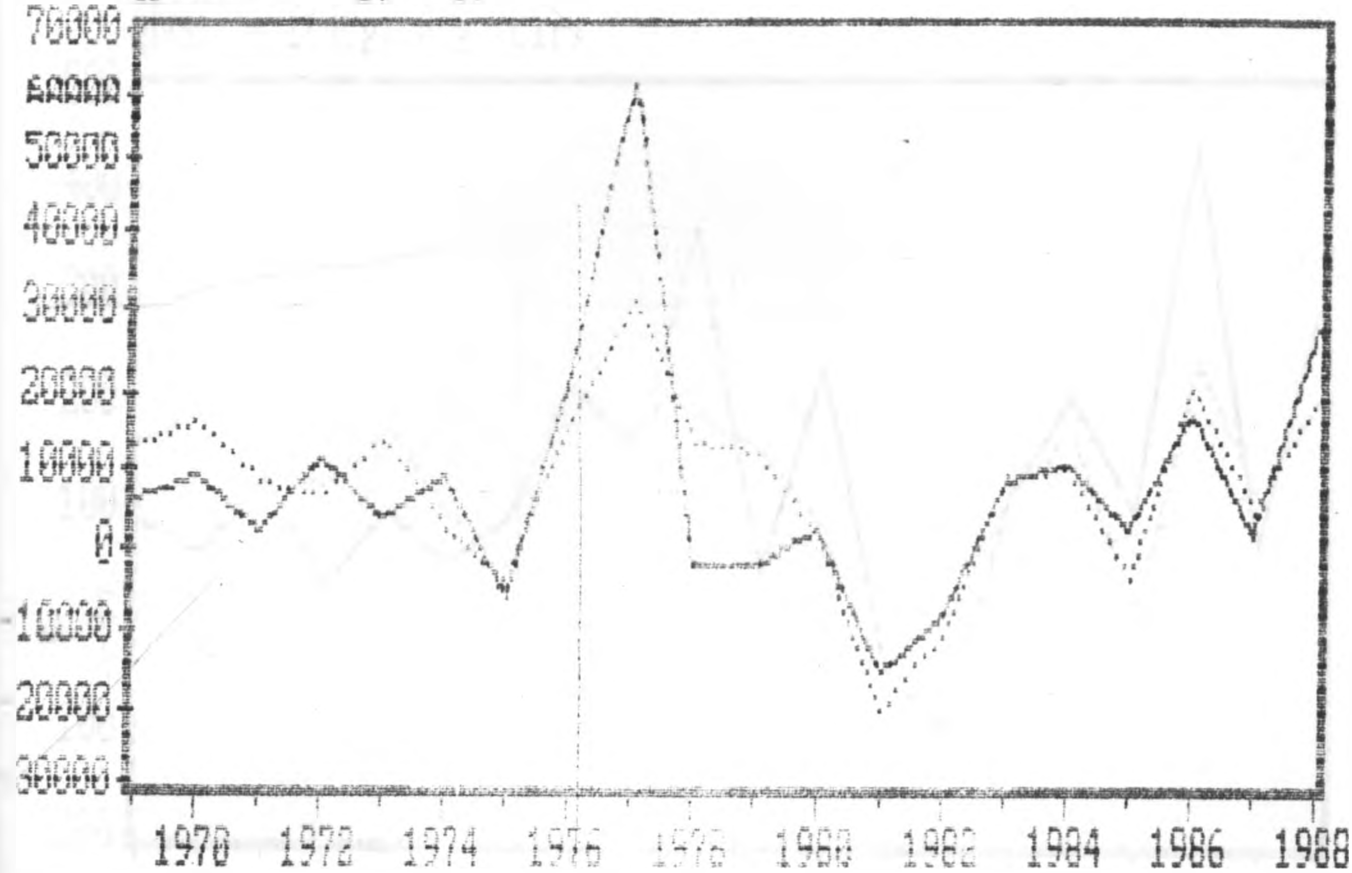

ytot = f(cdc, cir)
40000
30000
20000
10000
0
-10000
-20000
-30000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
—actual
......predicted

(v)

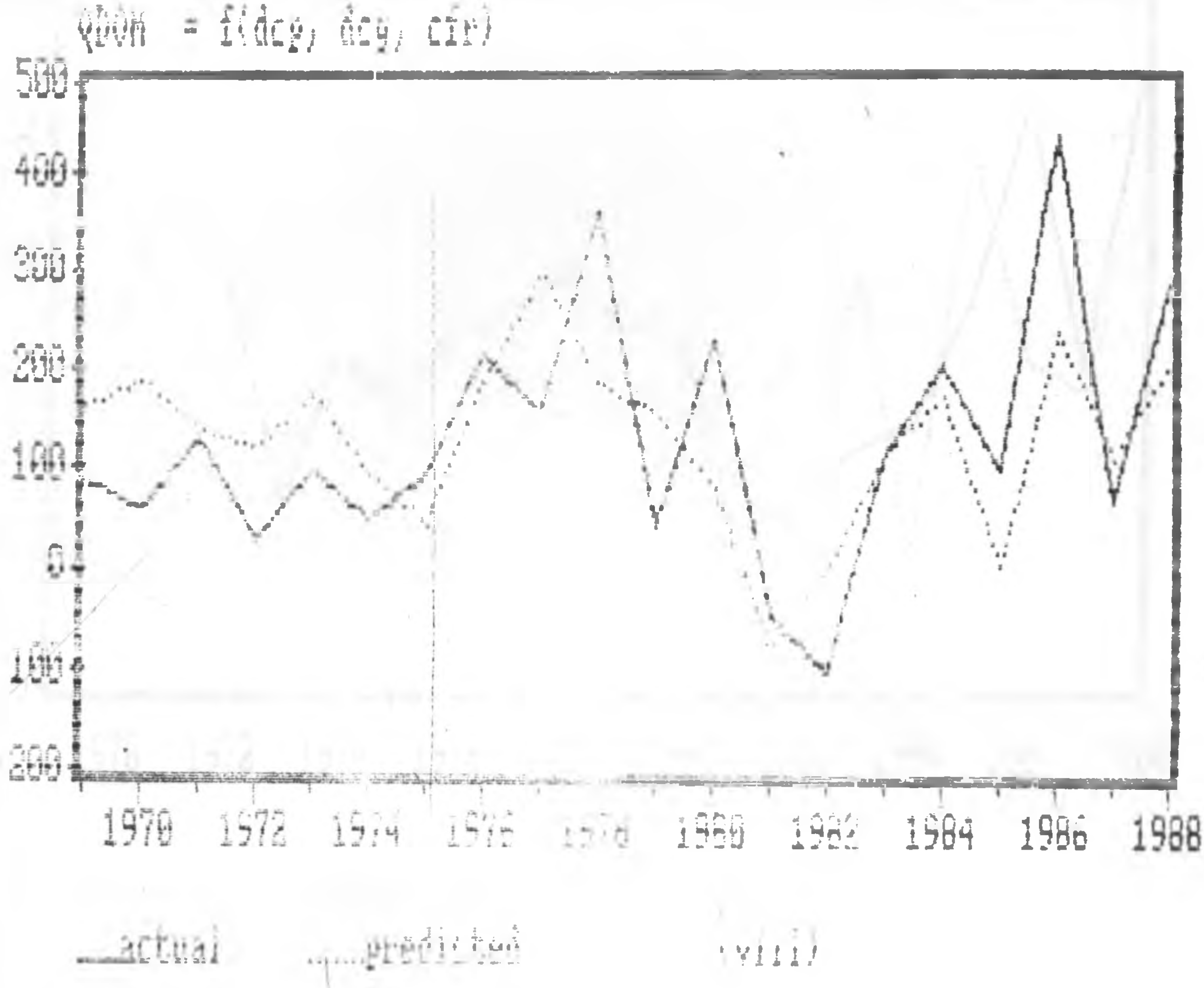

qtrad = f(dcp, dcg, cfr)
6000
5000
4000
3000
2000
1000
0
-1000
-2000
-3000
-4000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
__actual
....predicted

(vi)

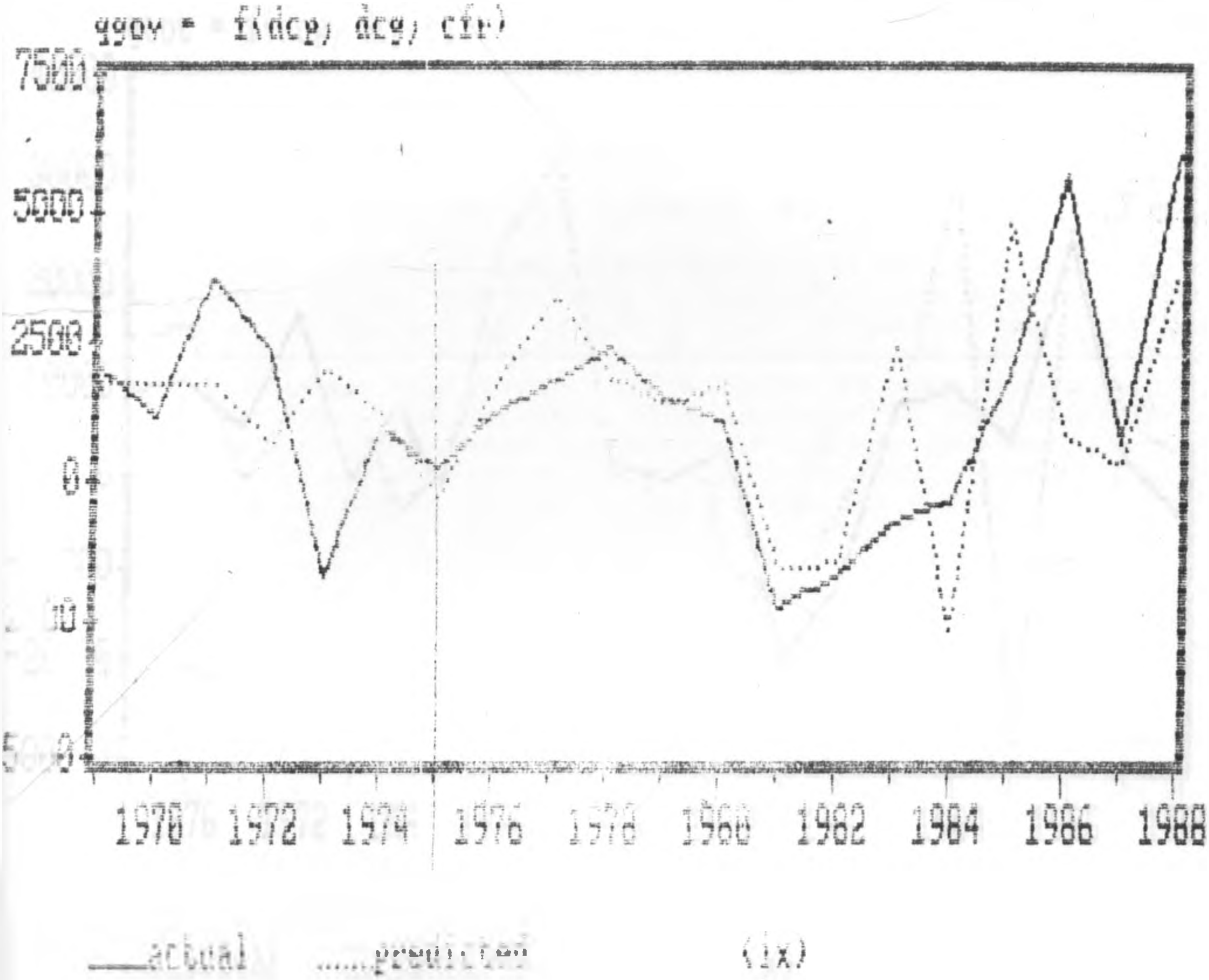
qpriv = f(dcp, dcy, cfr)



——actual ......predicted (vii)

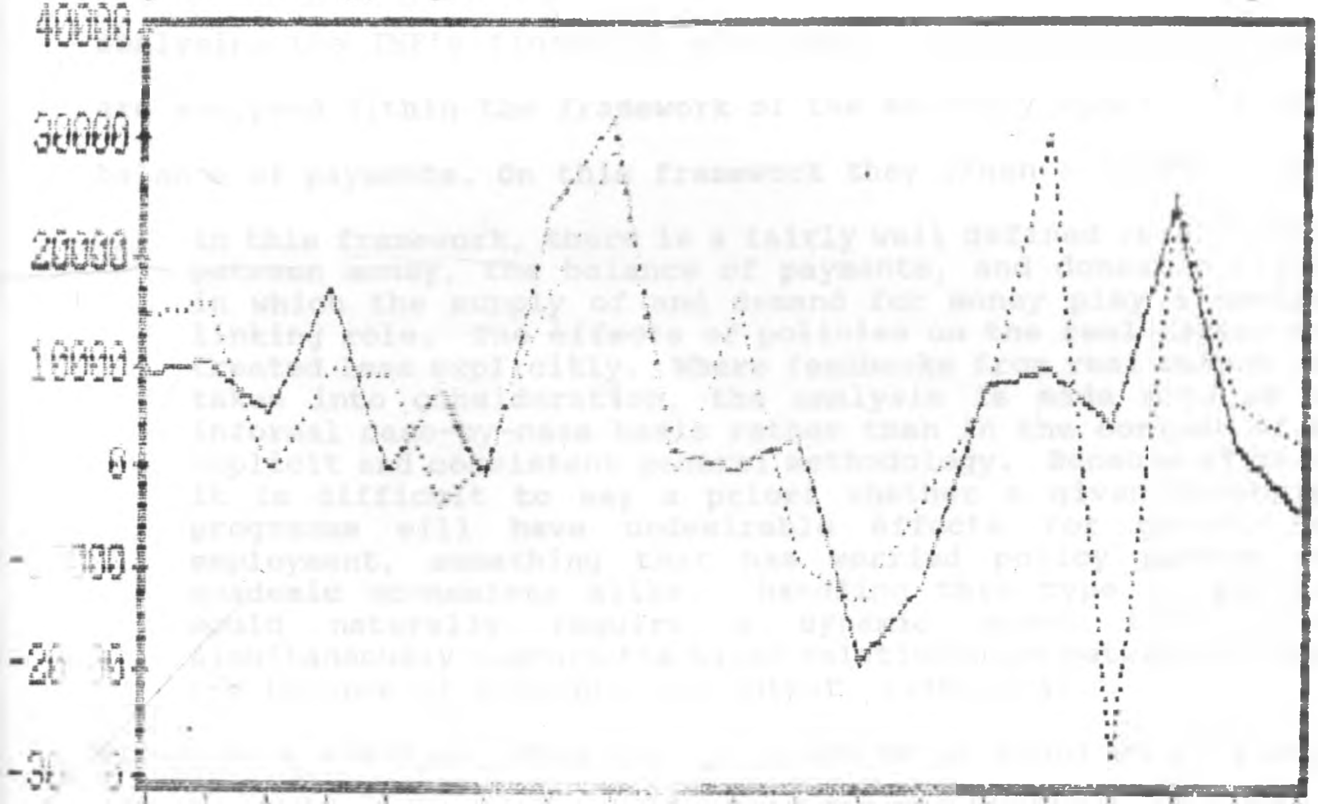

qbvh = f(dcg, dcy, cir)
500
400
300
200
100
0
-100
-200
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
actual
....predicted

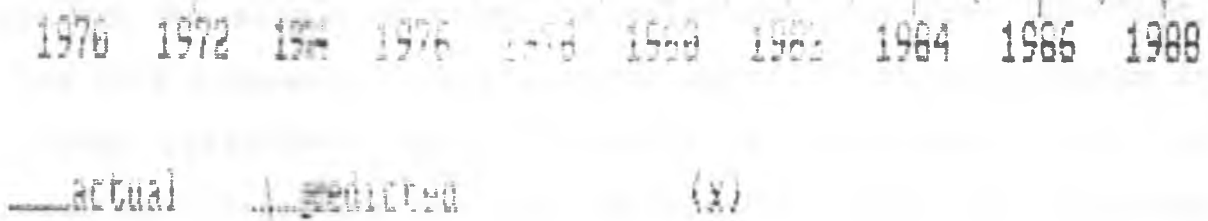
(viii)


ggov = f(dcp, dcg, cfr)
7500
5000
2500
0
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
____actual
......predicted

(ix)

gtot = f(dcp, dcg, cir)




1972
1976
1984
1988
actual
predicted
(x)

APPENDIX TWO

The Complete Monetary Model For The Kenyan Economy.

The complete monetary model of the Kenyan economy derives from the model developed by Khan and Knight (1981) as a framework for analysing the IMF's financial programmes. The fund's programmes are analysed within the framework of the monetary approach to the balance of payments. On this framework they (Khan & Knight) say;

> In this framework, there is a fairly well defined relationship between money, the balance of payments, and domestic prices in which the supply of and demand for money play a central linking role. The effects of policies on the real sector are treated less explicitly. Where feedbacks from real output are taken into consideration, the analysis is made more on an informal case-by-case basis rather than in the context of an explicit and consistent general methodology. Because of this, it is difficult to say a priori whether a given financial programme will have undesirable effects for growth and employment, something that has worried policy makers and academic economists alike. Handling this type of problem would naturally require a dynamic model that could simultaneously capture the major relationships between prices, the balance of payments and output. (1981;3-4)

By way of a solution, they have proposed their model as a "formal framework for examining these interelations, and more important, to use this framework to analyse the effects of policy changes in all these variables." (p.4) The model is developed to suit the generalised conditions of most developing countries, assuming poorly developed financial infrastructures, repressed interest rates and the absence of reliable data bases. Their model, unlike most others, treats income as endogenous, and provides for modification to endogenous capacity growth to allow for a more detailed analysis of the supply side of the economy.

We choose this model because of the former characteristic, and incorporate the latter modification. Our model's 7 behavioral equations explain inflation, the balance of payments, the government sector (expenditure and revenues), real income and capacity growth as follows;

Inflation.

The domestic rate of inflation, relative to the foreign rate is a positive function of change in supply of real money balances and a negative function of domestic prices from their equilibrium (or purchasing power parity) level i.e

$$\Delta P_t = A_0 + a_1(M_t - M_t) - a_2[B_0 - (P_{t-1} - E_{t-1}.P^{f(t-1)})] + a_3(E_t.P^f) \qquad \text{(i)}$$

Where

P = domestic price level

E = exchange rate (domestic currency units per unit of foreign currency)

P^f = foreign price level

M = stock of real money balances.

A_0 = constant

$\Delta$is a difference operator. B_0 is a parameter, representing the equilibrium ratio of domestic prices to prices in the rest of the world.

Balance of Payments

The overall balance of payments is specified as a positive function of nominal money balances and a negative function of the deviation of the domestic price level from its equilibrium level i.e;

$$R_t = a_4(M_t - M_{t-1}) - a_5(B_0 - P_{t-1}.P^{ft-1}) \quad \text{(ii)}$$

Where R is net stock of international reserves and all other variables are as defined in (i).

The Government Sector

Nominal government expenditure is assumed to be an adjustment to the difference between planned expenditure and the actual expenditure of the previous period. i.e

$$G_t = a_6(G^{*t} - G_{t-1}) \quad \text{(iii)}$$

and nominal taxes adjust to the difference between planned taxes and actual tax revenue in the previous period;

$$T_t = a_7(T^{*t} - T_{t-1}) \quad \text{(iv)}$$

Where G and T are nominal expenditure and taxes respectively and the * superscript denotes the planned amounts. Planned expenditure and revenue are are assumed to be functions of nominal income i.e

$$G^{*t} = B_2 + a_8(Y_t) \text{ and } T^{*t} = B_3 + a_9(Y_t)$$

Substituting these equations into (iii) and (iv) gives the specifications in the summary of the model below.

Real Income.

The rate of output change is a positive function of the change in stock of real money balances and the output gap (i.e excess capacity) which is defined here as the difference between normal capacity output and actual output of the previous period i.e

$$\Delta Y_t = A_1 + a_{10}(M_t - M_{t-1}) + a_{11}(Y^{*t} - Y_{t-1}) \qquad \text{(v)}$$

Y^{*t} is the normal capacity output level and is proxied by the trend level of real income.

Capacity growth is defined as adjusting to real money balances.

$$Y^{*t} - Y_{t-1} = a_{12}(M_t - M_{t-1}) \qquad \text{(vi)}$$

Identities

We have 3 identities defining changes in money balances.

$$\Delta M_t = M_t - M_{t-1} \qquad \text{(vii)}$$

$$M_t = FR_t - DC_t \qquad \text{(viii)}$$

$$DC = DCP_t + DCG_t + DC_{t-1} \qquad \text{(ix)}$$

Summary of the Model

inflation

$$\Delta P_t = A_0 + a_1(M_{t_f} - M_t) - a_2[B_0 - (P_{t-1} - E_{t-1}.P^{f(t-1)})] + a_3(E_t.P^f)$$

Balance of Payments

$$R_t = a_4(M_t - M_{t-1}) - a_5(B_0 - P_{t-1}.P^{ft-1})$$

Government Sector

expenditure

$$G_t = B_2 + a_6 a_8(y_t) + (1-a_6)G_{t-1}$$

revenue

$$T_t = B_3 + a_7 a_9(y_t) + (1-a_7)T_{t-1}$$

Income

$$\Delta Y_t = A_1 + a_{10}(M_t - M_{t-1}) + a_{11}(Y^{*t} - Y_{t-1})$$

Capacity Output

$$Y^{*t} - Y_{t-1} = a_{12}(M_t - M_{t-1})$$

Identities

$$\Delta M_t = M_t - M_{t-1}$$

$$M_t = FR_t - DC_t$$

$DC = \Delta DCP_t + \Delta DCG_t + DC_{t-1}$

Definition of the Variables.

endogenous
P = rate of inflation
FR = growth of international reserves
G = nominal government expenditure
Y = real income
y = nominal income
DC = domestic credit
M = real money balances

exogenous
E_f = exchange rate
P^f = foreign price index
Y^* = trend value of real income

APPENDIX THREE : DATA

obs	QTRAD	QAGR	QFOR	QFISH	QMIN	QMANF	QCON	QELEC	QTCOM	QHOT	QFIN
1969	1437368.	903430.0	79448.13	-723.6875	-100932.2	1998050.	-415186.0	134595.0	393210.0	701750.0	609239.0
1970	673192.0	2016630.	363864.0	4002.500	106942.8	1240120.	355006.0	223593.0	665700.0	2450360.	960708.0
1971	-82720.00	-1191590.	-212631.0	-10176.69	108204.3	1645450.	299453.0	-27553.00	23180.00	653900.0	358532.0
1972	4055520.	5228060.	-183167.0	-3102.625	-232328.4	922190.0	4534067.	106472.0	-1612380.	598030.0	1924558.
1973	-2037920.	371050.0	71389.00	-18825.28	175087.9	1781790.	-357371.0	-172913.0	415760.0	1529030.	-186398.0
1974	2148910.	-64760.00	113081.0	-19472.72	-117189.1	2284500.	-230921.0	-64910.00	686550.0	5137910.	1562612.
1975	1454649.	-1197630.	-58846.00	-3647.500	-56063.00	-1891040.	-1057735.	227118.0	-725310.0	-2195110.	151510.0
1976	920230.0	12467470	-26621.00	96805.31	90588.00	4947920.	-405417.0	-40179.00	571280.0	1956000.	1438110.
1977	707460.0	64224000	-45079.00	-53430.00	-82796.69	-1541960.	231231.0	589635.0	21730.00	104660.0	885408.0
1978	1403518.	-10429970	151762.0	141928.8	-14038.75	3511060.	1213517.	208154.0	2245270.	1606740.	921230.0
1979	4927060.	-3633760.	445953.0	-24017.81	21867.00	983270.0	1079946.	613605.0	551940.0	641010.0	1461600.
1980	-1210240.	-8980352.	152807.0	29054.69	13882.13	1968678.	1570860.	-117385.0	-105350.0	737680.0	548570.0
1981	-3222870.	-6203840.	-88362.00	102237.2	-114817.7	-3718128.	-949170.0	41951.00	-1491700.	-2897470.	-48600.00
1982	-1893520.	-2308016.	45843.00	44470.75	-29855.22	-1244170.	-1764166.	-135928.0	-602710.0	-1938190.	562140.0
1983	-768410.0	2271168.	140821.0	-9928.125	6643.594	-113430.0	1486196.	-324214.0	1207240.	3713470.	1495080.
1984	1756500.	6442184.	-114766.0	20440.81	21214.13	506560.0	-2429704.	-1199740.	1227240.	1016640.	-446930.0
1985	267330.0	-1703624.	46756.00	32481.56	27864.88	266900.0	785301.0	408464.0	71100.00	1252440.	863960.0
1986	1153040.	8799872.	17584.00	124743.9	48938.94	3243270.	294170.0	95398.00	1563050.	972540.0	1742550.
1987	1142510.	-2898560.	136488.0	44358.06	33231.00	1036790.	942143.0	221835.0	296600.0	631580.0	831980.0
1988	2592210.	7773992.	197555.0	406.0000	4464.500	4351408.	4051930.	335175.0	642580.0	3428960.	3506890.

obs	QDWEL	QPRIV	QDOM	QGOV	QXPT	QNXPT	QTOT	CDC	CFR	DCPRIV	DCGOV
1969	306219.0	5687576.	86939.00	2071870.	2562871.	6720825.	9283696.	1868478.	6715820.	1060220.	808254.9
1970	132092.0	8697632.	55580.00	1181230.	3419273.	7188427.	10607700	6566500.	5022030.	3660870.	2906631.
1971	24055.00	2107304.	128998.0	3877620.	1183346.	4847854.	6031200.	7498242.	-7245930.	7079620.	418613.0
1972	2327287.	11240700	-21961.00	2469300.	5867795.	11928630	17796420	5883668.	1119670.	215060.0	6668621.
1973	-84233.00	3716800.	100842.0	-1705760.	11715720	-11631720	84000.00	5890180.	586130.0	5599000.	291170.0
1974	3047758.	8803296.	45382.00	1001770.	11904490	-2891194.	9013296.	5729920.	-8744140.	4443668.	1286260.
1975	-662305.0	-6555400.	93461.00	250190.0	-2592959.	2097263.	-495696.0	4376040.	-4436691.	-2766268.	7142290.
1976	115695.0	21633990	216511.0	1318830.	18019150	6171040.	24190190	5360768.	5309911.	3104060.	2256710.
1977	246580.0	62179408	158826.0	1894950.	23678610	8138290.	31816900	5624696.	15183910	7369680.	-1744980.
1978	772060.0	-2238096.	358508.0	-2517798.	-14596100	16637200	2041104.	17416240	-12698920	13180410	4235830.
1979	76210.00	-2367008.	41285.00	1601464.	2062366.	-1768366.	294000.0	1822752.	7946580.	-349080.0	2171840.
1980	733190.0	2306704.	232452.0	1212080.	11707850	-8041754.	3666096.	1148688.	-9976620.	5074952.	-3926260.
1981	-152440.0	-15364100	-47270.00	-2222984.	1985578.	-20873770	-18888190	-421344.0	-11678150	-7633360.	7212010.
1982	-786080.0	-8445296.	-100799.0	-1650448.	2857519.	-14109520	-11252000	8291744.	-9278744.	-4116060.	12407790
1983	-45040.00	8361088.	117591.0	-753152.0	6410153.	2275735.	8685888.	-10503090	8694384.	-1506740.	-8996332.
1984	3016710.	10371600	208284.0	-330178.0	7589412.	2664698.	10254110	33471650	486595.2	-393232.0	33864880
1985	-195840.0	2353104.	101045.0	1969778.	1229592.	3461608.	4691200.	-30777950	-5207328.	1518872.	-32296830
1986	245290.0	17468190	442638.0	5663320.	9591237.	15135960	24727200	19427250	4390253.	6819800.	13607490
1987	971590.0	922016.0	66544.00	678812.0	-9857780.	12667670	2809888.	10309800	-3638232.	1808780.	8501000.
1988	2144200.	27669180	283956.0	6131820.	7523057.	-11695950	-4172896.	-196800.0	-532583.0	10573810	-10770690

obs	XRATE	FPI	GDPT	CCPI	GOV	RMON	QTOT
1969	17.14800	32.60000	1.53D+08	0.670002	104979.0	42691980	9283696.
1970	17.09800	33.80000	1.63D+08	1.429999	121464.0	54280512	10607700
1971	18.23200	31.32000	1.69D+08	4.040001	150808.0	54532820	6031200.
1972	16.77200	35.20000	1.87D+08	2.840004	180522.0	61536152	17796420
1973	16.63000	42.00000	1.87D+08	8.699997	230166.0	68012464	64000.00
1974	16.75400	68.20000	1.96D+08	11.80000	301582.0	64998240	9013296.
1975	16.70000	86.20000	1.96D+08	13.80000	373109.0	64936032	-495696.0
1976	14.15000	100.0000	2.20D+08	9.500003	409794.0	76608256	24190190
1977	15.20700	108.0000	2.52D+08	15.49999	598390.0	97416880	31816900
1978	15.05900	114.0000	2.54D+08	10.60001	6976100.	1.02D+08	2041104.
1979	16.35500	122.0000	2.54D+08	14.70000	7813200.	1.12D+08	294000.0
1980	16.08100	[illegible]	2.58D+08	[illegible]	9621100.	1.03D+08	3666096.
1981	19.67700	220.0000	2.39D+08	43.00000	1114410.	90976096	-18888190
1982	20.62700	252.8000	2.27D+08	39.59999	1190693.	69989104	-11252000
1983	20.05900	323.5800	2.30D+08	25.60002	1254700.	69789488	8685888.
1984	18.40100	337.9800	2.46D+08	30.69999	1534600.	90148872	10254110
1985	23.46600	340.0000	2.51D+08	35.79999	1651820.	86153360	4691200.
1986	23.56600	[illegible]	[illegible]	[illegible]	2124220.	1.10D+08	24727200
1987	30.68500	375.6700	2.79D+08	36.69999	2214690.	1.17D+08	2809888.
1988	33.30200	379.7600	2.74D+08	10.00000	3008230.	1.18D+08	-4172896.