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An econometric model of the economy of Cyprus

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AN ECONOMETRIC MODEL OF THE ECONOMY OF CYPRUS

by

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Abstract

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This study has set out to construct an econometric macro model of the economy of Cyprus. The intend here, was to investigate whether or not conventional theory is applicable in the case of a small open developing economy, and what adjustments were necessary if we are to properly explain the functioning of the economy. Ultimately, the aim of the study, is to assess the effectiveness of monetary, fiscal and supply-side policies on economic stabilization and also, serve as the basis for a more indepth future sectoral analysis of the Cypriot economy.

Cyprus is a newly created nation (1960) with a very small economy. It has during its short history been torn by political instability. The ongoing ethnic strife has disrupted the economy ever since even before independence. In spite of this political situation, the economy has experienced a very notable economic rate of growth and economic transformation.

The model is comprised of 20 sets of behavioral equations and 9 identities, which though are based on conventional economic theory, were adjusted so as to account for the peculiarities of the Cypriot economy. For the statistical work I used both Ordinary Least squares (OLS) and Two-Stage Least Squares (2-SLS). These equations dealt with Aggregate demand and supply, with taxation, the demand and supply of money, the problems of potential instability of inflation and unemployment and the existence of a Phillips curve.

Some of the problems I encountered were primarily the ceiling on interest rates, the quantification of supply-side policies and also the availability as well as consistency of the data.

For the most part, the results are characterized by high coefficients of determination (R2) and acceptable t-statistics (at the five percent level). Though without any very big surprizes, the results have shown the weakness of stabilization policy in the case of this small open economy and also its vulnerability to external forces.

The topic of Cyprus has indeed been a very interesting and rewarding one.

ACKNOWLEDGEMENTS

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I. INTRODUCTION:

"The government of the Republic took over in 1960, an economy with all the symptoms of underdevelopment. Stagnation of economic activity, a high rate of unemployment and emigration, lack of confidence in the future of the economy and capital outflow, an underdeveloped agricultural and an insignificant industrial sector, inadequacy of the basic infrastructure. These were in brief the main features of the Cyprus economy at the time".[1]

Indeed, during the course of this study it became clearly evident that the above quotation describes very accurately the poor economic standing of the Cypriot economy in 1960. In this discouraging condition, the newly established nation set out to compete in a world of multinational corporations equipped with fast advancing technological know-how. In fact the most important asset which it always possessed-- its strategic location--proved to be on occasion, a negative factor to its economic development, as it rendered the island to be a battleground on and off for centuries.

Nevertheless, during the following thirty years to the present time, Cyprus has presented us with a remarkable economic growth and development. The structural transformation that took place during the relatively short

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[1] Planning Bureau, The Third Five-Year Plan, Nicosia Cyprus, 1976 p.3.

period of time, produced an annual average growth rate unprecedented to the economic history of the island of about 12% in real terms. This represents an increase in GDP from 268.3 mn.to 1291.6 mn. pounds. Furthermore, the productive capacity of the most important sectors of the economy have been strengthened and there is clear evidence of the diversification of production. Value added in the primary sector increased on the average, by an annual rate of 8.01% in real terms, while its share of GDP declined as is expected during the development process, from 29.6% to 9%. Similarly, the secondary and tertiary sectors, have expanded at a fast rate and have correspondingly increased their share of GDP from 20.5% to 32% and from 49.9% to 59%.

This bright economic situation is, however, only but a portion of the Cyprus picture. Unfortunately, the island has been plagued by political instability arising from the division of its people. The majority of the Cypriot people are of Greek ethnic background (about eighty percent), while the minority is primarily of Turkish ethnic background. Unfortunately, owing to a multitude of reasons which are not to be discussed here, they have been at conflict with each other ever since independence (1960), and separated since the Turkish invasion of the country (1974), following the coup by Greece against the Greek Cypriot government.

The economic situation in Cyprus within that kind of political environment, was cause enough for me to do this study. Furthermore, the trend in economic analysis, of being

technical or empirical, making use of econometrics so as to quantify the results, gave the proper direction of this paper.

This study is an econometric macro model of the economy of Cyprus, and its ultimate goal is the identification of the various policy tools and the assessment of their effectiveness. To this end, I have disaggregated the analysis into the economic components of aggregate demand and supply, taxation, the nominal sector and the two major sources of economic instability, ie., inflation and unemployment. In all, we have twenty behavioral equations and nine identities, while the estimation method used is that of ordinary least squares (OLS) as well as two-stage least squares for all equations.

Aggregate demand is made up of one equation dealing with consumption expenditures, two equations dealing with investment in dwellings and investment in machinery and land development. Imports involve four equations addressing imports according to their destination, such as consumption, intermediate goods, capital goods and those of fuels and transportation equipment. Exports were disaggregated on the basis of origin such as agricultural, manufacturing and minerals.

Government spending was considered as an exogenous variable as is conventionally accepted in empirical analysis. Taxes however were analyzed through two equations which focused on direct and indirect taxes.

The supply side of the economy was disaggregated according to the origin of output. Thus we have three equations, each dealing with the output of the primary sector, the secondary sector and the tertiary sector.

The monetary sector of the economy is divided into the transactions demand and asset demand for money, as well as the money supply process. The last equations are aimed at investigating the problems of inflation and unemployment.

The structure of the various equations was motivated by economic theory but also by data availability. I tried to follow as much as possible the organization of data publication by the statistics and research department of the ministry of finance, in order to avoid as much as possible, problems arising due to inconsistencies of data.

Chapters two, three and four concentrate on the theoretical framework which justify the specification of the various equations in the real and nominal sectors and also the section on the sources of potential instability.

Chapter five deals with the exposition of the complete model, the data and the actual estimation and explanation of the results. Chapter six includes a short summary and concluding remarks.

II.MODEL SPECIFICATION- THE REAL SECTOR

CONSUMPTION

All economic activity centers around consumption. Aggregate demand which solely determines the level of employment, is a function of present consumption, or from activity aiming toward future consumption.[1] In viewing consumption this way, Keynes stipulated a functional relationship between the level of consumption and the level of income (in terms of wage units), calling it "The propensity to consume".

This relationship between consumption and real disposable income is indeed a fairly stable function, suggesting that an increase in in real disposable income, will have a positive though not a proportional increase in the level of consumption.

$$C=F(Y_d)$$
$$C=\alpha_1+\alpha_2 Y_d \qquad (\alpha_1>0, 1>\alpha_2>0) \qquad (1)$$

The discrepancies however between the long-run and short-run marginal propensity to consume, [2] has led to the

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[1] **Keynes J. M.**, The General Theory of Employment Interest and Money. Harbinger Edition 1964, P104

[2] **Most** of this research work is attributed to Simon Kuznet's findings.- "National Product Since 1869 and National Income, a Summary of Findings," New York National Bureau of Economic Research, 1946.

realization that a more encompassing theory of consumption was required.

The lifecycle hypothesis, which was developed by Franco Modigliani,[3] introduced wealth into the basic equation. This suggests that a consumer in his effort to maximize his consumption utility, through his life, takes into account his already accumulated nominal wealth. Based on the theory of utility maximization, such that the marginal utility of all consumption periods must equal each other, we aim at spreading our consumption through our lifes.

So the new equation developed as follows,

$$C=\alpha_1+\alpha_2 Y_d+\alpha_3 W \qquad (1)$$

Where Y is the real disposable income and W is the level of

wealth.

Yet another consumption theory evolution, which too builds on the keynesian approach and aims at explaining the difference between the short-run versus the long-run marginal propensity to consume (in the short-run being smaller than in the long-run), is Milton Friedman's "Permanent Income Hypothesis"[4].

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[3] **Modigliani Franco,** " The life Cycle Hypothesis of Saving the Demand for wealth and the Supply of Capital," Social research, Vol. 33, No. 2, 1966.

[4] **Milton Friedman, A theory of the Consumption Function, Priston University Press 1957.**

This theory also deals with the hypothesis that people behaving in a very rational fashion want to smooth out their consumption over their lifetime. The only difference between the two approaches is in the detail of the analysis. While in the Life Cycle hypothesis we take into account wealth as a determining factor, in the case of the Permanent Income hypothesis we assume that people base their consumption decisions on their levels of average current and expected real incomes over a number of periods rather than on just the level of current real income.[5] The measurement of permanent income is dealt with by assuming that permanent income is in fact a function of present and past income levels in a weighted average approach. Essentially, we need to take into consideration the known history of income in making our consumption decisions.

Given all the developments in consumption theory, we come to a more modern formulation of the consumption function.

$$C=\alpha_1 + \alpha_2 Y_d + \alpha_3 W + \alpha_4 Y_{d_{t-1}} \qquad (3)$$

This formulation in fact will be the basis for the specification of the Cypriot consumption function. Some minor modifications are however necessary, due to the

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[5] Cochrane, Gubins, kiker , Macroeconomics Analysis and Policy, Scott Foresman and Company, Glenview Illinois. P 114.

peculiarities of the Cypriot economy as well as data availability.

In trying to incorporate a measure of wealth in the consumption function (and the investment function in the following section), I was faced with a serious data availability problem because this information simply does not exist. Having accepted wealth as an important explanatory variable I looked for an acceptable proxy with similar explanatory characteristics.

Drawing from the theory of portfolio management as was put forward by James Tobin[6], I resolved this issue in the following manner. As a proxy for wealth I will use secondary liquidity or quasi money. It is assumed here that the sum of savings and time deposits will in fact give us a reasonably good reflection of the impact of wealth accumulation on consumption. Indeed (M2) could be thought of as a relatively liquid stock of wealth. Given a degree of risk aversion, a consumer or an investor will always hold a proportion of his wealth in this form.

By no means however this is to suggest any degree of constancy in the relative proportions of wealth holding in (M2) versus other less liquid assets. In fact this proportion will be negatively related to the inflation rate as well as the yield from other assets and positively related to the preconceived level of risk from other assets

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[6] James Tobin, "Liquidity Preference as a Behavior Toward Risk" Review of Economic Studies, Feb. 1958 .

and the interest rate paid on savings and time deposit accounts.

Having recognized that (M2) will only serve as a proxy for wealth, I am of the opinion that this measure will give us a good insight to the behavior of consumption as well as residential investment.

The second item of concern is whether or not to introduce a dummy variable, to take into account the war-time period of 1974-1975. On the one hand, though this catastrophe was of devastating proportions, the Cypriot peoples and their institutions have experienced war and political instability before. Though this parer is by no means a political one, the dates of 1955 (Revolution), 1960 (Independence), 1963 (first Civil/Ethnic war), 1967 (more civil unrest), 1974 (Greek coup/Turkish invasion), come to mind as the highlights of our most resent history. On the other hand, the experience of the last thirty years strongly suggest that the Cypriot peoples (both north and south), have learned to function very well within the political/military instability that has existed there ever since even before the country's independence. This is very clear from the speedy and sustained economic recovery after the 1974 war. The New York Times wrote then of the attitude of the people, that "Cypriots are not fatalists, they know to bend so they will not break. The history of Cyprus shows that they had to master the art of survival".[7]

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[7] New York Times , August 4 , 1977 , PA3.

Due to the severity of the war I concluded that such a variable ought to be included so as to capture its effects, but also I felt, we should take into consideration the other periods of political instability which were mentioned earlier.

So, having considered these points the final consumption equation to be estimated has the following form.

$$C = \alpha_1 + \alpha_2 Y_d + \alpha_3 M_2 + \alpha_4 Y_{t-1} + \alpha_5 D \qquad \text{Where,}$$

- C= Real consumption expenditures.
- Y_d= Real disposable income.
- M_2= Real savings and time deposits.
- Y_{t-1}= Real disposable income with a one year lag.
- D= A political instability dummy variable.

INVESTMENT

Investment, though not nearly as large a component of aggregate demand as consumption, is nevertheless a very important aspect of macroeconomic analysis. This obvious reasoning, lies in the fact that "investment is spending devoted to increasing or maintaining the stock of capital"[1], or in other words, it is expenditure toward future output and economic growth. Another aspect that gives rise to investment's significance is its responsiveness to both fiscal and monetary policies. This renders it as a fine vehicle for stabilization policy.

Investment demand stems from the need to maintain an optimal level of capital stock given an output level and the cost of other inputs; primarily labor and the user cost of capital itself. Investment decisions are based on microeconomic analysis, and specifically on the theory of the firm. Profit maximization being the motivating force, dictates that the present value of the internal rate of return exceeds the user cost of capital or the real interest rate paid for its finance.[2] In a perfectly competitive environment, a firm will employ a given factor input so that its ratio of marginal revenue product over its factor price equals that of all factor inputs.[3] Furthermore, in dealing

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1 Dornbush R., Fisher S. ,Macroeconomics ,McGraw-Hill Book Company 1978 P.175.

2 Jorgenson D.W., "Capital Theory and Investment Behavior", American Economic Review , May 1963 , PP247-257.

3 Baumol W., Economic Theory and Operations Analysis. Prentice Hall 1972 P.

with investing in capital stock we must think "in terms of the expectation of yield",[4] or a flow of return or output from that particular unit of capital, over its productive life-time.

The first explanatory source under consideration is that of economic growth itself. For this purpose ($DY=GDP-GDP_{t-1}$) will be included so as to capture the effect of the country's growth rate on the ability of the existing credit rationing system to respond to changes in credit needs. Certainly, "there is a general agreement among economists that a country's growth rate would have a positive impact on private investment"[5].

The issue of interest rates has been the most troublesome one, because in Cyprus there is a legislated ceiling on them of nine percent. This action is intended to stimulate investment, so for the purposes of this study we need to find another means to evaluate the effect of the cost of capital on investment demand. Once the interest rate mechanism is jammed through the pegging of interest ceiling rates, then the money market falls into a permanent disequilibrium albeit at rates higher than the ceiling rate. In that event then, investors are faced with a credit supply function which is seemingly infinitely elastic with respect

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325.

[4] Keynes J.M., op. cit. P136

[5] Green J. and Villanueva D., "Determinants of Private Investment in LDCs" Finance and Development, Dec. 1990 , P. 40.

to interest rates. With no other vehicle to dispense of credit in the conventional fashion, such that the feasibility of the project will dictate the level of borrowing, we must instead resort to credit rationing. In that case, "credit rationing arises as a means of market response to adverse selection",[6] or is dependent on applicant screening based on the probability of repayment. It appears a priori that this kind of credit rationing system lends itself as a potentially very potent supply management tool. To be able to control the availability of credit, would be to be able to control aggregate demand, direct supply and thus the outcome of real variables and prices. We must recognize however that overall credit controls can also have very damaging effects trough the possible (most likely) misallocation of credit. This will arise when interest rates are set below the market clearing rate through regulation. Also, from the policy analysis point of view, this kind of organizational set-up in which we have an excess demand for credit, we can use monetary variables as tools for supply management. "In a rationing equilibrium to the extend that monetary policy succeeds in shifting the supply of funds, it will affect the level of investment not through the interest rate mechanism but rather through the availability of credit".[7] In this case, the supply of credit itself is the

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[6] Jaffee D.M., and Russel T.,"Imperfect Information Uncertainty and Credit Rationing ". Quarterly Journal of Economics Vol. 90 Nov.1976 PP.651-66.

[7] Stiglitz J.E. and Weiss A., "Credit Rationing in Markets With Imperfect Information." A.E.R. Vol. 71 June 1981 , PP. 393-410.

powerful tool for the implementation of various economic goals and not interest rates.

Chorng-huey Wong in studying the demand for money in developing countries, put it very much in a similar way by stating that, "it is generally recognized that credit rationing constitutes the most powerful channel of monetary policy. In these countries, economic activity is often constrained by the amount of credit available for the banks to ration out rather by the cost of borrowing."[8] Having articulated this point he goes on to rationalize that "the interest rates in the nonorganized markets, although nonobservable, would reflect a degree of credit restrain in an economy. It follows that the degree of credit restraint itself, if appropriately measured, can be treated as proxy variable for the interest rate variable. "It is in this framework that he suggested ten alternative formulations of this "credit restraint" which could potentially be used as an explanatory variable to proxy interest rates. In very much the same way I will use a credit restraint to proxy the interest rate's distributive effects on capital, of the following form:

CR= -(DCR/GDP) where DCR= Domestic Credit.

In this way, I hope to shed some light on the effects of the opportunity cost of capital on the level of investment.

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[8] Wong Chorng-huey, "Demand for Money in Developing Counties", Journal of Monetary Economics, Vol. 3, No. 1 Jan., 1977.

The need to deal with the growth rate of prices, obviously arises from the fact that any inflationary pressures will tend to reduce the expected cost of capital. This is so because re-payments of both interest and principle will be at deflated or depreciated money. The expected rate of inflation therefore, must be incorporated as an explanatory variable when dealing with investment behavior. Especially so in the case of small developing economies with fragmented financial markets the estimation of the interest elasticity of investment is almost impossible. In most of those cases the inflation rate can be used as a good approximation to the cost of holding money[9], or in the case of investment to the cost of lending. With regard to this issue , Crocket and Evans [10] write the following. In most developing countries, financial markets are not developed in such a way that the substitution between money and other assets would be possible. Also, interest rates are most often centrally decermined and remain unchanged over long periods of time, such that for estimating purposes it is practically impossible to ascertain their influence on the demand for money or the true opportunity cost of investment. Due to the above two reasons they suggest that "it seems appropriate to estimate

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[9] Aghevli B.B., Mohsin S.K., Narvekar P.R., Brock K.S., "Monetary Policy in Selected Asian Countries." I.M.F. Staff Papers Vol. 26, No. 4 Dec. 1979.

[10] Crockett Andrew D. and Evans J.Owen , "Demand for money in Middle Eastern Countries" I.M.F., Staff Papers Vol. 27 No. 3 , Sept. 1980. P 549.

money demand functions using a measure of expected inflation as the opportunity cost of holding money.•

Another point that ought to be considered, is the considerable lag in the adjustment process of the level of business fixed investment. The adjustment process between the optimal level of capital stock and the existing level of capital utilization, will take place in a distributed lag stock-adjustment time path. This is so due to the extreme costs involved, if instantaneous adjustment is to be pursued on the part of business firms. To this end, since thus far it has been proven impossible to find data on capital stock we will need a proxy variable to capture the effect of the lagged behavior in the capital stock adjustment process. At this point of the study I am considering two options. The first one is the change of gross domestic product, such that $I=F(GDP-GDP_{t-1})$. Certainly, past output behavior must partially explain today's investment decisions directly. The second option is a lagged measure of investment itself. This accounting for lagged influences, it is hoped, will shed some light on investment decisions based on past performances.

Since this study will ultimately deal with policy options, I feel it would be imperative to incorporate two more explanatory variables. This is particularly so when dealing with the business fixed investment component of this analysis, as these two items can be used as fiscal or supply policy tools. The first one is direct business taxes .

Though not directly, taxes on business income, adversely affect investment decisions since profitability in general will be reduced, while marginally profitable projects will be forced to be abandoned. This is so, because a firm in arriving at its optimal capital-labor ratio or in this case its optimal level of capital stock, will consider the net of tax return on an investment and not the gross. Direct business taxes will have the same effect on investment as interest rates do, by simply reducing the profit margin of any business undertaking.

The second item at this point, is that we need to incorporate any direct or indirect government assistance to business. "Transfers" of this nature could be monetary or business assistance programmes. By this I refer to items such as direct business subsidies, government sponsored research and development, market procurement, improving the business climate by upgrading infrastructure, communications, education, training and so on. To capture this external positive impact on business decisions, particularly with regard to investment, I will incorporate investment tax credits into the model. Credits of this nature, directly stimulate investment simply by reducing its cost, or conversely, by increasing the profitability of business activity.

Specifically when dealing with investing in residential construction, we need to incorporate wealth as an explanatory variable. It is reasonable to assume that the

more wealth one owns the more housing he will want to buy. The reasoning for this assumption stems from two areas. The first one is the standard reasons for home ownership, such as avoiding rent payments, capital gains, a hedge against inflation, pride in home ownership etc. The second one is more peculiar and more prevalent in economies which have not yet developed diverse financial markets. In the absence of that kind of investment flexibility, from the point of view of the public, then real assets become the prominent store of value or wealth, available to them. So from this point of view, investment in residential housing represents a measure of wealth accumulation. Conversely therefore, we can assume that the level of wealth in such an economy, directly stimulates investment in housing. Since unfortunately, there is no data on wealth in Cyprus, we will use broad money (M2) as a proxy for wealth. This point was already explained in the previous section when the consumption component of aggregate demand was explained.

The last variable to be incorporated here will be the political dummy variable which will account for the political instability that disrupted economic activity on many occasions in Cyprus. This item was also explained in the previous section.

In specifying the investment behavior of the Cypriot economy I felt it would be best to disaggregate the investment function into two components. This is due to the different variables which appear to impact on each of them

and also due to the convention followed by the Cypriot statistical agencies which publish the data. The first equation is dealing with investment in dwellings (ID), and the second equation will be dealing with the gross fixed capital formation except dwellings. Specifically, (IMLO) is investment in machinery land and other.

$$IFC = ID + IMLO$$

$$ID = F\ (\ DY,\ P_{t-1}, M_2, D\ ,\ ID_{t-1}\ ) \qquad (1)$$

$$IMLO = F\ (\ DY,\ CR,\ P_{t-1},\ CT,\ ITC,\ D\ ) \qquad (2)$$

DY=Change in Real gross domestic product.

P_{t-1}= Inflation lagged one period - a proxy for expected inflation .

M_2= Secondary liquidity - a proxy for the level of wealth.

CR= Credit restraint - a proxy for the opportunity cost of investment.(CR=-BCR/GNP).

BCR= Bank credit.

CT= Corporate taxes.

ITC= Investment tax credit.

D= Political instability dummy.

GOVERNMENT SPENDING:

Government spending as is treated in most macroeconomic analyses, is here also assumed to be exogenously generated. As in most countries, in Cyprus too, government spending (G) is financed by total taxes[1] minus transfer payments plus deficit financing.

$$G = TTR - TRP + DF$$

TX= Total Tax Receipts.

TRP= Transfer Payments.

DF= Deficit Financing where,

$$DF = DB + FB + OTH$$

DB= domestic borrowing.

FB= Foreign borrowing.

OTH= Other, including grands and central bank profits.

From this form of analysis it is easy to see the transmission mechanism through which policy can be executed. Overall, debt financing of government spending will have a positive effect on aggregate demand due to the increase in (G). Domestic borrowing has two sources. One, is borrowing from the public by issuing government bonds and the other is trough borrowing from the central bank. The two sources of domestic financing have significantly different effects on the economy. When borrowing from the public, though the

[1] Taxes will be analyzed in later pages of this chapter.

stock of "high power money" remains the same, the new bond holders, considering them (government bonds) as a form of wealth will not reduce their consumption level proportionately. Certainly, this kind of financing is expected to exert upward pressures on the price and interest rate levels. However, the long term output effect of such an action, if we begin from a position of full employment equilibrium, will be zero. Borrowing from the central bank on the other hand, or the monetization of the public debt, has significant effects on the price level due to the proportionate increase of high power money. This kind of financing of the government deficit, will "give rise to an increase of the stock of money that will remain even after the government spending fall back to the initial level."[2] If this policy is pursued permanently, then inflation will increase at an increasing rate. The third source of borrowing is from abroad. This kind of financing will help to bridge the gap in the capacity for capital formation, which is caused either due to deficiencies in domestic savings or to an insufficient amount of foreign exchange. Most all countries in their development process required a certain amount of external financing whether that was in the form of actual capital, technology or training. Certainly, "it may be granted that in the short and intermediate run a capital inflow into almost any country can make possible an

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[2] Dornbusch R and Fischer S., Macroeconomics op. cit., P.449.

increased rate of economic growth."[3] Analysis from cross country data has shown that a substantial portion of the inflow of foreign capital is allocated toward increased consumption a fact which suggests that foreign capital has a negative effect on domestic savings. Nevertheless, Chenery and Syrquin with regard to this matter, write that " the finding that on the average an increase in external resources is only partially translated into investment does not demonstrate that there is no benefit from foreign aid. It does suggest, however, that planning models should allow for some effect on consumption."[4] Furthermore, the dependence on external financing will potentially have the added disadvantage of burdening the economy with future debt servicing.

TAXATION:

Tax receipts in Cyprus are categorized in two groups. The direct taxes of which about eighty percent is income tax, and indirect taxes of which about ninety percent are import or excise duties, both maintaining approximately equal proportions to the total.

With regard to direct taxation I have used the conventional wisdom arising from the national income accounting identities. Therefore, direct taxation is

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[3] Hagen E. Everett, The Economics of Development, Irwin edition 1975 P.430.

[4] Chenery Hollis and Syrquin Moises, Patterns of Development, A world Bank Research Publication, Oxford University Press , 1975, P. 125.

specified as a function of income (NI) and the political instability variable.

With regard to indirect taxes, I examined first the origin of revenues from import duties which fell almost entirely on imported consumer goods. Imports of consumer goods (IMCO) therefore, will be used as an explanatory variable in the indirect tax revenue equation. Similarly, with regard to excise taxes, I examined the kind of products most heavily burdened by this kind of taxation in Cyprus. As was expected cigarette production is the best representative of this kind of tax base. This is of course the case of a very inelastic demand function in which case any kind of taxation will have minimal output and employment negative effects. Therefore, cigarette production will be the second explanatory variable employed here.

The Tax equations to be estimated are as follows.

$$TX = TXD + TXI$$

$$TXD = F\ (\ NI,\ D\ ) \qquad (1)$$

$$TXI = F\ (\ NI,\ IMCO,\ CIG,\ D\ ) \qquad (2)$$

EXPORTS

The export sector for this analysis is disaggregated into three categories. Again, this level of disaggregation was due to the peculiarities of the three subsectors with regard to the explanatory variables involved. Furthermore this classification was also motivated by the mode of data publication which is followed by the Cyprus statistics and research department. Therefore, I will have three behavioral equations which will explain total exports, based on their production origin. This kind of breakdown of the export sector by economic origin, gives us the opportunity to incorporate origin specific explanatory variables.

The first equation will be dealing with exports of agricultural products (EXAG). This kind of exports primarily include citrus, carobs, potatoes, fresh vegetables and grapes. Though the overall trend in agricultural exports has been growing (see table of exports by economic origin P.), their relative contribution to total exports has been on the decline. More specifically, agricultural exports contributed 42% of total exports in 1970, 20% in 1980, 18.9% in 1985 and 14.9% in 1990.

This phenomenon is supported by economic theory, and specifically from the findings on the economic development process. Such findings suggest that " it is virtually impossible to construct a disaggregated model of long term growth in which there is not some shift of resources from primary production to industry, a rise in the ratio of

capital to labor and a systematic change of imports and exports."[1]

The first equation to be analyzed is dealing with agricultural exports and it is formulated as follows. EXAG = F(IMLO, WA, $EXAG_{t-1}$, D). Please note that two of the assumed explanatory variables, namely, (IMLO = Real investment in machinery and land, WA = water availability) would also be included if we were to study a production function for agricultural output. This suggests to some degree, that Cypriot agricultural exports are faced with a very elastic demand function, in such way that exports of the primary sector are only limited by the productive capacity of the economy, as well as the potential returns from other domestic investment opportunities.

Water resources is a very crucial input, as is the case of most countries in the Middle-East due to the nature of their semi-arid climate. It is crucial not only for agriculture, but for the other sectors of the economy as well. "Unless measures for the proper conservation, development and utilization of water resources continue on an expanded scale, a situation will soon be reached in which water will constitute a very severe constraint for the further development of all sectors of the economy."[2] Given the importance of water availability, we expect this

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[1] Chenery H. and Syrquin M. Patterns of Development, Oxford University Press 1975 PP.7-20

[2] Cyprus Water Planning Project , The Fith Five-Year Plan 1986 P.153.

variable to produce strong and statistically significant estimates.

The lagged agricultural exports variable ($EXAG_{t-1}$), is expected to capture the effect of the overall trend in exports as well as add a dynamic effect on the analysis.

The political instability dummy variable, is important because it will capture two negative aspects. The first one would be like a negative shock in the productive capacity of the country. The second one arises due to the limiting effect on the ability to conduct business on an international level in tha kind of domestic political instability.

Finally we have investment in machinery and land (IMLO), which serves here, as a proxy for the level of capital stock. Bear in mind that this variable incorporates items such as credit rationing, Investment tax credit, corporate taxes, the expected level of inflation and real national income. This item will also be important later on, from the point of view of policy analysis.

The second equation, explains total exports of manufactured goods (EXMA). Manufactured exports comprise the largest proportion of total exports in Cyprus. The most significant items are wine and alcoholic beverages, paper, clothing, footwear, cement, cigarettes, light machinery, leather and travel goods, processed fruit, wood and metal manufactures. The only additional explanatory variable which is included here is the relative export prices (RPEX =Export

prices /Domestic CPI).This variable is intended to capture the impact of these relative prices as an incentive in shifting domestic productive resources to the manufacture of exportable items from other sectors.

The final equation describes the exports of minerals (EXMI). The mineral exports from Cyprus comprise only but a small fraction of total domestic exports (about 3% in 1987). This renders its economic value far less significant than either agricultural or manufactured exports. Due to the small size of these exports it is deemed justifiable to treat the prices of mineral exports as exogenously determined. These prices are taken as given as far as the producer is conserned, because with such a low output and export levels, it cannot possibly play any significant role in determining world prices. Therefore the mineral export level is determined, or is limited by, the productive capacity of the country rather than the conventional demand limitations. Furthermore, the relatively very high fixed costs as opposed to variable costs involved in mining, suggests that any minor price deviation in the world market, would have no significant effect on the production and export level. From this point of view, the mineral exports function is specified as a function of investment, the lagged value of mineral exports and the political instability dummy variable.

The complete format of the export sector equations is as follows.

$$EX = EXAG + EXMA + EXMI \quad (1)$$

$$EXAG = F(IMLO, WA, EXAG_{t-1}, D) \quad (2)$$

$$EXMA = F(IMLO, RPEX, EXMA_{t-1}, D) \quad (3)$$

$$EXMI = F(IMLO, EXMI_{t-1}, D) \quad (4)$$

EX = Total Real Exports.

EXAG = Real Agricultural Exports.

EXMA = Real manufactured Exports.

EXMI = Real mining Exports.

IMLO = Real Investment in Machinery Land and Other.

WA = Water Availability.

D = Political Instability.

$EXAG_{t-1}$ = Lagged Agricultural Exports.

$EXMA_{t-1}$ = Lagged Manufactured Exports.

$EXMI_{t-1}$ = Lagged Mineral Exports.

RPEX = Relative Export Prices.

IMPORTS

The foreign sector is indeed a very vital section of the economy, especially so in the case of a small economy like the Cypriot one. This is so, because foreign trade dramatically expands the country's opportunities to specialize in what areas it posses a comparative advantage, thus it can more fully exploid the benefits from trade. Ever since independence, Cyprus has been an " open Economy ", though it has made extensive use of import duties. Import duties were not only a good source of goverment receipts, (about twenty percent of total ordinary revenue through the 1980,s)[1], but it was directed at import substitution as well. Expenditure switching toward domestic products is only but one facet of a policy aiming at a favourable position in the balance of payments. The other, is an active pursuit of export promotion, taking advantage of the country's geographical location. This policy has indeed been very effective in Cyprus,as is evidenced by the fact that even though imports themselvs expanded dramatically during the study period, (1960 total imports = C£38,538,000, 1990 total imports = C£ 980,475,000), the export/import ratio though it has declined, (from 51.9 percent to 37.1 for the respective years)[2] it has done so at a proportionately lower pace.

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1 Central Bank of Cyprus bulletin #91 June 1986.

2 Statistical Abstract 1989 &1990. General Statistics ,series 1, report Nos. 35&36 , Statistcs and research department, Republic of Cyprus.

It is certainly true that the benefits from trade are more significant in a small economy rather than a larger one, because it allows it to specialize. In the case of Cyprus, given the limited size of its geographical area as well as the size of the domestic market, the absence of trade would most certainly deprive the country of any substantial economic growth. Unlike a larger economy which could conceivably specialize within its large national frontiers in the case of Cyprus that would spell economic disaster. On the other hand however we must aknowledge the fact that over-dependance on trade brings with it the negative aspect that external shocks, economic or otherwise , are very hard-feld in the domestic economy. To some degree, this kind of dependence on foreign trade, tends to relinguish some conrol over the small economy's future growth.

The specification of the behavioral equations is of course guided by economic theory. To this end, I investigated various explanatory variables, the most important being the following.

Real National Income (NI) is certainly a strong explanatory variable in explaining the demand of imported goods. Just like any analysis of demand behavior income will be very significant in setting the overall level of demand . Price flactuations which in this case will be messured by relative import prices (PIMP = Import prices / domestic prices), are expected to affect the demand for imports

negatively. Relative prices as were described above, have a dual effect as follows. Given a rise in relative import prices we can expect a reduction of imports, but also an increase in exports as domestic products become now relatively inexpensive. For this reason a relative price variable will be incorporated into the export section of the foreign sector analysis as well.

Import duties is another variable that ought to be incorporated, since it will add to the cost of imported goods directly. This variable (DIM) is expected to have a negative sign as it significantly adds to the relative price of imported goods as opposed to domestic ones.

The political instability dummy variable will also be introduced, at least in some of the import equations, as it most certainly have influenced the decisions of both consumers and producers.

Specifically with regard to the imports of intermediate and capital goods, I will introduce last year's consumption level as an explanatory variable in order to get the proxy impact of aggregate demand on the level of imports. A vibrant consumption behavior last year will certainly stimulate the import of both capital and intermediate goods.

The credit restraint (CR), which was introduced when dealing with investment earlyer, will be included in explaining the imports of capital goods as well as transport equipment and fuels. The credit restraint (CR=-domestic credit /GDP) was expected previously, to behave as the

opportunity cost of investment. Here too this variable will be a proxy for the impact which the cost of capital will have on investment decisions.

Due to the fact that the level of various imports is affected differently depending on their destination, and also due to the fact that the Cyprus statistics and research department classifies imports this way, I also have disaggregated the import function by economic destination, and specified each category apriori in the following way.

Imports of consumer goods. IMCON (1)

IMCON = F(NI, RPIM, DIM, D)

Imports of intermediate inputs. IMII (2)

IMII = F(NI, RPIM, C_{t-1}, D)

Imports of capital goods. IMCA (3)

IMCA = F(NI, CR, , C_{t-1}, D)

Imports of transport equipment and fuels. IMTF (4)

IMTF = F(NI, CR, D)

NI = Real National Income.

RPIM = Relative Prices of Imports.

DIM = Duties on Imports.

C_{t-1} = Real Consumption of last year.

CR = Credit Restraint (CR=-Domestic Credit/GDP).

D = Political Instability Dummy.

ORIGIN OF GROSS DOMESTIC PRODUCT:

In trying to analyze the supply side of the economy, we are inherently trying to ascertain the contributions of the various inputs toward total output.

Given a relatively fixed amount of land and labor then the most crucial factor input we will concentrate on, will be the actual capital stock. The level of capital stock is positively affected by the level of output or real income and inversely to the user cost of capital. The level of capital stock is of course expected to enter the output equation positively. Unfortunately however such data on capital stock are not available for Cyprus. Instead, the real gross fixed capital formation will used as a close proxy and it will be abbreviated by (IFC), for investment in fixed capital.

Another explanatory variable is generated by the lagged nature of the adjustment process in total output. Recognizing a gap between the desired and the actual output levels, or * that current output affects expectations of permanent output *[1], I will use (GDP_{t-1}) as an explanatory variable. This variable will introduce the dynamic adjustment process into the production function.

In dealing specifically with agricultural output, we must incorporate water availability into the production function. Water is a very crucial factor input , especially

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[1] Dornbush R. and Fischer S. op. cit. P.181.

so being in that part of the world, and it is expected to be a very strong explanatory variable.

Furthermore, when dealing with the tertiary sector (QT), which is strongly comprised of tourism related output, we should take into account the exchange rates. This reasoning is based on the fact that exchange rates have much influence on the annual tourist influx of tourists in any country.

The last explanatory variable under consideration, is again the political instability dummy variable (D). In this section in particular, this variable is expected to be very strong due to the catastrophic effects of the 1974 war, and the loss of about forty percent of the available resources.

Certainly, in trying to formulate a production function for an economy, is best to disaggregate it into its major components. This action will help capture the significance of the various independent variables specific to an industry or an economic sector. To that end I have disaggregated the production function in three categories. The supply of output in the primary, the secondary and the tertiary sectors. Primary production (QP), includes total real agricultural output as well as mining and quarrying. Secondary production (QS), includes total real output in the "industrial" sector, and specifically manufacturing, electricity, gas, water and construction. Tertiary production (QT), includes total real output of the services sector, and specifically trade, restaurants, hotels,

transport and communications, finance, insurance and community services.

The final format of the supply side equations took the following form.

$$GDP = QP + QS + QT \quad (1)$$

$$QP = F(IMLO, QP_{t-1}, W, D) \quad (2)$$

$$QS = F(IMLO, QS_{t-1}, D) \quad (3)$$

$$QT = F(IMLO, QT_{t-1}, ER, D) \quad (4)$$

QP = Real Output in the Primary Sector.

QS = Real Output in the Secondary Sector.

QT = Real output in the Tertiary Sector.

IMLO = Real Investment in Machinery, Land and Other.

QP_{t-1} = Primary Sector Output Lagged One Period.

QS_{t-1} = Secondary Sector Output Lagged One Period.

QT_{t-1} = Tertiary Sector Output Lagged One Period.

W = Water Availability (measured in annual rainfall)

ER = Exchange Rates (against the British Sterling).

D = Political Instability Dummy.

CHAPTER III : MODEL SPECIFICATION - THE NOMINAL SECTOR

1. THE DEMAND FOR MONEY

The demand for money arises from its characteristics, which essentially void the need for a "double coincidence of wants" that would otherwise be required in a regime of barter exchange. To the degree that it minimizes friction in exchange in the product and the factor markets, money minimizes the transactions costs thus aids the economy in its attempt to reach its production possibilities frontier, or help foster and sustain economic activity.

Money serves very well as a unit of account, a store of value and as a standard of deferred payments. Its stronger characteristic however arises from the fact that it is generally accepted as a unit of exchange.

In analyzing the demand for money function we can view the literature from the three most generally accepted points of view. That is the inventory theoretic approach, the asset management approach and the quantity theory approach. Obviously, we need to draw on economic theory with regard to what the most appropriate specification format ought to be, keeping in mind of course the limitations set by both, data availability and the nature of the Cypriot monetary sector. Some of the questions which need to be answered are 1) The degree of disaggregation of the function, 2) The most appropriate explanatory variables, 3) The level of

functional stability and 4) The role of inflationary expectations.

Following these guidelines I will review the literature so as to use it as a guide in the specification of the Cypriot demand for money function later on.

The Keynsian view of the demand for money, essentially grew out of the pre-Chicago quantity theory and is based on the purposes for holding money. Though the money holder will not separate his money holdings such that each component would be directed to satisfying each of the motives, but instead will keep it all in one pool, the disaggregation of the motives becomes evidently important due to their different determinants.

The transactions and precautionary motives give rise to a component for the demand for money (M1), and it emanates from the need to make transactions as well as guard against unforeseen sudden expenditures and or opportunities. Obviously this level of demand is determined by the level of income which gives rise to a level of transactions. The level of (M1) is also determined by the "relative cost"of holding cash, or "depend on the cheapness and reliability of methods of obtaining cash".[1] The third motive is the speculative one (M2), which is characterized by its inverse relationship to the interest rates (which are affected by changes in the money supply through open market operations)

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[1] Keynes J.M., The General Theory of Employment, Interest and Money, Harbinger Edition 1964.

and expectations. Combining M1 and M2 Keynes suggested a demand for money function or total liquidity of the following form.

$$M=M1+M2=L(Y)+L(r)$$

From this analysis Keynes suggests that;

1.Given a change in the money supply, M2 will change due to a change in r and M1 will change due to the change in Y, (based on a change in investment).

2.The role of expectations with regard to the seriousness as well as the future behavior of the policy agent will be crucial as to how M1 and M2 would be organized in the new equilibrium.

3.At very low rates the speculative component M2, will become infinitely elastic thus rendering monetary policy ineffective.

The re-emergence of the Quantity Theory as was stated by Milton Friedman[2], has its routes to the pre-keynsian analysis of Irving Fisher's equation of exchange, which states that the value of nominal income (PY) equals the stock of money (M) multiplied by its velocity (V). Though it was later disproved, the assertion at the time was that in the short-run velocity could be assumed to be a constant,

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[2] milton Friedman,The Quantity Theory Of Money-A Restatement,"in Studies In The Quantity Theory Of Money, University of Chicago press, 1956 pp.3-21

such that a given change in the money supply would directly affect real output or inflation or both.

Friedman in restating the theory, essentially expanded on the analysis and was able to explain the observed changes in the value of money velocity, and re-assert that the demand for money function is a stable one.

This formulation is based on the assertion that "to the ultimate wealth-owning units in the economy, money is one kind of asset, one way of holding wealth. " From this point of view he specifies the demand for money as follows.

$$M=F\ \left(P, r_b-\frac{1}{r_b}\frac{dr_b}{dt}, r_e+\frac{1}{P}\frac{dP}{dt}-\frac{1}{r_e}\frac{dr_e}{dt}, \frac{1}{P}\frac{dP}{dt}; W; \frac{Y}{r}; U\right)$$

And the demand for real balances,

$$\frac{M}{P}=F\ \left(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, W; \frac{Y}{P}; U\right)$$

This formulation states that the demand for real cash balances is a function of some interest rate opportunity cost (in this case r_b =bond yield, r_e=equities yield), the inflation rate (another opportunity cost), the ratio of wealth to income (W), real income($\frac{Y}{P}$) and (U) which can be regarded as tastes with regard to the individual or technology with regard to business.

His conclusions from this analysis is that the demand for money function is "highly stable" with respect to the variables that determine it. Furthermore, the theory asserts that the factors which determine demand are not the same as those which generate the supply for money.

Realizing the measurement problems which arise by 1) deviations from the average trend of the relationship

between the stock of money and the level of prices or nominal income, 2) the lengthy adjustment or impact process from an expansionary or a contractionary adjustment, 3) deviations in the results of deficit financing (borrowing from the public versus printing money), the prescription for policy action the theory concludes,[3] is that which controls inflation or deflation by expanding the stock of money to keep pace with economic expansion. Furthermore, "changes in the growth of money are considered the dominant, not the exclusive determinant of the trend of nominal GNP and the price level. Long-run movements in output are little influenced by changes in the growth rate of money. In the short-run, however, changes in the growth trend of money or pronounced variations around a given trend exert a significant, but temporary, impact on output."[4]

The transactions demand for money as was analyzed by William Baumol, follows an inventory analysis approach in which " cash is held because it can be given up at the appropriate moment, serving then as its possessors part of the bargain in an exchange. "[5] So, this component of demand deals with the everyday transactions on the part of the

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[3] Milton Friedman,"Money: Quantity Theory", in Jonas Prager Monetary Economics. Random House, 1971 pp 196-203

[4] Leonall C. Anderson, "The state of the monetarist debate," in R. Thorn Monetary Theory and Policy, Random House 1976 P.269

[5] Baumol W.J., "The Transactions Demand For Cash: An Inventory Theoretic Approach", Quarterly Journal of Economics, Nov. 1952 PP545-556.

consumer and producer. The analysis in this article, essentially deals with the minimization of interest opportunity cost (i) (from holding too much cash), and also, with minimizing the transactions cost or "broker's fee" (b) which arises from too many transfers of money from interest bearing accounts to cash. This formulation suggests that the demand for cash balances is inversely related to the level of interest rates and positively to the level of transaction costs. This is shown by the square root equation, where (T) is the value of transactions.

$$C=\frac{\sqrt{2bT}}{i}$$

From this equation Baumol suggests that "the rational individual will, given the price level, demand cash in proportion to the square root of the value of his transactions". Also, the demand for cash (C) is positively related to the transactions costs and negatively to the interest rate. Furthermore, this result raises two questions. The first is, What would be the appropriate measure of the level of transactions (income or wealth) and the second, are there any scale effects in the demand for money.

The work which followed, added to the square root formulation by incorporating a less liquid component of money in the demand for money function. The fact that these investment or asset balances are less likely to change in

their form (less liquid) very often, minimizes the effect of the transactions cost consideration. Also, this highlights the desire on the part of the investor to hold a portion of his assets in cash as a result of risk-aversion to potential losses from other assets. James Tobin[6] identifies two sources for liquidity preference in portfolio management. "The first is inelasticity of expectations of future interest rates. The second is ucertainty about the future of interest rates". This analysis draws from the consept of diversification as a hedge against risk and it explains the "speculative component"[7] of the demand for money. This is generated on the part of the investor, based on the return from other assets (money being one of them in this case), the risk involved in other assets, and the level of risk aversion on the part of the investor. Furthermore, this analysis generates the familiar interest elastic demand function, with this elasticity becoming very large as the interest rate drops to very low levels.

The perspectives summarized above, were very helpful to me in tying to specify the money demand equation for Cyprus. They were very helpful from the point of view of establishing the degree of disaggregation which ought to be followed, as well as to what the appropriate explanatory variables should be in each one of them.

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[6] James Tobin, "Liquidity Preference as a behavior toward risk", Review of Economic Studies , feb. 1958 PP 65-86

[7] Keynes J.M. op.cit. PP194-209

With regard to the question of disaggregation I came to the conclusion that at the very least I should use two equations to explain the transactions/precautionary and the speculative aspects of the demand for money respectively. The work by Meltser (1963)[8] also suggests disaggregation, though not so directly, when dealing with the interest elasticity of demand. He suggests that the more general the specification is, the weaker would be the apparent interest effect. "This result is not surprising since the more inclusive the definition of money, the more likely that there would be positive and negative responses to a relative rise in interest rates. " The same conclusion was arrived at, also by Stephen Goldfeld (1973)[9] who, more explicitly asserts that "as far as the money demand equation is conserned, more rather than less disaggregation appears to be desirable".

Drawing from all of the above analysis the demand for money in Cyprus is now disaggregated into two equations.

$$TDM=F\left(\frac{Y}{P},\ i_t,\ TDM_{t-1},\ dlogP^*,\ D\right) \qquad (1)$$

$$ADM=\left(\frac{Y}{P}, i_t, ADM_{t-1}, dlogP^*, D\right) \qquad (2)$$

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[8] Meltser Alan H., "The Demand For Money:The Evidence From The Time Series". Vol. LXXF No 3, June 1963.

[9] Stephen Goldfeld, " The Demand For Money Revisited", Brookings Paper on Economic Activity, 3:1973 P. 598

- TDM=Transactions Demand for money (real-terms $\frac{M}{P}$) limited to cash and checking.
- ADM=Asset demand for money (real-Terms $\frac{M_A}{P}$) limited to savings and time deposits.
- $\frac{Y}{P}$ =Real Income =$\frac{GNP}{P}$
- i_s =Interest on savings accounts
- i_t =Interest on time deposits
- D =Political instability Dummy
- $dlogP^*$=Expected inflation rate $dlogP^*=dlogP_{t-1}$
- $dlogP_{t-1}$=Inflation rate lagged one year
- TDM_{t-1}= TDM lagged one year
- ADM_{t-1}= ADM lagged one year.

The first equation (TDM) takes into account primary liquidity or the currency held by the public plus demand deposits. On theoretical grounds, this will take into account the transactions and at least a portion of the precautionary component of the motives for the demand for money. Unfortunately, data on transactions costs are not available. Therefore, the impact of total transactions is expected to be captured by the level of real income ($\frac{Y}{P}$). Interest on savings deposits [10] is incorporated here, being the closest interest bearing, less liquid alternative way of holding money. It is expected a priori to carry a negative sign, signifying the interest opportunity cost of holding (TDM). At this point I must mention that I am well aware of the very limited variability of this explanatory variable.[11]

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[10] Interest rates on minimum monthly balances.

[11] Department of statistics and research. Ministry of finance. Republic of Cyprus. Statistical abstract 1990.

Given this reality, a result of no significance or with the wrong sign would not really surprise me. This invariability is brought about through institutional constraints within the Cypriot monetary and governmental structure. Should this occur I will make use of an interest rate proxy as was already analyzed when dealing with the investment function. The lagged transactions demand for money (TDM_{t-1}) is a Koyck-type lagged-adjustment formulation. Though the fixed nature of the duration of the adjustment process might be questionable, it is used here because it is a convenient specification.[12] The introduction of this lag variable signifies the delay in the adjustment process and also, introduces a form of dynamism in the specification.

The expected rate of inflation (dlogP*) is measured by a one-year-lagged rate of inflation. It is incorporated into the equation because it is simply another cost of holding money. as all nominal variables are proportionally affected by it. This is especially true in the case of developing economies where the financial markets are not fully developed, so that the interest rate mechanism can more adequately explain the cost of holding money.[13] Certainly,

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[12] Stephen M Goldfeld, op.cit. P 206

[13] 1.Joseph O. Adekunle, " The Demand For Money: Evidence From Developed and Less Developed Economies" IMF Stuff Papers, Vol 15 No 2 , 1968.

2. Chorng-huey Wong, " Demand for Money in Developing Countries," Journal of Monetary Economics, Vol.3 No.1 Jan. 1977.

3.Andrew D. Crocket and Owen J. Evans, "Demand for Money in Middle Eastern Countries," IMF Staff Papers Vol.27

from the basic characteristics of money, that of being a store of value, a unit of account and a standard of differed payments we can see the depreciating effect of inflation on the desire to hold cash balances. Therefore expected inflation will cause people to substitute money for real assets.

The political instability dummy variable is expected to carry a positive coefficient, and is analogous to a move toward more liquidity as a response to an increased level of risk.

The second equation describes the asset demand for money (ADM), and it will explain the demand for savings and time deposits. This component deals more with the speculative motive for holding money and it is treated as an asset within an owner's portfolio. The only variation from the previous equation (TDM), is the interest rate used, which in this case, will be the interest paid on time deposits.

No.3, 1980.

2. THE SUPPLY OF MONEY

In dealing with the supply of money we are faced primarily, with two questions. The first arises from the degree of endogeneity of the money supply process, especially in the case of Cyprus. The second one is the identification of the appropriate explanatory variables.

Following the evidence from the work of Andersen and Jordan[14](1968), and more recently of moore[15](1988), Pollin[16](1991) and Palley[17](1991) and also from the banking\monetary characteristics of Cyprus, I felt that treating the money supply as endogenous to the system will enhance the complete model. Especially in a small open economy like the one in Cyprus, the money supply will also be affected by factors beyond the control of the monetary authorities both domestic and foreign.

In reviewing the literature, it became evident that the process is dependent upon the behavior of the central government, the banks, the public and other external forces. Specifically, on the monetary base or high power

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[14] Leonal Anderson and Jerry Jordan, "The monetary base - Explanation and Analytical Uses", Federal Reserve Bank of St. Lious vol 50, 1968.

[15] Basil J. Moore, "The endogenous money supply" Journal of Post Keynesian Economics, 1988.

[16] Pollin Robert, "Two Theories of Money Supply Endogeneity", Journal of Post Keynesian Economics, Spring 1991.

[17] Palley Thomas, The Endogenous Money Supply: Consensus and Disagreement", Journal of Post Keynesian Economics, Spring 1991.

money, the reserve/deposit ratio, the currency /deposit ratio and foreign assets.

Brunner and Meltzer[18] based their analysis on the "banks response to free and surplus reserves" and concluded that the supply is affected as follows.

$$dM = MS + gdB$$

This equation suggests two sources of impact on the money supply. The first one arises directly from changes in the monetary base, as it adds directly to the money stock. The second component, is comprised by a money multiplier (m), which is a function primarily of the minimum reserve requirements (L), and "currency spillover" rates to other banks and the level of surplus reserves (s) generated.

$$s = adB+dL-adC+adT+adE-dV$$

Surplus reserves itself is a function of the monetary base (B), the reserve requirements (L), the public currency holdings (C), the time/total deposit allocation (T), interbank deposits (E) and the banks cash/total asset allocation (V).

This analysis emphasizes the effects of the monetary base, the currency- deposit ratio and the reserve-deposit ratio on the supply of money, while the interest rate effect is implied through the behavior of the public and the banks.

Other work on the subject made more explicit reference to interest rates, both in terms of returns on loans and

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[18] Brunner karl and Meltzer Allan, "Some futher investigations of the Demand and Supply functions for money", Journal of Finance, May 1964. pp. 242-256.

also of the cost of borrowing from the point of view of the commercial banks (ie Ronald Teigen[19]).

In the case of Cyprus, we are faced with a situation which limits the proper workings of the monetary sector and also, most probably, tends to allocate investment funds non-optimally. This situation is caused by two reasons. The first one is generated by the set ceilings on lending rates and the second arises due to the non-existence of a well developed capital market.

In view of the Cypriot reality, the analysis in this paper will focus on the actions of various economic agents which could potentially affect the money supply.

The level of GNP will identify the role of the monetary authorities in expanding the money supply in response to economic growth. Government spending (G) and deficit financing (DF) are included in order to identify the degree of monetization of the public sector deficits. Foreign assets (FA) aim to capture the external influences. The liquidity ratio (LR) and bank credit (BC) are incorporated since they are the major sources of control on the part of the Central Bank and the banking system. Finally, I will incorporate the role of inflation (P) and that of political instability (D) .

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[19] Teigen Ronald, "Demand and Supply Function for Money in the United States", Econometrica vol. 32, No. 4 , 1964.

The final specification of the supply of money function is as follows.

$$MS = f(GNP, G, DF, FA, LR, BC, P, D)$$

CHAPTER IV: MODEL SPECIFICATION - SOURCES OF INSTABILITY

1. UNEMPLOYMENT

Certainly no study on stabilization policy would be quite complete without the inclusion of unemployment and inflation as endogenous variables. The macro-consequences of unemployment, primarily due to the loss of output, concomitant with the micro consequences such as loss of output and the resulting social unrest, possible delinquency and psychological damages deem unemployment a primary target for economic policy. The reduction of the GNP Gap, or the difference between full employment output and actual output is the subject matter of economic stabilization. To this end, unemployment will be one of the variables analyzed in this paper and it will be endogenously befined.

$$U = F(G, TXD, M, TDC, D)$$

U = The level of unemployment.
G = Real government spending
TXD = Real direct taxes.
M = Real stock of money supply.
TDC = Total real domestic credit.
D = Political instability dummy.
DF = Real government budget deficit,(in lieu of G)

Government spending (G) and taxation (TX) are the tools available to the central government which can be used to either stimulate or dampen aggregate demand. Also, the use of tax incentives is a means to affect aggregate supply. Direct taxes are included here, in order to observe the degree of the dampening effect which taxes have on aggregate demand by reducing the level of disposable income and thus consumption and also, by reducing the level of total private investment. The primary source of direct tax revenues in Cyprus, are personal income tax as well as corporate profits tax. Therefore, the structural character of direct taxation, renders it a very powerful tool for both fiscal as well as supply side stabilization policy. Though the study does not explicitly deal with the dead-weight loss due to taxation, it is nevertheless taken into consideration implicitly since the end result will generate the net marginal impact of taxes toward the unemployment level.

From the budget deficit equation reviewed earlier,

(DF = DB + FB + OTH where DF = Deficit financing, DB = Domestic borrowing, FB = Foreign borrowing), it would be interesting to examine the impact which foreign borrowing has on real income, output, the level of employment and the rate of inflation. From this point of view I will investigate an unemployment equation of the following form:

$$U = F(DB, FB, TXD, M, TDC, D)$$

This specification form views the impact of government spending from the point of view of its financing source, either taxes or borrowing.

The stock of the real money supply (M), is of course a major policy tool available to the central bank, in order to manipulate the level of aggregate demand. The pegging of interest rates (as was analyzed when dealing with investment demand), limits of course the effectiveness of monetary policy. The proper control of money nevertheless, has much to do with moving the production and employment levels toward the full employment equilibrium which is compatible with price stability. The level of money supply or total liquidity is expected a priori to affect the level of unemployment negatively, at least in the short run. Its role vis-a-vis the aggregate demand, is one of either accommodating nominally the real growth rate of the economy or to serve as a policy tool against inflation or recession . This is accomplished either by changing the real cost of investment via the reduction of the equilibrium rate of interest, by fostering the expansion of bank credit and by stimulating consumption via perceived changes in the real income levels.

Total domestic credit (TDC), as was already analyzed, is expected to be a significant explanatory variable in the unemployment equation. The introduction of this variable I

believe, will help identify the role for supply management in stabilization policy for the case of Cyprus.

The last variable here, is again the political instability dummy which is expected to enter the unemployment equation positively.

2. INFLATION

Inflation is defined as the annual increase in the average level of prices of goods and services or alternatively as the as the percentage rate of growth of the price level. It is defined as an endogenously generated variable in this study due to its adverse effects on real output and income, due to its redistributive effects on income and wealth and also because of the social tensions and despair it can potentially generate. For the above reasons it would be advantageous from the point of view of the policy maker to ascertain the magnitude and origin of inflation both domestic and external.

$$P = F(G, TXD, M, RPIM, EX, D)$$

P = The inflation rate.

G = Real government spending.

TXD = Real direct taxes.

M = The real stock of money.

RPIM = the relative prices of imports.

EX = The exchange rate.

D = The political instability dummy.

Government spending enters the analysis since by definition it affects aggregate demand directly. Any increase in (G) will have a direct impact on output and employment if at the time of policy action output falls short of full employment. If however an increase in (G) is associated with full employment, such action will cause prices and nominal wages to rise leaving real variables unaffected. The impact of such government spending will be larger if it is financed by a bigger proportion through the creation of high power money as opposed to either borrowing from the public or increasing taxes.

Direct taxation (TXD), is similarly a fiscal policy tool available to the central government. While it does not directly enter the aggregate demand equation, it nevertheless affects it via the level of disposable income and thus consumption. Furthermore, taxation has negative effects on the supply of output by increasing the per unit cost of output thus reducing it at all price levels. Taxes therefor enter the inflation equation because of their properties in being able to affect aggregate demand and supply.

The money supply (M), as was mentioned when dealing with the specification of the unemployment equation, is a primary tool of monetary policy available in Cyprus.

The exchange rate (EX), is included here in order to capture two effects. The first one is due to the stimulating effect that a favorable rate will have on tourism. Tourism exerts excessive pressure on aggregate demand especially so during the summer months. It is worth mentioning that tourism in Cyprus has mushroomed into a major industry , surpassing the one million mark. The second effect is the influx of foreign currency in the country during favorable exchange rates. Essentially, the exchange rate variable will shed some light on the effect which external forces have on the inflation level in Cyprus.

The last items studied here are the relative prices of imports (RPIM) and the political instability dummy (D). (RPIM) is measured by the ratio of price indexes of imports to the domestic CPI. I hope that this explanatory variable together with (EX), will help explain the degree to which inflation in Cyprus is externally generated.

3.THE PHILLIPS CURVE:

The phillips curve arises from a historical relationship (inverse) between the unemployment rate and the rate of inflation. Phillips first suggested it in his study of changes in money wages and unemployment in England between 1826-1957[1], which suggested a trade-off between the two undesirable economic phenomena. If in fact this were to be true, that low unemployment is associated with high inflation and vice versa, then a government is only faced with making a choice with regard to what combination of the two to aim for.

The implications of the theory are indeed controversial. The biggest criticism comes from Milton Friedman (1968)[2]. Friedman postulated the " natural rate of unemployment " hypothesis, which suggests that given the institutional setup of an economy there appears to be an unemployment rate which is compatible to price stability. Any effort to manipulate aggregate demand, and specifically through the money supply, will lead in the long run, to price level changes only, leaving real variables unaffected. This point of view suggests that in the long-run, monetary and or fiscal policy should only be limited in accommodating

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[1] Phillips A.W., "The Relationship between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1826-1957", Economica, November 1958.

[2] Friedman Milton, " The Role of Monetary Policy ", American Economic Review, March 1968.

the real growth rate of the economy, and that beyond that point, there would be no scope in trying to reduce the unemployment rate below its natural one.

The " natural rate of unemployment can vary over time and under different circumstances. It is not a magical flash point below which inflation surges and above which it drops precipitously".[3] The factors that affect unemployment are to be found in the institutional organization of the economy and primarily in the labor market. Some of these structural items which affect the natural rate are, the labor force composition, unemployment insurance, government regulation, unions, the welfare system, minimum wage regulation, education, information availability, education and training. This kind of supply side effects on unemployment is still another means to discount the possibility of any long-run trade-off opportunities. All these suggest that unless these structural impediments to employment are removed, the natural rate itself will increase, and that any expansionary demand policies will fail in reducing the unemployment rate.

The basis of the controversy rests on the degree of accuracy to which economic agents forecast the rate of inflation. If the inflation rate is only partially anticipated, as could probably be the case in the short-run rather than the long-run, then unemployment can potentially be affected by the reduction in the real wages of factor

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[3] Blinder S. Alan, " Balancing the Equation Between Inflation and Joblessness ", Business Week , Feb. 15 1988.

inputs, thus increasing output and employment. If however, the inflation rate is fully anticipated in such a way that all contractual agreements take it into consideration, and account for it, then any policy to stimulate demand will further increase the price level leaving the unemployment level equal to its natural rate.

To show this result I will use a simple model, adapted from Gordon's article (1989)[4].

$$P_t = \alpha P^* - \beta(U_t - U_t^*)$$

P_t and U_t are the inflation rate and unemployment rate. P^* is is the expected inflation rat is the natural rate of unemployment , $U_t^* = \Sigma \frac{U_t}{n}$.

There is no inherent reason why in formulating the inflation expectations one would take into consideration only last years inflation rate. In fact, a more lagged adaptive expectations formulation, taking into consideration many past years, as well as any other information about inflation would be more preferable. for the purpose of this analysis however, we will set $P^* = P_{t-1}$, or that the expected rate of inflation is in fact the one experienced last year. The degree to which inflationary expectations contribute to the formulation of the actual inflation rate, or alternatively, the degree to which we adjust based on those inflationary expectations is measured by α.

So, If $\alpha < 1$

$$P_t - \alpha P_{t-1} = -\beta(U - U^*)$$

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[4] Gordon J.Robert , " Hysteresis in History: Was There Ever a Phillips Curve?", American Economic Review, may 1989.

Then, in this case , even if inflation is fully anticipated but not fully adjusted for, there would be a negative effect on the unemployment rate.

If $\alpha=1$, from
$P_t - P_{t-1} = -\beta(U - U^*)$

Then we must rely on inflation rates which are not anticipated by the public, if we are to hope for any effect on the level of unemployment.

So, in the short run we have two sources that might give rise to the trade-off opportunities between inflation and unemployment. The first one arises from the way inflationary expectations are formulated, and the second from the degree of adjustment the public can make given those expectations.

In the long-run however, the rate of inflation will most likely be fully anticipated and adjusted for in all contractual agreements.

$P_t = P_{t-1}, \alpha = 1, U=U^* - \frac{1-\alpha}{\beta} P_t$
or, $U=U^*$

This result suggests that there is no long-run scope for macropolicy, or as Phelps put it, " a change of inflation policy can bring only a temporary variation of output and employment, and, further, the prolonged maintenance of an

unemployment rate from the natural level must eventually bring either rising inflation or growing deflation in an explosive fashion."[5]

The diagram on page ( )[6], shows that historically for the United States in the short-run, there have been trade-off opportunities, though diminishing as evidenced by the shifting as well as the rotation of the curve upward and to the right. In other countries as well, the evidence suggests only limited opportunities for expansionary policy in order to affect output and employment, especially so in the long-run.[7] Furthermore, a phillips relation is not the same in all countries, and could be the result of microeconomic behavior especially so in the labor market. Labor contracts, information costs and job search, the degree of unionization and market structure are but a few of the determinants of a potential phillips relationship and how it changes over time. Holt in describing the issue writes; "such a stable relation can occur as the consequence of " frictions " in the job search process. Clearly the existence or nonexistence of such a relation cannot be settled by simple a priori arguments, but the conclusion on the issue must rest on knowledge about the economy in

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[5] Phelps S. Edmond, Inflation Policy and Unemployment Theory., W.W. Norton 1972 P.35.

[6] U.S. President's Report 1982.

[7] 1. Wallis K. F., Models of the U.K. Economy. 1988.
2.Gordon R.S. op. cit.

question ".[8]

There is certainly a widespread agreement that in the long run there is no real potential for deficit financing in order to expand the level of output and employment. In the short run, depending on the structure of the economy, there might be an opportunity during which it can be used as a stimulus tool, but always care is recommended. Especially so in the case of developing economies " we also emphasize that the scope for deficit finance as an engine of economic development is extremely limited and extraordinarily hazardous. When overdone, inflationary finance acquires a dynamic of its own that can set back the development effort by a decade or more".[9]

With regard to the present study, I will examine for the existence of a Phillips relationship within the Cypriot economic setup. The potential for this relationship will be specified as follows.

$$P = F(P_{t-1}, P_{t-2}, DU)$$

P = The inflation rate.

P_{t-1}= The inflation rate lagged one year.

P_{t-2}= The inflation rate lagged two years.

DU = (U - U*)

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[8] Holt C. Charles, " How Can the Phillips Curve be Moved to Reduce both Inflation and Unemployment ?" in Microeconomic Foundations of Employment and Inflation Theory W.W. Norton 1970 PP.252-53

[9] Dornbusch R. and Reynoso A., " Financial Factors in Economic Development " American Economic Review, may 1989.

U = The unemployment rate.

U* = The natural rate of unemployment.

U* = $\Sigma \frac{U_i}{n}$, i= the number of observation periods.[10]

[10] In measuring the mean unemployment rate as a proxy for the natural rate, care will be taken to eliminate any abnormal behavior due to external shocks.

CHAPTER V: SINGLE EQUATION ESTIMATION

1. THE COMPLETE MODEL

Consumption

$$CON = a1 + b1Y_d + c1Y_{d-1} + d1M2 + e1D \quad (1)$$

Investment

$$ID = a2 + b2DY + c2P_{-1} + d2M2 + e2ID_{-1} + f2D \quad (2)$$
$$IMLO = a3 + b3DY + c3P_{-1} + d3CR + e3CT + f3ITC + g3D \quad (3)$$

Exports

$$EXAG = a4 + b4IMLO + c4WA + d4EXAG_{-1} + e4D \quad (4)$$
$$EXMA = a5 + b5IMLO + c5RPEX + d5EXMA_{-1} + e5D \quad (5)$$
$$EXMI = a6 + b6IMLO + c6EXMI_{-1} + d6D \quad (6)$$

Imports

$$IMCO = a7 + b7NI + c7RPIM + d7DIM + e7D \quad (7)$$
$$IMII = a8 + b8NI + c8RPIM + d8CON_{-1} + e8D \quad (8)$$
$$IMCA = a9 + b9NI + c9CR + d9CON_{-1} + e9D \quad (9)$$
$$IMTF = a10 + b10NI + c10CR + d10D \quad (10)$$

Taxation

$$TXD = a11 + b11NI + d11D \quad (11)$$
$$TXI = a12 + b12NI + c12IMCO + d12CIG + e12D \quad (12)$$

Supply

$$QP = a13 + b13IMLO + c13QP_{-1} + d13WA + e13D \quad (13)$$
$$QS = a14 + b14IMLO + c14QS_{-1} + d14D \quad (14)$$
$$QT = a15 + b15IMLO + c15QT_{-1} + d15EXR + e15D \quad (15)$$

Demand for money

$$TDM = a16 + b16NI + c16i_l + d16TDM_{-1} + e16P_{-1} + f16D \quad (16)$$
$$ADM = a17 + b17NI + c17i_l + d17ADM_{-1} + e17P_{-1} + F17D \quad (17)$$

Supply of money

$$MS = a18 + b18DF + c18CR + d18FA + e18D \quad (18)$$

Unemployment

$$U = a19 + b19G + c19TXD + d19M + e19TDC + f19D \quad (19)$$

Inflation

$$P = b20G + c20TXD + d20M + e20RPIM + f20EXR + g20D \quad (20)$$

The Phillips Curve

$$P = a21 + b21P_{t-1} + c21P_{t-2} + d21DU$$

IDENTITIES

$$GNP = CON + IFC + G + EX + IM + SE \quad (1)$$

$$IFC = ID + IMLO \quad (2)$$

$$G = TX - DF + NTR + GRNT \quad (3)$$

$$TX = TXD + TXI \quad (4)$$

$$DF = DB + FB + \quad (5)$$

$$EX = EXAG + EXMA + EXMI \quad (6)$$

$$IM = IMCO + IMII + IMCA + IMTF \quad (7)$$

$$DM = TDM + ADM \quad (8)$$

$$M = M1 + M2 \quad (9)$$

2. THE CURRENT VARIABLES:

i_s = Interest paid on Savings.
i_t = Interest paid on Time Deposits.

ADM = Asset Demand for Money (M2).

BC= Bank credit.

CIG = Cigarette Production.

D= A political instability dummy variable.

DB= domestic borrowing.

DF = Real government budget deficit.

DIM = Duties on Imports.

DU = (U - U*)

DY = Change in the Real gross domestic product.

EX = Total Exports

EXAG = Real Agricultural Exports.

EXMA = Real manufactured Exports.

EXMI = Real mining Exports.

EXR = Exchange Rates (against the British Sterling).

EPI = Export Price Index

FA = Real Foreign Assets.

FB = Foreign borrowing.

G = Real government spending.

GDP = Gross Domestic Product

GNP = Gross National Product

GRNT = Grants

GS = Goverment subsities

ID = Real Investment in Dwellings

IFC = Gross domestic Fixed Capital Formation

IM = Total Imports

IMCO = Imports of consumer goods.

IMII = Imports of intermediate inputs.

IMCA = Imports of capital goods.

IMLO = Real Investment in Machinery Land and Other.

IMTF = Imports of transport equipment and fuels.

NI = Real National Income.

IPI = Import price Index

ITC = Investment tax credit.

LFP = Labor force in th Primary sector

M1 = Real Currency and Demand Deposits.

M2 = Real savings and time deposits.

M2 = Secondary liquidity - a proxy for the level of wealth.

MS = Real Money Supply.
NI = Real Natinal Income.
NTR = Non-tax Revenues.
OTH= Other, including grands and central bank profits.

P = The inflation rate.

QP = Real Output in the Primary Sector.

QS = Real Output in the Secondary Sector.

QT = Real output in the Tertiary Sector.

RPEX = Relative Export Prices.

RPIM = the relative prices of imports.

TCON = Real consumption expenditures.

CR= Credit restraint - a proxy for the opportunity cost of investment.

(CR= - Domestic Credit/GNP).

CT= Corporate taxes.

TDC = Total real domestic credit.

TDM = Transactions Demand for Money (M1).

TOT = Terms of Trade.

TRP= Transfer Payments.

TX = Total Tax Receipts.

TXD = Real direct taxes.

TXI = Real Indirect Taxes.

U = The unemployment rate.

U*= The natural rate of unemployment.

WA = Water Availability.(measured in annual rainfall).

YD = Real disposable income.

THE LAGGED ENDOGENOUS VARIABLES

(Please note that L = t-1)

ADML = Asset Demand for Money lagged one Period.

CONL = Real Consumption of last year.

EXAGL = Lagged Agricultural Exports.

EXMAL = Lagged Manufactured Exports.

EXMIL = Lagged Mineral Exports.

IDL = Investment in Dwellings lagged one period.

PL = Inflation rate lagged one year.

PL2 = Inflation rate lagged two years.

QPL = Primary Sector Output Lagged One Period.

QSL = Secondary Sector Output Lagged One Period.

QTL = Tertiary Sector Output Lagged One Period.

TDML = Transactions Demand for Money lagged one Period

YdL = Real disposable income with a one year lag.

3. ESTIMATION RESULTS:

In the previous chapter I have analyzed the theoretical justification of the behavioral equations which have been introduced. There are twenty-nine structural equations in all, of which fourteen (14) deal with the real sector, three (3) with the nominal sector, three (3) with the areas of instability of inflation and unemployment and nine (9) identities. This specification was guided by the conventional approach of analysis on the macro level, and specifically I have dealt with aggregate demand and supply, with the nominal sector and with the primary areas of instability. It should be mentioned at this point that during the empirical work I have experimented with additional explanatory variables besides the ones already introduced in the theoretical section. Those results will also be presented henceforth.

The aim of this chapter is to estimate and test the structural equations of the model and present the results. The method of estimation used were both ordinary least squares (OLS), as well as two-stage least squares (2SLS) as will be shown below.

The period of the exercise were the years of 1960-1989. In the absence of data in shorter intervals I used annual data in real terms with 1980 being the base year. The software employed was RATS (Regression analysis of Time Series)[1].

CONSUMPTION (TCON)

EQ #	INDEPENDENT VARIABLES							R2	DW	Meth. of Est
	Const	Yd	Yd1	YDAV	M2	MS	P1	D		
1.	103625	.37	.338		.0034		-30487	.98	.51	OLS
	(7.634)	(1.89)	(1.75)		(.071)		(-1.67)			
2.	113135		.521		.17	2252	-37442	.99	1.0	OLS
	(7.42)		(4.71)		(1.45)	(1.78)	(-2.86)			
3.	89730		.758		-.08	4305	-41425	.99	1.	OLS
	(7.48)		(18.63)		(-1.65)	(3.03)	(-3.15)			
4.	123807	.363	.290		.049		-40305	.99	1.1	2SLS
	(9.61)	(1.94)	(1.53)		(.845)		(-2.37)			
5.	112052		.708		-.036	2814	-48269	.99	1.5	2SLS
	(9.44)		(15.77)		(-.67)	(2.02)	(-4.28)			
6.	125439		.565		.11	1736	-46191	.99	1.7	2SLS
	(9.32)		(5.32)		(1.11)	(1.6)	(-2.07)			

[1] Var Econometrics PC RATS Version 3.0 Evaston, Il 60201.

The first set of results deal with the consumption function of Cyprus, and the different combinations of the various assumed explanatory variables. All the equations have characteristically high (R^2) which suggests a strong goodness of fit of the regression equation. A high coefficient of determination indicates that any changes of the depended variable can be attributed to changes of the incorporated independent variables, or rather, are caused by those variations. The second criterion to be used here and throughout the analysis are the t-ratio. For all the regressions I have used twenty-nine observations and the equations shown here, have twenty-four degrees of freedom. Given this information we can accept the estimated coefficient as statistically significant at the five percent level , when the t-ratio has an absolute value of 1.71.

The results suggest that the marginal propensity to consume out current disposable income is about thirty-seven percent while from lagged income is an additional thirty percent (eq.# 1, 4). When experimenting with the average of the two, I get results very similar to their cumulative effect. The cumulative effect of present and past income on consumption is in essence the long-run marginal propensity to consume (LRMPC) which in this case is about seventy percent (70%). This figure is very realistic with regard to the Cypriot economy, and is supported by the fact that for the last fifteen years the gross domestic fixed capital

formation though declining, has been around the thirty percent (30%) mark.[2]

The fact however that the long-run domestic savings has been on the decline signifies the degree to which excessive consumerism is developing in Cyprus, and raises the question whether the economy will be able to sustain the impressive rate of growth attained thus far. Furthermore, this must alert us to the dangers associated with the increasing dependence on external financing.

The question about the possibility of a wealth effect in the consumption function in Cyprus was rendered as negative by the results. All six equations shown here, have statistically insignificant results. With regard to money illusion, the result is that indeed an expansion of the money supply will increase consumption by about fifteen percent. This result, even though it is statistically significant at the seven percent level, it nevertheless alerts us to its existence. Please remember that all data used were in real terms fixed at the 1980 prices.

The last two variables under examination were the effects of expected inflation and those of political instability on the level of consumption. Both of these variables are statistically significant and appear to influence consumption as expected. Anticipated inflation stimulates consumption by about 2.5 million pounds per

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[2] Ministry of finance, Statistical Abstract # 35 & 36 1991

percentage point, while political instability has serious negative effects on consumption especially in the area of durable goods.

INVESTMENT

The section on investment is the second one to investigate, and to do so I have divided it into two areas. The first area deals with investment in dwellings and the second with all other investments. I have followed this formulation in part because the statistics department of the ministry of finance reports data in this fashion, and also due to the fact that housing in Cyprus represents more than just the construction of homes. Instead, in the absence of capital markets, housing becomes a secure store of wealth for the Cypriots, and a major status symbol. A German visitor has recently and correctly stated that " the Cypriots eat as if it is their last meal and build homes as if they will live for ever". From this point of view, I felt that investment in housing is indeed distinctly unique and thus should be treated separately.

The results on investment in dwellings are reported in the next page, and they suggest that construction in housing follows a certain trend (ID1 = ID lagged one year) and is affected positively by the level of GNP as well as the level of expected inflation (P1). Bank credit (BC), appears to have a very small impact on housing. This appears to be the case probably due to the fact that very little credit is

channeled toward housing, thus making private sources the primary finance source for the construction of homes.

DEPENDED VARIABLE : Investment In Dwellings (ID)

EQ #	INDEPENDENT VARIABLES							R2	D.W	Meth. of Est.
	Constant	DY	BC	PI	M2	IDI	DGNP D			
1.		.0003	.896	0000	.859		1.775	.93	1.74	OLS
		(3.66)	(1.21)	(-.37)	(5.59)		(.303)			
2.			1. 43	.00004	.78	.06		.96	2.28	OLS
			(2.41)	(2.68)	(7.86)	(1.11)				
3.		.00003	1.50		.75			.96	1.87	OLS
		(2.644)	(2.84)		(7.36)					
4.			.95	-.00001	.15	.00028		.93	1.80	2-SLS
			(1.34)	(-.55)	(6.02)	(4.014)				
5.		.0003	.91	0.0	.864			.93	1.73	2-SLS
		(3.96)	(1.27)	(-.37)	(5.81)					

Again, please note that the R2 are reported on the right, and the t-ratios under every estimate (in parenthesis).

DEPENDED VARIABLE :Investment in Machinery Land Other (IMLO)

EQ #	INDEPENDENT VARIABLES							R2	D.W	Meth. of Est.
	Constant	GNP	IMLO1	P1	CR	GS	D			
1.		.122	.497	1586	58829	-.118	18018	.82	1.80	OLS
		(2.46)	(2.91)	(1.09)	(1.19)	(-.14)	(1.70)			
2.	49072	.179		3441	132057	.243	17937	.87	1.74	OLS
	(4.54)	(5.58)		(3.04)	(3.04)	(.3 3)	(2.09)			
3.	38574	.148	.261	2849	120102		12714	.88	2.16	OLS
	(3.27)	(4.75)	(1.71)	(2.68)	(2.91)		(I.44)			
4.	40524	.16	.240	3120	13494		13658	.88	2.15	2-SLS
	(3.06)	(3.43)	(1.37)	(2.28)	(2.18)		(1.43)			

In the case of investment in (IMLO) machinery, land and other, there were no surprises. (IMLO) is about fifteen percent of GNP (higher when dealing with GDP), and it follows a trend as is indicated by its own lagged value (IMLO1). The opportunity cost of investment is measured here by two proxies. The need for proxies arises as was already explained, by the fact that in Cyprus there is an institutional ceiling on lending rates of nine percent. This

reality, besides the fact that it jams the interest rate mechanism, as a vehicle for stabilization policy by the monetary authorities, it also makes possible the misallocation of investment resources by making use of the existing rationing scheme. The first one is the expected level of inflation and is measured by the lagged inflation rate (Pl). The second one is credit rationing (CR), Which actually serves as a credit restraint (CR=BC/GDP). My results suggest that an increase of the expected rate of inflation, (Pl is here used as a proxy for the anticipated inflation rate of inflation), by one percentage point will stimulate investment by about thirty million pounds. With regard to the credit restraint ratio, I can say that it reflects the fast growth rate of the economy, and the need for more credit in order for it to maintain the present expansion rate.

The results on government subsidies (GS), which I hoped would serve as a proxy for stimulating supply side government actions in general, and for investment tax incentives in particular, did not yield unfortunately, statistically significant results. The political instability dummy variable, simply re-states the fact that the Cypriot economy rushed to rebuild the capital base damaged by the war.

The last variable under examination is the political instability dummy variable.

EXPORTS

In this section I will review the results of the three export equations. As was already mentioned this section was divided into three areas by production origin, and which are exports of agricultural products, of manufacturing and of minerals.

DEPENDED VARIABLE : EXPORTS - Agricultural products (EXAG)

EQ #	INDEPENDENT VARIABLES						R2	D.W	Meth. of Est
	Constant	IMLO	OP	EPI	TOT	EXAG1	CR	D	
1.	-12283	.111		178	.633	-8111	.78	2.10	OLS
	(-.345)	(1.14)		(.616)	(3.94)	(-1.30)			
2.	11676	.08			.638	-9865	.78	2.18	OLS
	(1.53)	(1.04)			(4.71)	(-1.76)			
3.	-35623	-.238	.735	199	.334	-2201	.92	2.3	2-SLS
	(-2.51)	(-2.8)	(3.86)	(4.91)	(2.54)	(-.54)			
4	-3964	-.257	.784	209	.331		.92	2.35	2-SLS
	(-3.36)	(-3.38)	(4.81)	(5.92)	(2.58)				
5.	-37413	-.206	.724	174	.291	-12570	-3357.91	2.26	2-SLS
	(-2.4)	(-1.46)	(3.60)	(1.84)	(1.44)	(-.291)	(-.579)		

From the previous page we can see that the results have been significantly improved by the introduction of the two stage least squares (2-sls) method of estimation, as the R2 value was raised from .78 to .92. Agricultural exports in Cyprus follow an annual trend as is indicated by the estimates of the lagged value of exports (EXAG). Also as I have already hypothesized, in the theoretical chapter, Cypriot exports of the primary sector are faced with an elastic demand function due to the relatively (as compared to the world output level) limited production capacity. Given this situation, exports are then limited by the output capabilities of the agricultural sector as is indicated by the strong estimates of the coefficient of the primary sector (QP). The other results of interest are the effects of the export price index (EPI), in which case we get statistically significant results (with 24 degrees of freedom a 1.71 t-ratio deems the estimate significant at the five percent level). Furthermore, the past export performance (EXAG1) is also very important, and this I presume, is due to the cumulative effects of market research, the creation of product "loyalty" abroad as well as access to product distribution networks.

Political instability (D), impacts exports negatively as was expected.

DEPENDED VARIABLE : EXPORTS-manufacturing (EXMA)

EQ #	INDEPENDENT VARIABLES						R2	D.W	Meth. of Est.
	Constant	QS	IMLO	EPI	EXMA1	D			
1	-43383		.051	368	.350	4383	.98	1.52	OLS
	(3.49)		(.58)	(4.95)	(2.59)	(-.88)			
2.	-27702	-.007	.-116	371	.46	-3975	.98	1.93	2-SLS
	(-2.27)	(-.06)	(-1.06)	(4.17)	(3.04)	(-.71)			
3.	-36311	.05	-.135	414	.313		.98	1.95	2-SLS
	(-4.2)	(.49)	(-1.62)	(5.61)	(1.98)				

The above results deal with exports of the manufacturing sector. The most significant explanatory variables in this area appear to be the past level of exports (EXMA1) and the export price index (EPI). The past export performance is very important for reasons already explained in the previous section. The (EPI) is simply a reflection of the supply function of exportable goods reacting to price incentives. The level of output itself (QS) as well as the level of investment were either statistically insignificant or carried the wrong sign.

DEPENDED VARIABLE : EXPORTS- minerals (EXMI)

EQ #	INDEPENDENT VARIABLES				R2	D.W	Meth. of Est.
Constant	OP	IMLO	EXMI1	EPI D			
1.6726		.183	.828	-16076	.91	2.05	OLS
(.347)		(.864)	(7.25)	(-1.25)			
2.		-.064	.262	544 -27472	.95	1.90	OLS
		(-.618)	(1.97)	(4.97) (-3.21)			
3-43776		.28	.012	678 -18165	.96	1.29	OLS
(-2.75)		(1.81)	(.078)	(6.26)(2.19)			

The above set of results deal with mineral exports. As I have already mentioned, this sector is only but a very small component of total exports of Cyprus.

The significant results here, are again past export performance (EXMI1), the export price index (EPI) behaving as a supply function and the political instability variable (D). The later has a negative coefficient due to the loss of mines and/or due to production interruptions. Here, the effect of investment (IMLO), when statistically significant (Eq.#3), is positive as it should be and of the magnitude of .28.

IMPORTS

In this section I will present the results of the import equations. For the purposes of this analysis I have divided total imports based on their destination. The intend for doing this, was that more specific explanatory variables could be applied. To that end therefor, I will be dealing in tern with the imports of consumer goods (IMCO), imports of intermediate goods (IMII), imports of capital goods (IMCA) and the imports of transportation equipment which includes fuels.

The imported consumer goods are thus far, very heavily taxed in Cyprus. In spite of that, they very much sought after, because either they are perceived to be of better quality than the domestically produced ones or they are simply not available from the home market. Furthermore, a great degree of xenomania does exist in Cyprus so that foreign products are used to a degree as status symbols, in such a way that they can be considered as luxury items. From the results which appear on the next page, I have estimated the income elasticity of demand for imported consumer goods and the result confirms this hypothesis. I estimated the elasticity for 1988-89 using the estimate of the coefficient for GDP, and it is equal to 1.46. With an income elasticity of greater than one, the above hypothesis is supported. Similar results can also be if we deal with the national income (NI) instead of (GDP).

DEPENDED VARIABLE : IMPORTS-consumer goods (IMCO)

EQ #	INDEPENDENT VARIABLES							R2	D.W	Meth. of Est.
	Constant	GDP	NI	TOT	IPI	DIM	IMCO(-1) dr	D		
1.	28169		.107	304	.319		-3159	.94	.89	OLS
	(3.95)		(2.81)	(5.34)	(.566)		(-.675)			
2.	95177	.0973		-774.1	.241		-11496	.93	.97	OLS
	(3.50)	(3.92)		(-3.42)	(.367)		(-2.255)			
3.	-16458		.063	274	2.83	.020		.93	1.83	2-SLS
	(-1.88)		(1.68)	(4.06)	(3.85	(.110)				
4.	61173		.071	-8.96	.19	-.98699	-11141	.92	1.63	2-SLS
	(3.234)		(2.78)	(-.119)	(.97)	(-2.47)	(-2.19)			

The estimates of the terms of trade (TOT) yielded negative coefficients as was expected, while the import price index (IPI) estimates suggest a positive relationship. This of course is an erroneous result rendering it an inappropriate

variable to serve as a proxy for import prices. This result was probably caused by the fact that even though the average import prices has been on the rise, the relative prices of imports has been on the decline. It is the relative prices in conjunction to the rising incomes which stimulate imports in this case.

Duties on imports (DIM) have the wrong sign as well, by indicating a positive relationship with imports. For this reason I incorporated a new variable (idr = DIM/IMCO), which is the ratio of total duties over total consumer imports. In this fashion I hoped to capture the effect of the import duties rate on (IMCO). This new variable indicates a negative relationship though its magnitude is questionable, since the depended variable is a component of the explanatory variable.

Finally, the political instability variable when statistically significant carries a negative sign as expected, while the impact of past imports is statistically insignificant.

DEPENDED VARIABLE : IMPORTS-intermediate goods (IMII)

EQ #	INDEPENDENT VARIABLES								R2	D.W	Meth. of Est.
	Constant	GDP	GNP	NI	IPI	TOT	CONI	EXMA	D		
1.	158320	.187				-1904	.157	-23078	.94	1.4	OLS
	(2.33)	(1.43)				(-3.257)	(.85)	(-1.60)			
2.	151087		.092			-1594	.267	-28710	.94	1.27	OLS
	(2.22)		(1.31)			(-2.85)	(2.23)	(-2.260)			
3.	-47337		.060		512		.116	-18712	.97	1.99	2-SLS
	(-5.19)		(1.16)		(6.70)		(1.40)	(-2.36)			
4.	-29282	.136			111		.770	-3408	.98	2.29	2-SLS
	(-1.44)	(6.20)			(.58)		(2.31)	(-.506)			
5	-29512	.134			93.9		.980		.98	2.13	2-SLS
	(-.819	(5.46)			(.274)		(8.20)				

The results on the previous page deal with imports of intermediate goods . As was expected, they are strongly affected by the level of GNP, and its estimate is about (.13) with a statistically significant t-statistic. The import price index (IPI) behaves as it did in the case of consumer imports. Its positive impact can be explained by the fact that both the imports and (IPI) have been on the rise during the study period. The terms of trade (TOT) show the correct negative sign. The most interesting results here, are the effects of lagged consumer spending (CON1) and manufacturing exports (EXMA). Both variables impact positively on intermediate imports as was expected, because to a very large degree, they both make use of imported intermediate goods. This point highlights the significance of trade in this small open and relatively developed economy. The final point rests with political instability (D), which caries a negative sign as it should. War had, as is always the case, detrimental results on consumption and production.

DEPENDED VARIABLE: IMPORTS. Capital goods (IMCA)

EQ #	INDEPENDENT VARIABLES						R2	D.W	Meth. of Est.
	Constant	GNP	EXMA	CR	IPI	D			
1.	6009	.055	.257	-83805	-316	-5080	.73	1.35	OLS
	(.34)	(2.85)	(.83)	(-2.67)	(-1.56)	(-.88)			

The above results deal with the imports of capital goods (IMCA). Unfortunately, I was not able to get strong results in this section with (R2 = .73). The only points of interest here is that the import price index (IPI) as well as the estimate for the credit restraint (CR) carry the correct negative sign. Keeping in mind that (CR = -BC/GDP, where BC = bank credit), this is the result I was expecting, as bank credit is the strongest source of monetary expansion. In the absence of a developed capital market, banks play a major role in the financing of the economy, both in terms of the direction of investment as well as to its magnitude. In some respect, the CR ratio is an indication of the credit rationing scheme in Cyprus. With interest rate ceilings being pegged at nine percent, the

vulnerability of the economy due to its dependence on credit rationing is obvious.

DEPENDED VARIABLE : IMPORTS- Transport equip. and fuels

EQ #	INDEPENDENT VARIABLES								R2	D.W	Meth. of Est.
	Constant	GNP	GDP	NI	CR	IPI	TXI	DIM	D			
1.	44519			.138	72887			-4250		.84	.98	OLS
	(-2.59)			(5.07)	(1.42)			(-.312)				
2.	-32041			.071	145807	715				.96	1.87	2-SLS
	(-3.55)			(3.13)	(3.62)	(6.48)						
3.				.133	203662	744		-1.64	-3555	.95	1.76	2-SLS
				(3.41)	(5.64)	(6.21)		(-2.67)	(-.48)			

The above results deal with the imports of transportation equipment and fuels. Especially in the case of the 2-stage least squares, are characterized with high R2 of the magnitude of .96, suggesting a strong goodness of

fit. Obviously, the level of income is very significant in this case as is the availability of credit. In fact the response of these imports to credit expansion is very large, a fact that highlights the strong growth of the economy as well as the expanding degree of consumerism in the country. According to my observations during a recent trip there, Cyprus has become a two car family nation, a fact that puts added burden on its balance of payments.

The import price index again has the wrong sign even though it is statistically significant. Duties levied on imports (DIM), have a strong adverse effect on imports as was expected, and is statistically significant with a t-ratio of 2.67 (eq # 3.). Finally, the war years impacted negatively on these kind of imports, though the results were statistically insignificant.

The next set of results I will present deal with taxation and are introduced on the next page.

TAXES

The analysis on taxes is here divided into two categories, those of direct taxes and indirect taxes. This was done primarily due to the very different nature of the source of each of these two revenues. In this way I hoped to identify in more detail how each area is affected. The first one presented below, deals with direct taxation.

DEPENDED VARIABLE : TAXES - Direct (TXD)

EQ #	INDEPENDENT VARIABLES								R2	D.W	Meth. of Est.
	Constant	GDP	NI	P	PI	FB	GRNT	D			
1.	-17997		.082					4664	.98	.93	OLS
	(-10.9)		(35.78)					(2.43)			
2.	-37305	.103		-668				6834	.95	.83	OLS
	(-10.24)	(20.78)		(2.19)				(1.96)			
3.	-41734	.109		-1251		.32		10299	.96	1.13	2-SLS
	(-10.39)	(22.09)		(-4.04)		(1.54)		(3.24)			
4.	-39619	.101		-1230	.458			10865	.91	1.63	2-SLS
	(-6.58)	(10.0)		(-2.55)	(1.245)			(2.05)			

The results on direct taxation are relatively stout with an acceptable goodness of fit (R2 = .91-.98). The national output and thus the national income, are the most significant explanatory variables as assumed, since this kind of taxation (primarily income tax) is a function of income. Inflation (P) and anticipated inflation as is proxied by the one year lag of inflation (P1), indicate a negative impact on direct taxes. This was not as expected, because inflation will tend to force taxpayers into a higher income-tax bracket so that they will be forced to pay a higher proportion of their income in taxes and not less as these results suggest. What the explanation could be in this case, is tax avoidance . In adjusting or preparing against inflation, small businesses seek out more cash transactions with the intend not to accurately report their total earnings.

The next two items that were investigated, were foreign borrowing (FB) and foreign grants (GRNT). In both cases, though the results were not statistically significant at the five percent level, they affect taxes positively. This result was as expected, because presumably this kind of capital influx will tend to stimulate the economy and thus total personal (taxable) income.

The last variable under examination here, is that of political instability (D). The result of this estimate bears out the efforts by the government not only to care for the refugee problem which was created by the war, but also to

help revitalize the economy as well as enhance the national defense. Due to the war, additional taxes were imposed on the Cypriot people to help finance the aforementioned goals.

The second area dealing with taxation is the following one, and it investigates the explanatory variables which impact on indirect taxation.

DEPENDED VARIABLE : TAXES - Indirect (TXI)

EQ #	INDEPENDENT VARIABLES							R2	D.W	Meth. of Est.
	Constant	GNP	GDP	IMCO	PI	P	NI	D			
1.	-29816		.10	.255	-597			5008	.97	.86	OLS
	(-7.37)		(6.00)	(1.60)	(1.45)			(1.18)			
2.	-40949		.071	.65	-929			13206	.94	1.68	2-SLS
	(-5.33)		(1.97)	(1.69)	(-1.03)			(1.66)			
3.	-26937			.68		-837	.054	10764	.96	1.94	2-SLS
	(-2.36)			(2.00)		(-1.3)	(2.16)	(1.65)			
4.	-16686			.318			.078	5450	.98	1.59	2-SLS
	(-2.79)			(2.25)			(7.09)	(1.48)			

With regard to indirect taxes there were no surprises besides the effects of inflation which, as in the case of direct taxes appear to be negative. Income, as is measured here by GNP or NI is statistically significant and it impacts on indirect taxes positively. Obviously, imports of consumer goods affect taxes positively as they are the most taxed of all import items. In this section we might be faced with the problem of multicolinearity between the depended variable and IMCO. In light of this problem, the results must be viewed with caution, especially with respect to their absolute values. As I have already mentioned, inflation as well as inflationary expectations have a negative effect on indirect taxes. Though originally this result was perplexing, this could be the result of the consumers delaying the purchase of imports in the anticipation of paying for them with cheaper or inflated domestic money later on. The resulted reduction of imports due to inflation could account for the indicated negative effect of inflation on (TXI).

The last item in this section is again that of political instability. The results here suggest that it affects (TXI) positively. This can be attributed to the fact that the tremendous economic re-vitalization experienced following the war gave rise to an increasing amount of imports, a fact which is wrongly captured by the regression analysis as if the war itself caused the increase.

SUPPLY ESTIMATES:

The analysis of the supply side of the economy was divided into three areas based on the origin of output, such as the primary sector, the secondary sector and the tertiary sector. I will begin review of the supply estimates by looking at the primary sector first.

DEPENDED VARIABLE : SUPPLY- The primary sector (QP)

EQ #	INDEPENDENT VARIABLES							R2	D.W	Meth. of Est.
	Constant	IMLQ	IFC	QP1	CR	EPI	RAIN	LFP	D	
1.	1.34969 (2.93)	.023 (.34)	.646 (4.13)	15284 (1.12)			-6212 (-1.53)	.58	2.62	2-SLS
2.	2.39987 (3.10)	.085 (1.34)	.524 (3.08)	-73.44 (1.57)				-4663 (1.03)	.58	2.47	2-SLS
3.	3.39054 (3.24)	.055 (1.28)	.59 (4.0)	29183 (1.76)				-3524 (-.778)	.60	2.48	2-SLS
4.		.09 (1.52)	.69 (7.8)		22 (2.11)	164 (1.9)	-5217 (-1.26)	.57	2.26	2-SLS

The results on the supply function of the primary sector have been very weak (R2 = .57-.60) and in spite of the fact that I have tried many formats and data, to date I have not been able to improve the results. We can however extrapolate from these results the basic characteristics of the production function of Cyprus.

There is an annual production trend in agriculture as is indicated by the lagged value of primary production (QP). This continuity accounts for about 65% of the following year's output level. Investment in general, expressed here in terms of IMLO (investment in machinery, land and other) and IFC (investment in fixed capital), have not generated statistically significant results at the five percent level. Furthermore, these more general variables suggest that the marginal productivity of investment is not more than ten percent. Other estimates of Fixed Capital Formation in the Primary sector (FCFP) not shown here, have generated estimates which suggest that the marginal productivity of investment in agriculture is in fact about fourty-two percent.

The estimate of the credit restraint or credit rationing variable (CR), is here positive, a fact which suggests credit bottlenecks in the primary sector. The estimates of the export price index (EPI) as well as the political instability variable did not yield satisfactory results as their t-ratio is less than the required 1.71 (with twenty-four degrees of freedom).

The introduction of rain and the labor force in the primary sector (LFP), did improve the individual estimates though it has not improved the equation as a whole. Rain, in the semi-arid Cypriot climate is very important for agriculture as is the shrinking size of the labor force employed there. In recent years they were forced into introducing foreign labor.

The next section deals with the supply function of the secondary sector.

DEPENDED VARIABLE : SUPPLY - Secondary sector (QS)

EQ #	INDEPENDENT VARIABLES						R2	D.W	meth. of Est.
	Constant	IMLQ	IFC	QSl	CR	BC	D			
1.	-25.22	.0003	.739	100.08		-37.53	.98	1.79	OLS
	(-1.16)	(1.34)	(7.10)	(2.67)		(-4.17)			
2.	-25629		.265	.632	-88285	-22846	.98	1.61	2-SLS
	(2.062)		(2.47)	(6.18)	(-3.20)	(-3.48)			
3.	22.68	.00001	.77		.00006	-35.4	.98	1.58	2-SLS
	(1.61)	(-.077)	(6.99)		(2.14)	(-3.74)			

The results of the secondary sector which is primarily light manufacturing, are a significant improvement over the

primary one. With high R2 as shown above we have an acceptable goodness of fit. Investment in fixed capital (IFC), has an estimated coefficient of .265 which is also statistically significant with a t-ratio of 2.47. The estimated marginal productivity of capital must interpreted with care because IFC refers to total investment and not investment specifically for the secondary sector. Such an estimate is expected to generate a much higher coefficient. These results are again a good indication of the stout growth rate of the economy and an indication of its capacity to productively absorb even higher levels of investment.

The lagged value of (qs) is also supported by strong t-ratios and they simply explain the continuity of production in the secondary sector. The estimates on bank credit, though significant appear to be very weak, contrary to my expectations. Bank credit is the single most important source for financing projects and as such I had expected much stronger results. Similarly, credit rationing (CR) has generated ambiguous results. The estimates from OLS are very different from those of the 2-SLS, in such a way that their interpretation is impossible. The political instability estimates are significant with the correct negative sign.

The following results shown on the next page, will be dealing with the tertiary sector.

DEPENDED VARIABLE : SUPPLY - The tertiary sector (QT)

EQ #	INDEPENDENT VARIABLE					R2	D.W	Meth. of Est.
	Constant	IMLO	IFC	QTl	CR	EXR	D			
1.	-84.10	.00045		.94		53.92	-30.62	.99	1.80	OLS
	(1.65)	(1.78)		(14.37)		(1.44)	(-1.99)			
2.	-18680		.638	1.00		10905	-16058	.98	2.9	2-SLS
	(-.465)		(2.61)	(11.69)		(.265)	(-1.22)			

Again, as in the previous supply equations, the lagged value of supply is very strong and significant and it highlights both the adjustment process in output as well the importance of technological know-how and capital formation. The estimates of the marginal productivity of investment of .64 exemplify the growth potential of the tertiary sector which for the most part deals with tourism.(This estimate for the primary sector was .08 and for the secondary sector was .27).

I had hoped that the exchange rates (EXR) would have generated strong results in this area, but unfortunately this has not been the case. At any rate, the estimates suggest a positive impact of a weakening domestic currency,

a result which is consistent with my expectations. lastly, the political instability dummy variable (D), indicates the negative effects of the war on the economy in general and on tourism in particular.

MONETARY SECTOR ESTIMATES:

In this section I will present the results of the nominal sector. Essentially, I will review three sets of equations each dealing with the transactions demand for money (TDM), the asset demand for money (ADM) and the money supply (MS).

DEPENDED VARIABLE : DEMAND FOR MONEY -Transactions (TDM)

EQ #	INDEPENDENT VARIABLES						R2	D.W	Meth. of Est.
	Constant	GNP	GDP	NI	TDM1	P1	D			
1	1.4941			.071	.64	-.089	7214	.99	2.38	OLS
	(1.65)			(2.52)	(4.23)	(-1.77)	(1.98)			
2	2.5860			.018	.92	291	8112	.99	2.40	2-SLS
	(1.74)			(.55)	(.5.44)	(.60)	(2.05)			
3	3.6578				1.001	-.076	8547	.99	2.38	2-SLS
	(1.98)				(7.995)	(-2.12)	(2.10)			
4	4.7920	.025			.92		7056	.99	2.33	2-SLS
	(2.08)	(1.65)			(5.83)		(1.58)			

The results listed on the previous page explain primarily the transactions but also the precautionary component for the demand for money and include the demand for currency as well as demand deposits.

The results are indeed consistent with economic theory and they validate our expectations. with the indicated high R2, we can say that the deviations of the dependent variable can in fact be explained by the variance of the explanatory variables. The income component, measured here by the level of GNP as well as the national income NI, have generated positive and statistically significant estimates. This is the correct result, because as the level of income changes it is expected that the demand for liquid money will be affected in a positive fashion as well. The opportunity cost of holding money is measured by the expected rate of inflation (Pl), has a negative effect as was expected.

The precautionary component of the demand for money is also indicated by the results, through the political instability variable. The positive estimate of (D) shows the desire of the people to be more liquid during periods of uncertainty. Finally, (TDMl) shows the adjustment process between the actual and the desired level of liquid money holdings.

In the next section the results will be different as I will deal with the less liquid forms of the demand for money.

DEPENDED VARIABLE : DEMAND FOR MONEY - Asset (ADM)

EQ #	INDEPENDENT VARIABLES						R2	D.W	Meth. of Est.
	Constant	GNP	GDP	NI	ADM1	P	P1	D			
1.	-192173	.58		.24		13870	-18305		.84	1.81	OLS
	(-2.437)	(3.65)		(1.34)		(2.38)	(-.29)				
2.	-92074		.607		-1219	19516	-35424		.87	1.73	2-SLS
	(-1.97)		(9.51)		(.19)	(3.065)	(-.639)				
3.	-192620		.60	.22		14508	-17781		.85	1.79	2-SLS
	(-2.41)		(3.59)	(1.20)		(2.49)	(-.28)				
4.	-202409		.60	.22		14195			.84	1.80	2-SLS
	(-2.86)		(3.89)	(1.21)		(2.53)					

The asset demand for money equation (ADM) generated results as was expected apriori. To estimate the income coefficient, I used three explanatory variables (GNP, GDP and NI)all of which have generated identical and statistically significant results of .60 with regard to the magnitude of the marginal income effect on the asset demand for money. The income elasticity of demand for ADM is 1.05, a value consistent with economic theory and which suggests

economies of scale in this sector. In the absence of a developed capital market which could absorb a significant portion of investment capital, this result is realistic.

The relatively low estimate (ADM1 = .24) of the lagged depended variable, suggest the speculative nature of ADM, as investors are primarily interested in current investment opportunities with much less regard to their past investment behavior. This result is highlighted further if we compare it to the same estimate for the case of TDM which was of the magnitude of .90.

The opportunity cost of holding money, for which I used expected inflation as a proxy, generated positive results though for the most part were statistically insignificant. If we take into consideration the fact that for the most part, inflation in Cyprus has been kept in check at the (2%-3%) level, we can explain this anomaly as a statistical error.

The last explanatory variable under investigation here, is the political instability one. Here we have statistically significant results with the correct negative sign. Obviously this was as expected, as investors desire to be more liquid during highly uncertain time periods.

The next area under investigation is the supply of money, the results for which are shown on the next page.

DEPENDED VARIABLE : SUPPLY OF MONEY (MS)

EQ #	INDEPENDENT VARIABLES							R2	D.W	Meth. of Est.
	Constant	GNP	G	DF	FA	U	LR			
1.	1.98771 (.555)	9.5 (6.9)	2.8 (2.9)	-8657 (-1.1)	-7479 (-.9)	-15552 (-2.61)	78154.89 (1.03)	1.73		OLS
2.		7.5 (6.12)	3.13 (3.03)	-7266 (-1.44)			30753 (.43)	.85	.77	OLS
3.	1.03 (5.61)	.57 (.35)	-.13 (-.19)	- 10768 (-3.97)			53291 (1.50)	.97	1.06	2-SL
4.	-.24 (-1.35)	1.45 (1.93)	.63 (1.96)	1329 (.83)	.66 (1.89)			.99	1.2	2-SLS
5.	-.124 (-1.24)	1.34 (1.98)	.61 (2.07)		.59 (1.89)			.99	1.5	2-SLS

When working on this area, I was primarily interested on the effect of the economic agents that can potentially affect the supply of money in Cyprus. My reasoning here is that the ultimate scope of this work would be its application as a guide for stabilization policy. To this end, I included as explanatory variables the level of GNP, inflation (P) unemployment (U) and political instability (D) in order to

capture the influence of the state of affairs in Cyprus. The government effect is introduced via government spending (G) and deficit financing (DF). The influence of the banking system is introduced by incorporating bank credit (BC) and the liquidity ratio (LR)(note: this is the actual liquidity and not the reserve requirement ratio). The effect is introduced via the foreign assets (FA) variable.

The results here, are characterized by a strong goodness of fit especially in the case of the 2-SLS, suggesting that the variance of the depended variable can indeed be explained by the deviations of the explanatory variables.

The estimate for GNP when statistically significant, has a positive coefficient of the magnitude of 1.03. This I feel is an exaggerated result as it suggests economies of scale in the supply of money, a fact which is inconsistent with the inflation rate which has been under control and at very low levels over the years. The estimates for both government spending and deficit financing are positive and statistically significant. This suggests an expansion of the money supply, and in conjunction with the prevailing low inflation rate might signal the existence of a crowding out effect in Cyprus a possibility which makes the subject matter for another paper possible. Foreign assets also contribute positively to the money supply as was expected. The exact magnitude of the effect however I have not been able to ascertain since the results from OLS and 2-SLS are

significantly different. The liquidity ratio estimates show a negative impact, while that of bank credit a positive one, both exhibiting a behavior in accordance to economic theory. The estimate of inflation is negative, but I think here we have a causation problem in that the existence of inflation trickers a contractional reaction on the part of the monetary authorities and does not imply that the existence of inflation itself, reduces the quantity of money. Finally the positive estimates for the political instability variable, simply reaffirms what took place there after the war, which was an expansionary fiscal as well as monetary policies in order to re-activate and stimulate the economy.

POTENTIAL INSTABILITY ESTIMATES

In this section I will present the results of the equations referring to the two major macroeconomic concerns, namely price instability and unemployment. Also, I will examine for the existence of any trade-off possibilities between the two of them in a phillips relationship. At this point, I would like to mention that since independence (1960) the level of unemployment with the exception of the war years has been kept at the (2%-3%)level, while the inflation rate has been around the (3%-6%)level. The magnitude of both of these potential instability sources is impressive, especially so in the case of a small developing economy.

In setting up the equations for the section, the intend was to look into the effectiveness of the various available policy tools, whether monetary, fiscal or supply side.

UNEMPLOYMENT

The results on unemployment are shown on the next page. As indicated , the goodness of fit revolves around the 85% mark, a fact which suggests that more indepth work can be done on this subject. The most obvious and striking conclusion here is that though the estimates for the most part, carry the correct sign and also are statistically significant as well, they are very weak. This has been a point of great interest to me and I intend to work on this

DEPENDENT VARIABLE : UNEMPLOYMENT

EQ #	INDEPENDENT VARIABLES								R2	D.W	Meth. of Est.
	Const.	GDP	GNP	G	TX	TXD	MS	BC	D			
1.	1.1		-0001	0002			-.00001		3.4	.76	1.5	OLS
	(1.69)		(-7.3)	(6.4)			(-.63)		(3.6)			
2.	5.8	-.0002				.0002	-.0004		2.8	.84	.99	OLS
	(2.1)	(3.0)				(3.4)	(-5.2)		(2.3)			
3.	1.3		-.2E4	-.5E4		.3E3	-.5E4	-.2E4	6.9	.86	1.8	2-SLS
	(1.27)		(-1.3)	(-1.4)		(3.8)	(-1.6)	(.8)	(2.6)			
4.	8.3	-.5E4		-.5E4	.3E3		-.2E4		6.5	.85	1.5	2-SLS
	(2.1)	(-3.06)		(-1.3)	(2.1)		(-1.4)		(2.2)			

subject on a later paper. My interpretation of these results at this point, is that the size of the economy is so small and thus so dependent on foreign agents, that render the economic stability of the country to be driven by events beyond the control of real control of the domestic authorities. For example, if a war were to break out in the Middle East, such that tourism would be seriously adversely affected, then unemployment as well as the standard of living of the Cypriot people would decline dramatically. Any

aggressive policy thereafter, would bring about only but small results. Similarly, the level of domestic exports depends to a very large degree, on the economic situation of our trading partners as well as on trade agreements they may have with others. It is true that all nations function with a degree of dependence on foreign markets. In the case of Cyprus however, this dependence is much more serious, because of the limited size of the domestic market. If Cyprus is to gain from economies of scale it must export and if it is to exploit its comparative advantage it must promote tourism.

Another reason for these results, could be found in the statistical analysis itself due to the fact that the variance of unemployment over the years has been relatively very small.

As was expected, unemployment is negatively related to the level of output, here measured by both the level of GNP as well as the level of GDP. Government spending, though very weak has the correct sign. Taxation, shown through total taxes (TX) and direct taxes (TXD), have a dampening effect on the economy as they reduce aggregate demand and cause unemployment to increase. The influence of the monetary sector is introduced by bank credit (BC) and also the money supply (MS). Again, an expansion of either variable will have a dampening effect on the level of unemployment, though very small. Political instability

always has as a result, the destabilization of the economy and the increase of unemployment.

Now, I will present the next area of potential instability and deal with inflation.

DEPENDENT VARIABLE : INFLATION

EQ #	INDEPENDENT VARIABLES									R2	D.W	Meth. of Est.
	GNP	DF	TXD	MS	LR	EXR	D	P1	U			
1.	.5E4	.15E3	-.48E3		-.32	-6.3	3.6			.75	2.6	2-SLS
	(3.3)	(3.7)	(-4.2)		(-2.0)	(-1.6)	(2.2)					
2.	.3E4	.2E3	-.5E3	.2E4		-9.0	2.2			.77	2.1	2-SLS
	(2.6)	(3.0)	(-3.3)	(1.4)		(-2.0)	(1.4)					
3.								1.04	-.39	.56	2.3	2-SLS
								(5.8)	(-1.08)			

The results on inflation indicate similar weak coefficients for the policy variables as was already found to be the case when dealing with unemployment. The impact of deficit financing (DF) was found to be inflationary, and the results are statistically significant. Direct taxes (TXD) help to curb inflation as does the liquidity ratio (LR),

which is a primary tool available to the monetary authorities. The most interesting estimate is that of the exchange rates (EXR). In this case we have strong negative, while significant results. The explanation for this, is that as the domestic currency becomes more expensive, the primary sources for aggregate demand in Cyprus, namely tourism and exports are reduced significantly. This obviously, has a dampening effect on wages and to a greater extend on prices. Also interesting is the coefficient of political instability, which is also significant but positive. The combination of the preference for more financial liquidity on the part of the people, and the increased scarcity of goods during war periods, will apply upward pressure on the price level.

The question of a Phillips relationship in Cyprus, is investigated with equation #3. Here, it is shown that the expected rate of inflation (Pl) has a strong impact on the inflation rate. Furthermore, though the results are not statistically significant at the five percent level, there appears to be a trade-off opportunity in Cyprus between inflation and unemployment.

CHAPTER VI CONCLUSION

This study has set out to construct an econometric macro model of the economy of Cyprus, with the aim to asses the effectiveness of monetary, fiscal and supply side policies on economic stabilization. Furthermore, this work will serve as the foundation for a more indepth analysis of the Cypriot economy at a later date.

As I have already mention, we are dealing here with a very young nation; with a small country whose economy has been constrained by the mere smallness of its domestic market, the relative scarcity of the factors of production, a handicapped investment activity due to the occasionally extreme political uncertainty, technological bottlenecks, insufficient as yet level of infrastructure, and finally in 1974 a military invasion. In the face of all these problems and drawbacks, it has experienced a very significant rate of growth and economic transformation. The level of GNP, during the study period (1960-1989) has increased (in real terms at constant 1980 prices) from 275.9 million pounds to 1316.5 million pounds. This represents a total increase of 378% or an annual rate of growth of 12.6%. similarly, the per capita private consumption expenditures have grown overall by 425% or at an annual rate of 14%. This represents a very impressive rate of growth and today it can boast a per capita GNP of over $12000. Furthermore, it is classified by the World Bank as of the last five years as a developed nation. Cyprus is indeed a very interesting subject.

The theoretical portion of this paper, in chapters three, four and five, have as their basis the conventional macro approach to economic analysis. Some modifications however were necessary in order to be able to account for the peculiarities of the Cypriot economy. The interest rate ceiling was probably the biggest such problem I had to deal with, especially when working on the investment function and the demand for money. To overcome this particular problem I used as a proxy for the interest rate effect, either a credit rationing ratio (CR = -TBC/GDP), or the inflation rate which served as an opportunity cost of liquidity. Furthermore, the absence of a well developed capital market, makes necessary the use of unconventional forms of monetary policy, relying more on the control of the reserve requirements as opposed to open market operations and also on regulations and restrictions, the quantification of which is virtually impossible. This situation significantly weakens the ability of the model to correctly assess the relevance of the various policy tools. Similarly, other supply side stimulation or support, primarily on the part of the government but also by various production associations cannot possibly be measured and thus be tested. Some of the examples in this respect are the formation of industrial zones and the concomitant support that goes to them, the subsidization of some grains as well as diesel fuel, the various market research and procurement efforts and agreements, technical support and education, grants, tax

incentives etc. I have tried to estimate at least partially the impact of these supply side policy measures, by incorporating into the model government subsidies (GS), but my efforts were not too successful.

The problem with regard to the data was twofold. The first one was that of availability and the second one was that consistency. With regard to the problem of availability, some data simply do not exist and those that are readily available, cannot be found in shorter intervals than annual reports as I would have liked. The problem of inconsistency arises by the need to use data which are published by the central bank and some from the statistics and research department of the ministry of finance. On many occasions their reports on the same item were conflicting a situation which made me very cautious when interpreting the results.

The study was divided into aggregate demand (this section included also, taxation), aggregate supply, the nominal sector and a chapter on the main sources of instability, of inflation, unemployment and the possibility of a Phillips trade-off relationship between them. Disaggregation I felt, was very important as it has allowed me the ability to incorporate very specific explanatory variables into the various equations. As a result, the model involves twenty sets of structural equations, each set containing three to five variations of the original formulation.

The model appears to be for the most part well specified as is indicated by the high values of (R2) the coefficient of determination especially if we take into consideration of the peculiarities of the Cypriot economy.

The real sector though it has grown at an amazing rate, is nevertheless still considerably very fragile due to its relatively very high dependence on external forces (tourism and exports) and also due to the constant uncertainty which arises from the existing political instability. I would even venture to speculate that the later problem, has caused the Cypriot investor to be short-term minded as uncertainty tends to limit their investment horizons.

The nominal sector though it was able to respond to the demands of the economy, it nevertheless exhibits many shortcomings and its effectiveness as an economic stabilization tool is very limited. For the most part, as it should, it limits itself to nominally support the growth rate of the economy. The ceiling on interest rates is a problem in the economy, as it makes necessary the use of a rationing scheme for the distribution of capital, probably promoting a non-optimal path of fixed capital formation. Furthermore the non-existence of a well developed capital market hinders the effectiveness of monetary policy and also it does not promote efficiency in investment.

It was found that the effectiveness of stabilization policy is thus far limited in Cyprus, since due to its size

it is disproportionately dependent upon or is exposed to external forces.

Finally I must say that this study has only served as a technical overview of the economy of Cyprus. It is my intention to pursue studying the economy of Cyprus and as situations there change, so must this econometric model if it is to serve the real purpose of any model, which is prediction.

To conclude, I must say that I have enjoyed working on this topic and have benefited a lot from it. I do hope that any other reader will find it instructive and beneficial as well.

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