

## BANK CREDIT, CREDIT RISK AND FARM PRODUCE: THE CASE OF INDONESIA

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### **ABSTRACT**

*The research investigates the determinants and impact of bank credit on output in the food crops and fisheries sub sectors; whether or not there is a significant difference in the risk on bank credit and output in the two sub sectors, and whether or not there is a relationship between risk obtaining in the two sub sectors. The results indicate the positive and significant influence of bank credit on food crops output, but a positive and insignificant influence on fisheries output, which unequivocally vindicates government intervention in credit disbursement to agriculture. The influence of banking deregulation on bank credit supply is shown to differ between the two sub sectors, for while it registers expected positive sign in the fisheries sub sector, it produces negative and insignificant influence in the food crops sub sector. Bank reserve requirements has a negative influence on bank credit extended to the fisheries sub sector, while it induces a positive and significant influence in the food crops sub sector. The 1997 economic crisis causes an autonomous contraction of bank credit to the food crops sub sector, but accentuates it in the fisheries sub sector. The food crops and fisheries sub sectors register significant influence of rate of interest rate on bank credit on bank credit supply. Obstacles to credit disbursement to the two sub sectors are presented, followed by policy implications deemed necessary to improve the credit situation in the agricultural sector.*

**Key words:** Credit default, collateral security, fungibility

### **INTRODUCTION**

The role of commercial banks playing in the national economy is no longer in doubt, which is why the once the state of the banking industry shows signs of wobbling however slight and meager that may be, sends an avalanche of concern and anxiety, to not only the bank managers and shareholders, but the entire population. The soundness of banks has a multitude of implications for borrowers as it is for lenders; the government as well as the private sector. Small wonder then that one of the key factors that have had tremendous impact on bank credit extension to the agricultural sector has been the 1997 economic crisis. The crisis, still a contentious topic among economists, is generally attributed to on one hand fundamental weaknesses manifested in macroeconomic imbalances; excessive borrowings; overvalued currencies; poor investments in Indonesia, Thailand, Malay-

sia, and Philippines (Medhi, 1999; Alburo, 1999; Ariff and Syarisa, 1999) and the phenomenon of the overlapping of long-term business cycle downturn with the investment cycle, high propensity of loan dependent management in industries; worsening business performance of the financial sector; and the dearth of sufficient preparation for instabilities in international financial markets in the Republic of Korea, on the other (Kim, 1999).

The diversity of causes of the 1997 economic crisis was equally matched by the multiplicity of effects it had on the affected countries. Nonetheless, the 1997 economic crisis had its most devastating effect on certain countries depending on the domestic institutional setting. South Korea, one of the most developed was hard hit as battered as Indonesia, which is farther down the development ladder. Apparently, the crisis had its worst effects on countries characterized by unhealthy banking systems, driven to such a precarious state by unfettered government intervention in their operations. Indonesia was one of those worst hit (Corsetti, 1998: 31-32; Marshall, 1994).

The major impact of economic crisis on the Indonesian economy was the aggravation of the already sorry state of the banking system, the poor performance of which caused the crisis in the first place, which definitely owed much to the deregulation policies in the financial sector conducted by the New Era government 1967-1998 for a span of almost two decades, which is as common knowledge, were not carried out along side substantial real sector reforms. Such conditions were hardly the necessary machinery to provide quick remedy for a battered economy, in any case as it became more than evident, contributed and goaded the economy into deeper mire. Meanwhile cross check of the economic system in the 1997 economic crisis aftermath provides some nerve racking and dreadful experience. Bank and corporate restructuring are already slowing, ground to a hasty halt as non performing loans soared by March 1999 had hit 55 per cent in Indonesia), corporate equity evaporated as cycles of depreciations, interest rate increases, and credit shocks undermined the very basis of their operations as well as increasing the value of their liabilities to banks (Corsetti, 1998: 32). No wonder endeavors to avert total bank collapse through bail outs cost nations staggering amounts, (a record 20-50 per cent of GDP if Corsetti's estimates are anything to go by), even if the turnaround process has barely taken root as yet. The effects of a malignant banking system on agriculture could hardly be any worse. Credit to the agriculture experienced drastic cuts, choking the many operations as the government coaxed and coerced by creditors and donor agencies, embarked on a cost cutting binge. Output suffered, leverage ratio surged, and mass unemployment became unavoidable. Apparently the agriculture sector, like other sectors was virtually in a paralysis, to put it mildly.

Yet hard hit as it was the agricultural sector that is considered risky hence according to conventional wisdom would have become 'forbidden territory' for investors turned out to be one of the few shining stars in an overcast sky. The agricultural sector showed more buoyancy at least most part of it, as other sectors hitherto considered cash cows wilted and went under (BPS, 2000). Pundits, in economics, agriculture and other related sectors have begun on an 'expedition' that will attempt to revisit a number of areas. The agricultural sector's resilience

during and in the aftermath of the crisis, contrary to expectations is evidenced by the increase in agricultural output paradoxically at the time when most forecasters were projecting immense declines, has boosted the importance of agri-business's prominence (Tabor et al., 1998: 12). The foundation of the economy is even being revisited. Indeed as testified by Seibel (1998: 5), a number of "small-scale entrepreneurs transferred their funds from other enterprises to those involved in agribusiness projects," as the prospects of the latter are better.

What is even more encouraging for those involved in agriculture is the fact that the performance of credit providing institutions is basically working outside commercial banking guidelines and principles seem to perform quite extraordinarily well. This is very true for rural financial institutions that do not rely so heavily on borrowings and capital from external sources. This is evidenced by the better performance of BRI units, which registered an excess of liquidity to the tune of Rp.10 trillion which is contrasted with the disastrous performance of KUT, KKUD, KKPA programs with 31 %, 18%, and 13% in arrears respectively, by July 1998 based on Seibel (1998: 4). It is in the context of such developments that a rethinking of the growth and development process is underway. The areas being reviewed include the very paradigm of the Indonesian economy including; 1) the role that agriculture should play in future efforts towards development; 2) the nature and kind of banking system that should be developed which must be in line with, not only short-term or medium term but also long term goals of development; 3) the part that should be played by the state in future endeavors towards economic development in general, and in agricultural development in particular; 4) the role to be given to private initiative and market mechanism in agriculture in light of the immense distortions that came to the fore as the crisis begun to bite which called for not only *ad hoc* corrective measures but also a dramatic re-assessment of key areas such as subsidy policies, directed credit programs, and direct government involvement in agricultural production (Rozelle et al., 1997).

The advent of the economic crisis thus, meant that a review of government policies in many areas became unavoidable especially as calls for rationalizing government expenditure resonated far and wide (Tabor et al. 1998). Doubtless, the remaining directed credit programs have come under the most fervent scrutiny. Yet the involvement of the state in credit provision to agriculture either directly or otherwise was ironically the only way the agricultural sector could continue standing on its feet. The economic crisis far reaching as it was in its effects, meant that the inherent risk in extending credit to the agricultural sector was in any case higher than before, that is according to conventional wisdom (Saha et al., 1994). The advent of the crisis, if anything introduced another factor that influenced one way or the other the extent to which the banking system regarded the agricultural sector as worth considering in its credit policy. Yet dominated as it is by the government as the banking sector is in the wake of the crisis, it is disputable whether the role of the state in directly influencing the decisions of the banking institutions isn't in any case higher.

The after math of the crisis thus, has meant that not only the assumptions on which policies in such economies that were hit were in for review, but also the very paradigm of development that was pursued and was being put to the test. In

the aftermath of the 1997 economic crisis for instance some re-thinking of the direction and components of economic growth has begun to take more than cosmetic considerations. Being the worst hit by the economic crisis that has hit South East Asian countries since 1997, July 2 (Sadli, 1998; Delhase, 1998; Cole and Slade, 1998) the effects of crisis showed the high degree of vulnerability and lack of self-sustenance, features which had hitherto been taken for granted (Cho, 1986; Chelliah, 1999). Despite torpedoing the national economy into 1997 multidimensional economic crisis, which by most accounts contributed much to its demise; it would be quite unfair, to underestimate the achievements of the New Era government in the spell of time between 1970 and 1997. The facts are quite impressive especially in the area of macroeconomic performance and in the field of financial deepening. Backed by a continuous era of political stability and explicit policies, economic growth reached hitherto undreamt of levels, that by 1966 standards, at least. According to Seibel and Parhusip (1998), gross domestic product (GDP) grew at an average of 7 percent, population at an average of 2 percent, resulting into a per capita income of 5 percent per annum, which is astounding by all accounts.

Macroeconomic stability, as manifested in a low rate of inflation hovering between 7.8 per cent in 1990 and 9.4 per cent in 1995, a nominal exchange rate between Rp. 1,905 and Rp 2,305 to the dollar, and an average deposit rate ranging between 17.75 per cent and 16.22 per cent in the same period. Such laudable economic growth was attributed to a series of interest and banking deregulation that were promulgated in 1983 and 1988 and beyond, which put the financial sector on a sound footing through encouraging the growth of both commercial banks and micro finance institutions, which in turn led to staggering growth in the volume of national savings reaching 30 per cent by 1996, providing as it were, an enviable source of loanable funds in the economy. In the backdrop of the foregoing, this research intends to several objectives which encompass: determine the contribution of bank credit towards the performance of the food crops and fisheries sub sectors in Indonesia; the main factors that influence the extension of such credit; and determine the level of bank and output risk in the two sub sectors, whether or not, there is significant difference in the magnitude of such risk, and how such risk relates with output risk in each sub sector. The remaining sections of the article will be presented as follows: Section two tackles the literature review and theoretical framework, which is followed by section three which handles methodology. Presentation and discussion of the results is done in section four, while section five concludes the article and section six present some policy recommendations.

## **LITERATURE REVIEW AND THEORETICAL FRAMEWORK**

Credit refers to the right to incur debt for goods and services and repaying the debt over some specified future time period. Credit is also defined as a transaction that involves trust, sometimes with security (guarantee) that the borrowed quantity will be returned at a certain time. Farm credit refers to loans meant to assist farmers in the ownership of land or production of farm products; while consumption credit refers to credit obtained to buy commodities or services used in the farm or outside the farm. Agricultural credit, is considered to encompass all

credit received by the farmer, as this directly or otherwise influences the success or failure of the farmer and his standard of living. Agricultural credit is subdivided into: a) Credit received by the farmer for the purpose of production; and b) credit for consumption purposes that is directly used in the farmer's household. While on one hand, productive credit is geared toward the purchase of capital goods, paying rent for land, hiring labor employed on the production process, consumption credit, refers to money borrowed for the purchase of goods that satisfy the consumer, on the other. Production credit is used in the production process to improve the input mix in quantum and balance so that production is increased which assists the farmer in a multitude of ways, including: the payment of interest and repayment of loans due; avoidance of undesired increase in end of year liabilities; increase in farmer's net worth; and provision of additional returns for withdrawal, consumption credit. Credit does not differ by form but also by the characteristics.

The market mechanism is hailed for its ability to allocate resources to activities where they receive the most returns, its downside however are of no less importance, especially the inability to protect the interests of the weak or the poor, as well as the interests of the state. Let unfettered, free market system more often than not, results into the richest to dominate the economy of such countries and since these are usually from the developed countries, the very sovereignty of the state is endangered (Stiglitz and Weiss, 1993).

Most important of all is the fact as holders of the largest proportion of domestic credit; commercial banks serve as the providers of funds to the government treasury to facilitate the smooth running of the economy. Thus governments in developing countries feel reluctant to remove the tight grip they have on commercial banking since the very survival of the state would be at stake if the role of commercial banks in the economy was in any way undermined as elucidated in Fry (1995).

If the part played by the commercial banks in the economies of developing countries is an established fact, the extent to which banking services are tailored to the needs of the agricultural sector leaves a lot to be desired. This is especially true of commercial banks in many a developing economy, where due to a multiplicity of reasons there is vivid indications of their reluctance to get involved in agricultural activities, ironically the very foundation of most developing economies (Susanto, 1992). The agricultural sector constitutes the largest sector in most, if not all, developing economies, in terms of 1) being the largest contributor to the gross national products of such countries; 2) the largest employer; 3) the largest earner of the much needed foreign exchange to name just a few; 4) the supplier of much needed raw materials in the manufacturing sector; 5) the largest contributor to the government tax revenue; 6) the sustainer of many an economy through ensuring food security for the population. It is imperative therefore, that contributing to the survival of the country as it does, agriculture greatly needs the services provided by the banking sector as much as, if not more, than other sectors of the economy since their survival or otherwise substantially depends on the performance of the agricultural sector.

It is in recognition of this fact that the government of Indonesia right from

the very beginning possibly thought it desirable to play a key role in influencing the services of the banking sector in order to foster the development of the agricultural sector. The government involvement isn't more illustrated than the directed credit policies conducted right from the late 1950s to the present. Through the directed credit policy, which is alternatively called targeted lending, the government extended low interest rate credit to particular sectors, sub sectors or individuals, in compliance with the directives or instructions issued by either the monetary authority or government (Greville, 1981; Mear, 1981, Timmer, 1975). Such sectors were considered to be of top priority in the drive to growth and development. The agricultural sector, considered a priority sector immensely benefited from the policy and still does to the present date, albeit at a reduced level. The directed credit policy was driven, among other reasons, by the need to: 1) encourage lower yielding investments, which however had high social returns. These were not targets of private investors because of their low private returns, yet were important in the drive to promote social welfare; 2) the setting of low long-term rates of interest to encourage firms in priority sectors to undertake long-term investments at lower risk than would have been the case without government involvement; 3) ensuring credit allocation to enable the undertaking of those investments considered the best for economic development; 4) making loan rates lower than deposit rates to encourage low cost investment; 5) and as a way of reducing income disparity between the economic sectors by easing accessibility of cheap credit to sectors normally regarded as risky (Fry, 1995; Stiglitz and Weiss, 1993).

In the course of the successive program implementation much headway was made in a number of areas. It is indisputable that direct government programs have fostered the change in farming practices by farmers, from traditional ones to better ones suited to modern varieties. Credit enabled the securing of good quality seeds, fertilizers, fungicides, working capital, facilitated irrigation and road infrastructure construction and maintenance (Soeharjo, 1976; Simodiningrat, 1982; Sendjaja, 1980). The use of better inputs induced increases in land productivity which arose from investment in expanding and rehabilitation of irrigation channels, use of modern variety seeds, which were responsive to high fertilizer, pesticides, and fungicide usage (Mears, 1981; Timmer, 1975; Prabowo and Sajogo, 1981; Deuster, 1981). More labor could be hired, better resource mixes, and more investment in land. The reduction of the credit constraint, which had been a millstone around many a farmers' necks, unleashed the potential for higher factor productivity (Hayami and Ruttan, 1985; Pingali, 1997). The consequence was increased volumes of output. With higher agricultural output farmers' incomes soared, enabling them to hire more labor, undertaking more investment in farm buildings, acquisition of agricultural machinery, and livestock. The food security problem in Indonesia, for example, was overcome despite temporarily in 1984 when Indonesia achieved food self-reliance, albeit temporarily as it turned out (Tambunan, 1998).

It is not disputable that thanks to the rice intensification programs, the level of savings increased, availing funds for investment in other sectors of the economy. Thus it could be argued that direct government intervention in credit provision by easing the credit constraint facing small farmers, opened new frontiers by making it possible for higher consumer surplus, the source for investment

in other sectors of the economy.

One of the most lauded policies to affect the banking industry was the series of banking deregulations, which were promulgated since 1978. However, the most important of all was the 1988 banking deregulation 'Pacto 1988' as it is known in Indonesian academic circles. Interest rate deregulation encourages savings by increasing the return on deposits; induces transfer of funds from the non-monetized informal sector to the formal sector which increases the level of financial development; increases the demand for money by investors who are compelled to save more to accumulate funds for investment; increases the volume of money available in the economy, thereby enhancing intermediation efficiency, which then facilitates the channeling of such money to deficit-spending units by financial intermediaries (Agarwal, 2001; Gupta and Leinsink, 1996; Fry, 1995).

Whatever the benefits of financial deregulation, indications are abound that unfettered deregulation may lead to financial volatility (Zoninsein, 1994; Diaz-Alejandro, 1985; Besanko and Thakor, 1992; Bernanke and Gertler, 1990; Miller, 1999). This is mainly arises from the impact of increasing interest rates on credit on firms' cash flows which in turn undermines their capacity to repay borrowed funds (Petersen and Rajan, 1995; Visser and Herpt, 1996; Hellman et al., 1996; Berthelemy and Varoudakis, 1996; Sadli, 1998; Cole and Slade, 1998; Delhase, 1998; McLeod and Garnaut, 1998). Little wonder many a scholar are of the view that the increase in the interest rate on deposits subsequent to financial liberalization may not necessarily lead to more savings, credit and financial growth and economic development as propounded by Bencivenga and Smith (1991), Fukuchi (1995), King and Levine (1993), but may instead induce financial volatility if adequate supervision and regulation isn't part and parcel of the process (Petersen and Rajan, 1995; Cole and Slade, 1998; Helman et al., 1996; Diaz-Alejandro, 1985; Corsetti, 1998: 27-30). Interest rate increase on deposits increases credit, as long as savings in the banking system come from currency since with less currency and more deposits in the system, the currency to deposits ratio declines, which increases the degree of monetization in the economy. It is a different matter, however, if savings come from capital investments, which are liquidated to obtain higher return on deposits than is available in productive activities. This may be possible in cases where investments opportunities are minimal and fraught with great uncertainties as is the case in many developing countries.

The effect of misalignment in macroeconomic variables on the national economy is cause major economic convulsions which if not handled quickly and tactfully may jeopardize the very foundation of any economy. This is why the causes and effects of the 1997 economic crisis have been some the most researched topics in the late 1990s. The advent of macroeconomic crisis results into increases in the prime rate, which is the reference rate for cost of funds estimation for banks, lowers the lenders' risk preference, lowers the probability of realizing given expected returns, thereby lowering the state of confidence the lender has in the borrower, which eventually increases the lenders' perception of risk. The result is for lenders to increase price and non-price terms on loans, making it difficult for borrowers who are conventionally considered risky to obtain credit at all; and if so it is at higher interest rate, shorter maturity, less than the required amount and

provided under tighter covenants.

In addition, increasing macroeconomic risk induces lenders to make cut-backs on the number of credit recipients and the size of each loan provided. This is particularly so for small borrowers who borrow on credit market terms. Increasing variability of interest rate makes it difficult for lenders to compute cash flow figures, as well as the confidence of such estimates, lowers the output, increases the interest rate payments to cash flow ratios, making it more than likely that many farms will default on loans given. In other words increasing risk that results from higher macroeconomic changes, should engender higher credit rationing

It sounds pertinent then, that due to the high probability that loans channeled may default that links lenders willingness to supply loans to the potential distribution of suffering losses. Credit that is extended to very risky ventures takes the form of debt rather than an investment, thus lenders' supply depends on: 1) lenders' willingness to provide debt, which is a cumulative probability distribution function of loan losses; 2) the likelihood of reducing loan supply at higher than 'normal' interest rates fearing the possibility of even higher default; 3) to vary interest rate on loans in accordance with differing loan default probabilities; and 4) the forces underlying farmer credit demand (Turvey and Weersink, 1997; Nayak and Turvey, 1997; Morgan, 1998).

The existence of limited liability in agricultural loan agreements limits the recovery of outstanding and delinquent loan principal to the assets secured or collateralized by the agreement. Loan default is high for agricultural loans for the lender can only recover the loss to the tune of the secured assets. Such limited liability and financial risk engender excess demand relationships, since not all those who need loans can get, leading to a situation of credit rationing.

It becomes an intractable problem for the lender to provide an agricultural loan that has limited liability and as such financial risk, he therefore has to ensure that the borrower's investment is worth the value of the loan for profits from such an investment has a bearing on the lender's financial position. It is therefore deemed appropriate for the lender to demand some guarantee in form of equity from the borrower. This implies that loan demand cannot be isolated from loan supply. It is interesting to note that the borrower of the loan aims at maximizing terminal wealth through investment in either risky or risk-free assets. He has to decide how much of the risky investment is financed with debt. On the other hand, the lender aims at maximizing wealth through the amount of debt supplied to the borrower given the borrower's equity position, investment choices, and the probability of default. It is the effect of the probability of default that induces the reduction in loan supply above a certain interest rate.

The equilibrium of the borrower-lender relationship represents a contract curve and reflects a form of credit rationing. Limited liability provides the borrower with a cost less option (value of the loan above the secured assets). It is revealed further that loan default probabilities decrease with increased liquidity, profitability, repayment ability and security. Default probabilities increase with financial leverage, change in contribution margin, absolute loan amount, nominal interest rate, and refinancing.



### Hypotheses

1. *Bank credit has a positive influence on output in the food crop and fisheries sub sectors*
2. *Bank reserve requirements, previous year credit level, interest rate on credit, bank Indonesia certificates held, agricultural output, 1997 economic crisis, and 1988 banking deregulation influence bank credit extended to the food crops and fisheries sub sectors*
3. *There is no difference in the level of risk on output obtaining in the food crops and fisheries sub-sectors*

### RESEARCH METHODOLOGY

The scope of the research-covered food crops sub sector and the fisheries sub sector. The two sub sectors are known to enjoy differential treatment from the government, which is reflected by differences in status accorded to the two sub sector. The food crops sub sectors has been top priority sub sector for decades, if not centuries, a status that facilitated huge injections of subsidized inputs and investment in infrastructure. The fisheries sub sector, on the contrary, has had no such treatment, being left to 'go it alone' as it were. This puts the two sub sectors in different operating conditions, hence the justification for the research of the two sub sectors. On the side of commercial banks, the scope of research encompassed bank credit (both working and investment purposes) extended to the food crops and fisheries sub sectors of the agricultural sector by the commercial banking sector in Indonesia. This included bank credit from state national banks, private national banks, and foreign incorporated banks operating in Indonesia, joint venture banks and regional development banks. Secondary data were used in the research which went as far back as possible before 1988 (1970 to be exact)); that is before full scale banking deregulation, to the present as far as complete data availability warranted. Bank credit data consisted of primarily operational purposes as well as credit extended to the food crops and fisheries sub sectors for capital/investment purposes.

Data on sub sector product prices, interest rate<sup>1</sup> on bank credit, level of inflation was obtained from the department of agriculture, central bureau of statistics, and Bank Indonesia. Data on the amount of credit issued by commercial banks, government credit, level of bank assets, excess reserve position of banks, and bank Indonesia credit to commercial banks was obtained from Bank Indonesia and central bureau of statistics publications, and IMF'S *International Financial*

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<sup>1</sup> Interest rate on bank credit extended to the agricultural sector, as is the case with government credit, is rarely market determined. This has the implication that interest rate on credit is no longer a variable as would be the case under market conditions; rather is taken as given. Nonetheless, interest rate on bank credit as a variable is beginning to take effect in the wake of the 1997 economic crisis, in the wake of which most subsidized credit was all but phased out. That is not to say, however, that subsidization of one form or another is entirely nonexistent.

statistics, and the World Bank's annual *Development indicators*, and *United Nations Social and Economic statistics for Asia and the Pacific*.

**Delineation of models**

**Food crops sub sector**

$$LFOOD = \beta_{10} + \beta_{11} LFOOD(-1) + \beta_{12} LBCF + \beta_{13} CRIS + \beta_{14} DER + \epsilon_t$$

$$LBCF_t = \beta_{20} + \beta_{21} LBCF(-1) + \beta_{22} LBRES + \beta_{23} LIBC + \beta_{24} LSBI + \beta_{25} CRIS + \beta_{26} DER + \epsilon_t$$

**Fisheries sub sector**

$$LFISH = \beta_{10} + \beta_{11} LFISH(-1) + \beta_{12} LBCFISH + \beta_{13} CRIS (a)$$

$$LBCFISH = \beta_{20} + \beta_{21} LBCFISH(-1) + \beta_{22} LBRES_t + \beta_{23} LIBC_t + \beta_{24} CRIS + \beta_{25} DER + \epsilon_t$$

**Equality of output risk in the food crops and fisheries sub sectors**

$$H_0 : \mu_1 DFOOD = \mu_3 DFISH$$

$$H_1 : \mu_1 DFOOD \neq \mu_3 DFISH$$

Whereby LFOOD is the value of food crops output; LFISH the value of fisheries output; LBCF is the level of bank credit channeled to food crop sub sector in a year; LBRES is the amount of bank reserve requirements; LIBC is the rate of interest on bank credit; DER is the dummy for the 1988 banking deregulation, and CRIS is the dummy for the 1997 economic crisis; DFOOD and DFISH are proxies of food and fisheries sub sector output variability.

**Analysis Procedure**

To obtain the estimates the three stage least squares analysis procedure was employed because of the existence of simultaneity among the endogenous variables, which pre-supposed contemporaneous dependence among residual variables in each model. It is an appropriate analysis method in situations whereby tests for identification reveal over identified equations. This method is most appropriate as it removes the simultaneous equation bias, which would otherwise make OLS estimates biased (Griffith et al. 1993; Green, 2000). The three stage least squares method is a system method applied to all equations in a model at the same time giving estimates of all parameters simultaneously Koutsoyiannis (1977:474). To obtain estimate of the differences in variance, ANOVA method was employed. To interpret the results, 5 percent significance error was used.

































