BANKING DISINTERMEDIATION AND ITS IMPLICATION TO MONETARY POLICY:

Theoritical Views and Countries' Experiences

Sponsored by:
Bank Indonesia
Asian Development Bank

BANK INDONESIA

ADB
Asian Development Bank

Contents

Modeling the Disconnect Between Financial Policy and Real Sector Using the Financial Social Accounting Matrix as a Data System: The Case of Indonesia[1]

Iwan J Azis*
Cornell University and University of Indonesia

Introduction

Seven years after the devastating crisis, Indonesia's recovery remains tepid. GDP growth since 1997 never exceeded 5%. The highest growth rate (4.9%) in 2000 was mainly due to a partial catch-up from a low-base (i.e., GDP growth equaled minus 13.1 and +0.8 percent in 1998 and 1999, respectively). At the early stage of the crisis the slow growth was partly due to the restrictive monetary and fiscal policies, but since 2001 the sluggish growth continued despite the persistent declines in the interest rates. The restrained recovery has been featured by the disappointing growth of credit and investment (Figure 1).[2] Thus, there seems to be a disconnect between monetary policy and the growth of real sector. While such a phenomenon is not uncommon, especially in a post-crisis period, the precise reasons may vary between countries. What is clear is, the trends have caused the unemployment rate to soar.

Why has credit and investment growth been slow? Are banks content with good and safe earnings from government securities and other investment, or do they still suffer from a liquidity problem? Does the presence of non-performing loans reduce the collateral of financial intermediaries such that banks are forced to reallocate their portfolio, making fewer funds available at any given interest rate (credit rationing)? Have banks simply become much more conservative and risk averse after the crisis (Minsky hypothesis)? Or, is it because the legacy of having no serious credit risk assessment persists? Could it be that bank supervisors implemented the rules too rigidly? Is it the case that the uncertainties related to economic and non-economic factors remain high, e.g., weak property rights, rule of law, labor regulation (popularly coined as the investment climate), or , has the corporate restructuring in Indonesia languished?

---

* Professor of Economics at Cornell University, US and University of Indonesia

1 Paper prepared for an international conference on "Banking Disintermediation and Its Implication to Monetary Policy: A Theoretical View and Country Experiences" organized by PPSK-Bank Indonesia, December 15-16, Bali. The author wishes to acknowledge the excellent research assistance of Dr. Chanin Manopiniwes and the comments from participants at the workshop organized by RIETI of the Japan's Ministry of Economy, Trade and Industry (METI), Tokyo, 2004.

2 Note that during the first two quarters of 2003 the growth rate of investment was negative, and close to zero in the first quarter of 2004.

The aims of the paper are twofold: (1) To argue that the credit market frictions may have played an important role in the seeming disconnect between monetary policy and investment growth in Indonesia, reducing the effectiveness of the policy; and (2) To demonstrate the role of integrated flow-of-fund (FoF) and social accounting matrix (SAM) data in the analysis, particularly for providing a more complete picture about the link between financial sector, real sector, distribution of income, and poverty. To meet the first aim, the study uses a general equilibrium model that incorporates the agency costs, the balance sheet effect, the imperfect competition market for some industrial sectors, and the explicit link between macro-financial block, price block, and household incomes. Since the main data system for the model requires the fusion of balance sheet information from FoF and comprehensive data on real sector, trade sector, and household incomes from SAM, the paper begins with the discussions on how FoF and SAM can be integrated.

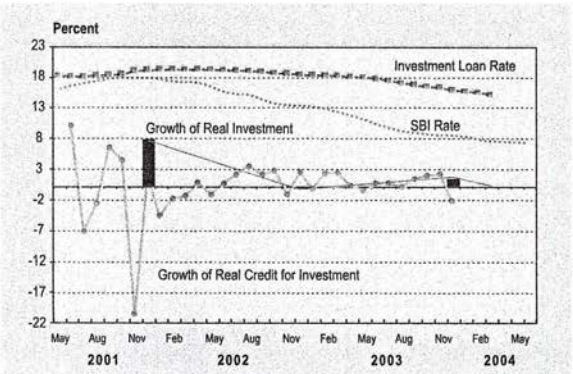

Figure 1. Interest Rates and the Growth Rates of Real Credit and Investment

Integrating SAM and the Flow of Funds

Indonesia is one of the very few countries in the world that has produced social accounting matrix (SAM) and flow-of-funds (FoF) tables on a fairly regular basis. To the extent that the analysis of the disconnect between monetary policy and the growth of real sector requires information regarding the balance sheets of various agents, and that the ineffectiveness of monetary policy could have profound effects on other development indicators, e.g., unemployment, income distribution and poverty, the first necessary step to take is to integrate the real SAM and the FoF to generate a financial social accounting matrix (FSAM).

In principle, FoF can be inserted into SAM by replacing the column of investments and the row of savings, in effect zoomed into the saving/investment account. Merging SAM with FoF insures that the base run equilibrium is consistent in many fronts, e.g., commodity and factor markets, balance of payments, household incomes and expenditures, and markets for loanable funds. The latter is insured by the matching of aggregate savings (supply of funds) with total investments (demand for funds).

Unlike SAM, however, FoF table is not in a matrix format. Thus, more information from other sources are still needed to establish a complete connection between the two accounts. The starting point is to decompose each institution in SAM. For example, Firms which is treated as a single institution in SAM (single row and single column), can be broken down into banks and non-banks. Gover nment should be r eclassified into Central Bank and Gover nment; the former manages monetary policy , the latter influences the economy primarily through fiscal policy. The financial actors may therefore consist of households, production sectors, and rest of the world (all of which are already disaggregated in SAM), central bank, government, commercial banks, and non-banks. Further disaggregation can be made when the data in a matrix-format is available (e.g., domestic and foreign institutions).

Next is to select different categories of financial instruments relevant to the country under study. Financial assets and liabilities can be classified into several types, e.g., foreign assets/ liabilities, government deposits, M_1, time deposit, government bond, central bank s instruments (e.g., required reserves and liquidity support), central bank credit, commercial bank credit, other credit (from government and rest of the world), central bank certificate (e.g., SBI), money market, equity, and fixed assets. Again, further dis-aggregation can be done, providing the data are available. For example, foreign assets may be broken down into equity and non-equity assets,[3] time deposits can be grouped into deposits in local and foreign currencies, and M_1 into currency and demand deposits.

Once the institutions and financial variables are defined, a matrix depicting the allocation of different financial assets/liabilities by different institutions can be constructed, the basic format of which is shown in Tables 1A and 1B. Essentially, the list in the Tables reflects items in the balance sheet of all institutions. The difference between total assets and liabilities reflect the institution s wealth or net worth (denoted by WEAL in Table 1B).

---

3 Including those assets issued abroad, such as US Treasury bills, as well as foreign holdings of domestically issued debts, consisting of both long-term and short-term debts of the government and the private sector.

Table 1.a
Assets Holding by Institutions

	CenBank	Govt'	ComBank	Firms	Sectors	HH	ROW
FA	X		X				
FL							X
Reserv			X				
Gdep		X					
M1					X	X	
TD					X	X	
GBond	X		X				X
BLBI	X						
BICredit	X						
PCredit			X				
Ocreit		X					X
SBI			X	X			
MMS	X		X				
EQ		X		X		X	X
FIX	X	X	X		X	X	X

Table 1.b
Liabilities Holding By Institutions

	CenBank	Govt'	ComBank	Firms	Sectors	HH	ROW
FA							X
FL	X	X	X	X			
Reserv	X						
Gdep	X		X				
M1	X		X				
TD	X		X				
GBond		X					
BLBI			X				
BICredit			X		X		
PCredit					X		
Ocredit					X		
SBI	X						
MMS					X		
EQ					X		
WEAL	X	X	X	X		X	X

Legend: *CenBank = central bank, Govt = government, ComBank = commercial bank, Firms = corporate firms, Sectors = production sectors, HH = households, ROW = rest of the world, FA = foreign asset, FL = foreign liability, Reserv = bank's required reserve, Gdep = government deposits, M1 = currency and demand deposit, TD = time deposit, Gbond = government bond, BLBI = Bantuan Likuiditas Bank Indonesia (government liquidity support), BICredit = central bank's credit, PCredit = private credit, OCredit = other credit, SBI = central bank's certificate, MMS = money market securities, EQ = equity, and WEAL = institutional wealth*

Discrepancies between data in FoF and in SAM are common. In such a case, making assumptions to generate some estimates is inevitable. A case in point is when we need to guarantee that saving of household group *j* is consistent with the saving data from SAM. In such a case, the change in other asset holdings can be estimated by subtracting changes in households M_1, time deposits, and fixed investment from total saving (see column HH in Table 1A).

Table 2.
Schematic Financial SAM of Indonesia

	FACTORS	i.HH	i.FIRM	i.Gov	ACTIVITIES	TRADE&TRANSPORT MARGIN	COMMODITIES domestic	COMMODITIES import	KA.HH	KA.ComBank	KA.Firms (non-bank)	KA.CenBank	KA.Govern	KA.ROW	KA.SECTORS	FA	FL	Reserv	Gdep	M1	TD	Gbond	BLBI	BICredit	PCredit	OCredit	SBI	MMS	EQ	FIX	TAX	i.ROW
FACTORS																																R02
i.HH																																
i.FIRM	R03		R04																													R06
i.Gov			R26																												R05	
ACTIVITIES							R07																									
TRADE&TRANSPORT MARGIN							R08	R09																								
COMMODITIES domestic					R11	R13																							FX			R04
COMMODITIES import			R10		R12																											
KA.HH		R15																														
KA.ComBank			R16														Y		Y	Y	Y		Y	Y								
KA.Firms (non-bank)			R17														Y															
KA.CenBank				R18													Y	Y	Y	Y	Y						Y					
KA.Govern				R19													Y					Y										
KA.ROW																Y																R20
KA.SECTORS																								Y	Y	Y		Y	Y			
FA										X		X																				
FL														X																		
Reserv										X																						
Gdep													X																			
M1									X						X																	
TD									X						X																	
Gbond										X		X		X																		
BLBI												X																				
BICredit												X																				
PCredit										X																						
OCredit													X	X																		
SBI										X	X																					
MMS										X		X																				
EQ									X		X		X	X																		
FIX									F01	F02		F03	F04	F05	F06																	
TAX							R21	R22																								
i.ROW	R23		R24					R25																								

Legend: *R01 = Factor Payment; R02 = ROW Payment to factors; R03 = Domestic Factor Income; R04 = Institutional Transfer (among domestic institutions); R05 = Tax collected by Government; R06 = Institutional Transfer (from abroad); R07 = Output; R08 = Trade & Transport Margin for domestic commodities; R09 = Trade & Transport Margin for imported commodities; R10 = Private and Government Consumption (CD+GD); R11 = Domestic Intermediate Inputs; R12 = Imported Intermediate Inputs; R13 = Total Trade & Transport Margin; R14 = Exports; R15 = Household Saving; R16 = Commercial Bank Saving; R17 = Firms (non-bank) Saving; R18 = Central Bank Saving; R19 = Government Saving; R20 = ROW Saving; R21 = Indirect Tax; R22 = Tariff; R23 = Factor Income of ROW; R24 = Institutional Transfer (to abroad); R25 = Imports; R26 = Direct Tax; X = Assets; Y = Liablitites; FX = Total Investment; F01 = Household Fixed Asset; F02 = Commercial Bank Fixed Asset; F03 = Central Bank Fixed Asset; F04 = Government Fixed Asset; F05 = ROW Fixed Asset; F06 = Production Sectors Fixed Asset*

Tables 1A and 1B are used to substitute the Capital Account in SAM. Hence, the single-column Capital Account is br oken down into two sets of account: capital account (KA) and financial account (FA). Entries of the sub-matrix in which KA is the column and FA is the row are taken from Table 1A, and entries of the sub-matrix in which FA is the column and KA is the row are from Table 1B. Integrating these two accounts into SAM yields FSAM shown in Table 2. Note that the fixed assets of different institutions in different sectors represent the real (non-financial) investment.

The FSAM will not only give valuable information on the linkages between financial and real sector, employment and income distribution, but it also provides an opening for modeling the mechanisms of those linkages. As in illustration, in order to investigate the nature and intensity of various paths connecting different blocks in the model that capture direct, indirect and feedback effects, we could apply a *structural path analysis* (SPA) technique by generating a set of multipliers from the constructed FSAM. Or, using FSAM as the benchmark we may build a more sophisticated model such as the one discussed in the next Section, in which prices are endogenous and no restrictions are imposed on capacity utilization. One of the advantages of using this type of model is that, it enables us to simulate a set of counterfactual policies in a consistent and meaningful way, and compare the outcomes of those policies.

Modeling Credit Market Frictions, Balance Sheet Effects, and Monopolistic Competition

The model used in this study is an extension of Azis (2001) and Azis (2002). Due to space constraint, the full description of the model will not be repeated here (available upon request). Rather, the focus of discussions is on the role of credit market frictions, the balance sheet effect of exchange rate changes, and the monopolistic competition market for some industrial sectors.

Asymmetric Information and Agency Cost

The ineffectiveness of monetary policy can be closely associated with the problem of credit allocation.[4] It has been known that the fluctuations of credit growth are due to changes in the supply and demand for funds, both of which are influenced by shocks and other factors. One of the important factors is the financial structure of lenders and borrowers.[5] When firms are also lenders to other firms, frictions in the credit market are likely to amplify, propagating real and nominal shocks to the economy (Stiglitz and Greenwald, 2004). Under what conditions do credit market frictions occur?

---

4 Unlike in the traditional monetary economics, the basic premises of the new monetary economics are: (1) credit, not interest rate, plays a central role in determining economic activities. Yet, the actual allocation of credit is critically dependent on the judgments of lenders concerning the risk associated with borrowers, not on an auction market; (2) The presence of asymmetric information implies that there is a cost for acquiring information (agency cost) and this cost is sunk; thus, the credit market is inherently imperfectly competitive; (3) the relation between money and output is not necessarily stable (only some of the transactions are related directly to income and output generation), and the relation between the two is endogenous.

5 There is also a body of research emphasizes the limited commitment—rather than the asymmetric information—between the financial intermediary (lender) and the firm (borrower). Marcet and Marimon (1992) argue that in some cases the presence of limited commitment has more pervasive effects on investment spending than the asymmetric information framework (see also Kehoe and Levine, 1993).

In a principal-agent problem, credit and investment cycle can be affected through several ways. A depressed collateral value of the firm due to falling asset prices, or a worsening firm s balance sheet caused by a double mismatch in firm s leverage, can raise the agency costs imposed by asymmetric information between borrowers and lenders.[6] In such circumstances, there is an incentive for borrowers to pass off risky or potentially bad projects as good projects to lenders. This can lower the probability that loan is repaid, or raise the probability that firm will go bankrupt. Either way it will lead to higher cost of external finance (higher interest rate).[7] In a multi-period framework, the high rate of bankruptcy can be a consequence of high interest rates. The initial upward pressure on the rates may be independent of economic fundamentals or the underlying real event (it can simply come from the lenders belief, e.g., through a coordinated signal that the economy hence the pr oject has no good pr ospect and that the probability of bankruptcy is high). At any rate, the causality between the interest rates and bankruptcy can work in both ways.

What if the balance sheet problem locates in the banking side, e.g., large holding of non-liquid assets (i.e., recap bonds), and considerable size of non-performing loans (higher defaults)? In such a case, the collateral of financial intermediaries is likely to fall. This will force lenders to undertake portfolio reallocations that may result in credit rationing; that is, at any given interest rate fewer funds are made available.

All the above hypotheses essentially suggest that credit and investment are sensitive to the net worth if agency costs associated with asymmetric information are present. This will not only propagate and amplify the initial shock to the economy but it can also make monetary policy ineffective (a fall in the nominal interest rate can fail to stimulate the economy even in the short-run). In order to test these hypotheses, the relevant features associated with the agency cost problem ought to be incorporated in the analysis.

The exchange rate shock following capital outflows during the crisis has affected investment not only directly by bringing about higher interest rates, but also indirectly by worsening firms balance sheets (creditworthiness). The latter, exacerbated by high interest rates, are likely to raise the monitoring costs (agency costs) imposed by asymmetric information, exerting further upward pressure on the interest rates, reducing the amount of available funds.[8]

---

6 Stgilitz and Weiss (1981) demonstrate the effect of lenders' inability to distinguish between different types of borrowers on credit restrictions through the agency cost. Williamson (1987) shows that even if lenders know the risk characteristics of different borrowers, there is an incentive of lenders to verify the borrowers' claim and monitor the project, and this will raise costs that can lead to credit rationing.

7 The cost difference between external finance and internally generated finance is a measure of agency cost which are likely increasing in recessions and decreasing in booms.

8 Bernanke and Gertler (1989) argued that the mechanism works through the effect of firm's net worth on the risk premium on external financing.

The bank s balance sheet is depressed due to the high exposure of foreign debt and large holding of non-liquid asset (recap bonds).[9] Even after a huge amount of government bonds has been issued to recapitalize troubled banks, the expected increase of credit did not materialize. Instead, banks have greater incentives to hold central bank certificates (SBI), and are content with holding bonds and other non-risky assets to secure high capital adequacy ratio. The whole premise of the recapitalization program was that, a considerable portion of the bonds will eventually be converted into credits, so that the intermediation function can gradually resume. As this did not happen, firms ability to invest declined.[10]

Hence, loan or credit is influenced by the net worth of borrowers, as well as by the asset composition and the net worth of lenders:

$$CREDIT_i = s_i LBL_{Combank}\left[\left(WEAL_{Corp}/(P_K K)_{Corp}\right)WF_K\right]^{\mu 1}\left[B^{recap}_{ComBank}/AS_{ComBank}\right]^{\mu 2}\left[\left(WEAL_{ComBank}/(P_K K)_{ComBank}\right)WF_K\right]^{\mu} \quad (1)$$

where *LBL* is the size of loanable fund, WF_K is the unit value of capital used to measure the value of agent s wealth; P_K and K are the price of and demand for capital, respectively. The first bracket in the RHS reflects the balance sheet position of the corporate sector, the second denotes the proportion of bank s risk-free yet illiquid asset, mostly recap bonds (B as a proportion of AS); s_i is positive constant, m_1, $m_3 > 0$, and $m_2 < 0$. The last term on the RHS captures bank s net worth. Thus, a depressed value of net worth leads to a lower amount of credit, so does a high proportion of illiquid asset in the lender s total asset.

Given the considerable amount of recap bonds issued by the Indonesian government since 1998, and agents balance sheets are still weak, it is expected that the above framework of analysis suits better with the country s condition. It is consistent with the postulate of credit market frictions, in which interest rates do not necessarily perform as the equilibrating factor in the supply and demand markets for loans (to be corroborated later by the results of model simulation).

Balance Sheet Effects and Firm s Investment

In the two cases discussed above, the credit constraint is associated with the lender s decision and behavior such that the supply curve for intermediated finance moves to the left. But the demand side can also be an important explanation for real credit crises, one mechanism of which works through the corporate manager s decision not to invest especially when they believe that the depressed balance sheet can raise the bankruptcy cost.

In theory, the presence of asymmetric information between agents (managers) and principals (owners) can lead to transfers of firm s resources by and to managers who are risk-neutral and unconcerned with their reputation should their action ultimately bankrupt the firm (Jensen and Meckling, 1976). In reality, however, managers are likely risk-averse since they are afraid of loosing job if the firm goes bankrupt. They are less willing to take on risky projects that do not maximize the firm s value. Assuming that firm s manager maximizes expected profits less expected bankruptcy costs in which the latter are a decreasing function of firm s equity, the lower the equity of the firm the lower is the output; see Greenwald and Stiglitz (1993). This implies that firm s balance sheet could affect managers decision to invest. More specifically, a depressed firm s net worth will not only raise the cost of external finance but also influence managers decision not to invest.[11]

One of the distinctive features of firm s balance sheet during the crisis is the high leverage on short-term and un-hedged foreign debt. The impact of adverse exchange rate shock is therefore magnified by the increased debt burden, depressing firm s equity. To avoid the possible high cost of bankruptcy, indebted firms tend to pass up investment. Thus, changes in the exchange rate *e* can have a contractionary effect on domestic investment ($INV_{dom,i}$):

$$INV_{dom\,i} = \lambda_i VA_i^{\lambda_1 i}(1 + r_{loan})^{\lambda_2 i} \left(e/\pi\right)^{\lambda_3 i} \qquad (2)$$

where VA_i is the value added in sector i (output accelerator), r_{loan} is the loan interest rate, and *p* is the inflation rate; *ls* are constant, where $l_2 < 0$. When *e* is favorable, few firms would be balance sheet-constrained, in which case the direct effect of *e* on aggregate demand would be minor. On the other hand, if *e* collapses, firms with foreign-currency debt and deteriorating balance sheets would be unable to invest. In the interim, exports may rise but the effect of a bankrupt corporate sector and the absence of new investment may be large enough to outweigh the direct effect of improved export competitiveness. In such a case, a weaker exchange rate is contractionary. Given *e*, the normally upward-sloping curve of aggregate demand may have a backward-bending segment (Aghion et.al, 1999), creating multiple stable equilibria, one of which is a bad equilibrium with collapsed *e* and bankrupt corporate sector (see the Appendix for the exposition that the effect of exchange rate on aggregate demand could lead to a bad equilibrium or a backward bending AD-curve).

---

9 During the crisis, the bank run following the closure of 16 banks in late 1997, and the high interest rate policy, also played a critical role in causing bank's balance sheet to deteriorate

10 At the early stage of the crisis, the resulting recession caused the market confidence to fall, intensifying capital outflows and weakening the currency further. Hence, a vicious recessionary cycle replaced the previously virtuous growth cycle (see Azis, 2002 and Azis 2004).

11 This is often alleged by Indonesian bankers whom the author spoke with during the 2002-2004 period

The level of economic activity, interest rates, returns on different assets, and agents behavior in allocating wealth, all will determine the allocation of incomes (earnings) and the money demand of households and other institutions.[12] The money supply is modeled through money multiplier and high powered money (reserve money), the size of which is determined by the difference between the central bank s loan plus reserves (NDA plus NFA), wealth plus non-interest bearing government deposits, and the central bank s certificate (SBI). The money multiplier fluctuated rather sharply during the crisis, because household behavior varied considerably. Therefore, it is allowed to vary, the magnitude of which is influenced among others by government s policy, e.g., reserve requirement (see Harberger, 2000 for a discussion of flexible multipliers during the Asian crisis).

Given the total liabilities, including foreign debt, bank s assets other than credit are determined endogenously (recall that credit is specified through equation 1).[13]

Non-Marginal Cost Pricing in Imperfect Competition

Some industrial sectors display at least one of the following characteristics: product differentiation, strategic behavior, and economies of scale or increasing returns, be it internal (cost per unit depend on the size of the individual firm but not necessarily on the industry) or external (cost per unit depend on the size of the industry but not on the size of any one firm). The product markets of these sectors are therefore featured by monopolistic competition.

One of the characteristics of monopolistic competition is that, the marginal revenues curve lies below the market demand curve since additional unit can only be sold by lowering the price of all units. The resulting deadweight loss (welfare loss) stems from the fact that the produced output quantity is smaller than the socially optimal quantity.

In a condition whereby each firm enjoys some monopoly power, able to choose its price (or output) by taking the price (or output) of other firms as given, the average cost depends on the size of the market and the number of firm in the industry; more firms imply higher average cost and each will sell less.[14] From the f.o.c:

---

12 The household portfolio allocation is specified under the assumption of no perfect substitutability. Households' wealth is allocated between liquid and less liquid assets. The latter is further allocated between time deposit and other assets, the specific allocation of which is determined by household's preferences/tastes, i.e., influenced by the expected returns on those assets; see Tobin (1970), Brunner & Meltzer (1972), Bourguignon, Branson and de Melo (1989), and Thorbecke et.al (1992). The production sectors' demand deposit is specified as a function of total output.

13 A certain portion of total credit is assumed non-performing.

14 Excluded in the specification is a collusive behavior in which firm can raise the profits of all firms at the expense of consumers, a group of firms affect the behavior of competitors and deters potential rivals from entering an industry

$$(1/N) + c + P_\theta = 2P_i \tag{3}$$

where N is the number of firms in the industry, c is the firm s marginal cost, P_i is the price charged by the firm, and P_q is the average price charged by firm s competitors. Under symmetry assumption, where $P_i = P_q$:[15]

$$P_i = c + (1/N) \tag{4}$$

that is, the mark-up over marginal cost decreases as N increases. The larger the number of firms, the lower the price. Thus, the more firms there are, the higher the average cost of each firm, and the lower the price each will charge.

A straight forward way of incorporating the above specification in the model is by using price mark-ups on the marginal costs which determine producers monopoly rent (Ginsburgh and Keyzer, 1997). When using the *Lerner* mark-up (price minus marginal costs divided by price), information about the number of firms and their market shares are implicitly taken into account, although we also need to assume that manufacturing firms are aware of their price-sales relation (Harrison et.al, 1996). This is a rather unrealistic assumption. Alternatively, the mark up component can be set exogenously, treated like an additional tax, leaving the output price *PX* net of taxes unchanged but the domestic price *PD* higher:

$$PD_i = (PX_i X_i - PE_i E_i) / (1 - id_i . ttd_i . \sigma_i) D_i \tag{5}$$

where *id* is the indirect domestic tax, *ttd* is the trade and transport margin rates. *X, D* and *E* are total supply, domestic output, and exports, respectively, and *PX, PD* and *PE* are the corresponding prices. Although parameter s_i denotes the degree of market imperfection in sector i, not exactly the measure of mark up, it has the same role as the mark up. The f.o.c yields

$$D_i = \frac{E_i}{\left\{ \left[PE_i / (1 - id_i - ttd_i - \sigma_i) PD_i \right] \beta_i / (1 - \beta_i) \right\}^{1/(\rho_i - 1)}} \tag{6}$$

15 All firms in the industry are assumed symmetric, i.e. the demand function and cost function are identical for all firms

where $0 < b_s < 1$ and $r_s > 1$. As the firm enjoys some monopoly power, the higher s_i the more likely that it will produce less output (lower *D*). Thus, the production level of industries that enjoy monopolistic competition tends to be lower. However, with the mark up price, incomes of the firms operating in those industries can still increase:

$$Y_{corp} = \sum_f \varphi_{corp,f} YF_f + \sum_{in} TRF_{corp,in} + \sum_i \sigma_i PD_i D_i \quad (7)$$

where *j* is the distribution parameter, *YF* is the factor income, and *TRF* is the institution transfers.

Incorporating the Distribution of Income and Poverty Estimates

To extend the analysis to include distribution of income and poverty, the specification of household income *YHH* for each category *ihh* is essential. There are four components of household incomes: (1) factor incomes, the first term on the RHS of equation 8; (2) transfers from ROW, inter-households, and government; (3) corporate dividends; and (4) interest income from time deposit *TDH* at the initial period:

$$YHH_{ihh} = \sum_f dis_{ihh,f} YF_f + \left(e \cdot TR_{row,ihh} + \sum_{ihh} YHH_{ih} + TR_{gov,ihh}\right) + div_{ihh} Y_{corp} + rt.TDH_{ihh,t-1} \quad (8)$$

$$TDH_{ihh} = \mu_{,ihh}(WEAL_{ihh} - M1_{ihh} - FASS_{ihh}) \quad (9)$$

$$HHSAV = \sum_{ihh} mps_{ihh} YHH_{ihh}(1 - th_{ihh}) \quad (10)$$

$$WEAL_{ihh} = mps_{ihh} YHH_{ihh}(1 - th_{ihh}) + WEAL_{ihh,t-1} \quad (11)$$

As argued in Azis (2004), if the deposit interest rate *rt* increases, the *YHH* of household *ihh* who hold savings (*TDH*) will also increase. Hence, those holding more time deposit assets will enjoy higher incomes. Household time deposit *TDH*, on the other hand, is determined by the size of household wealth *WEAL* (equation 9), which is specified as the sum of current household saving *HHSAV* (*mps* out of *YHH* after tax), and the wealth at the beginning of the period (equations 10 and 11). Hence, the size of time deposit is also influenced by the household income, making the two variables interdependent.

The estimates of poverty can be determined by the outcomes of two transmission mechanisms. The most direct one is through changes in wages and other incomes, and another

mechanism is through changes in the price of basic commodities in order to determine the monetary poverty line. To arrive at the prices of basic needs (prices presumably paid by the poor), the consumption pattern in the rural and urban areas has to be taken into account to reflect different prices actually paid by poor households in those two areas. The starting point is to select a basket of Basic Needs (BN) reflecting the consumption pattern of the households around the presumed poverty line and yielding the threshold caloric requirements. Typically, food is by far the most important commodity in the BN basket. Denoting the basket of BN by p_{com}, the poverty line is essentially $S_{com}\, p_{com}.\, P_{com}$, where P_{com} is the endogenously derived poverty line prices.

The remaining information needed to arrive at the poverty estimates is the intra-household distributions. Without such information, we can only approximate the resulting poverty by comparing the trends of the price of poverty line (equation 12) and the estimated incomes of poor households derived from equation 8:

$$P_{com} = \sum_{bc} PQ_{bc} Q_{bc} \Big/ \sum_{bc} Q_{bc} \qquad (12)$$

where *bc* denotes the basic commodities presumably consumed by the poor.

Simulation Results

Two sets of simulations are conducted. The first is intended to demonstrate the importance of changes in the agents balance sheets in analyzing the seeming disconnect between monetary policy and investment growth, the second is designed to emphasize the vital role of agency costs. More specifically, the first set compares the results of simulations based on two versions of general equilibrium models, one without financial sector (hereafter NFS) and the other with financial sector (FS). The second set is to compare the results from FS with those based on a model with agency costs (hereafter FSAC). It is shown that the explicit inclusion of a fairly detailed financial sector that captures the balance sheets conditions of all agents (FS) provides better results, in the sense that the estimated values of credit, investment, and a set of other endogenous variables, are closer to the actual data compared to the values generated by the model that ignores the changes in the balance sheets of many agents (NFS). When the role of agency costs is included and specified explicitly (the FSAC model), the estimates are even more accurate.

In NFS, the domestic investment is determined by output accelerator and loan interest rates, without looking at the dynamics of financial assets and the balance sheets of agents. In

essence, any amount of investment demand generated by the economic activity given the interest rates will be materialized regardless of the behaviors of lenders and borrowers and the availability of the loanable funds. Since the financial sector is excluded from the system, the mechanisms of the balance sheet effect of the exchange rate changes on investment are also dysfunctional. In FS, on the other hand, an exchange rate depreciation could have a contractionary effect working through the depressed balance sheets of firms with large foreign currency-denominated debt. More importantly, credit and investment are constrained by the amount of loanable funds. Given the balance sheet position of firms and banks, and the prevailing exchange rate, when interest rates are raised the effect of higher costs of money may be amplified by the effect associated with the changes in bank s balance sheet. The latter is determined by the dynamics of the financial sector and the bank s preference concerning the asset portfolio allocation, e.g., SBI and government bond holding. Thus, the policy effect of higher interest rates could be larger in FS than in NFS.

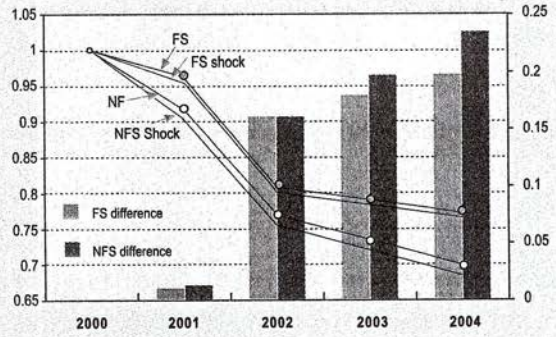

Figure 2. Real Investment Under the FS and NFS: Before and After Interest Rate Shock

Introducing a shock of 2 percent higher loan interest rate, the simulation results show that during 2000-2004 the size of investment decline under FS is indeed larger than under NFS (Figure 2). While the declining patterns in both simulations are similar, the investment levels derived from the latter are lower at all times, before and after the interest rate shock. Note that the difference between before and after the shock in both models (the bars in the Figure) increases over time. More importantly, the gap between the two models also tends to widen, implying that the cumulative error of ignoring the changes in the balance sheets of agents could be large.

Although the estimates of endogenous exchange rate in FS are higher than in NFS, no depreciation is detected. This is consistent with the actual data. Also, to make the two more comparable, the influence of exchange rate changes on investment as depicted in equation 2 is assumed for the moment not to take effect in both models. Thus, the balance sheet effect of exchange rate changes cannot serve as the main explanation for the lower investment in FS. It appears that the difference in price effect that matters. As the exchange rate in FS is weaker than in NFS, the price of the tradable sector in the former is also higher, and so is the general price index. In turn, wages are higher, causing labor demand and value-added lower. It is the combination of this mechanism and the constraint of loanable funds in the balance sheet that makes the investment under FS lower than in NFS.

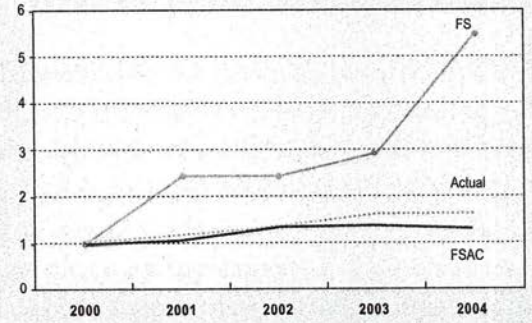

Figure 3A. Trends of Credit: With and Without Agency Costs

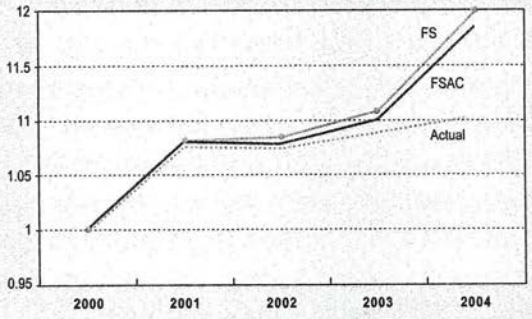

Figure 3B. Trends of Real Investment: With and Without Agency Costs

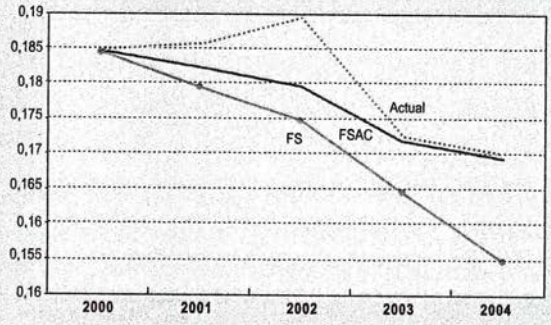

Figure 4. Trends of Loan Interest Rates: With and Without Agency Costs

But even in the FS model the actual amount of funds made available by banks to lend is likely overestimated. The weak balance sheet reflecting the unfinished restructuring of corporate sector may have raised the agency costs imposed by asymmetric information between borrowers and lenders. This can lower the probability that loan is repaid, or increase the probability of bankruptcy. Either way it will lead to higher costs of external finance. On the banking side, the large holding of non-liquid assets (i.e., recap bonds) and central bank certificate (SBI), and the fear of a likely increase in NPL may have affected lending behavior, causing fewer funds actually made available for loans at any given interest rate. Some banks may translate this into higher lending rates, others may simply undertake credit rationing. This agency costs component, which is absent in FS, is included in FSAC.

Figures 3A and 3B show that by incorporating the agency costs the resulting estimates of credit and investment are much closer to the actual data. Thus, even when the central bank has lowered the interest rates on SBI since 2002, and the exchange rate has not been weakening, such a policy failed to stimulate investment.[16] The fact that the loan rates under FSAC is higher than in FS, and that the actual loan rates did not decline as fast as the policy-based SBI rate did (see again Figure 1) suggests that banks have been inclined to keep the loan rates high. Figure 4 clearly shows that the loan rates under the agency cost model are closer to the actual data compared to those generated by the model without agency costs.

16The yearly average of the exchange rate has actually strengthened, i.e., from 9,595 rupiah per US dollar in 2000 to 8,465 in 2003, and is expected to average around 9,100 in 2004.

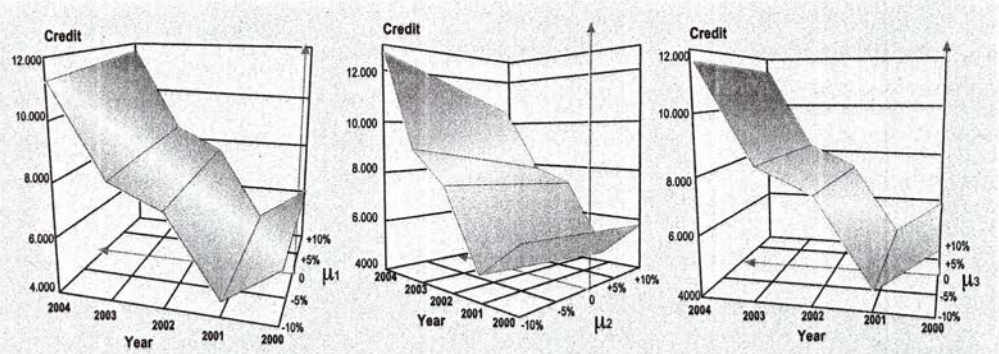

Figure 5A. Sensitivity of Firm's Net Worth

Figure 5B. Sensitivity of Illiquid Asset Holding

Figure 5C. Sensitivity of Bank's Net Worth

To have a better understanding of the mechanisms capturing the effect of agency costs, a sensitivity analysis focusing on credit is conducted by changing the values of m_1, m_2, and m_3 in equation 1. In Figures 5A, 5B and 5C, different levels of credit are measured on the vertical axis, and different values of m_s are measured on one of the horizontal axes. The other horizontal axis denotes the year.

Figure 5A shows that as m_1 increases (greater sensitivity with respect to firm s net worth) credit increases. Such a relation persists during the period under observation despite the fact that at any given value of m_1 credit declines in 2001. A symmetrically opposite result is detected when the value of m_2 is raised (sensitivity of the share of illiquid assets held by banks), except that the magnitudes of credit change a decline, in this case ar e larger than in the earlier case (Figure 5B).

Testing the sensitivity of banks net worth by raising the value of m_3 results in a rather different pattern. During 2000-2003, higher weight of bank s net worth leads to larger amount of bank s credit. However, at the end of the period a larger m_3 generates a *lower* amount of credit (Figure 5C). The incentives to hold non-risky assets appears to be larger when the lending behavior is very sensitive to the bank s net worth.

Counterfactual Simulations

To verify further the vital role of agency costs, counterfactual simulations are conducted in which the policy-based SBI rates are lowered from the actual data by six full percentage point in 2001 (a one-time shock). Imposing this scenario on FS and FSAC models reveals that the

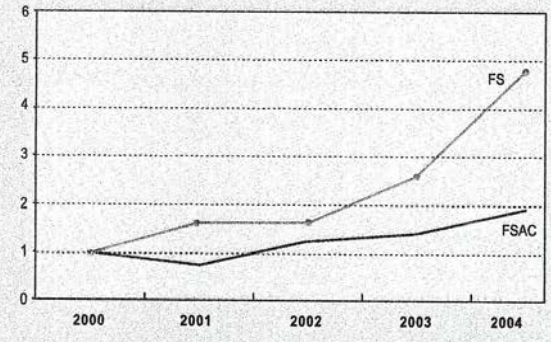

Figure 6. Trends of Credit Following the Reduction of Interest Rate: With and Without Agency Costs

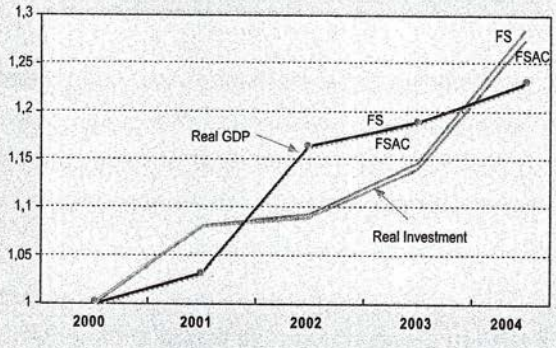

Figure 7. Real GDP and Investment Following the Reduction of Interest Rate: With and Without Agency Costs

stimulating effect of lower interest rates on credit, investment, and GDP under FSAC is smaller than under FS (Figures 6 and 7). This is due to a combination of banks behavior associated with the agency costs and different magnitude of the exchange rate effect on firm s investment that works through the changes in the balance sheet position.

Simulation results also shows that the FSAC estimates of loan interest rate are higher (Figure 8), and the resulting unemployment rate is also higher. It is important to note that the gap between unemployment rates in FS and in FSAC gets wider over-time (Figure 9), implying that the cumulative error of using the model that ignores the role of agency costs could be large, and the resulting unemployment rates are likely underestimated.

Household incomes, as specified in equation 8, consist of wage and non-wage incomes including earnings from various financial assets. As expected, higher investment and output following the reduction in the interest rates leads to greater demand for factors. As a result, wages and other factor incomes increase. Figures 10 and 11 show that the FSAC model is likely to generate wages and non-wage incomes that are lower than in FS.

By neglecting the agency costs, corporate income tends to be overestimated, causing the dividends received by households overestimated as well (Figure 12). On the other hand, since the loan interest rate under FSAC is higher than in FS, the estimated interest incomes of the households are also higher (Figure 13). It remains to be explained, however, why does interest income increase when the interest rates decline? Recall from equations 8 to 11 that household savings and incomes are interdependent. Hence, rising household incomes following the reduction of interest rates leads to higher savings such that the total interest income increases (despite the decline in the interest rates).

Notice that for the majority of variables the change is larger and more visible in 2002, implying that there is a time lag before the real effects of the interest rate policy emerge. Note also that most of the differences or the gaps in the values generated by the two models are monotonically-increasing, a strong indication once again that ignoring the role of agency costs imposed by asymmetric information between borrowers and lenders could have a deleterious implication in terms of generating large cumulative errors.

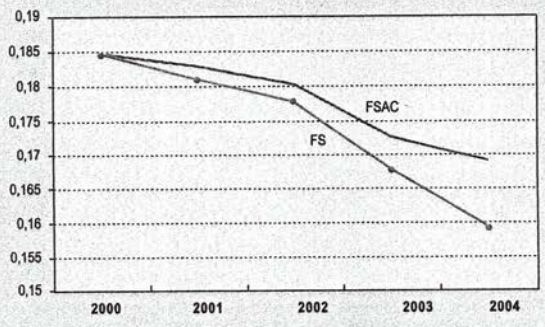

Figure 8. Trends of Loan Interest Rate Following the Reduction of Interest Rates: With and Without Agency Costs

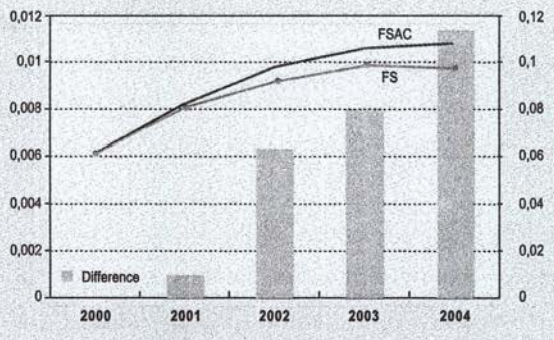

Figure 9. Unemployment Rate Following the Reduction of Interest Rates: With and Without Agency Costs

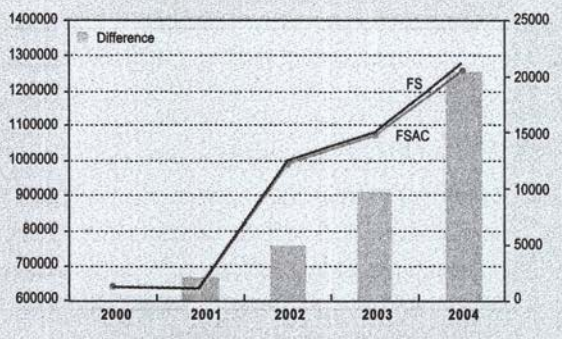

Figure 10. Wage Income Following Interest Rates Reduction: With and Without Agency Costs

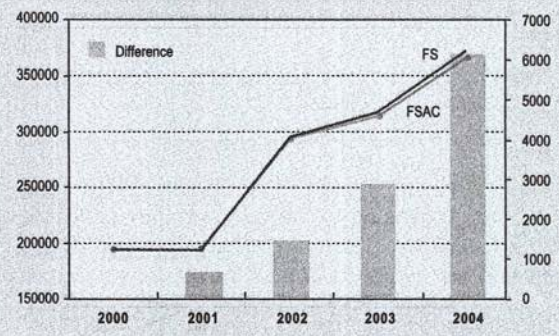

Figure 11. Other Factors Income Following Interest Rates Reduction: With and Without Agency Costs

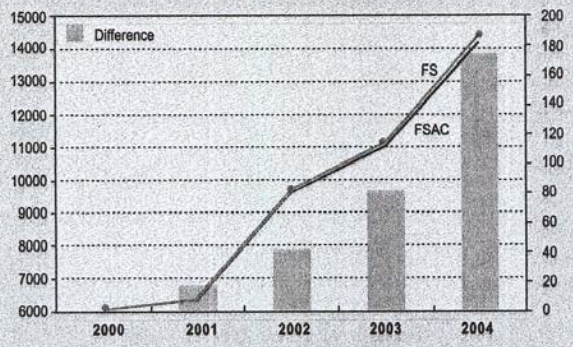

Figure 12. Devident Following Interest Rates Reduction: With and Without Agency Costs

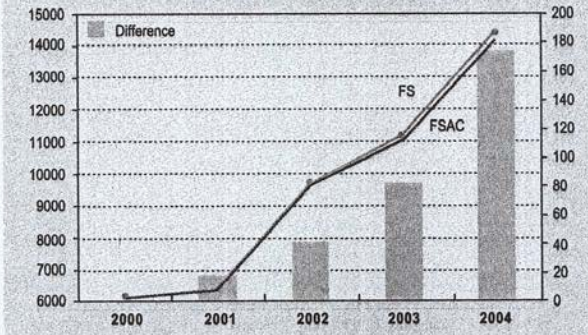

Figure 13. Interest Income Following Interest Rates Reduction: With and Without Agency Costs

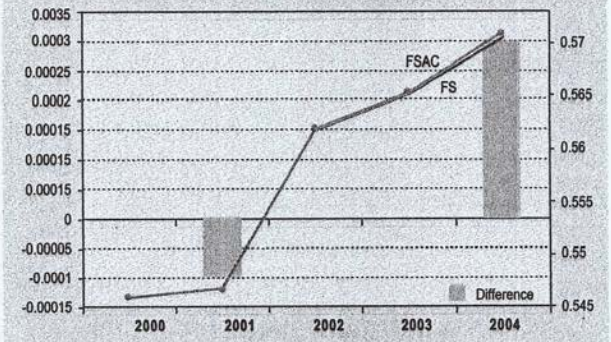

Figure 14. Gini Index Following the Reduction of Interest Rates: With and Without Agency Costs

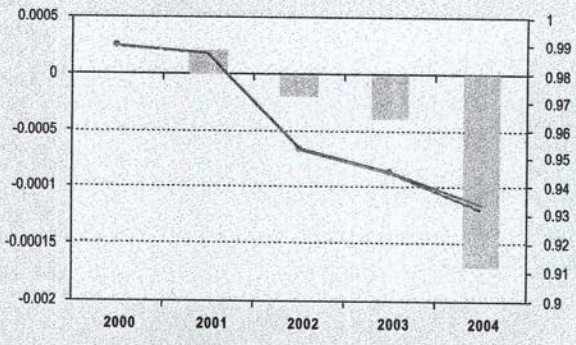

Figure 15. Income Share of Poor Households Following the Reduction of Interest Rates: With and Without Agency Costs

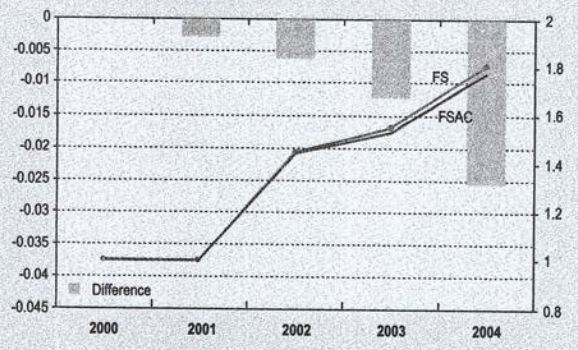

Figure 16. Income of Poor Households Following the Reduction of Interest Rates: With and Without Agency Costs

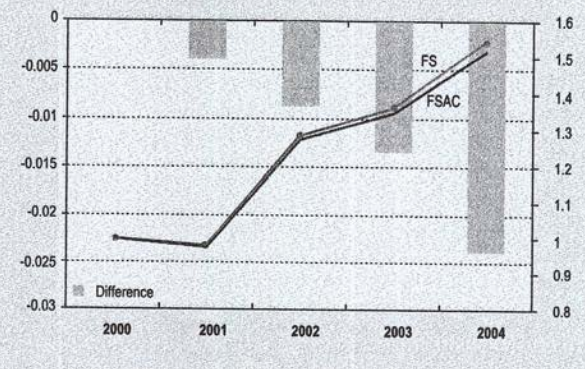

Figure 16. Price of Proverty Line Following the Reduction of Interest Rates: With and Without Agency Costs

Taking advantage of the detailed breakdown of household in the model based on SAM classification, all the macroeconomic and financial stories above can be explicitly linked with the distribution of household incomes. As shown in Figures 14 and 15, the effect of lower interest rates on the relative income distribution is unfavorable: income of the rich increases more than income of the poor. The Gini index jumps in 2002 and continues to rise.

Incomes of the poor households tend to rise following the reduction in interest rates (Figure 16). But the poverty line is also higher since its price increases (Figure 17). Therefore, the precise estimate of poverty incidence is unknown. However, the general direction of change can be approximated by comparing the growth rate of the poor-households incomes and that of the poverty line. It appears that the income of the poor increases by a higher percentage than the increase of poverty line. This could imply that the number of poor households living below the poverty line declines. Should that be the case, results of the simulation indicate that the favorable effect under FSAC is slightly stronger than under FS, since the percentage difference is a little bit larger in FSAC.

Concluding Remarks

The general equilibrium effects of monetary policy analyzed in this study are measured based on a model that fuses financial sector and real sector of the economy and explicitly links such a relation with the endogenously determined incomes of different household categories and the poverty line prices. An integrated financial social accounting matrix (FSAM) is used as the main data system, in which balance sheet data from the flow-of-funds (FoF) are merged with the detailed information regarding production, factor incomes, institutional incomes, saving and consumption from the social accounting matrix (SAM), to insure consistency of the complex interrelations. The paper explains how the two sets of data are merged and used in the model.

Through a set of simulations, it is shown that even a fairly comprehensive model can produce wrong estimates of the effect of monetary policy when the dynamics of agents balance sheet is not explicitly taken into account. More importantly, it is shown in the subsequent analysis that ignoring the role of agency costs could have a deleterious implication, i.e., generating a large cumulative error in the prediction of the effects of monetary easing through targeting the nominal interest rate. On the same token, the contractionary effect of monetary tightening could become larger when credit channel exists.

There is some evidence that the supply and demand for funds in the post-crisis Indonesia are a function of the financial structure of both the corporate and financial sectors. The combination of continued high leverage and weak balance sheet of the corporate sector, asset

APPENDIX

Denoting *y* and *DD* as output and domestic demand, *r, e, P, P** and *NX* are interest rates, exchange rate, domestic price, foreign price, and net-exports, respectively,

$$y = DD(y, r, eP^*/P) + NX(eP^*/P, y)$$

When firms are highly leveraged with foreign currency-denominated debt, the fluctuations of *e* could affect their balance sheets. In turn, this may put constraint on investment and domestic demand *DD*. There are two general cases:

- **Case 1:** When *e* is strong, only few firms would be balance-sheet constrained. In this condition, if *e* depreciates the total direct effect on investment and *DD* is minor, in which case the positive effect on the net exports *NX* dominates such that *y* will increase.
- **Case 2:** When *e* is weak, a further depreciation tends to affect investment adversely because the balance sheets of highly leveraged firms deteriorate. Afraid of loosing job if the firm goes bankrupt, managers are less willing to take on risky projects that do not maximize the firm's value. Under such circumstances, firm's decision not to invest is highly likely.

Another way to look at the scenario is to specify that firm s manager maximizes expected profits less expected bankruptcy costs (Greenwald and Stiglitz, 1993). The latter is a decreasing function of firm's equity. Either way, the firm's balance sheet position influences manager's decision regarding investment. The lower the equity of the firm the lower is the firm's investment and output. Thus, a depressed net worth will not only raise the cost of external finance along the line of the agency cost hypothesis, but it also influences managers' decision not to invest. It remains uncertain, however, whether the total direct effect of *e* on *DD* is trivial or not at the margin. That is, we cannot be assured that the effect of *e* on *NX* still dominates. Decomposing *DD* into *n* (the number of high leverage firm) and *df* (the demand of each leverage firm), the following is obtained:

$$\partial DD/\partial e = (P^*/P)\frac{\partial df(eP^*/P)}{\partial(eP^*/P)} n(eP^*/P) + (P^*/P)\frac{\partial n(eP^*/P)}{\partial(eP^*/P)} df(eP^*/P)$$

While the second component is always < 0, the first component depends on the level of *e* and hence the size of *n*. When *e* is low, *n* tends to be large, and $\partial df(.)/\partial(.)$ is positive. When *e* is high, regardless whether *n* is large or small, $\partial\, df(.)/\partial(.)$ is either positive or negative (balance sheet effect). At any rate, somewhere there exists a critical value of *e* such that $\partial DD/\partial e$ turns < 0, causing $dy/de < 0$. Thus, the aggregate demand curve has a backward-bending component.

APPENDIX

Denoting *y* and *DD* as output and domestic demand, *r, e, P, P** and *NX* are interest rates, exchange rate, domestic price, foreign price, and net-exports, respectively,

$$y = DD(y, r, eP^*/P) + NX(eP^*/P, y)$$

When firms are highly leveraged with foreign currency-denominated debt, the fluctuations of *e* could affect their balance sheets. In turn, this may put constraint on investment and domestic demand *DD*. There are two general cases:

- **Case 1:** When *e* is strong, only few firms would be balance-sheet constrained. In this condition, if *e* depreciates the total direct effect on investment and *DD* is minor, in which case the positive effect on the net exports *NX* dominates such that *y* will increase.
- **Case 2:** When *e* is weak, a further depreciation tends to affect investment adversely because the balance sheets of highly leveraged firms deteriorate. Afraid of loosing job if the firm goes bankrupt, managers are less willing to take on risky projects that do not maximize the firm's value. Under such circumstances, firm's decision not to invest is highly likely.

Another way to look at the scenario is to specify that firm s manager maximizes expected profits less expected bankruptcy costs (Greenwald and Stiglitz, 1993). The latter is a decreasing function of firm's equity. Either way, the firm's balance sheet position influences manager's decision regarding investment. The lower the equity of the firm the lower is the firm's investment and output. Thus, a depressed net worth will not only raise the cost of external finance along the line of the agency cost hypothesis, but it also influences managers' decision not to invest. It remains uncertain, however, whether the total direct effect of *e* on *DD* is trivial or not at the margin. That is, we cannot be assured that the effect of *e* on *NX* still dominates. Decomposing *DD* into *n* (the number of high leverage firm) and *df* (the demand of each leverage firm), the following is obtained:

$$\partial DD/\partial e = (P^*/P)\frac{\partial df(eP^*/P)}{\partial(eP^*/P)}n(eP^*/P) + (P^*/P)\frac{\partial n(eP^*/P)}{\partial(eP^*/P)}df(eP^*/P)$$

While the second component is always < 0, the first component depends on the level of *e* and hence the size of *n*. When *e* is low, *n* tends to be large, and $\partial df(.)/\partial(.)$ is positive. When *e* is high, regardless whether *n* is large or small, $\partial\, df(.)/\partial(.)$ is either positive or negative (balance sheet effect). At any rate, somewhere there exists a critical value of *e* such that $\partial DD/\partial e$ turns < 0, causing $dy/de < 0$. Thus, the aggregate demand curve has a backward-bending component.

REFERENCES

Aghion, P., Bacchetta, P., and Banerjee, A. (1999), A Simple Model of Monetary Policy and Currency Crises, mimeo.

Azis, Iwan J (2001). Modeling Crisis Evolution and Counterfactual Policy Simulations: A Country Case Study, *ADB Institute Working Paper*, No 23, Tokyo.

_____(2002) What W ould Have Happened in Indonesia if Different Economic Policies had been Implemented When the Crisis Started? *The Asian Economic Papers*, vol. 1 no. 2, MIT Press

_____(2004) Counterfactual Policy Scenarios During and After the Crisis Using A Financial CGE Model With Poverty Module: The Case of Indonesia, paper pr esented at the Economics Division Seminar, Research School of Pacific and Asian Studies, Australian National University, September, Canberra ACT.

Bernanke, Ben and Gertler, Mark (1989). Agency Costs, NetW orth, and Business Fluctuations. *American Economic Review*, March, 79(1), pp.14-31.

Bouguignon, F., W.H. Branson, and J. De Melo (1989), Adjustment and Income Distribution, *Working Paper*, World Bank, May, Washington, DC.

Brunner, Karl, and Alan H. Meltzer (1972) Money , Debt, and Economic Activity, *Journal of Political Economy*, 80, pp. 951-977.

Ginsburgh, V and Keyzer, M (1997). *The Structure of Applied General Equilibrium Models.* MIT Press, London.

Harberger, A (2000), *Monetary Policy in Post-Crisis Period*, unpublished report for the USAID, February, Jakarta.

Harrison, G.W.; Rutherford, T and D.G. Tarr (1996). Quantifying the Uruguay Round in Martin W, and L.A Winters (eds) *The Uruguay Round and the Developing Countries*, 1996, Washington, DC.

Jensen, Michael and William Meckling, (1976), Theory of the Firm: Managerial Behaviour , Agency Costs and Ownership Structure , *Journal of Financial Economics*, 3, 305-360.

Kehoe, Timothy J. and David K. Levine (1993): Debt-Constrained Asset Markets , *Review of Economic Studies*, (60), 865-888.

Marcet, A. and Ramon Marimon (1992): Communication, Commitment, and Gr owth , *Journal of Economic Theory*, (58), 219-249.

Stiglitz, Joseph and Andrew Weiss (1981), Cr edit Rationing in Markets with Imperfect Information , *American Economic Review*, 71, 393-410.

Stiglitz, Joseph and Bruce Greenwald (2004), *Towards a New Paradigm in Monetary Economics*, Cambridge University Press.

Thorbecke, E., et al. (1992), *Adjustment and Equity in Indonesia*, Development Center Studies, Paris, Organisation for Economic Co-operation and Development.

Tobin, J. (1970), A General Equilibrium Appr oach to Monetary Theory, *Journal of Money, Credit and Banking*, November, 2, 461-72.

Williamson, Stephen (1987), Costly Monitoring, Loan Contracts and Equilibrium Cr edit Rationing , *Quarterly Journal of Economics*, 102, 135-145.