Economics and Finance in Indonesia Vol. 57 (1), Page 1- 23

Macro Stability Can Be Detrimental to Poverty

Iwan J. Azis

Abstract

Consider the following propositions frequently voiced by policy makers and economists alike:

***Proposition 1:** Macroeconomic stability is essential for growth, and economic growth is the single most important factor influencing poverty. By implication, macroeconomic stability should be upheld. Furthermore, low inflation is good for the poor, thus macro stability is even more essential for poverty reduction.*

***Proposition 2:** Slower growth and higher inflation can worsen poverty; by implication, maintaining macroeconomic stability is necessary for reducing poverty.*

Despite the seemingly logical narrative in the above propositions, no generalization can be made as to their validity. Only after we identify the detailed transmission mechanisms from macro policy to poverty can we be more certain about the propositions. In this paper I identify and use such transmission mechanisms, and show by using the Indonesian case that the above two propositions are void, at the very least inadequate. The mechanisms involve some complex relations in whom growth, stability, income inequality and poverty are all endogenous and interrelated.

Keywords: Macroeconomic Stability, Economic Growth, Poverty

JEL Classification: E0, F43, I32

1. CONCEPTUAL FRAMEWORK

If an economy has a flat aggregate supply (AS) curve, implying that aggregate demand (AD) policy is more effective to stimulate growth, it remains unclear what type of AD shock must be pursued. When the resulting output growth and prices are linked with the poverty line and incomes of the poor, the uncertainty in terms of the policy implications on poverty gets even bigger, e.g., raising government expenditure will generate different outcomes of growth-poverty nexus than lowering the interest rate (in addition to the effect of sectoral composition).

How does the above relate to the poverty measure? It is known that the standard poverty measure depends critically on the poverty line (*PL*) and incomes of the poor (Y^{Poor}). The starting point to determine *PL* 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. Food is typically the most important commodity in the BN basket. Denoting the basket of BN by π_{com}, the poverty line is essentially $\Sigma_{com}\ \pi_{com} \cdot P_{com}$, where P_{com} is the endogenously derived poverty line prices. To arrive at the poverty measure, one has to determine first the intra-group income distributions corresponding to the characteristics of each group. Given such a distribution, various poverty measures can be used.[1]

No matter what measure is used, clearly *PL* and INC_h hold the key to the measure. In an expansionary policy, the price increase can be larger or smaller than the increase in the poverty line (*PL*), and the *GDP* expansion may be greater or smaller than the increase in incomes of the poor (Y^{Poor}). A contractionary policy may also generate a fall of *PL* that is smaller or larger than the decline in *GDP*. The results vary between countries and the type of policies being taken (e.g., fiscal versus monetary). The precise relation will be known only after the transmission mechanisms are evaluated empirically.

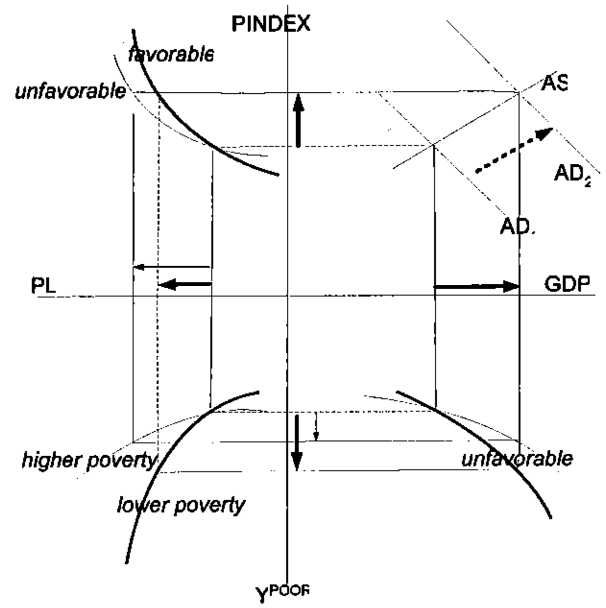
1 One of the most common measures is the FGT (Foster-Greer-Thorbecke), capable of measuring: (1) the headcount, i.e. the number of people below the poverty line; (2) the poverty gap or shortfall of the poor below the poverty line (a measure of the resources required to eliminate poverty); and (3) the severity of poverty. (what is the definition of the severity of poverty?) The general formula of FGT is (see Foster, Greer, Thorbecke, 1984):

$$P_\alpha^h = \int_0^z \left(\frac{PL - INC_h}{PL}\right)^\alpha f^h(INC_h)dINC_h,$$

where PL^* is the poverty line, α s the poverty-aversion parameter, and INC_h is household income of households *h*. α=0 is the headcount index, α=1 measure the poverty depth, and α=2 gives the measure of poverty severity. Thus, *PL* and INC_h hold the key to the poverty measure.

If under an expansionary policy the relation between *PL* and Y^{Poor} form a convex curve (*PL* being the x-axis), the likelihood of an improved poverty condition is high since the increase of *PL* is smaller than the increase of Y^{Poor}. However, there is no reason that a convex curve cannot result in a larger increase of *PL* than of Y^{Poor}. As displayed in ***Figure 1***, two scenarios may arise under a convex curve case: a worsening poverty—represented by the thin curves and thin arrows, and an improved poverty condition—represented by the bold curves and arrows in quadrant 2, 3, and 4. Thus, even if we know the precise shape of the curves, it is still uncertain whether an expansionary policy will generate a favorable or unfavorable poverty outcome. The same is true for a contractionary policy depicted in ***Figure 2***, where all curves are concave: the case of worsening poverty is depicted by the thin curves, while the bold curves represent a scenario of improved poverty condition.

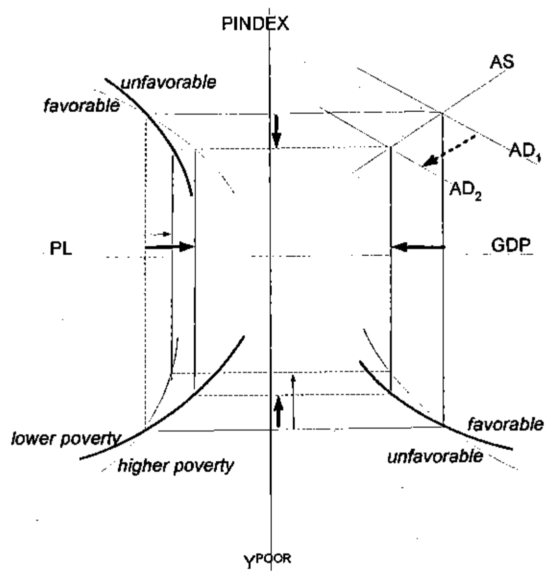
Figure 1
General Equilibrium Relations Under Expansionary Policy



As far as the relation between *GDP* and Y^{Poor} (in quadrant 4) is concerned, the dynamic slope of the curve also predicts what happens with the income distribution: in an expansionary policy, a concave (convex) curve suggests that the inequality tends to worsen (improve) after the policy shock, whereas in a contractionary policy a concave (convex) curve implies an improvement (deterioration) in income distribution after the shock. To the extent that the relations between *PL* and the price level (*PINDEX*), as well as between output (*GDP*) and incomes of the poor (Y^{Poor}) are too complex to be estimated in a partial equilibrium setting, FGE model is used (see Azis, 2008b).

The inclusion of financial assets is particularly important amid what has been happening during the last few years in most emerging markets including Thailand and Indonesia, where there exists an excess liquidity (saving) characterized by a faster growth of investment in financial assets than in the real sector. This phenomenon is noticeable from the Flow-of-Funds table showing total saving being greater than total investment in the real sector (most excess saving goes to financial investments).[2]

Figure 2
General Equilibrium Relations Under Contractionary Policy



2 A preferred model is therefore one where investment is endogenously determined through investment function and institutional portfolio allocations. The institutional savings will also be a part of the institutional balance sheet as they represent changes in wealth.[2] The rate of return for each asset is determined by the supply and demand of financial assets.

2. AS AND AD ANALYSIS

The starting point for the analysis in the above framework is to identify the characteristics of output-price relations. Under normal circumstances, a line stretching from the northwest (northeast) to the southeast (southwest) quadrant is generated under AS (AD) shocks. Plotting the data of real GDP and inflation, however, will not provide the information as to whether the locus shifts are due to AD or AS shocks. Thus, a multivariate approach is used in which the structural vector autoregression (SVAR) is applied with specific restrictions ala Blanchard & Quah (1989), hereafter B-Q, and the decomposition technique shown in Gamber (1996).[3] A more detailed description about the procedure is described in the Appendix. For an illustration, two countries are used, Thailand and Indonesia, and the selected period is 1993:Q1 – 2007:Q2, with 2000 being the base year.[4]

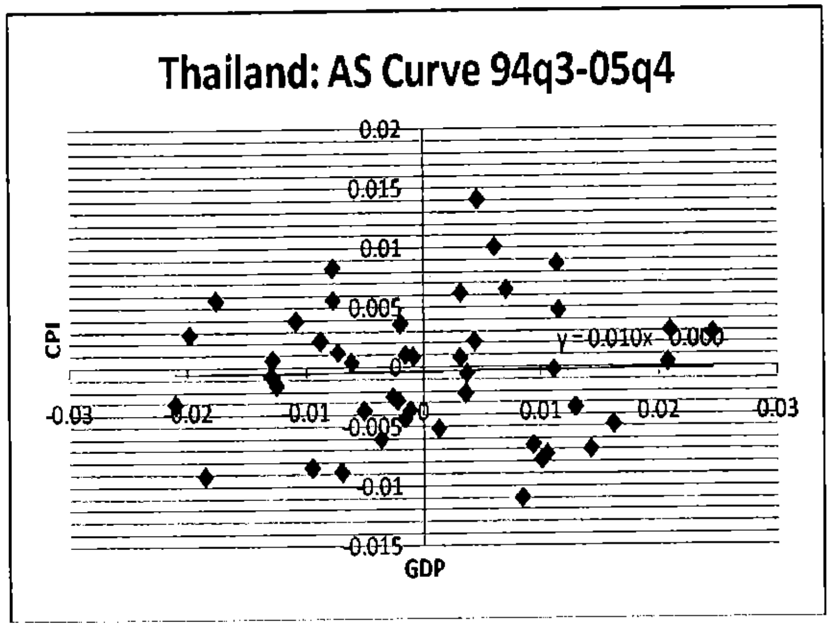
3 To the extent that both shocks jointly determine the changes in output and prices, one needs to use a decomposition procedure. This can be done through a univariate approach of ARIMA with the assumption that disturbances are either orthogonal (Watson, 1986) or serially correlated (Beveridge and Nelson, 1981), or, through a multivariate approach.

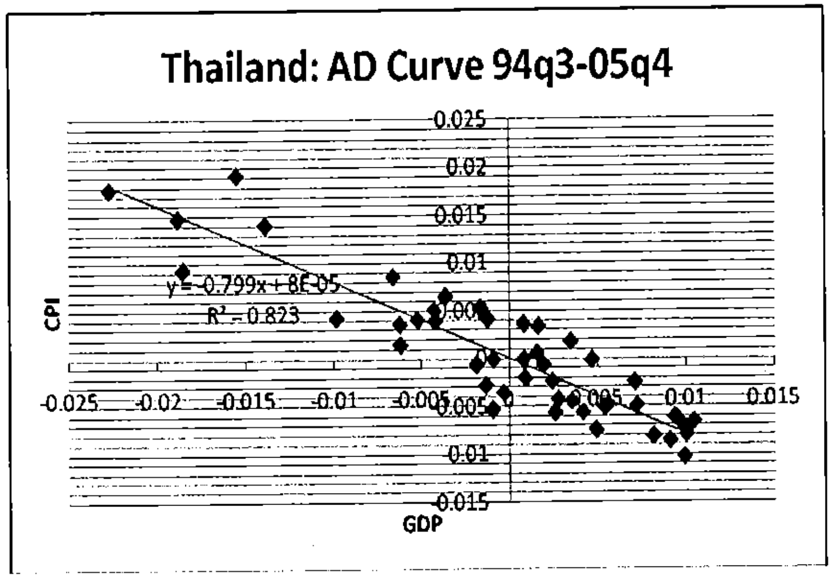
4 The unit root test using ADF suggests that when the second-difference log is used, the null hypothesis of unit-root is rejected at 1 percent level (available upon request). To determine the appropriate time lag, the Ljung-Box test is used for the selection process, from which it is found that all residual series will no longer be correlated when a lag length of 4 is used. Thus,

$$\Delta^2 y = b_0 + \sum_{i=1}^{4} b_{1i} \Delta^2 y_{i-1} + \sum_{i=1}^{4} b_{2i} \Delta^2 p_{i-1} + \varepsilon_t^{\Delta y}$$

$$\Delta^2 p_t = d_0 + \sum_{i=1}^{4} d_{1i} \Delta^2 y_{i-1} + \sum_{i=1}^{4} d_{2i} \Delta^2 p_{i-1} + \varepsilon_t^{\Delta p}$$

Figure 3





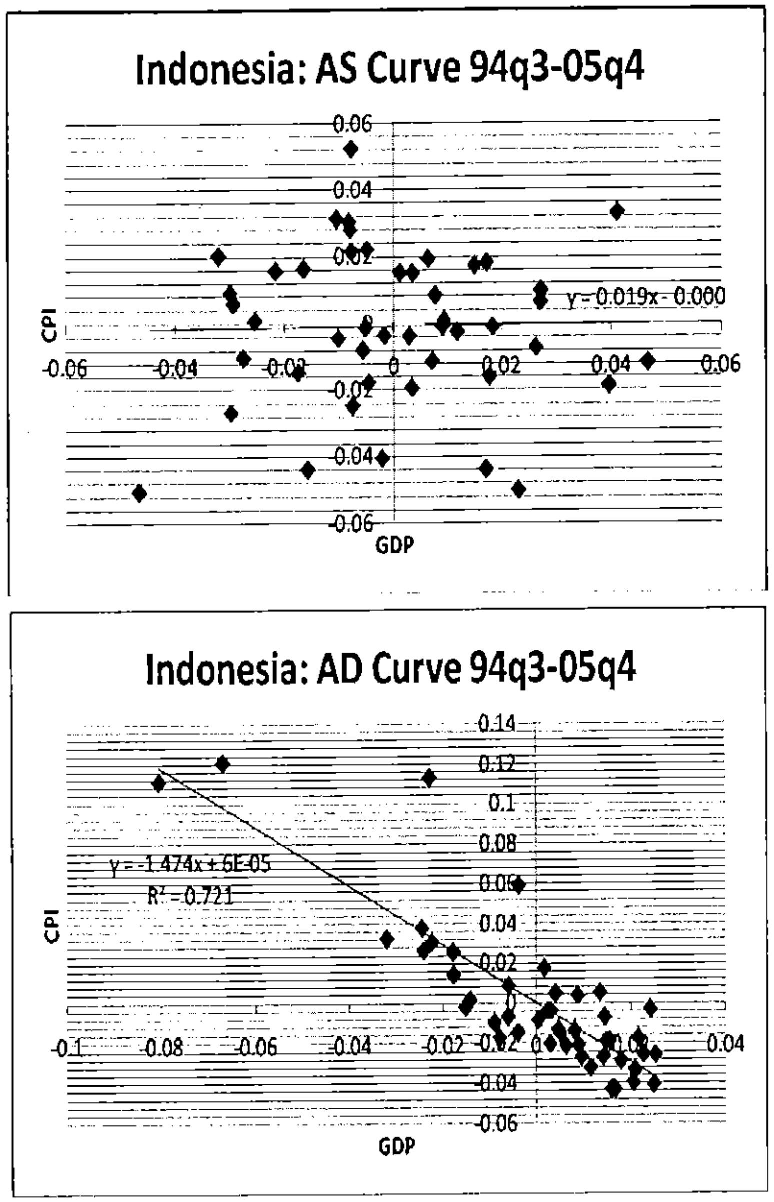
Source: Author's calculation based on the decomposition model

The results, depicted in ***Figures 3*** **and** ***Figures 4***, show that in both countries the slopes of AS and AD are according to what the theory predicts, i.e., positive for AS and negative for AD. The slopes in both countries are clearly flat (even more so when compared to the slopes in Korea and Malaysia).[5] This suggests that in Indonesia and Thailand a positive AD shock would have been effective to stimulate a non-inflationary growth during the period of observation; output will increase faster than prices. Along the AS curve, a positive growth innovation of 1 percent corresponds to a positive inflation innovation of 0.01 and 0.02 percent in Thailand and Indonesia, respectively.

The decomposition results also show that Indonesia has a steeper AD curve (with a slope equals to -1.474). Along the AD curve a positive inflation innovation of 1 percent corresponds to a negative output growth innovation of -0.68 percent. The corresponding figure for Thailand is -1.25. To the extent that a stabilization policy tends to focus on inflation control, a steep AD curve suggests that using AS shock rather than AD policy to lower the price level would have been more effective.

[5] The slopes in other Asian countries also confirm the theory prediction (not reported here).

Figure 4



Source: Author's calculation based on the decomposition model

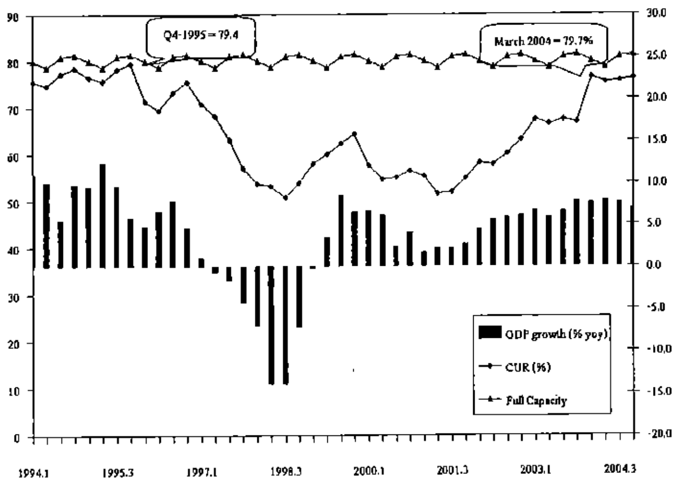
Broken down the period into pre and post-crisis, it is revealed that the slope of the AS curve in both countries became much flatter after the crisis.[6] In the case of AD curve, the trend was the opposite: flatter in Thailand, but steeper in Indonesia. This clearly suggests that after the crisis, an AD-based policy would have been even more effective than before the crisis in stimulating growth, and less effective for controlling inflation. Such was most profound in Indonesia because not only did the slope of the AS curve turn negative, but the AD curve also became much steeper. In the case of Thailand, the post-crisis AS slope remained positive, and the negative-slope AD curve became less steep.

During a major economic slowdown, the capacity utilization tends to be low (the gap between potential and realized output is large), in which case an expansionary policy is needed. As shown in Figures 5 and 6, this was indeed the case in both countries.

Measuring up the above finding with the actual policy validates the predictive outcome. As shown in ***Figures** 7* and ***Figures** 8*, immediately after the crisis Thailand adopted an expansionary AD policy: widened the fiscal deficit and reduced the interest rates. The expansionary fiscal policy continued even when the external assistance provided under the *Miyazawa Fund* and other sources ended in 2000. In 2001 and 2002, the fiscal deficit was recorded at between 2 and 3 percent of GDP. As the economy recovered, a fiscal surplus began to appear in 2003.

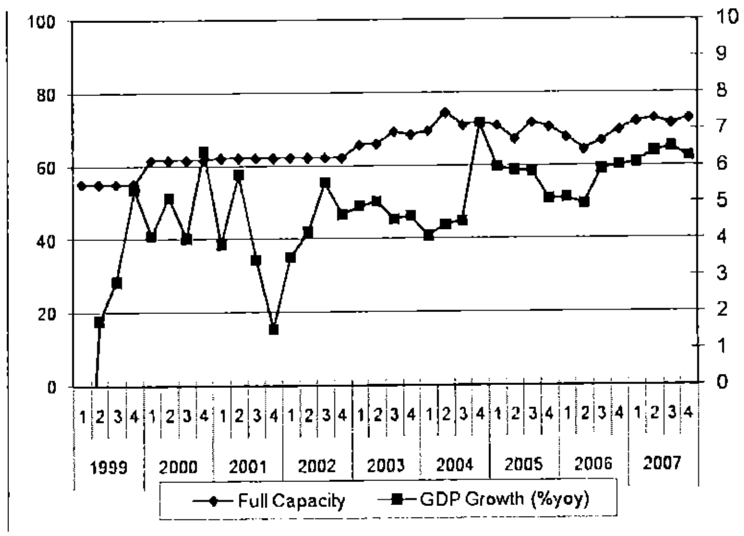
6 By now it has been widely recognized that the Asian Financial Crisis was not a standard current account crisis. There was little evidence of substantial overvaluation of exchange rates, and there was a dramatic swing of the current account, i.e., from deficit to surplus. In Thailand, the current account swung from minus 8 percent of GDP in 1996 to a surplus of 12 percent in 1998. This startling adjustment was accomplished entirely through imports compression (plunged by 40 percent).

Figure 5
Thailand's Cap Utilization



Source: Ministry of Finance, Thailand.

Figure 6
Indonesia's Cap Utilization



Source: Bank Indonesia

Figure 7
Fiscal Balance

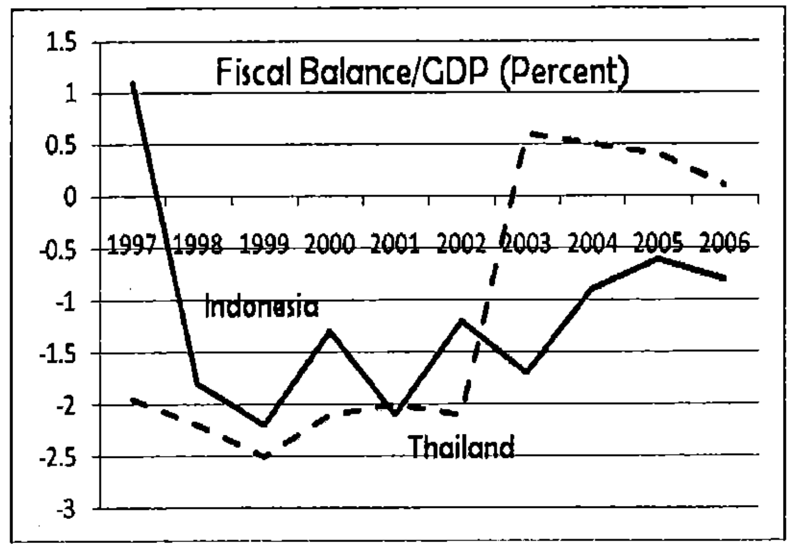
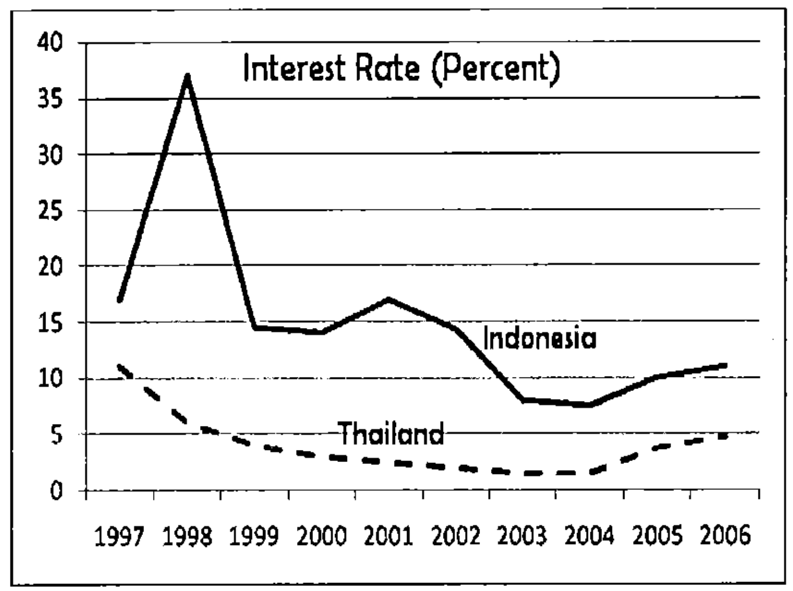


Figure 8
Interest Rates



Source: Ministry of Finance of Thailand, Bank of Thailand, and Bank Indonesia

In contrast, Indonesia's fiscal position was in surplus even at the early stage of the crisis, and the tight monetary policy lasted longer despite the downward pressure on the output during the time. Only a few years later a fiscal deficit began to appear. Until 2002, measured as a percentage of GDP Indonesia's deficit was not only lower than in Thailand but also the lowest among all Asian countries hit by the crisis. This is quite puzzling given the fact that Indonesia suffered the most from the shock, i.e., a sharpest fall in output.[7] While the interest rates in Thailand had been lowered since 1997, the rates in Indonesia were raised to 17 percent in 1997 and 37 percent in 1998. Since then, the rates continued to be at double-digit levels except in 2003 and 2004, a lot higher than in Thailand (*Figure 9*).

Thus, while Thailand's policy was consistent with what the decomposition analysis suggests, the policy in Indonesia was not (see Azis, 2008a). The resulting outcomes were as expected: the Thai economy recovered more steadily than the Indonesian economy.

Following the decline during 1996:Q4 and 1997:Q1, Thailand's real GDP rebounded briskly in 1997:Q2, peaked in mid-1997, then fell more than 10 percent before reaching a trough during the second half of 1998. The inflation rate also surged, reaching 9 percent in the first quarter of 1998, then a double-digit rate in the second quarter, before declining to 5 percent in the last quarter (*Figure 9*). Data show that the resulting poverty line and incomes of the poor were indeed adversely affected.

7 Unconstrained by the IMF agreements, Malaysia's fiscal deficit was fairly large, reaching close to 6 percent of GDP during 2000-2003. The deficit remained larger than 2 percent in 2006, validating the country's stand in adopting the necessary counter-cyclical fiscal policy. Even Korea's fiscal deficit during and immediately after the crisis was larger than in Indonesia. However, its V-shape recovery allowed the Korean government to subsequently reverse the trend by achieving a fiscal surplus in 2000-2002.

Figure 9
Inflation Rates

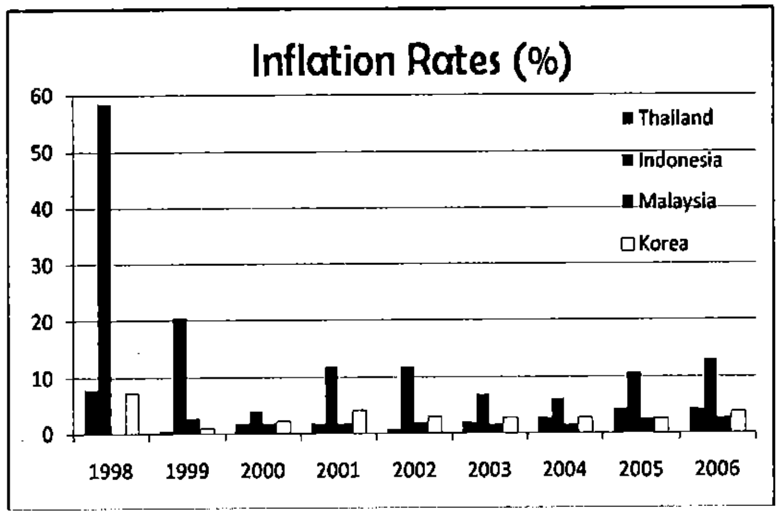
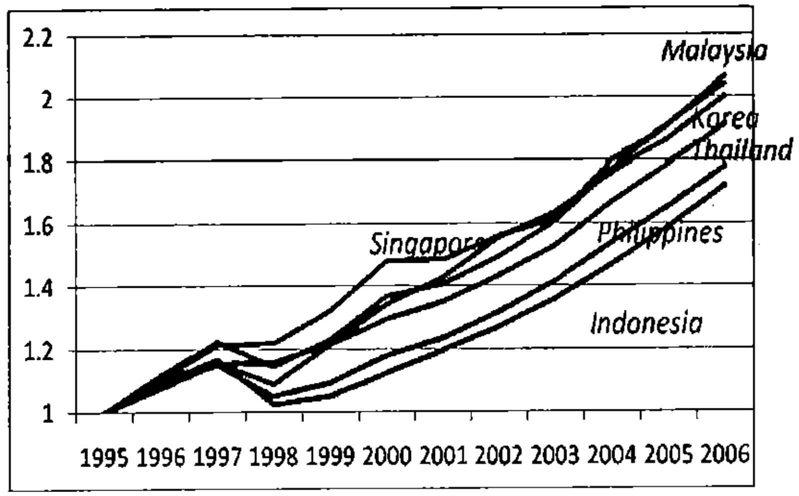


Figure 10
Trend of PPP-Based GDP In Selected Asian Countries



Source: IMF, International Financial Statistics, various issues

Indonesia's GDP growth, on the other hand, has been the most disappointing among all the Asian crisis-affected countries (***Figure 10***); the fall of GDP was the largest in 1998, and yet the turn-around had been the slowest. The government's decision to inject a huge amount of liquidity support to some troubled banks led money supply to increase significantly, despite the high interest rates. As a result, investment fell and inflation soared. The IMF-recommended policy of structural change (AS policy shock) failed to produce the necessary recovery because the AD was severely curtailed.

Figure 11
Unemployment Rate

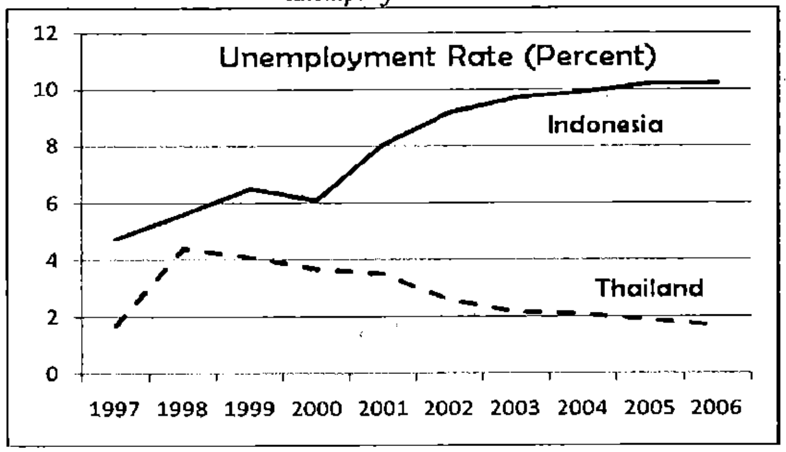
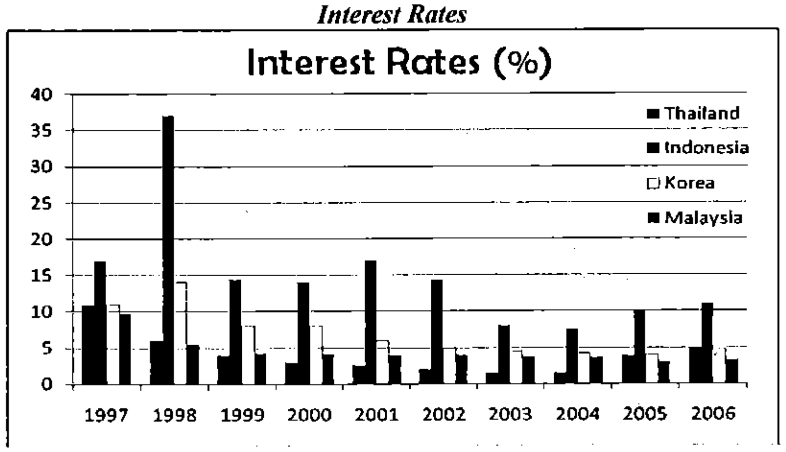


Figure 12
Interest Rates



Source: Statistical Office of Thailand and Indonesia, and International Financial Statistics

With real GDP falling by 15 percent between the third quarter of 1997 and 1998, and inflation surging, the unemployment rate increased persistently (***Figure 11***), creating a double whammy: lower incomes of the poor, and rising price and poverty line. This was the reason why Indonesia's poverty incidence soared dramatically during the period.

Indonesia's inflation rate had been the highest among the crisis-affected countries. This was despite the relatively tight monetary policy (***Figures 9* and *Figures 12***). The AD-based policy had clearly been less effective than expected: the country's AS curve was flat and the AD curve was very steep. Yet, all indications point to the authority's strong tendency to continue using AD-based policy to curb inflation at the costs of growth, incomes, and poverty. Indeed, during the crisis the negative impact of the policy response on poverty has been much more severe in Indonesia than in Thailand.

The role of the supply and demand shocks as the source of inflationary pressure can also be analyzed by generating the time series of inflation given each shock. The results are shown in ***Figures 13*** and ***Figures 14*** (excluding the drift term that represents the persistent impacts of the supply shock). The reconstructed time series components clearly show that in both economies the supply shock dominated the source of the sharp fluctuations of prices in 1997. In Thailand, the dominance occurred from 1997:Q2 to 1998:Q3, while in Indonesia it lasted longer, i.e., from 1998:Q2 to 2002:Q4. Indonesia's price increase was by far the most dramatic, as the country's socio-political crisis and institutional changes prompted a major cost-push pressure. The severe drought season related to the El-Nino weather phenomenon also exacerbated the inflationary pressure during the time. At any rate, controlling AD to curb inflation in such circumstances was clearly ineffective.

Figure 13
Inflation Dynamics: Thailand

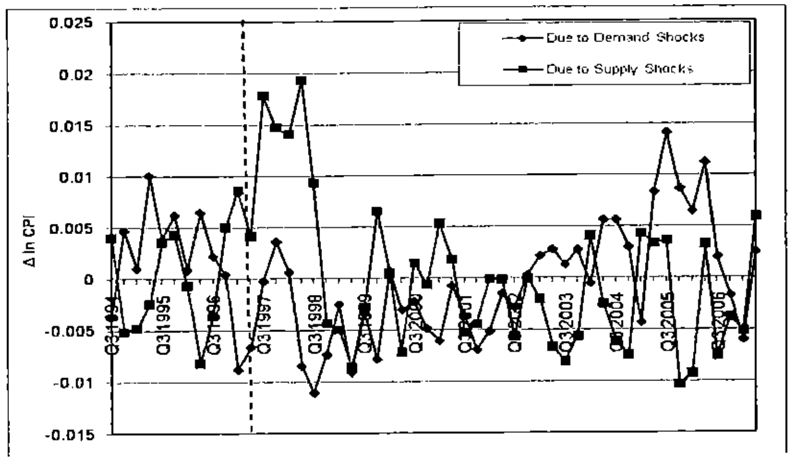
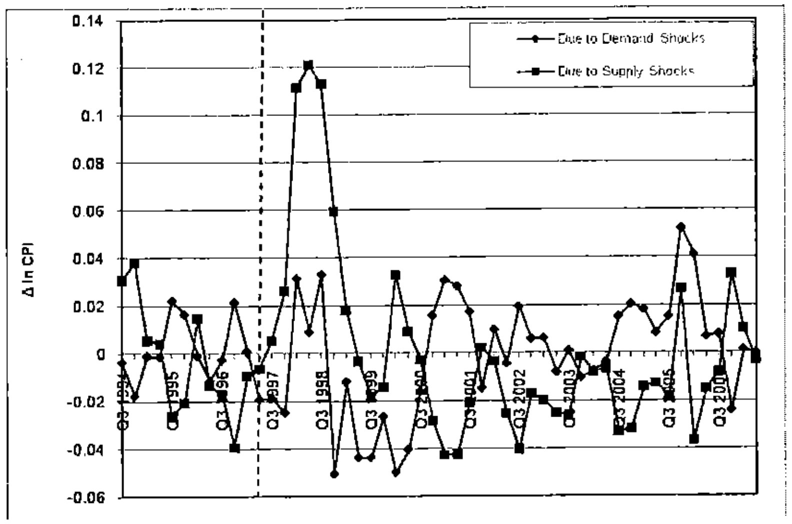


Figure 14
Inflation Dynamics: Indonesia



Source: Authors' calculation based on the decomposition model

3. LINKING AS-AD WITH POVERTY

To the extent that a certain form of relation (shape of the curve) exerts a different impact on poverty when examined under expansionary and contractionary policy, the following analysis is conducted based on these two sets of simulation. In each set I will distinguish the impact of monetary (interest rate) policy. The mechanisms to arrive at the poverty condition are based on a financial general equilibrium (FGE) model, and the focus is on the relations among four variables in the 4-quadrant setting described earlier (the structure of the model is available upon request). One of the most important features of the model is that, prices, including *PL*, are endogenous, and the financial sector is explicitly linked to the real sector of the economy. The ultimate variable of interest is the real income of the poor denoted by Y^{Poor} (deflated by the appropriate poverty line prices). Since the role of income inequality in affecting the growth-poverty nexus is critical, the simulations in each scenario also include the relative income distribution.

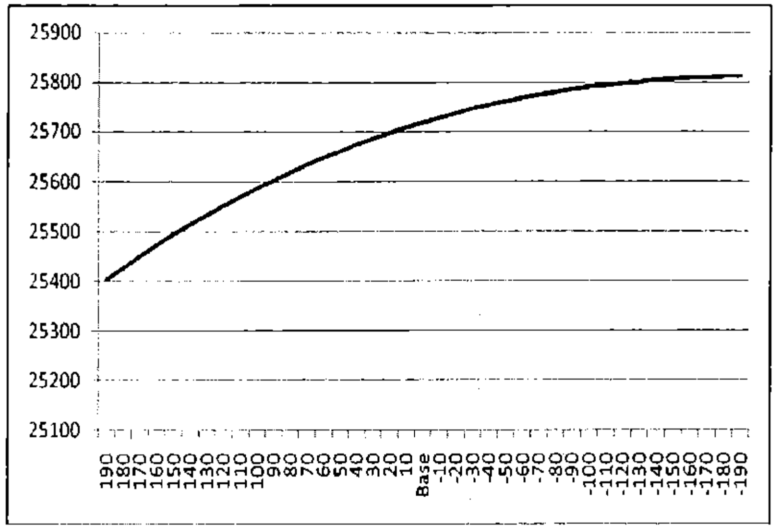
From the sensitivity analysis and the re-examination of the model structure, it is revealed that the parameter linking wages and prices (call it ρ) plays an important role in determining the outcomes. While incomes of the poor change according to the policy shock, i.e., declines under a contractionary policy and increase when the economy expands, the effect on real income of the poor (Y^{Poor}) depends critically on what happens with the prices and the poverty line. In a scenario where ρ is low, the rate of income change tends to be faster than the rate of price change.

An expansionary monetary policy by lowering the interest rates successively generates higher income of the poor but also higher price of the poverty line (hence higher *PL*). On the other hand, higher interest rates will reduce the income of the poor and the *PL*. The net effect on Y^{Poor} is determined by which of the two changes is larger. As shown by the curve to the right of the "Base" point in Figure 14, lowering the interest rates successively will likely raise the Y^{Poor} implying that the rate of income increase is higher than the rate of *PL* increase. Conversely, by raising the interest rates successively the Y^{Poor} tends to decline, suggesting that income will fall faster than *PL*.[8] Note, however, that the change in Y^{Poor} in both directions is at a decelerating rate. This is to be expected: given the prevailing excess capacity, a positive shock of AD will effectively raise the *GDP* without strong inflationary pressure. But as the excess gets smaller and eventually disappears, a further positive shock of AD will become less effective in stimulating growth, and it will generate strong inflationary pressure such that the expected rate of increase of the *GDP* and real income of the poor decelerates.

[8] Note that the unit in the Figure is basis point.

Figure 14

Monetary Policy With Low ρ_x Indonesia's Y^{Poor} (y axis in Rp bill)



Source: Results of FGE model simulations

What happens with the resulting income inequality? The effect of monetary expansion turns out to be also favorable for reducing the income inequality, as indicated by the dynamic trend of the slope between GDP and income of the poor (see again the relation in quadrant 4 of ***Figure** 1*). As the interest rates are lowered, the slope gets larger, suggesting that the income of the poor increases more proportionally than the increase of the GDP. On the other hand, a tight monetary policy tends to worsen the income inequality as indicated by the decreasing size of the slope in *Figure 15*.

Figure 15

Monetary Policy With Low ρ_x Indonesia's GDP-Y^{Poor} Slope

Source: Results of FGE model simulations

A further look at the mechanisms points to the vital role of the price (hence of the *PL*). The effect of monetary policy on the price level is larger, such that the increase of incomes of the poor is likely offset by the *PL* increase. On the relative income distribution, the channel through which incomes from financial assets are determined turns out to play an important role. As the returns on financial assets fall with the interest rates, incomes of those owning such assets (high income groups) will also decline. The poor households, on the other hand, are unaffected; they are insulated from the changing returns on financial assets as they generally do not hold such assets. This finding highlights the importance of incorporating the financial sector in the model.

4. CONCLUSIONS

If poverty reduction is to be integrated into macro policy objectives, it is imperative that any macro policy is evaluated in terms of its impact on the poverty line and household incomes. In this paper I address this issue by exploring the theoretical and empirical link between output, price, poverty line, and household incomes, and juxtapose them with the effect on poverty. Central to my argument is the premise that neither growth itself nor the stability per-se is the answer to poverty reduction.

The fact that the AS curve in Indonesia is flat implies that a stabilization policy based on AD shock is not effective. On the other hand, a positive AD shock can produce a non-inflationary growth and raise incomes of the poor. To the extent that the transmission mechanisms through which output and prices affect household income and the poverty line are complex, involving direct, indirect and feedback effects including the role of the financial sector within an economy-wide system, a FGE model is used.

As it turns out, growth, stability, income inequality and poverty are all endogenous and interrelated. Poverty and income inequality are particularly sensitive to the type of macro policy shock, the price elasticity of wages, the structure of the economy, and the mechanisms through which the financial sector affects household income. In the Indonesian case, the effect of monetary expansion turns out to be favorable for both poverty reduction and reducing income inequality. This does not bode well with the essence of the two propositions at the beginning of the paper. That is, macro stability can be detrimental to poverty reduction.

APPENDIX

Let Δy and π denote output growth and inflation rate, and $\varepsilon^{\Delta y}$ and $\varepsilon^{\Delta \pi}$ are the two innovations. Following B-Q decomposition technique, the moving average (MA) is obtained by inverting the unrestricted vector autoregression representation:

$$\begin{bmatrix} \Delta y \\ \pi \end{bmatrix} = \begin{bmatrix} c_{11}(L) & c_{12}(L) \\ c_{21}(L) & c_{22}(L) \end{bmatrix} \begin{bmatrix} \varepsilon^{\Delta y} \\ \varepsilon^{\pi} \end{bmatrix} \quad \text{.......} \quad (1)$$

where ε's are mean zero innovations with covariance matrix **Ω**. B-Q decomposition requires that the variable subject to decomposition, i.e. output growth rate, is *I(1)*. The second (stationary) variable, which undergoes the same orthogonal shocks, is the inflation rate. Given a matrix of coefficients *C(L)* with lag operator $c_{ij}(L)$, the impulse response function of disturbances shows the effect of shocks (i.e., $\varepsilon^{\Delta y}$ and $\varepsilon^{\Delta \pi}$) in period t on Δy and π in period $t+j$ (j = 0,1,2,... .). To overcome the correlated innovation ε's (Cooley and LeRoy,1985), an alternative MA is used:

$$\begin{bmatrix} \Delta y \\ \pi \end{bmatrix} = \begin{bmatrix} a_{11}(L) & a_{12}(L) \\ a_{21}(L) & a_{22}(L) \end{bmatrix} \begin{bmatrix} u^{\Delta y} \\ u^{\pi} \end{bmatrix} \quad \text{.......} \quad (2)$$

where u's are uncorrelated innovations with covariance matrix Σ (a diagonal matrix).

The MA representations in (1) and (2) are linked by:

$A(j) = C(j)A(0)$, j = 0,1,2,... .... (3)

$A(0)A(0)'\Sigma = \Omega$ .... (4)

Let ω_{ij} and σ_{ij} denote elements in matrix Ω and Σ so that (4) is

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} a_{11} & a_{21} \\ a_{12} & a_{22} \end{bmatrix} \begin{bmatrix} \sigma_{11} & 0 \\ 0 & \sigma_{22} \end{bmatrix} = \begin{bmatrix} \omega_{11} & \omega_{12} \\ \omega_{21} & \omega_{22} \end{bmatrix} \quad \text{.......} \quad (5)$$

from which three elements of *A(0)* are identified:

$$(a_{11}^2 + a_{12}^2)\sigma_{11} = \omega_{11} \quad \text{.......} \quad (6)$$

$$(a_{21}^2 + a_{22}^2)\sigma_{22} = \omega_{22} \quad \text{.......} \quad (7)$$

$$(a_{11}a_{21} + a_{12}a_{22})\sigma_{22} = \omega_{12} \quad \text{.......} \quad (8)$$

Following B-Q, σ_{11} and σ_{22} are unity. That is, AS and AD shocks are normalized with standard deviation equals to 1. Considering the neutrality of long run effect of AD shock on output, the following applies:

$\Sigma c_{11}(L)a_{11}(0) + \Sigma c_{12}(L)a_{12}(0) = 0$ .... (9)

Solving (6) to (9) gives the four elements in *A(0)*, based upon which the impulse responses of the orthogonal shocks can be generated by (3). Thus, the unrestricted VAR with n lags is:

$$\Delta^2 y = b_0 + \sum_{i=1}^{n} b_{1i}\Delta^2 y_{i-1} + \sum_{i=1}^{n} b_{2i}\Delta^2 p_{i-1} + \varepsilon_t^{\Delta y} \quad \text{.......} \quad (10)$$

$$\Delta^2 p_t = d_0 + \sum_{i=1}^{n} d_{1i}\Delta^2 y_{i-1} + \sum_{i=1}^{n} d_{2i}\Delta^2 p_{i-1} + \varepsilon_t^{\Delta p} \quad \text{.......} \quad (11)$$

where $\Delta^2 y_t$ and $\Delta^2 p_t$ are the second-difference log of real output and CPI, respectively.

To insure that the residuals $\varepsilon_t^{\Delta y}$ and $\varepsilon_t^{\Delta p}$ in (1) are orthogonal, (6) – (9) are used, and *A(0)* are multiplied by *C(j)* – as shown in (3). This gives a new MA representation of (2), which has orthogonal residuals ($u_t^{\Delta y}$ and $u_t^{\Delta p}$):

$$\Delta^2 y_t = \sum_{s=0}^{j-1} a_{11}(s) u_{T+j-s}^{\Delta y} + \sum_{s=0}^{j-1} a_{12}(s) u_{T+j-s}^{\Delta p} \quad \text{.......} \quad (12)$$

$$\Delta^2 p_t = \sum_{s=0}^{j-1} a_{21}(s) u_{T+j-s}^{\Delta y} + \sum_{s=0}^{j-1} a_{22}(s) u_{T+j-s}^{\Delta p} \quad \text{(13)}$$

where $u_t^{\Delta y}$ and $u_t^{\Delta p}$ are the orthogonal residuals.

To generate the decomposed series of output growth as a result of AD shocks, we assign zero to $u_t^{\Delta p}$ in (12). This results in second-difference log of real GDP ($\Delta^2 y_t^{AD}$) associated with AD shocks. Similarly, to obtain second-difference log of CPI ($\Delta^2 p_t^{AD}$), the value of $u_t^{\Delta p}$ in (13) is set to zero. Converting the second-difference log data into the first second-difference is similar to integrating the second derivative to obtain the first derivative in continuous domain (obtained by cumulatively summing the values of second-difference log data):

$$\Delta y_t^{AD} = \sum_{i=0}^{t} \Delta^2 y_{t-i}^{AD} \quad \text{(14)}$$

$$\Delta p_t^{AD} = \sum_{i=0}^{t} \Delta^2 p_{t-i}^{AD} \quad \text{(15)}$$

Using the above procedure, we generate the scatter plot of Δy_t^{AD}, Δp_t^{AD}, and the corresponding slope of the linearized trend:

$$\Delta p_t^{AD} = g + h \Delta y_t^{AD} + v \quad \text{(16)}$$

where g, h and v are the intercept, slope and residual, respectively. This captures the responses of real GDP growth and inflation to the AD shocks.

A similar approach is applied to generate the decomposed series of output growth and inflation due to AS shocks, i.e., setting the value of $u_t^{\Delta y}$ in (12) and (13) to zero, and compute the series of $\Delta^2 y_t^{AS}$ and $\Delta^2 p_t^{AS}$.

REFERENCES

Azis, Iwan J.,2008a. Indonesia's Slow Recovery after Meltdown. *Asian Economic Papers*, Vol 6, No 3, MIT Press

__________2008b. *Macroeconomic Policy and Poverty. ADB Institute Discussion Paper* No. 111, Tokyo-Japan

Beveridge, S. & Nelson, C.R.,1981. A New Approach to Decomposition of Economic Time Series into Permanent and Transitory Components with Particular to Measurement of the Business Cycle. *Journal of Monetary Economics* (March), 151-74.

Blanchard, O. & D. Quah,.1989.The Dynamic Effects of Aggregate Demand and Supply Disturbances, American Economic Review 79, 655-673.

Foster, J., J. Greer, and E. Thorbecke,. 1984. A Class of Decomposable Poverty Measures. Econometrica 52.

Gamber, Edward N,. 1996. Empirical Estimates of the Short-Run Aggregate Supply and Demand Curves for the Post-War US Economy. Southern Economic Journal, 62 (April), 856-872.

Watson, Mark D.,.1986.Univariate Detrending Methods with Stochastic Trends, Journal of Monetary Economics, July, 49-75.

***