

Simulation experiments for public spending policies in Sri Lanka

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ABSTRACT. This paper examines the economic impact of government spending policies in Sri Lanka. For simulation experiments, the paper uses a macro-econometric model developed by Jayawickrama (2006) for Sri Lanka on annual data from 1978 to 2005. The model is simulated to find the impact of government consumption, investment and transfer payment spending policies. Results reveal that while decreases in government consumption expenditure and transfer payments leave many macro variables unchanged, low government investment spending policies have significant negative impacts on the economy. Though government consumption expenditure and transfer payments cuts lower fiscal deficit markedly, low government investment expenditure would result in higher fiscal deficits as it triggers an economic recession.

KEY WORDS: Econometric Modeling, Government spending, Fiscal deficit, Simulation experiments

JEL: C51, C52, E62

Introduction

The present paper simulates the impact of spending policies of the government of Sri Lanka in a macroeconomic framework. Like many other developing countries, chronic deficit is the major problem relating to the government budgetary policies in Sri Lanka. Over the last few decades, the government of Sri Lanka has consistently experienced budget deficits of 9-18 percent of GDP. As a result, public debt stock rose rapidly (see Abeyratne and Rodrigo, 2002; Jayawickrama, 2004). Though Jayasundara (1986) and Athukorala and Jayasuriya (1994) attribute these high fiscal deficits to publicly funded massive development projects, defense spending and interest payments emerge as major sources of fiscal deficits since mid 1980s (Abeyratne and Rodrigo, 2002; Jayawickrama, 2004). Since recurrent and large budget deficits may have repercussions on the sustainability of the fiscal policy, there has been growing pressure on the government of Sri Lanka, especially from international financial agencies, to revise its budgetary policies with the objective of fiscal consolidation. In the context of large expenditure obligations in respect of national defense and interest payments on past debts, the government has resorted to raise tax revenue and restrict its other expenditures. Since potentials for revenue increase are rather limited due to sluggish economic growth and weaknesses in the tax system (see Athukorala and Jayasuriya, 1994; Colombage, 1996), much of deficit lowering efforts were placed on the spending side. The selection of programs for expenditure reduction is, however, a main concern as there is no clear evidence on the extent to which various government expenditure components affect the macro-economy.

The paper shed light on the issue by tracing out the macroeconomic impact of government consumption, investment and transfer payment spending policies. The paper finds that the economic impact of government investment expenditure is large in comparison to the impact of government consumption expenditure and transfer payments. It is also found that decreases in government consumption spending and transfer payments have large negative impact on the fiscal deficit. Since it results in an economic recession, low public investment spending, on the other hand, results in higher fiscal deficits in the long-run.

The organization of the rest of the paper is as follows. Section 2 presents the macroeconomic model used for the policy simulation experiment. This section includes discussions on the salient features of the model, its statistical properties, sample and data, stochastic equations and identities, and the transmission mechanism of the model. Tracking performance of the model is briefly assessed in Section 3. Section 4 discusses the results of simulation experiments for government consumption, investment and transfer payment expenditures. Section 5 concludes the paper.

An Econometric Model for Sri Lanka

Macro-econometric models developed by Karunasena (1986), Athukorala and Huynh (1987), Wijesinghe (1989), Jayamaha (1989), Colombage (1992), Perera (1994), Rankaduwa et al. (1995) and Cooray (1996) have been used for various policy simulation experiments. We, however, find that these models are inappropriate for our purpose as they lack many important macroeconomic links. One important drawback of existing models is the lack of the production function in aggregate or disaggregated levels. An adequate treatment was not given to the capital and labour market decisions too. Further, these models fail to relate disequilibria in goods and labour markets into prices and money wages. In the developing country context, the goods market does not immediately clear due mainly to various market imperfections, and the resulting disequilibrium feeds mainly into prices. Unemployment, on the other hand, has a significant impact on wage determination. Because of the heavy government involvement in the economy, failure to relate government activities to other sectors of the economy sufficiently leads to incorrect policy conclusions and advice. The paper, therefore, uses the macro-econometric model developed for Sri Lanka in Jayawickrama (2006) incorporating many vital characteristics of the economy.

Salient features of the model

Our model is a medium-scale model with 28 endogenous and 15 exogenous variables. There are 15 stochastic equations and 13 identities in the model and it shares important features of new Keynesian and neoclassical views of economic fluctuations. The demand-side of the model reflects new Keynesian features such as sticky wages and disequilibria in labour and goods markets. We allow for neoclassical aspects by incorporating rational expectations, production function, and capital and labour market decisions into the model. The economy produces two goods, a domestic good and an exported good and consumes two goods, the domestic good and an imported good. Financial market of the economy consists of two assets, money and interest-bearing government bonds. The bond market is, however, eliminated by Walras' law. Interest rates have no role in investment and money market decisions as they are

highly institutionally pegged. Price of consumer goods, price of domestic goods, price of intermediate goods and price of export goods are determined endogenously. Price of imports and price of world exports are exogenous. Agents in the goods market have rational expectations on future prices of the domestic good.

Since our prime objective is to examine the macroeconomic impact of alternative government spending policies, the fiscal sector has been given an extensive treatment. Total revenue of the government is modeled as a stochastic equation while revenue from income taxation is modeled as an identity. Among various components of government spending, we treat only interest payment as endogenous. We also assume that the government faces a borrowing constraint and this borrowing constraint allows the government to finance its excess spending in three ways: Issuing bonds, printing money (seignorage) and using foreign grants. In this framework, fiscal deficit and bond finance of deficit are also endogenously determined.

We incorporate labour market decisions to the model by modeling demand for labour, the unemployment rate and money wages. Labour market disequilibrium (unemployment) feeds into money wages through consumer prices. In the model, the domestic good is produced by capital and labour under the Cobb-Douglas technology. The external trade sector is added to the model through current account transactions. Demand for and supply of export, and demand for import functions are determined by the model. The model closure, goods market disequilibrium or excess demand (the difference between gross domestic spending and GDP), has the role of correcting prices of domestic goods until the equilibrium is restored.

Statistical properties

The model equations are estimated in an error correction model (ECM) format or in first differenced form by OLS. The only exceptions are the export supply and government interest payments equations which are estimated as partial adjustment mechanisms. As is well known, in static regressions involving non-stationary variables t and F statistics of estimated parameters do not follow standard t and F distributions. However, Pesaran and Shin (1998) demonstrate that t and F statistics of estimated parameters involving $I(1)$ variables follow relevant distributions in dynamic models. Therefore, we derive the long-run relationship of $I(1)$ variables from a fully specified dynamic model. We use cointegrating solutions to estimate ECMs as they provide more stable parameter estimates and capture short-term dynamics of variables along their long-term movements. In the ECM, the effect of long-run constant term is restricted in the error correction (EC) term. In certain cases, dummy variables are added to capture non-structural outlying effects. The model is estimated and simulated by built-in programmes in PcGive and EVIEWS software packages. The goodness-of-fit of the model is examined by R^2 value and the plot of actual and fitted values and the best fit model is chosen by AIC and SC criteria. Diagnostic tests are performed for serial-correlation, conditional heteroscedasticity, normal errors, heteroscedasticity and regression specification. The stability of estimated parameters is examined by the time plot of recursive parameter estimates. Out-of-sample forecast performance is assessed by forecasting for the period 2001-2005 using estimates from the period 1979-2000. All the estimated equations pass the above diagnostic tests and show a quite impressive out-of-sample forecast performance.

Sample period, data and variables

The model is built on annual data for the period 1978-2005. We exclude the period before 1978 to avoid potential structural breaks in the economy due to policy changes taken place since 1977. Cointegrating relationships of stochastic equations involving $I(1)$ variables are obtained for the period 1978-2005 while their short-term relationships are estimated for the period 1979-2005. Data for all variables except foreign export prices, foreign income and exchange rates are from Annual Reports of the Central Bank of Sri Lanka. Data for world export price index, income and exchange rates of 15 major trade-partners of Sri Lanka are from the International Financial Statistics Yearbook of the IMF. We use constructed data series from Jayawickrama (2006) for capital stock, nominal effective exchange rate and trade-weighted world income. (See Table 1 and Tabel 2)

Stochastic equations

Stochastic equations describe the behaviour of private consumption, private investment, tax revenue, government interest payments, money demand, export demand, export supply, import demand, labour demand, the unemployment rate, money wages, price of intermediate goods, price of domestic goods, price of consumer goods and the production of domestic goods (see Table 1 for the specification of model equations and Appendix for the estimated stochastic equations).

Private consumption expenditure (CP) is treated as a function of private disposable income (YD), a wealth variable and short-term interest rate. However, the wealth effect and the interest rate effect turned out to be insignificant. In the ECM, the short-term income elasticity of consumption has the expected sign and is statistically significant. The income elasticity of consumption is similar in the long-run and in the short-run. The coefficient of the error correction term suggests a very slow speed of adjustment to the equilibrium errors in private consumption spending.

We incorporate the accelerator effect and the interest rate effect on private investment (IP) decisions. However, preliminary estimations suggest that the interest rate effect is insignificant in the short-run and in the long-run private investment equations. The fit of the ECM is good as it captures all the important turning points of the growth rate of private investment spending. As is given by the error correction coefficient, 0.4 percent of any one percent deviation from the equilibrium level of private investment is adjusted in a year.

Though the government revenue (T) consists of taxes and non-tax revenue, we do not separate them in the model. Following the literature, tax revenue function is specified as a function of GDP (tax base) and the average tax rate (τ) which is used as a proxy for the marginal tax rate. As expected, government revenue depends positively on the tax base and the tax rate. The fit of the short-term government revenue function is remarkably good as the model captures all the short-term deviations very well. Government expenditure consists of five components: Consumption (CG), investment (IG), transfer payments to households (TPG), interest payments (IPG) and other expenditures (OG). Though it is not wrong to assume other spending components as exogenous, we do not deny the endogeneity of interest payment spending. The endogeneity of government interest payment spending is obvious as it depends on the stock of debt. To ignore the endogeneity of interest payments leads to incorrect

outcome as it prevents important links with other sectors. Thus, we specify interest payments as a function of distributed lags of fiscal deficit. In the estimation, we replace the higher order lags of fiscal deficit by one period lagged dependent variable. Since interest payment spending is an I(1) process and fiscal deficit (FD) is an I(0) process, deterministic time trend is added to capture the trend in interest payments which could be a result of trending debt series. The estimated coefficient of lagged fiscal deficit is positive and significant. The partial adjustment coefficient suggests that 0.6 percent of the current interest payments would carry over to the next period.

Demand for exports (X^d) is assumed to be a function of price of domestic exports (P^*), foreign export prices in domestic currency (ERP^{*w}) and foreign income (Y^w). It is expected that export demand is negatively related to price of exports and is positively related to foreign export prices and world income. Though world income and price of foreign exports have significant impacts on the long-term export demand function, they have virtually no role in the short-term function. It is quite meaningful for world income variable to be insignificant in the short-term as temporary income effect is less important in demand decisions. However, the insignificance of foreign export prices in the short-run is not well explained and it may be because the average of world export prices does not well reflect the competitive price of Sri Lanka's exports. Due to their insignificance, both world income and foreign export prices are not included in the ECM. The ECM captures the short-term dynamics of export demand quite well. It also suggests a very slow speed of adjustment for any equilibrium error in the export demand function. On other hand, export supply (X^s) is defined as a function of price of exports (P^*), price of intermediate goods (P^i) which stands for production cost of exports, and capital stock (K) which represents the production capacity of the economy. Export supply is expected to be positively related to price of exports and capital stock, and negatively related to price of intermediate goods. To solve the issue of identification, an inverse export supply function is estimated. Further, at the equilibrium $X^d = X^s = X$ where X is the value of exports. The inverse export supply function is estimated as a partial adjustment mechanism because the relationship between price of exports and export supply turned out to be negative in the short-run notwithstanding their long-term positive relationship. In the estimation, the level series of intermediate prices and capital stock were replaced by their first differenced form because of better predictive performance. The estimated parameters of the export supply function have the expected signs and are significant. Following the literature, we specify import demand (Z) as a positive function of disposable income (YD) and a negative function of price of imports relative to domestic price (P^i/P^*). Unit root tests revealed that import demand and disposable income are I(1) but relative price of imports is I(0). The ECM unit root test statistic ($=-4.231$) suggests that import demand and disposable income are cointegrated. The ECM explains over 70 percent of the short-term deviations of the demand for imports. Both independent variables have the expected signs and are significant. The speed of adjustment to short-term deviations is relatively slow in the import demand function.

While money supply is assumed exogenously given, demand for (real) narrow money ($M1$) is modeled as a stochastic equation. Though demand for money is assumed to be a function of gross national expenditure and the short-term nominal interest rate, preliminary estimation shows that the interest sensitivity of money demand in Sri Lanka is clearly insignificant. With highly institutionally pegged nominal interest rates, this might be due to static expectations on interest rates. Therefore, the nominal interest rate is excluded from the

money demand function. The ECM explains the short-term deviations of money demand quite well. The speed of adjustment of equilibrium errors of money demand is moderately fast as the estimated EC coefficient is about 0.5.

This paragraph discusses the modeling of labour market decisions. Money wages (W) are treated as a positive function of expected inflation rate (π^e) and the labour productivity (Y/L) and a negative function of the unemployment rate (U). We invoke rational expectations hypothesis here to set the conditional expectations of the inflation rate to be a martingale sequence. That is, agents' expectations on $t+1$ period inflation rate based on the information set at time t is given by the actual inflation rate at time t . Thus, inflation expectations enter into the model in a fully-model consistent framework. One period lagged labour productivity is included in money wage equation as current wages depend mostly on the productivity of the previous period. Though the unemployment rate turned out to be insignificant, the expected inflation rate and the productivity variables capture the deviations of money wages quite well. Demand for labour (L) is determined by two main factors: output (Y) and real wages (W/P^y). Since demand for labour is implicitly determined by the production function, higher output implies higher demand for labour given that capital is fixed. A high real wages relative to the cost of capital, on the other hand, lead to low demand for labour as firms shift production from labour intensive technology to capital intensive one. Unit root test statistics suggest that demand for labour is cointegrated with output and real wages. The estimated long-term income elasticity of labour demand is about 0.5 and is significant. If real wage rises by one percent, demand for labour decreases by 0.32 percent. Though real wages have a significant impact on the long-term labour demand, it is insignificant in the short-run. This result is quite meaningful as firms are unable to replace labour by capital in the short-run. As the estimated ECM indicates, the short-term income elasticity of labour demand amounts to 0.8 which is higher than that of the long-term. The result is again meaningful as firms hire more workers to increase the production in the short-run. The estimated coefficient of the error correction term indicates relatively fast adjustment of equilibrium errors of labour demand. On the other hand, the unemployment rate (U) is treated as a negative function of change in output (ΔY) and change in government consumption expenditure (ΔCG). Government consumption spending is added to hold the negative effect of unemployment due to the expansion of non-productive labour force in government undertakings. Since the unemployment rate posses a negative trend in our sample, we estimate ΔU to avoid statistical issues in OLS estimation. The estimated equation explains changes in the unemployment rate fairly well. Increases in output and government consumption result in a low unemployment rate.

A large part of intermediate goods used in the production process in Sri Lanka is imported goods such as fuel, fertilizers, chemicals, textiles and related items. Hence, price of intermediate goods (P^i) is mainly determined by price of imported goods (P^r) in the long-run. It is found that one percent increase in import prices leads to 0.8 percent increase in long term-intermediate prices. The high dependency of intermediate prices on import prices indicates the vulnerability of the domestic economy to foreign price shocks. The ECM explains the short-term fluctuations of price of intermediate goods quite well. The model also implies a moderate adjustment to the past deviations of equilibrium errors. In the model, price of domestic goods, the GDP deflator, (P^y) is assumed to be a linear combination of money wages and price of intermediate goods which stand as cost variables of production. Further, price of the domestic good is specified as a function of the excess demand (ED) for the domestic good. A positive

coefficient on excess demand has the meaning that any disequilibrium in the goods market corrects prices until the equilibrium is restored. As expected, all the estimated parameters in domestic goods' price equation have the expected signs and are significant. Because consumption of the economy is made of two goods, domestic good (Y) and an imported good (Z), price of consumer goods (P^c) is obviously a linear combination of the price of domestic goods and the price of imported goods. Given that import prices cause intermediate prices, and intermediate prices cause domestic good prices in the model, price of consumer goods is specified as a function of price of the domestic good in the long-run. The ECM unit root test statistic is ($=-5.196$) assures the cointegration between price of consumer goods and price of domestic goods. Though the long-term behaviour of consumer prices is determined by price of domestic goods, its short-term dynamics could be governed by market imperfections, such as labour market disequilibrium. We add changes in the unemployment rate (ΔU) in the short-term consumer price equation to represent the trade-off between inflation and unemployment rates. One period lagged ΔU is included as it is more meaningful to have lagged effect of unemployment on consumer prices. We found that the short-term effect of price of domestic good is quite similar to its long-term impact. As expected, there is a trade-off between inflation and unemployment in the short-run. Though money wages do not depend on the unemployment rate directly, labour market disequilibrium causes money wages to fall by lowering the expected inflation. The speed of adjustment of equilibrium errors is fast in the consumer price equation.

The domestic good (Y) is produced by two factors, capital (K) and labour (L) with Cobb-Douglas technology. Assuming constant returns to scale, we estimate the intensive form of the production function as it provides more meaningful factor elasticity coefficients than the production function in levels. The ECM unit root test ($=-5.959$) reveals that output per-worker (Y/L) is cointegrated with capital per-worker (K/L). As shown in the estimated production function, the long-run output elasticity of capital and labour are approximately the same. Further, output per-worker increases by 0.013 units from one year to another due to time trend which is expected capture the effect of technological progress. The estimated ECM captures the short-term behaviour of output per-worker quite well and suggests a very slow adjustment to short-term deviations of the production function which signals that shocks have persistent impact on the production.

Accounting and definitional identities

Our econometric model consists of the following identities: Gross national expenditure (GNE) is the sum of gross domestic expenditure (GDE) and net factor income from abroad (NFIA). GDE consists of private consumption spending (CP), government consumption spending (CG), aggregate investment less of inventories and net exports (X-Z). I is the sum of private investment less of private sector inventories (IP) and government investment less of government sector inventories (IG). The economy's capital stock (K) is given by the perpetual inventory accumulation method. Private sector disposable income (YD) is obtained by adding government transfers (TPG) and net foreign private transfers (FTP), and subtracting government's income tax revenue (IT) from GDP. IT is proportional to total government revenue. The slight variation of this proportionality factor (α) over the last three decades led us to assume it to be constant at its period average (0.132). Fiscal deficit is the difference between

government expenditure and government revenue. We assume that governments can finance certain amount of deficits by printing money and utilizing foreign grants and the rest is financed by issuing public bonds. Money printing is given by changes in currency in circulation (CU). Money supply is the sum of currency in circulation and demand deposit. In the equilibrium, we assume that both demand for and supply of money equal to the stock of narrow money in the economy. No data distinction between export supply and export demand led us to assume equilibrium in the export market so that both export supply and demand can be given by the value of exports. The excess demand of the economy (ED) which serves as the model closure is the difference between GDE and GDP.

Tracking Performance of the model

Though the estimated individual equations fit actual data well, it is quite possible for them to perform poorly when all equations solved simultaneously. In particular, the dynamic solution may deviate from the actual as forecast errors accumulate over time. Using Gauss-Seidel iterative algorithm, we obtain static and dynamic (deterministic) solutions to the model. In order to evaluate the tracking performance of the model, we compute the mean absolute percentage error (MAPE) and Theil U statistic and compare actual and simulated (static and dynamic) time paths of selected variables. The computed MAPE is below 10 percent for most of the endogenous variables and it does not exceed 15 percent for none of the variables. Further, Theil's U statistic values are quite low (below 0.1) for most of the variables. The only exception is fiscal deficit which constitutes Theil U statistic value over 0.15. From the plot of actual and simulated data, we find that the static simulation results are quite impressive as they track actual data very closely. Though simulated data deviate from actual values of some variables (especially investment series) in the middle of the sample, the tracking performance of the dynamic simulation is also impressive as simulated paths of variables converge to the actual at the end of the sample. Thus, we find that the model is quite appropriate for policy simulation experiments.

The Transmission Mechanism of the model

For the analytical purpose, we divide our econometric model into six main blocks: Production block, expenditure block, fiscal block, monetary block, price block and international trade block. As Chart 1 illustrates, any increase in output (GDP) reinforces as it leads to higher capital and employment subsequently. Increased output directly raises demand for labour while it increases capital accumulation through private investment. In the model, production shocks precipitate into fiscal, trade and price blocks and, then, into aggregate spending and monetary blocks. The impact of an output shock lasts long as it affects aggregate output and aggregate spending in many rounds. (See Chart 1)

Exogenous government expenditure shocks, the main focus of this paper, would have significant impact on other sectors of the economy. An increase in government investment expenditure increases output by raising the capital stock. It also raises aggregate expenditure and thus affects prices and wages. On the other hand, changes in government consumption expenditure affect the economy through aggregate expenditure and labour market. A change in government transfer payments to households affects private consumption and import

demand by changing private sector disposable income. Moreover, changes in any components of the government expenditure alter the fiscal deficit and interest payments in many rounds. Because of these varying degree linkages with other sectors of the economy, the extent of the impact of various expenditure components is expected to be heterogeneous. In the present setting of the model, government revenue shocks, on the other hand, affect the economy through disposable income and fiscal deficit.

Price of intermediate goods which is determined by import prices has positive impacts on price of domestic goods and price of exported goods. On the other hand, price of domestic goods together with the unemployment rate determine consumer goods prices. Price shocks precipitate into the real economy through money wages and demand for imports. Any external price shock (i.e. oil price shock) transmits to the economy through the price of intermediate goods. World income, world export prices and exchange rates have linkages to the economy through export and import functions. International trade shocks mainly transmit to the economy through price and expenditure blocks. In its present setting, our model does not adequately connect money market decisions to its other blocks. Though money demand depends on gross national expenditure, it does not feedback to the real or nominal sectors. Money supply, which is exogenous, affects government's budgetary accounts. On the other hand, any shocks to production, fiscal, price and international trade blocks easily feed into the expenditure block. An increase in aggregate spending changes money market conditions by increasing demand for real money. Changes in aggregate spending also feed into prices and money wages through goods (domestic) market disequilibrium.

Simulation on Public Spending

In this section, we perform simulation experiments on government consumption, investment and transfer payment spending shocks. We introduce one-time negative spending shocks (10% spending cut) with a policy aim of reducing fiscal deficits at present as well as in the future. Since our simulation is deterministic, random disturbance components of stochastic equations are set to zero. A baseline solution is obtained by solving the model dynamically. The model is again solved for three scenarios of one-time shocks in government consumption, investment and transfer payment spending. We ignore the possibility of multiple shocks at a time. The short-term impact of a shock is the annual deviation of counterfactual (shock-impinged) paths from their baseline solution. The sum of the short-term impacts is the long-term effect of a shock. Figure 1 illustrates impact multipliers while Table 3 provides long-term impacts of government spending shocks on selected variables.

Government consumption spending shock

The instantaneous effect of 10 percent consumption spending cut on most of the real variables (except money demand, aggregate spending and imports) is zero. However, the shock immediately reduces aggregate expenditure, money demand and imports by 1 percent, 0.7 percent and 0.04 percent respectively. It increases the unemployment rate by about three percent immediately. Nominal variables such as price of domestic good, consumer prices and money wages fall significantly. Prices fall due to low aggregate demand when aggregate supply remains constant. High unemployment and low prices lead to low money wages.

As expected, the policy will have large negative impact (16 percent) on the fiscal deficit. The low public consumption spending policy marginally affects variables such as private consumption, private investment, total investment, labour demand and GDP in subsequent years. Nevertheless, its impact on imports, government interest payments, fiscal deficit and nominal variables is significantly high in the post-shock years too. From the second period of the shock, government interest payments drop markedly because of low fiscal deficits. Due to the partial adjustment mechanism presents in the fiscal deficit, the effect geometrically decays over the years. Nominal variables also continue to fall in the post-shock period. The cumulative impact is significantly high only on fiscal deficit, government interest payments, imports, the unemployment rate and nominal variables. Government Interest payments and fiscal deficit are lower than their baseline by nine percent and 23 percent respectively. Aggregate expenditure and total imports are less by one percent. The unemployment rate is higher than its baseline by three percent. (See Figure 1 and Tabel 3)

Investment expenditure shock

An equivalent (10 percent) decrease in government investment spending lowers aggregate investment, capital stock and, therefore, GDP significantly. Decreased output lowers demand for labour, private consumption, exports, imports, tax revenue, disposable income and money demand. The shock immediately raises the unemployment rate by 0.16 percent. Because both aggregate demand and aggregate supply decreases simultaneously with the shock, pressure on nominal variables is less compared to the case of consumption spending change. Due to low public spending, fiscal deficit immediately falls by about five percent. From the second period of the shock, private investment and government interest payments fall markedly. All the endogenous variables except the unemployment rate and fiscal deficits continue to fall significantly. The unemployment rate rises over time. Fiscal deficit decreases only up to the second period of the shock. Thereafter, it rises over time as the fall in government revenue overwhelms the fall in government spending. It raises government interest payments further and put more pressure on fiscal deficits. In a decade, the spending policy change has lowered GDP of the country by two percent from its baseline. Thus, it has a significant negative impact on capital stock, labour demand, investment, private consumption, exports, imports, government revenue, money demand, and, therefore, aggregate spending.

Transfer payment shock

As in other two cases, 10 percent transfer payment (to households) cut has a significant negative impact on fiscal deficits and government interest payments. In a decade, the spending policy change has resulted in three percent fall in government interest payments and nine percent fall in fiscal deficit from their baseline figures. Moreover, private consumption and imports drop instantaneously as the shock lowers private disposable income. Nevertheless, the transfer payment lowering policy leaves most of the other macroeconomic variables unaffected instantaneously as well as subsequently.

Conclusions and Policy Implications

The macro-econometric model used for simulation experiments in this paper is designed to share important features of the economy and estimated by OLS on annual data from 1978 to 2005. Better forecast performance of the model suggests the model's appropriateness for policy simulation experiments and for other impact analyses. The aim of simulation experiments performed in this paper is to choose best public spending policies that generate low fiscal deficits. Simulation results show that low government consumption spending initially affects only few macroeconomic variables. It leaves many real variables, especially the production sector, unchanged but has a significant impact on nominal variables. In particular, the shock has large negative effect on the fiscal deficit. Government transfer payment cuts have significant impact only on private consumption, imports, government interest payments and fiscal deficit. As is in consumption spending, the shock has large negative effect on current and future fiscal deficits. In contrast, a decrease in government investment expenditure leads the economy into a recession both in the short-run and in the long-run. As a result, fiscal deficits tend to be high in the future.

These results draw important policy implications on deficit reduction through low consumption and investment spending, and transfer payments to households. The government of Sri Lanka would be able to reduce fiscal deficits markedly both in the short-run and in the long-run if it lowers its consumption expenditures and transfer payments, not affecting the other sectors of the economy significantly. If the government, instead, decides to have low investment spending it can still relax its fiscal stress in the short-run but such a policy would deteriorate government's budgetary accounts in the long-run as it triggers a long-term economic slowdown.

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Table 1
Model Specification: Stochastic Equations and Identities

Stochastic equations ^(a)	
(S-1) Private consumption	$\Delta \ln CP_t^p = \beta_{0,1} + \beta_{1,1} \Delta \ln YD_t - \lambda_1 [\ln CP_{t-1} - \alpha_{1,1} \ln YD_{t-1}] + \varepsilon_{t,1}$
(S-2) Private investment	$\Delta \ln IP_t^p = \beta_{0,2} + \beta_{1,2} \Delta \ln Y_{t-1} - \lambda_2 [\ln IP_{t-1}^p - \alpha_{1,2} \ln Y_{t-1}] + \varepsilon_{t,2}$
(S-3) Government revenue	$\Delta \ln T_t = \beta_{0,3} + \beta_{1,3} \Delta \ln Y_t + \beta_{2,3} \Delta T_t - \lambda_3 [\ln T_{t-1} - \alpha_{1,3} \ln Y_{t-1} - \alpha_{2,3} T_{t-1}] + \varepsilon_{t,3}$
(S-4) Government interest payments	$\ln IPG_t = \beta_{0,4} + \beta_{1,4} \ln FD_t + \beta_{2,4} T_{t-1} + \beta_{3,4} \ln IPG_{t-1} + \varepsilon_{t,4}$
(S-5) Export demand function	$\Delta \ln X_t^d = \beta_{0,5} - \beta_{1,5} \Delta \ln P_t^x - \lambda_5 [\ln X_{t-1}^d + \alpha_{1,5} \ln P_{t-1}^x - \alpha_{2,5} \ln(ER_t P_t^{xw})]_{t-1} - \alpha_{3,5} \ln Y_{t-1} + \varepsilon_{t,5}$
(S-6) Inverse export supply function	$\ln P_t^x = \beta_{0,6} + \beta_{1,6} \ln X_t^d + \beta_{2,6} \Delta \ln P_t^x - \beta_{3,6} \Delta \ln K_t + \beta_{4,6} \ln P_{t-1}^x + \varepsilon_{t,6}$
(S-7) Import demand function	$\Delta \ln Z_t = \beta_{0,7} + \beta_{1,7} \Delta \ln YD_t - \beta_{2,7} \Delta \ln(P_t^x / P_t^y) - \lambda_7 [\ln Z_{t-1} - \alpha_{1,7} \ln YD_{t-1}] + \varepsilon_{t,7}$
(S-8) Money demand	$\Delta \ln M_t^d = \beta_{0,8} + \beta_{1,8} \Delta \ln GNE_t - \lambda_8 [\ln M_{t-1}^d - \alpha_{1,8} \ln GNE_{t-1}] + \varepsilon_{t,8}$
(S-9) Money wages	$\Delta \ln W_t = \beta_{0,9} + \beta_{1,9} \Delta \ln P_t^x + \beta_{2,9} \Delta \ln(Y/L)_{t-1} + \varepsilon_{t,9}$
(S-10) Labour demand	$\Delta \ln L_t = \beta_{0,10} + \beta_{1,10} \Delta \ln Y_t - \lambda_{10} [\ln L_{t-1} - \alpha_{1,10} \ln Y_{t-1} + \alpha_{2,10} \ln(W/P^y)]_{t-1} + \varepsilon_{t,10}$
(S-11) Unemployment rate:	$\Delta U_t = \beta_{0,11} - \beta_{1,11} \Delta \ln Y_t - \beta_{2,11} \Delta \ln CG_t + \varepsilon_{t,11}$
(S-12) Prices of intermediate goods	$\Delta \ln P_t^i = \beta_{0,12} + \beta_{1,12} \Delta \ln P_t^x - \lambda_{12} [\ln P_{t-1}^i - \alpha_{1,12} \ln P_{t-1}^x] + \varepsilon_{t,12}$
(S-13) Price of domestic good	$\Delta \ln P_t^y = \beta_{0,13} + \beta_{1,13} \Delta \ln P_t^x + \beta_{2,13} \Delta \ln W_t + \beta_{3,13} ED_t + \varepsilon_{t,13}$
(S-14) Prices of consumer goods (CPI)	$\Delta \ln P_t^c = \beta_{0,14} + \beta_{1,14} \Delta \ln P_t^x - \beta_{2,14} \Delta U_{t-1} - \lambda_{14} [\ln P_{t-1}^c - \alpha_{1,14} \ln P_{t-1}^x] + \varepsilon_{t,14}$
(S-15) Production of the domestic good	$\Delta \ln(Y/L)_t = \beta_{0,15} + \beta_{1,15} \Delta \ln(K/L)_t - \lambda_{15} [\ln(Y/L)_{t-1} - \alpha_{1,15} \ln(K/L)_{t-1} - \alpha_{2,15} T_{t-1}] + \varepsilon_{t,15}$
Identities	
(I-1) Gross national spending	$GNE_t = GDE_t + NFIA_t$ (I-2) Gross domestic spending $GDE_t = CP_t^p + CG_t + I_t + X_t - Z_t$
(I-3) Aggregate investment	$I_t = IP_t^p + IG_t$ (I-4) Capital stock $K_t = (1-\delta)K_{t-1} + I_t, \delta = 0.095$
(I-5) Disposable income	$YD_t = Y_t - \Pi_t + TPG_t + FTP_t$ (I-6) Income taxes $IT_t = \kappa T_t, \kappa = 0.132$
(I-7) Fiscal deficit	$FD_t = (CG_t + IG_t + TPG_t + IPG_t + OG_t) - T_t$ (I-8) Deficit financing $BF_t = FD_t - \Delta CU_t - GF_t$
(I-9) Seignorage	$\Delta CU_t = CU_t - CU_{t-1}$ (I-10) Money supply $M_t^s = CU_t + DD_t$
(I-11) Money equilibrium	$M_t^d = M_t^s = M_t$ (I-12) Export equilibrium $X_t^d = X_t^s = X$
Market disequilibrium	$ED_t = \ln GDE_t - \ln Y_t$ (I-13)

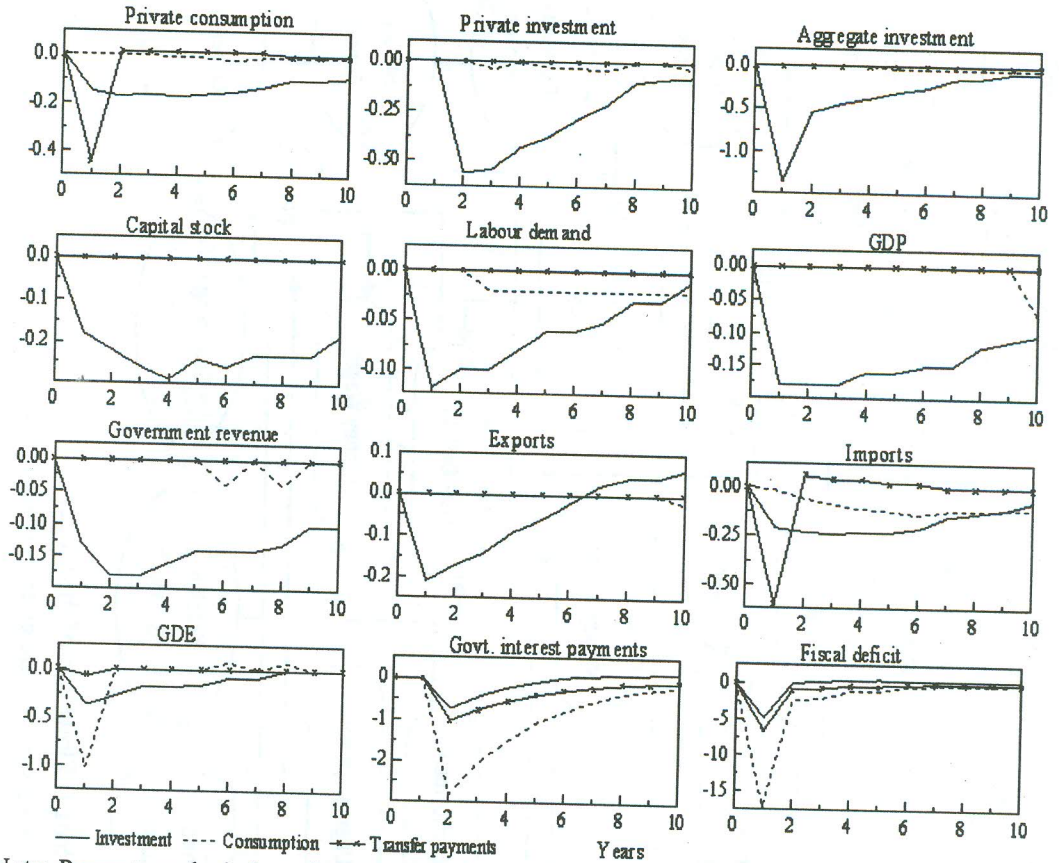
Note: (a) $\beta_{i,j}$ and λ_j are short term parameters and error correction coefficient respectively, $\alpha_{i,j}$ are cointegrating coefficients (where applicable) and $\varepsilon_{i,j}$ is the iid disturbance term in i th equation. A description of all model variables is given in Table 2. Estimated stochastic equations with diagnostic tests statistics are given in the Appendix.

Table 2
Definition of Variables in the Model

Notation	Variable Description	Type
BF	Deficit financing by issuing government bonds	Endogenous
CG	Government consumption expenditure	Exogenous
CP	Private consumption spending (on locally produced goods and services and imported goods and non-factor services)	Endogenous
CU	Currency in circulation	Exogenous
DD	Demand deposits	Exogenous
ED	Excess demand (changes in inventories)	Endogenous
ER	Nominal effective exchange rate (NEER)	Exogenous
FD	Fiscal deficit	Endogenous
FTP	Foreign private transfers (net)	Exogenous
GDE	Gross domestic expenditure	Endogenous
GF	Deficit financing by foreign grants	Exogenous
GNE	Gross national expenditure	Endogenous
I	Aggregate investment less of changes in stocks	Endogenous
IG	Government investment less of changes in govt. stocks	Exogenous
IP	Private investment less of changes in private sector stocks	Endogenous
IPG	Government's interest payments	Endogenous
IT	Revenue from income taxes	Endogenous
K	Capital stock of the economy	Endogenous
L	Labour demand (number of persons employed)	Endogenous
M1 ^d	Demand for narrow money (in the equilibrium M1 ^d equals M1, stock of M1)	Endogenous
M1 ^s	Supply of narrow money (in the equilibrium M1 ^s equals M1, stock of M1)	Exogenous
NFIA	Net factor income from abroad	Exogenous
OG	Government spending on debt repayments, capital/other transfers to public institutions and restructuring expenditures	Exogenous
P ^c	Consumer prices (Consumer Price Index)	Endogenous
P ^x	Export prices (Export Price Index)	Endogenous
P ^{x,w}	World export prices in USD (World Export Price Index)	Exogenous
P ⁱ	Intermediate prices (Price Index for intermediate goods)	Endogenous
P ^z	Import prices (Import Price Index)	Exogenous
P ^y	Price of domestic good (GDP deflator)	Endogenous
T	Government revenue	Endogenous
TPG	Government transfer payments to households	Exogenous
Trd	Deterministic time trend	Exogenous
U	Unemployment rate	Endogenous
W	Money wages (Index for workers in Wages Boards Trades)	Endogenous
X ^d	Demand for exports of goods and non -factor services (in the equilibrium X ^d equals X, value of exports)	Endogenous
X ^s	Supply of exports of goods and non -factor services (in the equilibrium X ^s equals X, value of exports)	Endogenous
Y	GDP	Endogenous
YD	Private-sector disposable income	Endogenous
Y ^w	Trade-weighted world income in USD	Exogenous
Z	Imports of goods and non-factor services	Endogenous
τ	Average tax rate	Exogenous

Note: There are 28 endogenous variables and 15 exogenous variables in the model.

Figure 1: Impact multipliers of government spending shocks (selected variables)



Note: Percentage deviation of counterfactual path from the baseline. The shock is given at period (year) 1.

Source: Author calculations.

Table 3

Cumulative impact of 10% reduction in government expenditure components on selected macroeconomic variables^(a)

Variable	Consumption expenditure			Investment expenditure			Transfer payments to households					
	Year 1	Year 2	Year 5	Year 10	Year 1	Year 2	Year 5	Year 10	Year 1	Year 2	Year 5	Year 10
Private consumption (<i>CP</i>)	0.00	0.00	-0.02	-0.08	-0.15	-0.33	-0.86	-1.49	-0.44	-0.42	-0.38	-0.37
Private investment (<i>IP</i>)	0.00	0.00	-0.03	-0.19	0.00	-0.59	-1.93	-2.88	0.00	0.00	0.00	0.00
Aggregate investment (<i>I</i>)	0.00	0.00	-0.06	-0.13	-1.29	-1.85	-3.09	-3.91	0.00	0.00	0.00	0.00
Capital stock (<i>K</i>)	0.00	0.00	0.00	-0.08	-0.19	-0.37	-1.20	-2.49	0.00	0.00	0.00	0.00
Labour demand (<i>L</i>)	0.00	0.00	-0.06	-0.16	-0.12	-0.24	-0.54	-0.76	0.00	0.00	0.00	0.00
GDP (<i>Y</i>)	0.00	0.00	-0.08	-0.22	-0.18	-0.36	-0.92	-1.74	0.00	0.00	0.00	0.00
Exports (<i>X</i>)	0.00	0.00	0.00	-0.02	-0.21	-0.38	-0.67	-0.55	0.00	0.00	0.00	0.00
Imports (<i>Z</i>)	-0.04	-0.13	-0.42	-1.06	-0.23	-0.47	-1.18	-1.97	-0.61	-0.55	-0.47	-0.47
Government revenue (<i>T</i>)	0.00	0.00	-0.05	-0.09	-0.13	-0.31	-0.86	-1.61	0.00	0.00	0.00	0.00
Interest payments (<i>IPG</i>)	0.00	-2.64	-6.93	-8.89	0.00	-0.70	-1.38	-0.87	0.00	-0.96	-2.57	-3.29
Money demand (<i>M</i>)	-0.67	-0.57	-0.57	-0.27	-0.29	-0.39	-0.67	-0.76	-0.08	-0.08	-0.08	-0.08
Unemployment rate (<i>U</i>)	2.71	2.71	2.71	3.02	0.16	0.41	1.36	3.00	0.00	0.00	0.00	0.00
Money wages (<i>W</i>)	-0.14	-0.31	-0.64	-1.12	-0.03	-0.10	-0.44	-0.94	0.00	0.00	-0.02	-0.03
Consumer prices (<i>P^c</i>)	-0.19	-0.43	-0.89	-1.48	-0.05	-0.11	-0.31	-0.40	0.00	-0.02	-0.05	-0.08
Price of domestic good (<i>P^d</i>)	-0.17	-0.35	-0.84	-1.48	-0.05	-0.11	-0.30	-0.37	0.00	-0.02	-0.05	-0.07
Disposable income (<i>YD</i>)	0.00	0.00	-0.07	-0.21	-0.17	-0.34	-0.87	-1.54	-0.43	-0.43	-0.43	-0.43
GDE	-1.03	-1.03	-1.03	-0.87	-0.37	-0.64	-1.23	-1.62	-0.07	-0.07	-0.19	-0.19
Fiscal deficit (<i>FD</i>)	-16.10	-18.30	-22.10	-23.30	-4.48	-4.50	-3.34	-1.21	-6.14	-6.96	-8.36	-8.72

Note: These results are from within-sample simulation for the period 1995-2004. The shock is given in the year 1. Impacts of the expenditure shocks are traced output for 10 years from the time of the initial shock.

Source: Author calculations.

APPENDIX

ESTIMATED STOCHASTIC EQUATIONS OF THE MODEL

This section presents the estimated stochastic equations and identities of the model. The estimated stochastic equations are given below (with t statistics in parentheses and diagnostic test statistics with their p values in braces). Year dummies are used for non-structural outlying effects.

(1) Private consumption expenditure (controlled for outliers in 1979 and 1985)

$$\Delta \ln CP_t = 0.138 + 1.128\Delta \ln YD_t - 0.177[\ln CP_{t-1} - 0.872 \ln YD_{t-1}]$$

	(2.94)	(8.10)	(-3.28)		
R ²		0.882		ARCH 1-1 F test	0.234{0.634}
DW statistic		2.05		Normality Chi ² test	0.734{0.693}
Regression F test			30.00 {0.000}	Hetero F test	
0.312{0.935}					
AR 1-2 F test		0.012{0.998}		RESET F test	1.184{0.290}

(2) Private investment expenditure (controlled for an outlying effect in 2001)

$$\Delta \ln IP_t = -1.289 + 3.608\Delta \ln Y_{t-1} - 0.394[\ln IP_{t-1} - 1.163 \ln Y_{t-1}]$$

	(-3.74)	(4.16)	(-3.62)		
R ²		0.637		ARCH 1-1 F test	1.195{0.287}
DW statistic		1.83		Normality Chi ² test	1.351{0.509}
Regression F test			12.80 {0.000}	Hetero F test	
0.627{0.682}					
AR 1-2 F test		0.693{0.512}		RESET F test	0.861{0.364}

(3) Government revenue (controlled for outliers in 1980 and 1984)

$$\Delta \ln T_t = -1.11 + 0.984\Delta \ln Y_t + 4.831\Delta \tau_t - 0.464[\ln T_{t-1} - 0.976 \ln Y_{t-1} - 4.978\tau_{t-1}]$$

	(-11.5)	(17.4)	(7.08)	(-11.6)	
R ²		0.998		ARCH 1-1 F test	0.003{0.957}
DW statistic		2.19		Normality Chi ² test	2.844{0.241}
Regression F test			1496 {0.000}	Hetero F test	
0.430{0.888}					
AR 1-2 F test		0.395{0.679}		RESET F test	1.158{0.296}

(4) Government interest payments (controlled for an outlying effect in 2004)

$$\ln IPG_t = 1.250 + 0.152 \ln FD_{t-1} + 0.02Trd + 0.591 \ln IPG_{t-1}$$

	(2.06)	(2.49)	(2.96)	(5.84)	
R ²		0.982		ARCH 1-1 F test	0.569{0.460}
DW statistic		2.34		Normality Chi ² test	1.929{0.381}
Regression F test			232.8 {0.000}	Hetero F test	
0.686{0.698}					
AR 1-2 F test		0.913{0.418}		RESET F test	2.280{0.148}

(5) Export demand (controlled for outliers in 1984 and 1990)

$$\Delta \ln X_t = 0.673 - 0.463\Delta \ln P_t^x - 0.114[\ln X_{t-1} + 0.13 \ln P_{t-1}^x - 0.02 \ln(ER_{t-1} \cdot P_{t-1}^{x,w}) - 1.35 \log Y_{t-1}^w]$$

	(2.61)	(-5.41)	(-2.30)		
R ²		0.745		ARCH 1-1 F test	0.013 {0.909}
DW statistic		1.46		Normality Chi ² test	5.241 {0.073}
Regression F test			15.32 {0.000}	Hetero F test	
0.393 {0.871}					
AR 1-2 F test		1.645 {0.219}		RESET F test	1.529 {0.230}

(6) Export supply-inverse (controlled for outliers in 1983 and 1984)

$$\ln P_t^x = -2.548 + 0.449 \ln X_t + 0.993\Delta \ln P_t^i - 3.299\Delta \ln K_t + 0.733 \ln P_{t-1}^x$$

	(-1.85)	(2.14)	(4.05)	(-4.50)	(7.27)
R ²		0.993		ARCH 1-1 F test	0.055 {0.817}
DW statistic		2.13		Normality Chi ² test	2.059 {0.357}
Regression F test			297.4 {0.000}	Hetero F test	
0.224 {0.984}					
AR 1-2 F test		0.538 {0.594}		RESET F test	1.001 {0.331}

(7) Import demand (controlled for outliers in 1981 and 1988)

$$\Delta \ln Z_t = -0.038 + 1.554\Delta \ln YD_t - 0.195 \ln(P_t^z / P_t^y) - 0.323[\ln Z_{t-1} - 0.89 \ln YD_{t-1}]$$

	(-0.94)	(2.36)	(-2.10)	(-2.56)	
R ²		0.700		ARCH 1-1 F test	0.009 {0.925}
DW statistic		1.60		Normality Chi ² test	1.223 {0.543}
Regression F test			7.40 {0.000}	Hetero F test	
0.232 {0.980}					
AR 1-2 F test		1.191 {0.328}		RESET F test	2.283 {0.148}

(8) Money demand (controlled for outliers in 1981 and 1988)

$$\Delta \ln M1_t = 1.107 + 0.576\Delta \ln GNE_t - 0.471[\ln M1_{t-1} - 0.49 \ln GNE_{t-1}]$$

	(3.88)	(3.89)	(-2.27)		
R ²		0.673		ARCH 1-1 F test	0.701 {0.414}
DW statistic		2.31		Normality Chi ² test	0.329 {0.848}
Regression F test			6.51 {0.001}	Hetero F test	
0.350 {0.925}					
AR 1-2 F test		2.714 {0.100}		RESET F test	0.906 {0.354}

(9) Money wages (controlled for outliers in 1981 and 1988)

$$\Delta \ln W_t = -0.006 + 0.736\Delta \ln P_t^c + 0.808\Delta \ln(Y_{t-1} / L_{t-1})$$

	(-0.34)	(4.90)	(4.85)		
R ²		0.791		ARCH 1-1 F test	0.010 {0.921}
DW statistic		2.12		Normality Chi ² test	0.519 {0.771}
Regression F test			11.99 {0.001}	Hetero F test	0.378 {0.909}
0.378 {0.909}					
AR 1-2 F test		0.075 {0.928}		RESET F test	0.766 {0.393}

(10) Labour demand (controlled for outliers in 1982 and 1984)

$$\Delta \ln L_t = -0.954 + 0.791\Delta \ln Y_t - 0.494[\ln L_{t-1} - 0.477 \ln Y_{t-1} + 0.324 \ln(W_{t-1} / P_t^y)]$$

(-3.91) (3.41) (-3.91)

R ²	0.696	ARCH 1-1 F test	0.001{0.970}
DW statistic	2.09	Normality Chi ² test	0.436{0.804}
Regression F test	7.49 {0.000}	Hetero F test	0.715{0.662}
AR 1-2 F test	1.281{0.301}	RESET F test	1.847{0.190}

(11) Unemployment rate (controlled for outliers in 1980, 1983, 1984 and 1988)

$$\Delta U_t = 0.002 - 0.185\Delta \ln Y_t - 0.032\Delta \ln CG_t$$

(0.45) (-1.90) (-1.98)

R ²	0.867	ARCH 1-1 F test	0.040{0.844}
DW statistic	1.92	Normality Chi ² test	0.525{0.769}
Regression F test	19.56{0.000}	Hetero F test	0.193{0.988}
AR 1-2 F test	0.534{0.569}	RESET F test	0.810{0.381}

(12) Price of intermediate goods (controlled for outliers in 1994 and 1995)

$$\Delta \ln P_t^i = 0.488 + 0.403\Delta \ln P_t^z - 0.466[\ln P_{t-1}^i - 0.819 \ln P_{t-1}^z]$$

(5.34) (5.70) (-4.94)

R ²	0.775	ARCH 1-1 F test	0.491{0.492}
DW statistic	1.80	Normality Chi ² test	0.225{0.894}
Regression F test	18.04{0.000}	Hetero F test	0.254{0.894}
AR 1-2 F test	1.041{0.372}	RESET F test	3.104{0.100}

(13) Price of domestic goods (controlled for an outlying effect in 1985)

$$\Delta \ln P_t^y = 0.047 + 0.271\Delta \ln P_t^i + 0.174\Delta \ln W_t + 0.14ED_t$$

(4.38) (3.97) (2.03) (1.90)

R ²	0.716	ARCH 1-1 F test	0.465{0.503}
DW statistic	2.09	Normality Chi ² test	0.153{0.926}
Regression F test	13.21{0.000}	Hetero F test	0.882{0.546}
AR 1-2 F test	0.271{0.766}	RESET F test	0.586{0.453}

(14) Price of consumer goods (controlled for an outlier in 1980)

$$\Delta \ln P_t^c = -0.327 + 1.091\Delta \ln P_t^y - 0.153\Delta U_{t-1} - 0.667[\ln P_{t-1}^c - 1.108 \ln P_{t-1}^y]$$

(-5.30) (18.0) (-1.76) (-5.56)

R ²	0.963	ARCH 1-1 F test	0.000{0.991}
DW statistic	1.71	Normality Chi ² test	0.976{0.614}
Regression F test	134.6{0.000}	Hetero F test	0.396{0.888}
AR 1-2 F test	0.366{0.698}	RESET F test	0.582{0.454}

(15) Production of domestic good (controlled for an outlier in 2001)

$$\Delta \ln(Y_t / L_t) = 1.052 + 0.564 \Delta \ln(K_t / L_t) - 0.336 [\ln(Y_{t-1} / L_{t-1}) - 0.465 \ln(K_{t-1} / L_{t-1}) - 0.014 Trd]$$

	(2.25)	(7.52)	(-2.23)	
R ²		0.729	ARCH 1-1 F test	0.146 {0.706}
DW statistic		1.46	Normality Chi ² test	1.005 {0.605}
Regression F test		19.73 {0.000}	Hetero F test	1.203 {0.344}
AR 1-2 F test		1.023 {0.377}	RESET F test	0.269 {0.609}

1. Perera (1999), Thenuwara (1999) and Dasanayake (2000) discuss a number of models built for Sri Lanka since independence. However, many of those models are not maintained and not regularly used for policy simulation exercise.
2. Cointegration of non-stationary variables is diagnosed by the ECM unit root test (see Banerjee et al., 1998) and the long-term residual based ADF test.
3. The accelerator model of investment is given as $I_t = K_t - K_{t-1} = \alpha(Y_t - Y_{t-1})$ where K is capital stock and Y is output. In this case, K adjusts to its desired level fully. A partial adjustment accelerator model is given as $I_t = \alpha\lambda Y_t - (1-\delta)\alpha\lambda Y_{t-1} + (1-\lambda)I_{t-1}$.
4. The estimated short-term income elasticity of private investment is nearly 3 times higher than that of the long-term. This might be due to large fluctuations in private investment in the short-term. This period, 1977-2005, involves massive investment boom and recession periods in Sri Lanka.
5. For examples, see McKibbin and Sachs (1991) and Powel and Murphy (1995).
6. Minford and Walters (1987) treated all components of government expenditures as endogenous.
7. ER stands for nominal effective exchange rate and P^{x^w} stands for world export prices in foreign currency.
8. The Cobb-Douglas technology requires factor income shares (for example, output shares of capital and labour) to be constant over time. Our empirical data well-supported Cobb-Douglas technology as an approximate labour-income share is roughly constant around 55 percent over the period 1978-2004.
9. The rate of depreciation of overall capital stock is 9.05 percent, the average of depreciation rates of various components of capital reported by Hulten and Wykoff (1980).
10. Though MAPE and Theil U statistics, and actual and simulated data of variables are not reported here to preserve space, they are available from the author upon request.
11. In the fiscal deficit accounting identity, 10 percent cut in government consumption, investment and transfer payment spending decrease fiscal deficit by 11 percent, 4 percent and 6 percent respectively. These figures could, however, be different when macroeconomic links are present.