An application of an open economy IS-LM model for a hypothetical country: A short note

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Contents

1 Abstract

In this paper we will analysis the Open Economy IS-LM model from the **text book of Rudiger Dornbusch, Stanley Fischer and Richard Startz, named Macroeconomics** by artificial simulations.

2 Introduction

In news paper and article often we read a lot about the actions those have taken by the government and Central Bank to stable the economic progress of a respective country, known as the Fiscal Policy and Monetary Policy respectively.

In this paper we are going to investigate the effect of an exogenous shock (changing the tax rate or government expenditure for example) on the IS-LM model. The mathematical model for the IS-LM model has taken from the book of Macroeconomics, is written by R.Dornbusch, S. Fischer.

3 Technical Structure of The Model

IS curve shows the **goods market equilibrium schedule** (Dornbusch,Fischer;P-92). In a macro structure of an economy we have considered the aggregate level of the output, investment, income, savings and so on. By holding a simple assumption that the planned investment is equal to the Income, IS schedule shows the combination of interest rate and the output level.

$Equilibrium\ Income$	Y
$Desposable\ Income$	YD
$Transfers$	TR
$Taxes$	TA
$Consumption$	C
$Savings$	S
$Aggregate\ Demand$	A
$Propensity\ to\ Consume\ Out\ of\ Income$	$\bar{c}$
$Investment\ Spending$	I
$Autonomous\ Spending$	$\bar{A}$
$Government\ Spending$	$\bar{G}$
$Investment\ Spending$	$\bar{I}$
$Export$	$\bar{X}$
$Imports$	Q
$Fixed\ level\ of\ the\ 'Imports$	$\bar{I}$
$Autonomous\ Consumption\ Spending$	$\bar{C}$
$Interest\ response\ of\ Investment$	b
$Constant\ amount\ of\ transfers$	$\bar{TR}$
$Real\ exchange\ rate$	R
$Coefficient\ of\ the\ real\ exchange\ rate$	v
$Marginal\ Propensity\ of\ the\ import$	m
$Marginal\ Propensity\ of\ savings$	s

$Y = C + I + G + NX = YD + TA - TR = C + S + TA - TR$
$YD = C + S$
$YD = Y - TA - TR$
$TA = tY$
$G = \bar{G}$
$TR = \bar{TR}$
$C = \bar{C} + cYD = \bar{C} + c(Y + TR - TA)$
$Y = A + NX = \frac{(c*\bar{TR}+\bar{I}-b*i+\bar{G}+\bar{X}+v*R)}{(1-c+m)}$
$C = \bar{C} + cY$
$A = \bar{A} + \bar{c}Y$
$\bar{c} = c(1-t)$
$\bar{A} = \bar{I} + \bar{G} + c\bar{TR}$
$I = \bar{I} - bi$
$NX = X - mY + vR$
$R = \frac{eP_f}{P}$
$s = 1 - c$

Demand for real balances	L
Interest Rate	i
The sensitivity of the demand for real balances to the level of Income	k
The sensitivity of the demand for real balances to the level of the Interest rate	h

The LM schedule is also known as **the money market equilibrium schedule**.If we consider the demand for real balances equal to the supply, then the LM schedule shows all combinations of interest rate and levels of Income.

$Y = \frac{1}{k}((\frac{\bar{M}}{P}) + hi)$
$L = kY - hi$ h>0
(Dornbusch,Fischer,Startz ;P-254,255)

4 Code

For the source code you can check the following link:
https://github.com/shahrear86/Dynamics/blob/master/IS-LM1.m
https://github.com/shahrear86/Dynamics/blob/master/IS-LM2.m
https://github.com/shahrear86/Dynamics/blob/master/IS-LM3.m
https://github.com/shahrear86/Dynamics/blob/master/IS-LM4.m

5 Result

	Combinition-1	Combinition-2	Combinition-3	Combinition-4
$\bar{TR}$	10	10	10	10
$\bar{I}$	5	5	5	5
$\bar{G}1$	2	2	2	2
$\bar{G}2$	6	9	3	6
$\bar{X}$	1	1	1	8
P	1	1	1	1
P_f	20	20	1	2
e	1/30	50	1	0.1
b	0.9	0.9	0.4	0.9
c	0.8	0.67	0.57	0.8
m	0.9	0.9	0.001	0.1
v	0.2	0.2	0.2	0.2
R	0.667	1000	1	0.20
t	0.2	18	0.2	0.2
$\bar{I}$	5	5	1	5
i	0:0.1:10	0:0.1:10	0:0.1:10	0:0.1:10
Y1	min:5.66	min:15.48	min:0.55	min:30.52
	mean:9.23	mean:15.82	mean:0.74	mean:40.30
	med:9.23	med:15.82	med:0.74	med:40.30
	max:12.80	max:16.155	max:0.93	max:50.09
Y2	min:8.84	min:16.00	min: 0.65	min:39.22
	mean:12.41	mean:16.34	mean:0.83	mean:49.00
	med:12.41	med:16.34	med: 0.83	med:49.00
	max:15.98	max:16.68	max: 1.02	max:58.78
NX1	min:-10.39	min:186.46	min: 1.20	min:3.03
	mean:-7.18	mean:186.77	mean:1.20	mean:4.00
	med:-8.3848	med:186.77	med: 1.20	med:4.00
	max:-3.96	max:187.07	max: 1.20	max:4.99
NX2	min:-13.25	min:185.99	min:1.20	min:2.16
	mean:-10.03	mean:186.29	mean:1.20	mean:3.14
	med:-10.03	med:186.29	med:1.20	med:3.14
	max:-6.82	max:186.60	max:1.20	max:4.12
$\bar{M}$	10	10	10	10
$\bar{P}$	5	5	5	5
k	0.08	0.08	0.08	0.08
h	0.8	0.8	0.8	0.8

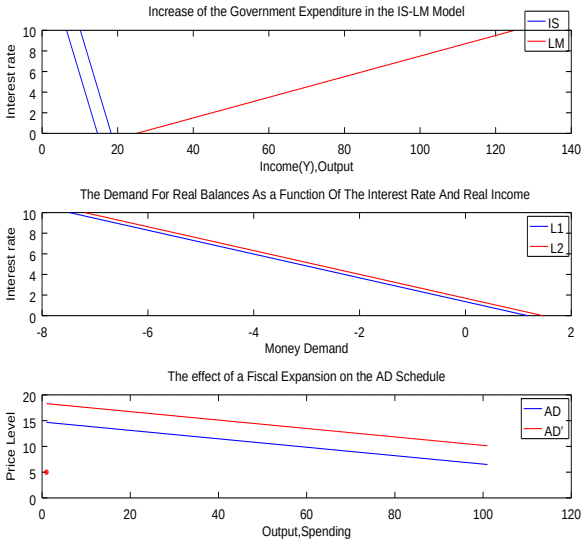

Figure 1: Combinition-1

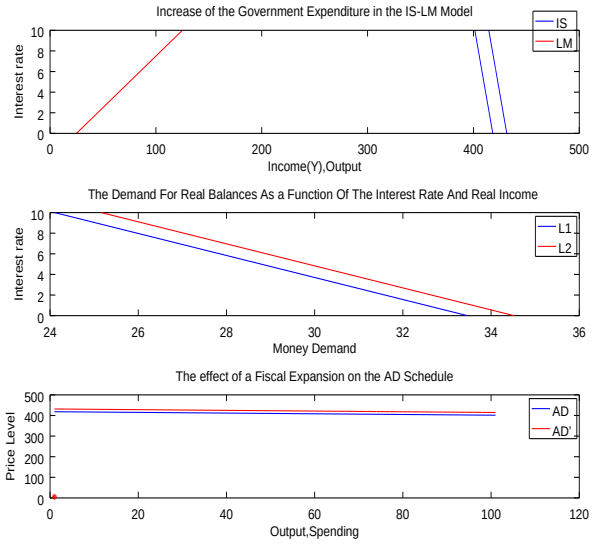

Figure 2: Combinition-2

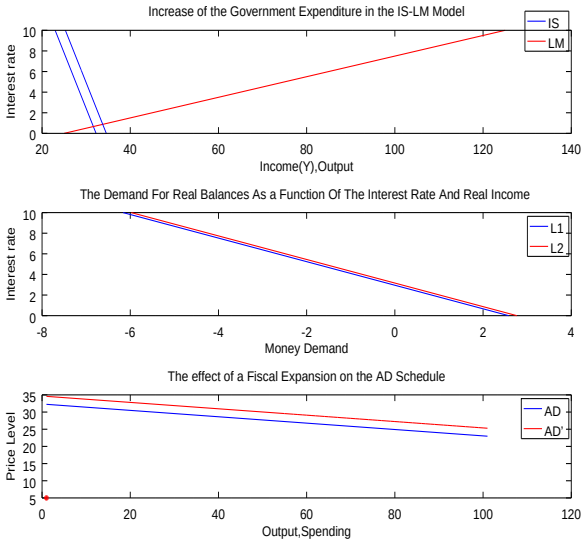

Figure 3: Combinition-3

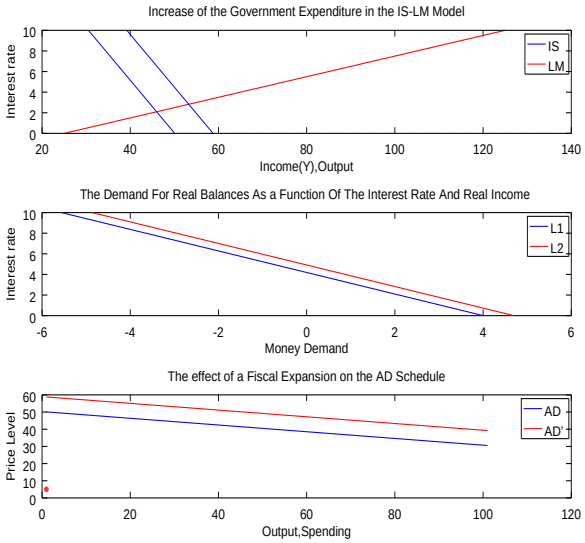

Figure 4: Combinition-4

6 Conclusion

The whole mathematical structure is based on some strict assumptions (check the text book). Therefore no solid point to point guide line is possible from such a model. But as it is true for every ideal case, such simulations can be halpful to take strategies and actions against any adverse situation (unexpected price hike, unemployment for example), which can steady the development path of a country.

7 References

1. Dornbusch,Rudiger; Fischer,Stanely;Startz,Richard. 2004 .*Macroeconomics*. McGraw-Hill/Irwin,Ninth Edition,pp.215-255
2. User Manual. Octave.