

# **EC9012 MACROECONOMICS**

## **WEEK 6 - PROBLEM SET 4**

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**FATİH KANSOY**

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**Email:** f.kansoy@warwick.ac.uk

**Web:** [warwick.ac.uk/fatihkansoy](http://warwick.ac.uk/fatihkansoy)

## PROBLEM SET 3

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## **QUESTION - 3 -**

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In 2008, the policy makers of the economy of Eastlandia projected the Debt–GDP ratio and the ratio of the budget deficit to GDP for the economy for the next 10 years under different scenarios for growth in the government's deficit. All variables are real: GDP is currently \$1,000 billion and is expected to grow by 3% per year, the public debt is \$300 billion at the beginning of the year, and the budget deficit (by deficit here we intend primary deficit) is \$30 billion in 2008.

## QUESTION - 3 -

- A -

Complete the accompanying table to show the debt–GDP ratio and the ratio of the budget deficit to GDP for the economy if the government's budget deficit remains constant at \$30 billion over the next 10 years. (Remember that the government's debt will grow by the previous year's deficit.)

Year	Real GDP \$	Debt \$	Budget Deficit \$	Debt % of GDP	Budget Deficit % of GDP
2008	1000	300	30		
2009					
2010					
2011					
2012					
2013					
2014					
2015					
2016					
2017					
2018					

## QUESTION - 3 -

- A -

Complete the accompanying table to show the debt–GDP ratio and the ratio of the budget deficit to GDP for the economy if the government's budget deficit remains constant at \$30 billion over the next 10 years. (Remember that the government's debt will grow by the previous year's deficit.)

Year	Real GDP \$	Debt \$	Budget Deficit \$	Debt % of GDP	Budget Deficit % of GDP
2008	1000	300	30	3	3
2009	1030	330	30	32.04	2.91
2010	1061	360	30	33.93	2.83
2011	1093	390	30	35.68	2.74
2012	1126	420	30	37.30	2.66
2013	1159	450	30	38.83	2.59
2014	1194	480	30	40.20	2.51
2015	1230	510	30	41.46	2.44
2016	1267	540	30	42.62	2.37
2017	1305	570	30	43.68	2.30
2018	1344	600	30	44.64	2.23

## QUESTION - 3 -

- B -

Redo the table again to show the debt–GDP ratio and the ratio of the budget deficit to GDP for the economy if the government's budget deficit grows by 20% per year over the next 10 years.

Year	Real GDP \$	Debt \$	Budget Deficit \$	Debt % of GDP	Budget Deficit % of GDP
2008	1000	300	30		
2009					
2010					
2011					
2012					
2013					
2014					
2015					
2016					
2017					
2018					

## QUESTION - 3 -

- B -

Redo the table again to show the debt–GDP ratio and the ratio of the budget deficit to GDP for the economy if the government's budget deficit grows by 20% per year over the next 10 years.

Year	Real GDP \$	Debt \$	Budget Deficit \$	Debt % of GDP	Budget Deficit % of GDP
2008	1000	300	30	3	3
2009	1030	330	36	32	3
2010	1061	366	43	34	4
2011	1093	409	52	37	5
2012	1126	461	62	41	6
2013	1159	523	75	45	6
2014	1194	598	90	50	8
2015	1230	687	107	56	9
2016	1267	795	129	63	10
2017	1305	924	155	71	12
2018	1344	1079	186	80	14

- C -

What happens to the debt–GDP ratio and the ratio of the budget deficit to GDP for the economy over time under the two different scenarios?

When the deficit remains constant at \$30 billion, the ratio of the budget deficit to GDP declines but the debt–GDP ratio continues to increase because debt is rising faster than GDP. When the deficit grows by 20% per year, the ratio of the budget deficit to GDP rises from 3.0% to 13.8% in 10 years and the debt–GDP ratio more than doubles from 30% to more than 80%.

## **QUESTION - 6 -**

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## QUESTION - 6 -

### QUESTION 6-A

Briefly explain the social costs of inflation.

#### The costs of expected inflation include the following:

- [►] Menu costs: Higher inflation induces firms to change their posted prices more often. This may be costly if they must reprint their menus and catalogs.
- [►] Relative Price Distortions: If the firms change their prices infrequently, then inflation causes greater variability in relative prices. Since free market economies rely on relative prices to allocate resources efficiently, inflation leads to microeconomic inefficiencies.
- [►] Unfair Tax Treatment: Many provisions in tax code do not take into account the effect of inflation. Hence inflation can alter individuals' or firms' tax liabilities.
- [►] Unit of Account Costs: Money is the yardstick with which we measure economic transactions. Money is a less useful measure when its value is always changing.

#### Unexpected Inflation also has the following costs:

- [►] Arbitrary Redistribution of Wealth: Unexpected inflation arbitrarily redistributes wealth among individuals. For example if inflation is higher than expected, debtors gain and creditors lose. Also people with fixed pensions are hurt because their dollars buy fewer goods.
- [►] Increased Uncertainty: When inflation is high, variable and unpredictable, uncertainty increases which makes economic transactions more difficult and people worse off.

## QUESTION - 6 -

### QUESTION 6-B

The table from the IMF provides the inflation rate in 2000 and the average inflation rate over the period of 2000-2007 for eight different countries

Country	Inflation 2000 (%)	Average Inflation Rate in 2000-2007 (%)	Actual-Expected Inflation	Favor Borrowers?
Brazil	7.1	7.3		
China	0.3	1.6		
Indonesia	3.8	8.8		
Japan	-0.7	-0.3		
Turkey	56.4	27.8		
United States	3.4	2.8		
Zimbabwe	55.7	904.1		

Calculate the difference between average inflation during 2000-2007 and the expected inflation, assuming that expected inflation rate was the inflation rate in 2000. Show the countries where the inflation rates most favored borrowers with seven year loans that were taken out in 2000.

## QUESTION - 6 -

[►] If actual inflation is higher than expected, debtors gain because the real interest rates that they pay declines. To be able to rank the countries, we need to look at the difference between the average inflation during 2000-2007 and the initial inflation in 2000, which is the expected inflation when the loan was borrowed.

[►] The most favorable loan was obtained by borrowers in Zimbabwe. Because of the hyperinflation in Zimbabwe, the actual inflation turned out to be 848% more than the expected in year 2000, therefore the real cost of borrowing was significantly negative.

[►] On the other hand, in Turkey, because the average inflation fell down, the borrowers ended up paying more in real interest rates. So the loan was not favorable.

[►] This exercise is an example of how unexpected inflation can redistribute wealth from borrowers to lenders or vice versa.

Country	Inflation 2000 (%)	Average Inflation Rate in 2000-2007 (%)	Actual-Inflation	Expected Inflation	Favor Borrowers?
Brazil	7.1	7.3	0.2		Yes.
China	0.3	1.6	1.3		Yes.
Indonesia	3.8	8.8	5		Yes.
Japan	-0.7	-0.3	0.4		Yes.
<b>Turkey</b>	<b>56.4</b>	<b>27.8</b>	<b>-28.6</b>		<b>No.</b>
United States	3.4	2.8	-0.6		No.
Zimbabwe	55.7	904	848.4		Yes.

## QUESTION - 6 -

### QUESTION 6-C

According to the rational expectations theory, under what circumstances might it be possible to reduce inflation without causing a major recession? Can you talk about a specific country example where this was achieved?

- [►] One way to reduce the inflation is to have a recession, raising unemployment above its natural rate. It is possible to bring inflation down without a recession however if we can costlessly reduce the expected inflation.
- [►] According to the rational expectations approach, people optimally use all of the information available to them in forming their expectations. In order to reduce the expected inflation, we require first that the plan to reduce inflation be announced before people form their expectations e.g. before wage agreements or price contracts are set and second, that those setting wages and prices believe that the announced plan will be carried out.
- [►] If everyone believes that the government is credible and committed to reducing inflation, then expected inflation will fall immediately and without cost. This in turn will bring down the actual inflation without creating a major recession; the sacrifice ratio will be small. As long as policy makers are perceived to be credible, the cost of disinflation is minimized.
- [►] From the short-run aggregate supply equation, , if then  $Y = \bar{Y} + \alpha(P - P^e)$ , if  $P = P^e$  then  $Y = \bar{Y}$ .

## **QUESTION - 7 -**

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## QUESTION - 7 -

### QUESTION - 7 -

Read the article from the [FT JULY 7 2005 ↗](#). Discuss the following statement.

*“Macroeconomic and inflation performance is found to be better for countries with more independent central banks”*

In your explanation, refer to the relationship between central bank independence, political business cycles and time-inconsistency problem.

## VENEZUELA POISED TO SEIZE BANK'S RESERVES (1/3)

Venezuela's central bank is bracing itself for a hostile takeover bid by an unlikely suitor: the government of President Hugo Chávez.

Legislators loyal to Mr Chávez are close to approving a law that will allow the government to withdraw and spend at least \$5bn (€4.2bn, £2.9bn) of the bank's international reserves, which currently stand at \$29bn.

For more than a year, Mr Chávez has insisted that the level of reserves accumulated by the world's fifth-largest oil exporter is too high, and that the money would be better used for social programmes.

Among Latin American economies, Venezuela has the highest level of reserves as measured by equivalent weeks' worth of imports.

The central bank, says Mr Chávez, should belong to "the people", and it must come under full control of his radical nationalistic "Bolivarian revolution".

Government-aligned deputies, who maintain a narrow but effective majority in the National Assembly, began the final debate on the law on Thursday and they predict its passage next week. But the move is leaving some economists aghast at what they see as the demise of the bank's role as guardian of the bolvar, Venezuela's national currency. The bank has tried to resist the law.

## VENEZUELA POISED TO SEIZE BANK'S RESERVES (2/3)

Jose Guerra, economic research chief at the bank until earlier this year, says the measure will undermine the value of the currency, as some of the dollars will be converted twice into bolvars.

The move also in effect opens the door to enabling Mr Chávez to finance Venezuela's chronic fiscal deficit with part of the reserves, he added. "The big loser in all of this will be the credibility and the reputation of the central bank as an institution," said Mr Guerra. "Who's to say that after the first \$5bn is withdrawn there won't be another \$5bn that's taken out?"

Venezuela's international reserves are invested in a mixture of US Treasuries, Euro-denominated bonds, cash and gold.

Critics say other state entities, such as state oil company Petroleos de Venezuela and Bandes, a state development bank, have about \$10bn in overseas accounts, and the government should use some of that money instead of the bank's international reserves.

Gaston Parra, the central bank's president, may resign if the law is passed, sources at the bank say, because of the perceived "illegality" of the government-proposed legislation.

The central bank could challenge the constitutionality of the law in Venezuela's supreme court. But analysts see the court as controlled by the government.

Economists predict that the expenditure of part of the reserves will stoke inflationary pressures, although the impact may be limited in the medium-term because of the existence of price and exchange controls.

## VENEZUELA POISED TO SEIZE BANK'S RESERVES (3/3)

"Investors are more concerned with the signal that is sent by the measure, especially given what they see as potential for the seized funds to be used in a non-transparent fashion," said Vitali Meschoulam, emerging markets strategist at HSBC Securities in New York. "There is a concern that these funds will not be used for productive investments but rather to finance current spending, increasing the risk that inflation may get out of hand."

Fewer international reserves may harm Venezuela's ability to service its foreign debt if oil prices decline.

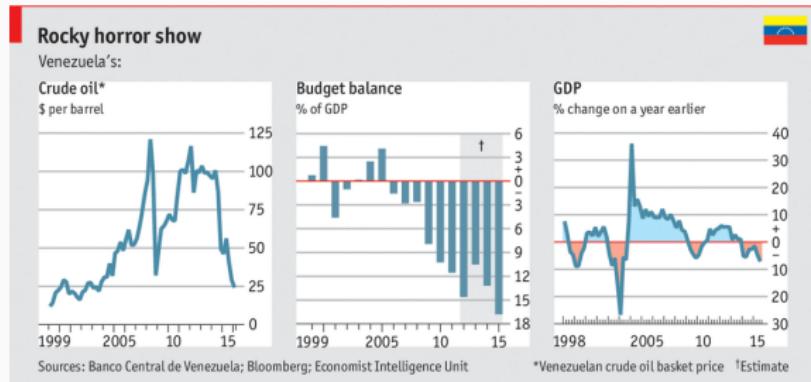
Under the draft law, some of the reserves are earmarked for vaguely-worded "strategic situations".

Mr Chávez, who has been in power for more than six years, faces presidential elections at the end of next year.

Published Financial Times [Here is the link ↗](#).

Andy Webb-Vidal in Caracas JULY 7 2005

# HERE IS THE SOME OF THE RESULTS



## QUESTION - 7 -

The statement is true. As seen in the article, Chavez's decision to use part of the reserves to cover fiscal deficits and increase social spending creates fear of higher inflation and loss of Bolivar's value as a result of weaker central bank credibility. Strongest argument for independence rests on the view that subjecting the central bank to political pressures would impart inflationary bias in monetary policy.

Major argument for central bank independence rests on the dangers of short-sighted political business cycles and time-inconsistency problem:

[►] Excessive monetary growth to stimulate economy, lower unemployment and reduce short run interest rates before elections. However this creates long-run increase in inflation and interest rates.

[►] The central bank could become the tool for treasury financing of large budget deficits by purchases of treasury bonds.

[►] The central bank could be more likely to deviate from the rules or policies that it has promised to the public creating time inconsistency problem.

Historically macroeconomic and inflation performance is found to be better for countries with more independent and credible central banks. Independence is important because independent central banks pursue lower rates of inflation without harming overall economic performance.

## **QUESTION - 1 -**

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## QUESTION - 1 -

In September 2007, the U.S. government's total debt reached \$9 trillion, approximately 64% of GDP. At the time, the average real interest rate paid by the government on its debt was 5%.

All variables below are real (i.e. computed for at prices fixed in a base year, hence disregard price changes). Using the following equations linking deficit, change in debt and growth rate of debt-to-GDP ratio, answer the questions:

Deficits are composed of interest payments on past debt and primary deficit in time  $t$ .

$$\text{Deficit}_t = rB_{t-1} + G_t - T_t$$

Change in debt in time  $t$  equals deficit.  $B_t - B_{t-1} = rB_{t-1} + G_t - T_t$

Define  $r$  is the real interest rate on debt payments and  $g$  is the growth rate of real GDP.

### QUESTION - 1-A -

Calculate the total increase in national debt if the government incurs a primary deficit of \$200 billion in 2008, assuming the only other change to the government's total debt arises from the real interest payments on the current debt stock of \$9 trillion.

The total debt increases by \$650 billion, i.e. the \$200 billion budget deficit plus the \$450 billion interest payment.

## QUESTION - 1 -

### QUESTION - 1-B -

From the above formula, derive the following equation linking the change in Debt-to-GDP ratio to the level of Debt-to-GDP

$$\Delta \frac{B_t}{Y_t} = \frac{(r - g)}{1 + g} \frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

$$B_t - B_{t-1} = rB_{t-1} + G_t - T_t$$

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_t} = \frac{rB_{t-1}}{Y_t} + \frac{G_t - T_t}{Y_t}$$

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{(1+g)Y_{t-1}} = \frac{rB_{t-1}}{(1+g)Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{(1+g)Y_{t-1}} - \frac{gB_{t-1}}{(1+g)Y_{t-1}} = \frac{rB_{t-1}}{(1+g)Y_{t-1}} - \frac{gB_{t-1}}{(1+g)Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

$$\frac{B_t}{Y_t} - \frac{(1+g)B_{t-1}}{(1+g)Y_{t-1}} = \frac{(r-g)B_{t-1}}{(1+g)Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = \frac{(r-g)B_{t-1}}{(1+g)Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

$$\Delta \left( \frac{B_t}{Y_t} \right) = \frac{(r-g)B_{t-1}}{(1+g)Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

## QUESTION - 1 -

### QUESTION - 1-C -

Verify that it's the same equation we obtained in class.

$$\Delta b_t = (\phi - 1)b_{t-1} - pb_t$$

$$\Delta \frac{B_t}{Y_t} = \frac{(r - g)}{1 + g} \frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

## QUESTION - 1 -

### QUESTION - 1-C -

Verify that it's the same equation we obtained in class.

$$\Delta b_t = (\phi - 1)b_{t-1} - pb_t$$

$$\Delta \frac{B_t}{Y_t} = \frac{(r - g)}{1 + g} \frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

$$\begin{aligned}\Delta \frac{B_t}{Y_t} &= \left( \frac{(1 + r_t)}{1 + g_t} - 1 \right) \frac{B_{t-1}}{Y_{t-1}} - \frac{T_t - G_t}{Y_t} \\ &= \left( \frac{1 + r_t - 1 - g_t}{1 + g_t} \right) \frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t} \\ &= \left( \frac{r_t - g_t}{1 + g_t} \right) \frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}\end{aligned}$$

## QUESTION - 1 -

### QUESTION - 1-D -

If the government operates on a balanced budget ( $G=T$ ), at what rate must GDP grow in order for the Debt–GDP ratio to remain unchanged? Explain the intuition for your answer.

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### QUESTION - 1-D -

If the government operates on a balanced budget ( $G=T$ ), at what rate must GDP grow in order for the Debt–GDP ratio to remain unchanged? Explain the intuition for your answer.

Using the formula for the evolution of debt to GDP ratio above, since  $r=5\%$ , U.S. GDP must grow at  $g=\%$  so that the debt–GDP ratio remains unchanged, namely its change is zero. This is because the total debt and GDP would grow at the same rate.

## QUESTION - 1 -

### QUESTION - 1-E -

Why is the Debt–GDP ratio the preferred measure of a country's debt rather than the dollar value of the debt? Why is it important for a government to keep this number under control?

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Why is the Debt–GDP ratio the preferred measure of a country’s debt rather than the dollar value of the debt? Why is it important for a government to keep this number under control?

GDP measures the size of the economy, which determines the ability of the government to repay the debt through taxes. A falling Debt–GDP ratio indicates a decreasing debt burden, and vice versa. To prevent the debt burden from becoming overwhelming, a government should keep the Debt–GDP ratio in check.

## **QUESTION - 5 -**

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## QUESTION - 5 -

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Discuss the Ricardian view of government debt and explain why there are objections to this view.

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Discuss the Ricardian view of government debt and explain why there are objections to this view.

According to the Ricardian view, a debt financed tax cut does not stimulate consumption because it does not raise permanent income. Forward-looking consumers understand that government borrowing today means higher taxes in the future. Because the tax cut does not change consumption, households save the extra disposable income to pay for the future tax liability that the tax cut implies. This increase in the private saving exactly offsets the decrease in public saving associated with the tax cut. Therefore the tax cut has no effect on national saving. Consumers will save the extra income they receive in order to offset that future tax liability. Therefore under rational expectations, the effect of tax cut, on total demand, interest rates, and capital formation in an economy will be same.

**Ricardian Equivalence** requires a number of restrictive assumptions, and it is controversial whether the idea has any relevance for actual modern economies:

- [►] A perfect capital markets requires any household to borrow or save as much as required.
- [►] The path of government spending is fixed.
- [►] Citizens are often de facto myopic/short-sighted in making their decisions.