**Brigham Young University Department of Economics**

# Economics 459 - International Monetary Theory

**Dr. Phillips (section 1) Spring Term 2006**

**Midterm Exam key**
**June 1 - 2, 2006**

This exam is closed book and closed notes, though you may use a calculator. Read all questions carefully before answering. Write your answers legibly in the space provided. Keep your answers concise and correct. Points will be deducted for answers which are irrelevant to the question. Each question is worth 20 points.

Due to the outstanding education you received at BYU, you have been hired by the Ministry of Finance in the Republic of Zalchistan. The Deputy Minister for International Finance, Mr. Bojo DeClaun, a graduate of the University of Utah's economics department, knows absolutely nothing about modern economics and has asked you to advise him on critical questions relating to international finance. He has submitted 5 questions. Answer each one in the space provided, and remember that death by hanging is still an acceptable punishment in Zalchistan. FYI, the currency in Zalchistan is the zotney, and the capital city is Zalchipour.

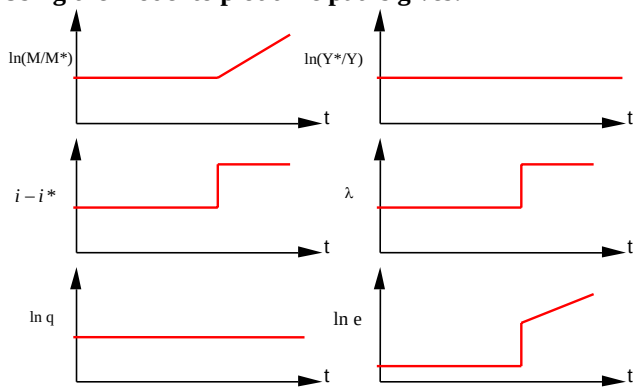
1. "The president asked my advice on exchange rate policy last week and I recommended that we double the growth rate of our money supply as soon as we can. However, I need to show some economic analysis of this proposal and its effect on exchange rates in the long-run. Do this for me and use only the space provided below since both the president and I have a short attention spans."

**This is an application of the equilibrium approach or the monetary approach to exchange rates. This can be written using the following mathematical formula:**

$$e = q\left(\frac{Y}{Y^*}\right)\frac{M}{M^*}\Lambda\left(\frac{Y^*}{Y}, \delta^e + g^e_M - g^e_Y - g^e_{M^*} + g^e_{Y^*} + \overline{\rho}\right)$$

**Where *e* is the nominal exchange rate, *q* is the real exchange rate, *M* is the money supply & *Y* is GDP. An asterisk indicates the value for the foreign country. $\Lambda$ is the ratio of foreign real money demand to home real money demand. $g^e$ indicates the expected growth rate. $\delta^e$ is the expected percentage change in *q* and $\rho$ is a risk premium (assumed constant).**

**Using the model to plot time paths gives:**




**Since this is a shock to money only, there is no change in q or d. Once the new policy becomes well-known, pople should expect higher money growth than in the past and we will observe an increase in i-i*. This leads to a jump up in $\Lambda$. The net effect is a one-time jump up followed by a gradual rise in the nominal exchange rate.**

***A common error here was mistaking the doubling of the <u>growth rate</u> of the money supply for the doubling of the money supply itself.***

2. "I had the people at the central statistical bureau run the analysis you asked for last week. They report the following relation between the percentage change in the spot rate and the 90-day forward premium: $\varepsilon_t = .01 - 1.5\phi_{t-1} + u_t$. The spot exchange rate today is 1443 zotneys per $US and the 90-day forward rate is 1496 zotneys per dollar. You said I could make money on average by exploiting this information. I still don't understand how. Explain it again and tell me should I buy or sell dollars on the 90-day forward market!"

**Since we are in Zalchistan, we will view the zotney as the home currency. The expected return on a short position in foreign currencies (selling on the forward market and buying on the spot) is** $E\{\Delta_{t+1}\} = \ln f_t - E\{\ln s_{t+1}\}$**, which is mathematically equivalent to**

$\phi_t - E\{\varepsilon_{t+1}\} = (\ln f_t - \ln s_t) - (E\{\ln s_{t+1}\} - \ln s_t) = E\{\Delta_{t+1}\}$

**Given the regression equation above we get** $E(\varepsilon_{t+1}\} = .01 - 1.5\phi_t$

**The non-annualized forward premium,** $\phi_t = \ln 1496 - \ln 1443 = .0361$

**So,** $E(\varepsilon_{t+1}\} = .01 - 1.5(.0361) = -.04415$

**And,** $E\{\Delta_{t+1}\} = .0361 + .0442 = -.0803$

**Hence, the expected return on a short investment is 8.03%.**

**You should take a short position in $US (selling on the them on forward market and plan to buy them on the future spot) and the expected return from this strategy would be 8.03% in 90 days.**

***Most people got this right, I took a couple of points off if you indicated the correct strategy for the correct reason, but didn't show how much money one might expect to make.***

3. "Here are the figures from this morning's edition of the Zalchipour Journal with exchange and 30-day interest rate quotes:

| Country | Currency | zotney equivalent | 30-day LIBOR (APR) |
|---|---|---|---|
| USA | dollar | 1443.0 | 1.2% |
| Beluga | bugle | 110.3 | 3.7% |
| Zalchistan | zotney | - | 14.8% |

"My dear, sweet, saintly grandmother has a nest egg of 4,000,000 bugles which she got through a perfectly legitimate and legal business along the border with Beluga. Despite her boundless love for our great country she does not want to hold zotneys and would prefer a "hard" currency like Swiss francs or Euros. Nobody here buys or sells Swiss francs or Euro! However the Wall Street Journal reports that francs trade at $0.8259 per franc in New York and Euros are selling for $1.2872/€. How many Swiss francs can my kindly grandmother buy? What about Euro, how many could she get? Explain how you get your answers carefully so I don't have to keep asking you!"

**Convert her bugles to dollars first, and then buy Euro or Swiss francs. The bugle for dollar rate can be deduced by triangular arbitrage conditions and is (1443 z/$)/(110.3 z/b) = 13.08 b/$. Hence, 4 million bugles is worth 4 ÷ 13.08 million dollars or $ 305,752.**

**Convert this to euro at the rate of $1.2872/€ to get <u>€ 237,533</u>.**

**Alternatively, convert it to SFr at the rate of $0.8259/SFr to get <u>SFr 370,205</u>.**

***The only errors people made on this one were using the wrong exchange rate; 1/e, for example.***

4. "The latest World Bank Development Report says per capita income here in Zalchistan was $4600 in 2006. That seems way too low to me. At the finance central committee meeting last month I remember you saying something about PPP adjustments to GDP numbers right before I fell asleep. The Penn World Tables give a value of 75.0 for Zalchistan in 2000. Here are some other useful data:

| | US CPI | Zalchistan CPI | exchange rate (zotneys/dollar) |
|---|---|---|---|
| 2000 | 107.9 | 115.2 | 98.6 |
| 2006 | 132.0 | 1590.4 | 1443.0 |

"Our Central Statistical Agency says real GDP per capita in 2006 was 4,743,000 zotneys. What was it, if we adjust properly for deviations from purchasing power parity? Explain how you get this answer so I can rub it in the face of the World Bank representative when he visits next month!"

**Let's view the US as the home country, since this is how the Penn World Tables (PWT) report their real exchange rates. (If you want to view Zalchistan as the home country then invert the PWT number of .75 to get a *q* in 2000 of 1.33).**

**We have $q = ekP^*/P$, where the *P*'s are price indices, *e* is the nominal exchange rate and *k* is a constant.**

**For 2000 this equation is .75 = (1/98.6) *k* (115.2/107.9), which can be solved to get *k* = 69.2639.**

**For 2006 this equation is *q* = (1/1443) x .69.2639 (1590.4/132.0) =.5783.**

**With a per capita income of 4,743,000 zotneys, the conversion to US dollar equivalent requires dividing by 1443 to convert to $ and then dividing again by .5783 to adjust for PPP deviations. This number is <u>$5684 per person</u>. So the World Bank has indeed underestimated our real GDP in US dollars by 24%!**

***Common mistakes here were to use*** $\%\Delta q = \%\Delta e + \%\Delta p^* - \%\Delta p$ . ***This holds only as an approximation from q=ep*/p. The percentage changes in e and p where over 1000% and the above approximation is very poor in that case. This means the %Δq you get is very inaccurate.***

***In addition, there is the issue of which country is the home country. If it is the USA, then in 2000 q=.75 and e = (1/1443). If it is Zalchistan, then in 2000 q=(1/.75) and e=1443. You will get the wrong answer if you use q=.75 and e=1443.***

5. "It is possible I will be receiving a gift that has absolutely nothing to do with my governmental position from a close acquaintance in another country. It will arrive in one month and will be in dollars, but I would like to exchange it for zotneys so that I can hire workers to add a second swimming pool onto my summer home. Since the exchange rate has become so volatile lately, I would like some insurance, but I can't find the quotes for the 90-day forward rate on the dollar/zotney exchange rate. Use the information I gave you in one of my earlier questions and tell me how many zotneys I can get in 30-days for $1,000,000 if I lock in my exchange with a forward rate contract. Oh, and don't tell anyone else in the government about the gift, OK? It might make them jealous."

**First off, you need the 30-day forward rate, not the 90-day forward rate if you are going to receive dollars in one month!**

**We can use the covered interest rate parity condition and information from question #3 to solve for the 30-day forward rate.**

**CIRP is** $(1+i) = \frac{f}{s}(1+i^*)$ **, substituting values from question #3 and adjusting for the fact that the reported interest rates are in APR terms gives** $1.148^{1/12} = \frac{f}{1443}(1.012^{1/12})$ **. Solving this gives *f*=1458.24.**

**Hence, $ 1 million could be exchanged for 1458.24 z/$ x $ 1 million = <u>1.458 billion zotneys</u> in 30 days if you lock the exchange rate in with a forward rate contract.**

**Solving this using the approximation method would be using** $\frac{1}{12}(.148 - .012) = .0113 = \phi$

$f = (1+\phi)s = 1.0113 \times 1443 \doteq 1460$ **which gives <u>1.46 billion zotneys</u>**

***The most common error here was to use the 90-day forward rate from question #3. The 90-day rate is not applicable since this is a delivery in 30 days.***

***Some of you used the 90-day forward premium and converted it to a 30-day rate (i.e raised it to the 1/3 power). In the real world this will get close, but the interest rate parity condition allows you to solve for it much more accurately.***