Honors General Exam

Solutions

Harvard University
April 2013

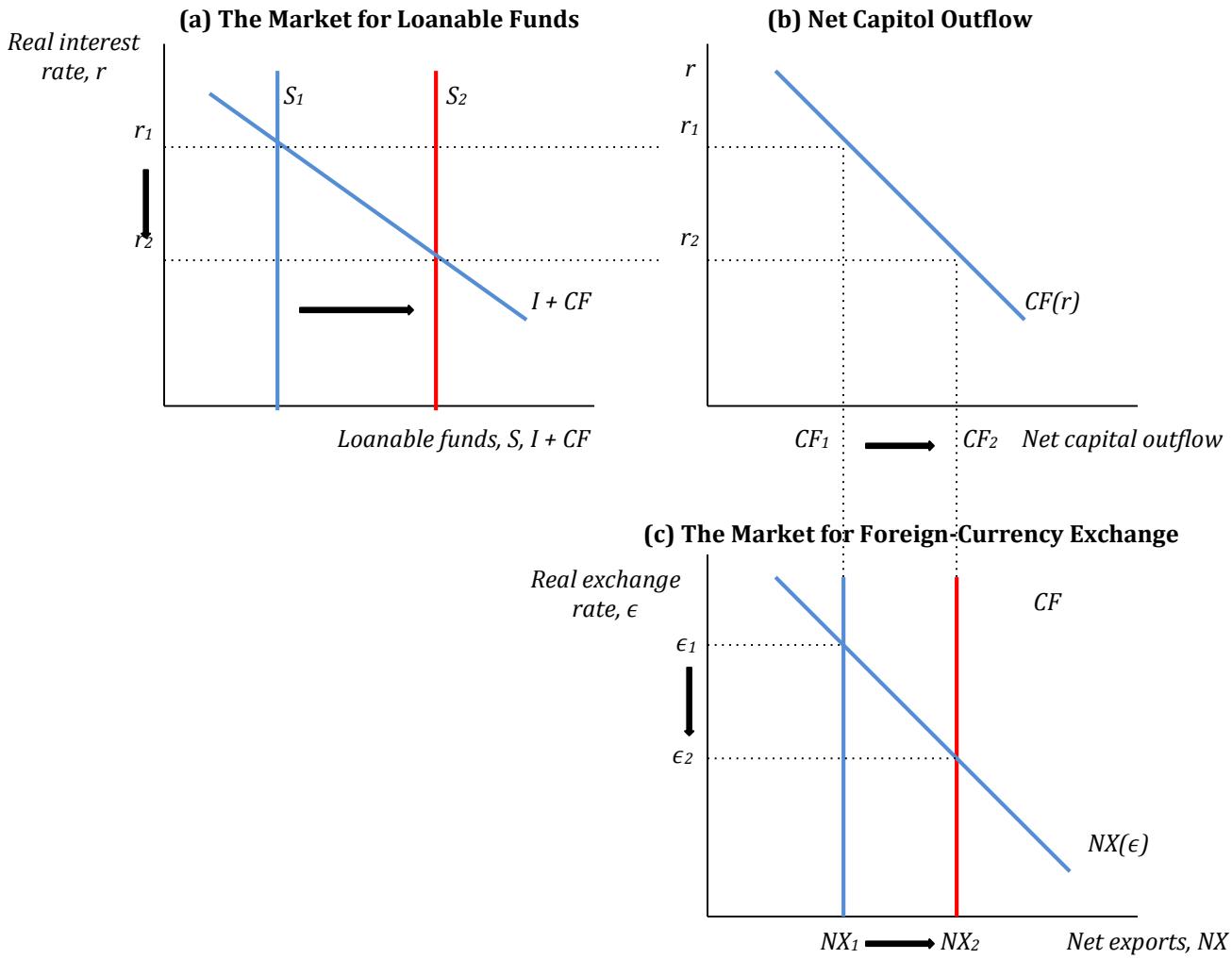
PART 2: MACROECONOMICS

Question 1

The savings rates of Chinese households are among the highest in the world. This question asks you to analyze the consequences and potential causes of high Chinese saving using some standard macroeconomic models. As you answer the different parts of the question, assume that the Chinese saving rate underwent a large once-and-for all shift upward some time ago (say, around 1978) and that the saving rate has remained at its high level since then.

(a) For this part of the question, assume that China is a *large* open economy with perfect capital mobility. (In reality, China has capital controls, but you can ignore them here.) What is the likely *long-run* impact of an increase in the saving rate on the level of Chinese investment, net exports, real interest rate, and real exchange rate? Assume that the savings rate occurs because of a "level shift" in the consumption function; the marginal propensity to consume MPC, which is greater than zero and less than one, does not change. To get full credit, use a graph (or graphs) to bolster your argument. (Note: this part of the question asks about the long run, in which prices are perfectly flexible but the level of capital and labor are fixed at $\bar{K}$ and $\bar{L}$, respectively. In the very long run, investment I is allowed to change the capital stock K. But that's not what we are dealing with here.)

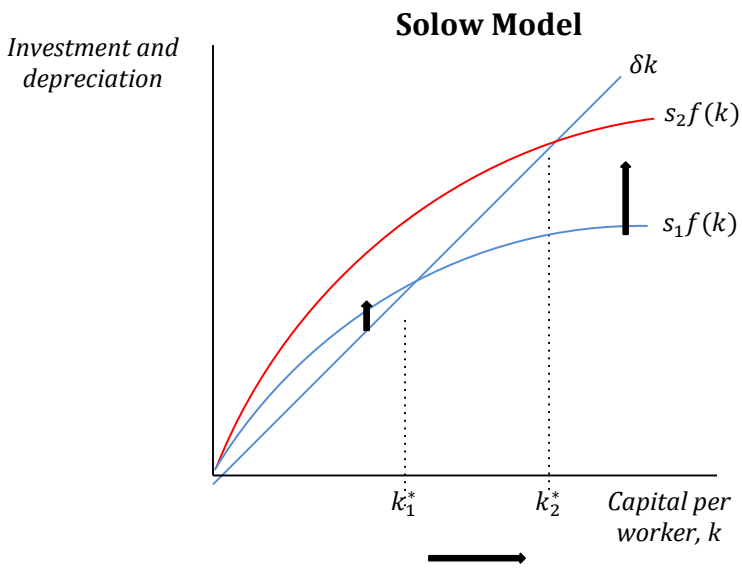
Solution: In a closed economy, a higher savings rate lowers the real interest rate r and raises investment I. In a small open economy, an increase in the savings rate lowers the real exchange rate ϵ and increases net exports NX. The large open economy case is somewhere between these two polar cases: r is lower, I is higher, ϵ is lower, and NX is higher. To get partial credit, students can simply describe the polar cases and say that the large open economy is somewhere between these polar cases. To get more points, they should mention the role of capital flows in this answer: Lower interest rates in China (lower r) increase net capital outflows and therefore lower the real exchange rate. This increases net exports. To get full credit, students should show how this works using the standard three-panel graph for the large open economy (see below).



(b) Now think about the effect of higher savings in the very long run. What will happen to the levels of aggregate output Y and output-per-worker $\frac{Y}{L}$ as a consequence of the increase in the saving rate? Be sure to discuss what will happen to Y and $\frac{Y}{L}$ during the immediate period after the savings increase as well as L the permanent effects of the savings increase. In this part of the question and in all following parts, assume that China is a closed economy. Use graphs.

Solution: This is a plain-vanilla Solow model question. The permanent increase in the saving rate s increases the steady-state level of k for the

Chinese economy. As China transitions to this new steady state, output-per-worker y grows faster than the steady-state rate, g. The ultimate effect of the higher savings rate on Y is to raise its level; when China reaches the new steady state, the rate of growth in output L per worker reverts back to g. As for output Y, essentially the same story holds. In the transition, output grows faster than $n + g$ (the steady state rate of growth for Y). As the new steady state is reached, output growth reverts back to $n + g$.



(c) Now consider China's situation after any adjustments to the new saving rate have taken place. Is there a theoretical possibility that the level of Chinese saving will be "too high," in the sense that the new steady-state level of living standards is lower that it would be with a lower saving rate? What real-world data could you use to study whether Chinese saving is higher-than-optimal in this sense? And would a "too high" savings rate be Pareto optimal with respect to different generations in China?

Solution: The savings rate will be "too high" if the new steady-state level of capital-per-effective-worker k^* is above the Golden Rule level k_{GR}^*. At such a savings rate, the level of consumption-per-worker is lower than it would be at the Golden Rule. (The growth rate of consumption-per-worker in steady state is always g, regardless of whether we are at the Golden Rule or not.) Above the Golden Rule level of k_{GR}^*, we have:

$$MPK < n + \delta + g$$

How can we use real-world data to figure this whether this condition holds? The main problem is that we don't observe MPK directly. One way to infer it is to use the fact that real interest rate r should be close to $MPK - \delta$ due to an arbitrage relationship between physical capital and bonds. (This arbitrage relationship is complicated by the fact that holding capital is risky, and by the potential for capital gains, but this can be ignored for the purpose of this question.) Also, in steady state, the rate of growth in the economy is just $n + g$. So if the real interest rate is lower than the steady-state growth rate of output, then we are likely below the Golden Rule.

Another way to do this (described on p. 244 of the 8th edition of the Mankiw text) is to use the fact that α is equal to the share of output received by owners of capital, or $\frac{MPK \cdot K}{Y}$. Divide this (observable) fraction by the (observable) capital-output ratio $\frac{K}{Y}$ to back out MPK. You can then back out the depreciation rate δ by a similar method: Divide to the total share of output lost to depreciation each year $\frac{\delta \cdot K}{Y}$ by the capital-output ratio $\frac{K}{Y}$. We now have both MPK and δ, so we can compare the resulting $MPK - \delta$ to the growth rate of the aggregate economy Y. Finally, if we have a k that is above the Golden Rule level, then the economy is Pareto inefficient. We can make future generations better off by having the current generation consume more today.

(d) For this part of the question, suppose you are told that the shift toward higher saving occurred at the same time that three other economic changes occurred in China. First, the Chinese welfare state became less generous, in that free housing was no longer offered to young workers. Second, government spending on social programs like unemployment benefits and health care was also reduced. (No more free knee replacements or liver transplants.) Third, employment became more unstable as the right to a lifetime job was ended. How might standard models of consumption link these economic changes to the drop in saving? Given your answer, how might the development of China's private-sector financial system—to something that resembles the U.S. private-sector financial system—affect Chinese saving rates? (Note: Don't worry about incorporating the effect of the reforms in your answers to the previous parts of this question. The reforms are relevant for this part of the question only.)

Solution: This question implies that savings went up for two reasons. First, precautionary savings on the part of households is higher due to the greater risk of unemployment and health shocks. Second, the end of free government housing means that young people have to save to buy a house. The question should be weighted so that most of the points given in this part come from the precautionary piece, because the housing angle isn't as obvious.

Regarding precautionary savings: If Chinese residents have to insure themselves against big health shocks, or the loss of jobs, then their savings rates will rise. This will be "inefficient" in the sense that all Chinese residents will be saving at very high rates even though only a portion of them will actually suffer unemployment or health shocks. Note, however that health shocks are likely to be idiosyncratic, while unemployment shocks are likely to have a business cycle component. Regarding saving for housing: Life- cycle models generally predict that young people are net savers, building up wealth to spend in retirement. But if we add housing to the model, some of the saving that young people do could take the form of saving to buy a house.

How are financial markets relevant here? Two functions of financial markets are to spread risk and to match savers to investors. Formal insurance markets help spread risk by allowing people to pay small premiums to avoid catastrophic expenses, such as those that might arise via health shocks or other major idiosyncratic disasters (like the loss of a home due to fire). Financial markets can also allow people to go into debt for these types of expenses if they don't have insurance, then pay off the debt later. If these types of insurance features are not available, then we might see older people refuse to draw down their savings, for fear that they will be hit with a big health shock. Finally, if financial markets are not developed enough to allow young people to take out mortgages, they will have to save 100% of the purchase price of a house, rather than a much smaller down payment.

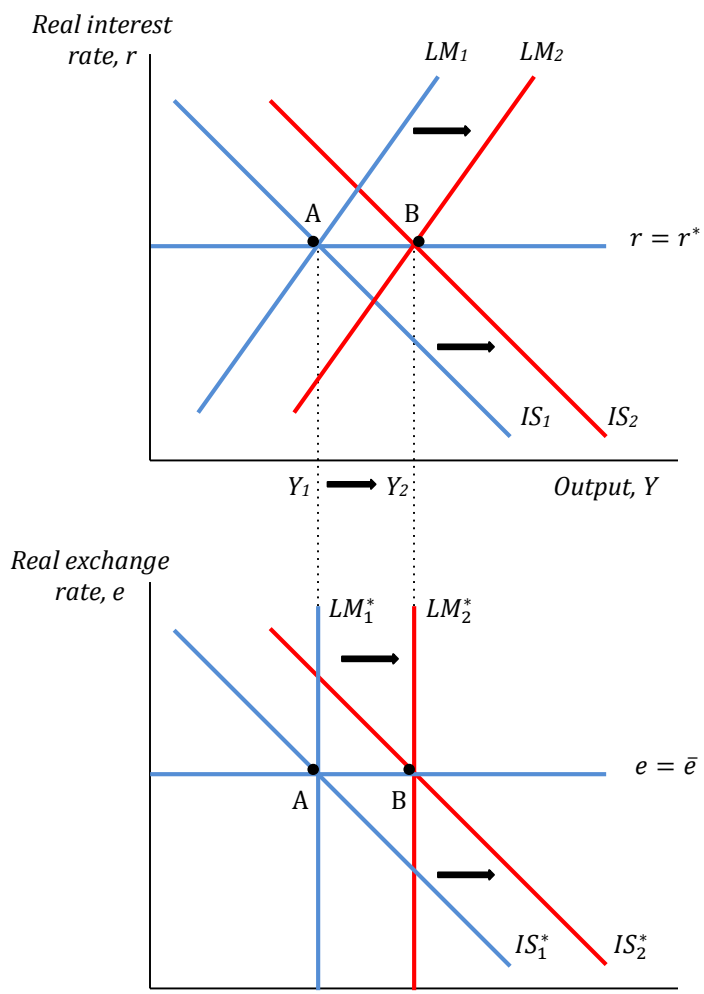
The development of financial markets, like health insurance or mortgages, would therefore be expected to lower China's saving rate. But importantly, private-sector markets can only insure against idiosyncratic shocks. That's why there is no private insurance against business cycle related shocks.

Question 2

(a) For the past several years, Greece, a country that uses the euro, has endured a serious recession. Many people have argued that Greece should undertake a fiscal expansion in order to lower its unemployment rate. The question asks you to evaluate that recommendation. As you answer it, assume that Greece is a small open economy (SOE) with perfect capital mobility and a fixed exchange rate. Use graphs when necessary.

Solution: This part asks students to report what happens in one of the standard Mundell-Fleming cases: A fiscal expansion under fixed rates. The IS^* curve shifts out. To maintain the fixed rate, the LM^* curve shifts out endogenously. Output rises. Investment stays constant and the real interest rate (which is pinned down at r^* does not move either. The same is true for net exports and the nominal exchange rate (which of course is fixed). Since we are in the short run here, we assume that the ratio of price levels $\frac{P}{P^*}$ too, so the real exchange rate also stays the same. If the fiscal expansion takes place because of an increase in G, then G rises and consumption C rises because of the higher level of output Y. If the expansion is due to lower taxes, then G remains constant and C rises due both to the tax cut and to the higher level of Y.

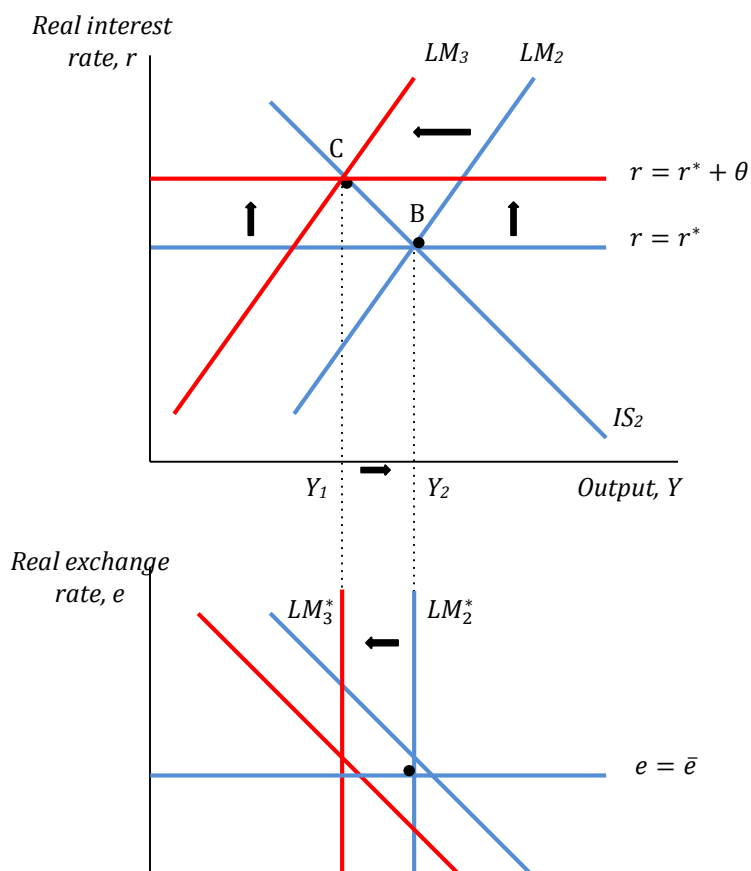
Mundell-Flemming Model

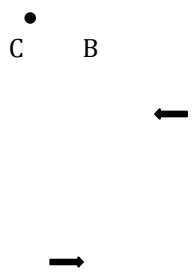


(b) Now think about Greece's specific situation. One reason many analysts disagree with the benefits of a fiscal expansion in Greece is that they believe such an expansion will undermine the confidence of Greece's international creditors. That is, these analysts believe that if Greece undertakes a fiscal expansion, international creditors will lose confidence in the Greek government's ability to pay its bills, and will therefore require higher compensation to hold Greek debt. If these critics are correct, how would a loss of international confidence in Greece affect your answer above?

Solution: This part of the question deals with an increase in country risk for an SOE with fixed rates. The higher interest rate shifts the IS^* curve back. At the same time, the LM and LM^* both shift back in order to maintain the fixed rate. The higher interest rate reduces investment I and therefore offsets the effects of the initial fiscal expansion. To the extent that the effect on output is lower, so is the multiplier effect on consumption.

Mundell-Flemming Model





(c) In theory, could the effects of the loss of confidence described in part (b) be so severe as to cause total Greek output to decline after the fiscal expansion? Explain how your answer affects the debate over whether Greece should choose a fiscal expansion on one hand or fiscal "austerity" on the other.

Solution: Yes. Once international creditors lose confidence in a currency, the country risk premium might rise so much as to completely offset or even swamp the initial increase in output that arises from the fiscal expansion. The problem is that it is very hard to know how creditors will react to a fiscal expansion. The reaction of creditors to a fiscal expansion determines whether the expansion will "work," but these expectations are impossible to know for certain before the expansion takes place. The same is true, but the way, for fiscal contractions. Countries like Greece may choose austerity, hoping that a resulting drop in country risk will raise output. But no one can know for certain whether this strategy will work.