Economics 435
Fall 2021
University of Wisconsin-Madison

Menzie D. Chinn
Social Sciences 7418

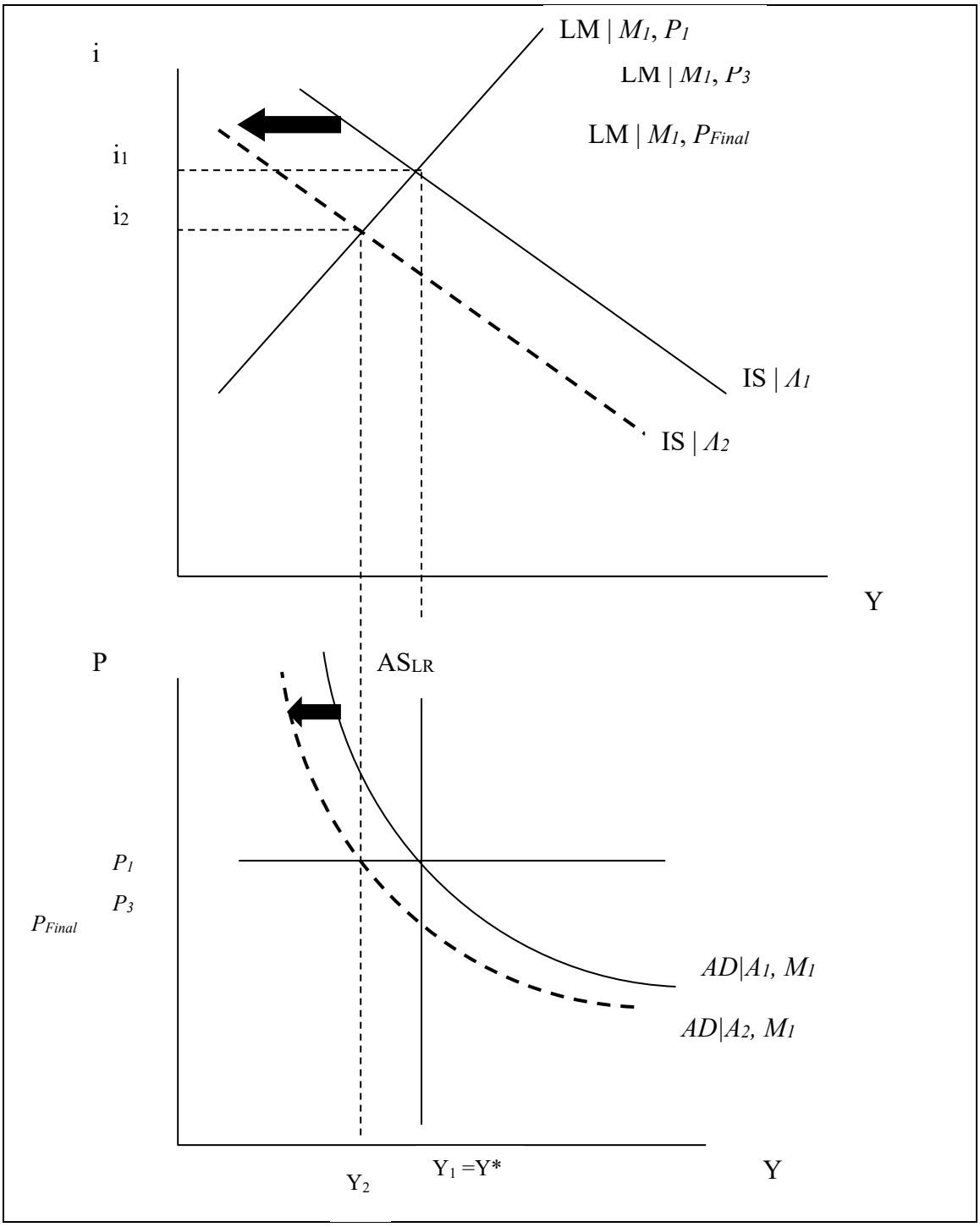
Problem Set 2 Answers

Due ***via Canvas*** on Friday October 15, 11pm (You can submit early). Be sure to put your name on your problem set. Put "boxes" around your answers to the algebraic questions.

1. Consider the Aggregate Demand-Aggregate Supply framework, where initially the economy is at short and long run equilibrium. Suppose government spending is reduced. You can assume for simplicity expected inflation is always zero.

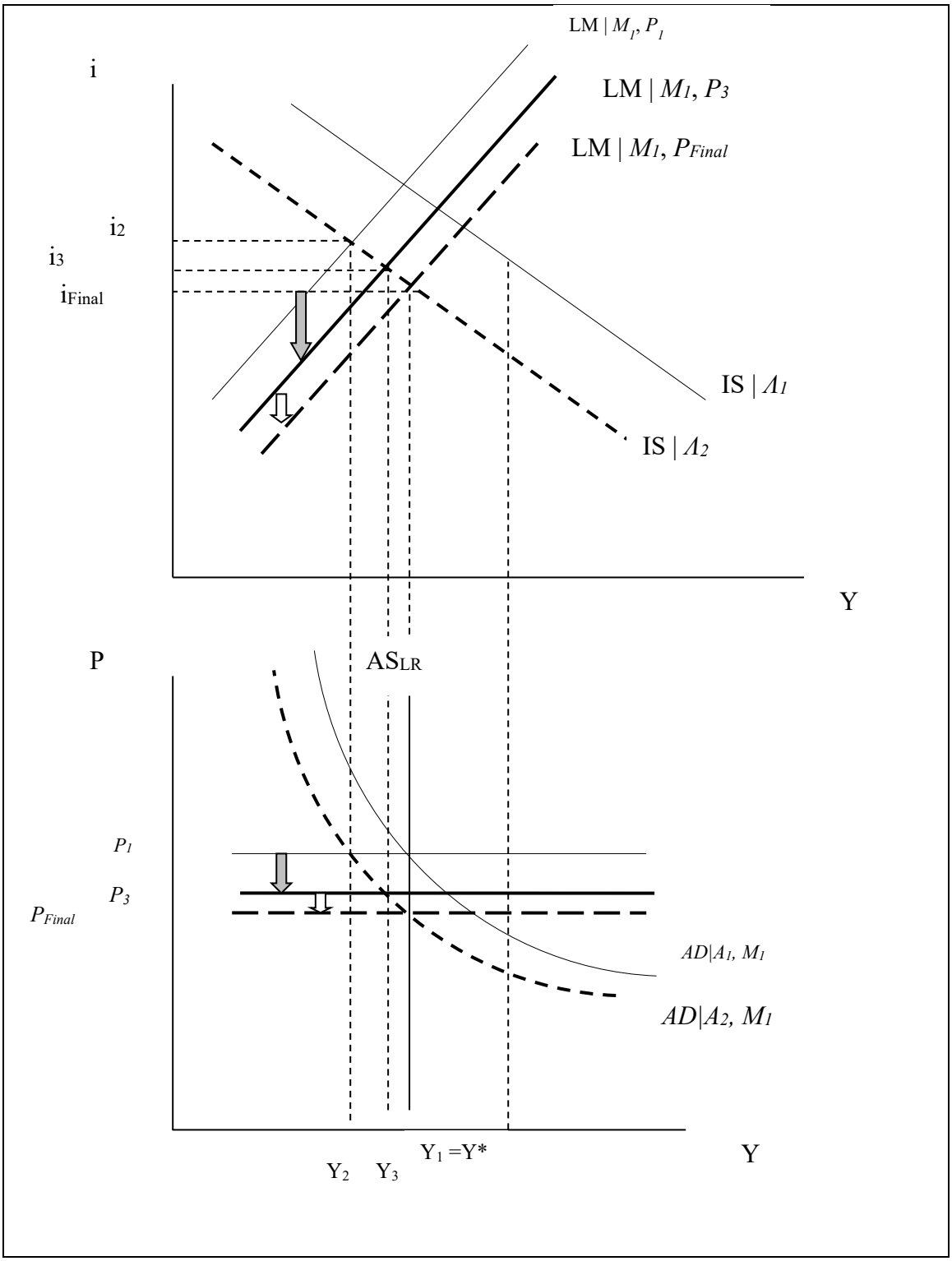
1.1 Show what happens in an IS-LM and AD-AS graph in the period the government spending reduction occurs.

Start at full employment, to simplify the exposition. The reduction in government spending in period 2 shifts in the IS, AD curves (black arrows). Interest rates fall from i_1 to i_2; income falls from Y_1 to Y_2. The price level remains fixed at P_1



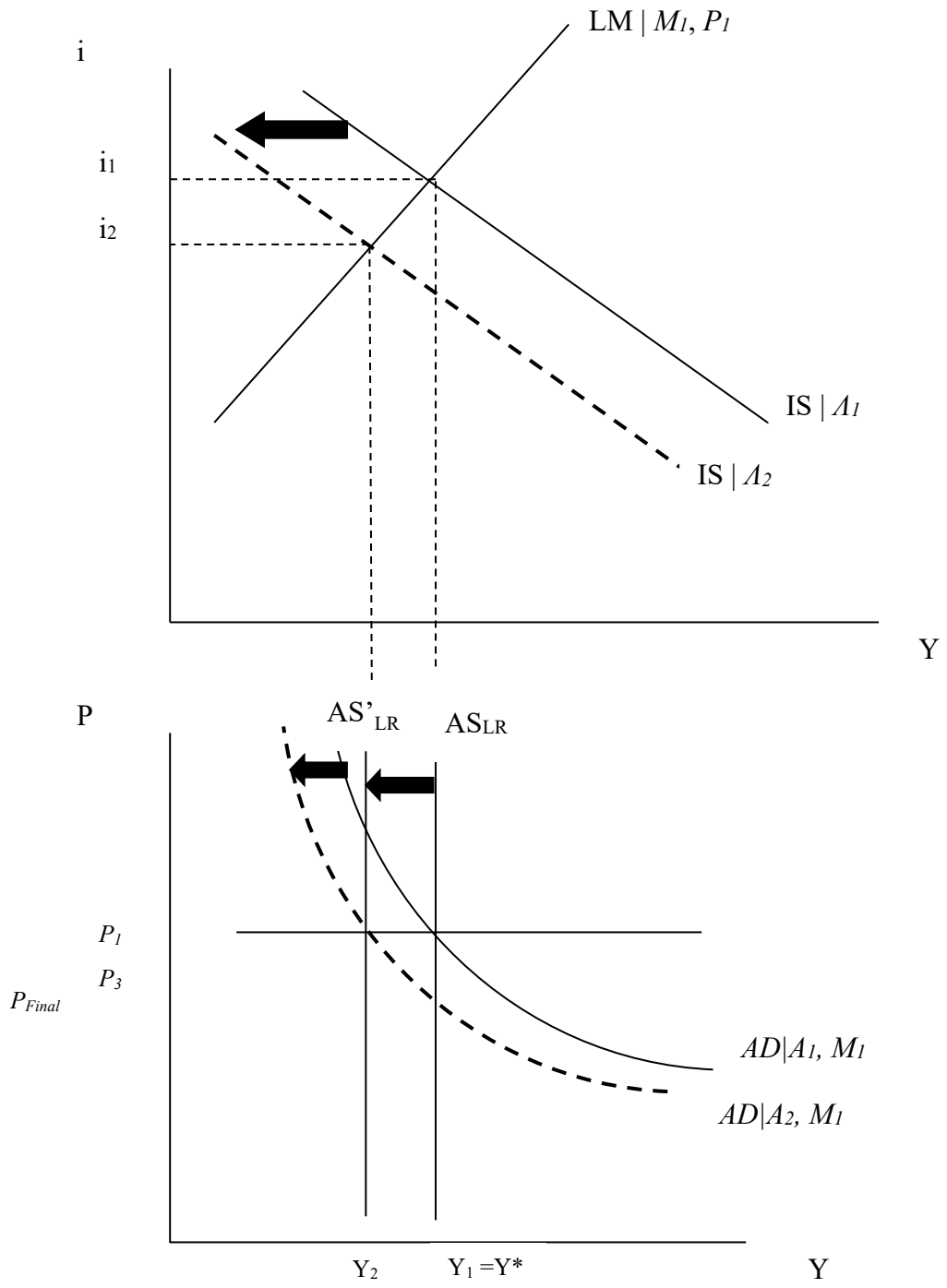
1.2 Show what happens over time to output, the price level, and the interest rate.

In period 3, the price level falls (gray arrow), driving up the real money stock and thereby shifting out the LM (gray arrow), dropping interest rates to i_3, spurring investment, so that income rises to Y_3. (gray arrows). Over time (white arrows), the price level continues to fall, so that M/P continues to rise, shifting out the LM curve, thereby driving the interest rate down to i_{Final}, and output back to Y^*.



1.3 Repeat 1.1 and 1.2, assuming potential GDP falls by the same amount the AD curve shifts.

Starting from equilibrium, the long run AS shifts in by the same distance the AD curve shifts in (black arrows). Output falls to Y_2, as interest rates fall to i_2.



In period 3, since the output gap is 0 in period 2, then the short run AS curve doesn't shift. As a consequence, the LM curve does not shift. In fact, equilibrium shifts immediately and permanently to the new long run equilibrium.

2.1. Look up on Bloomberg https://www.bloomberg.com/markets/rates-bonds/government-bonds/us the yield on (as close as possible to) a one year T-bill. Calculate the price as if the bond were to mature one year from now (specify the date you looked up the data). Show your calculations.

Bloomberg Sign In

Overview **Indices** **U.S.** **U.K.** **Germany** **Japan** **Australia**

Treasury Yields

NAME	COUPON	PRICE	YIELD	1 MONTH	1 YEAR	TIME (EDT)
GB3:GOV 3 Month	0.00	0.04	0.04%	+1	-5	10/15/2021
GB6:GOV 6 Month	0.00	0.05	0.05%	+1	-6	10/15/2021
GB12:GOV 12 Month	0.00	0.10	0.10%	+3	-2	10/15/2021
GT2:GOV 2 Year	0.25	99.72	0.39%	+17	+25	10/15/2021
GT5:GOV 5 Year	0.88	98.80	1.13%	+29	+80	10/15/2021
GT10:GOV 10 Year	1.25	97.09	1.57%	+23	+83	10/15/2021
GT30:GOV 30 Year	2.00	99.08	2.04%	+16	+51	10/15/2021

See red circled item. Using the formula, $P = \frac{100}{1+i} = \frac{100}{1.001}$, one can solve for $P = 99.9$ (and 100-99.9 = 0.1)

2.2 Once again, look up the one year and two year yields. Assuming the expectations hypothesis of the term structure holds, what is the expected interest one year interest rate, one year from today. Show your calculations.

According to the expectations hypothesis of the term structure, for a two year bond,

$i^e_{1t+1} = 2i_{2t} - i_{1t}$

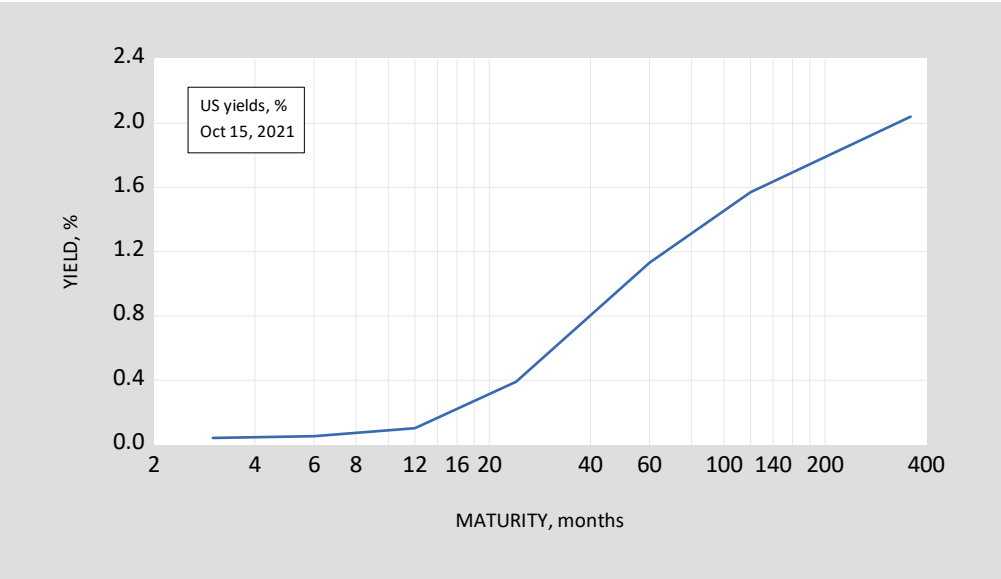
Substituting in 0.0039 and 0.0010 for the two and one year bond yields results in:

$$i^e_{1t+1} = 2 \times 0.0039 - 0.0010 = 0.0068$$

Or

$$0.68\%$$

2.3 Hand-draw the yield curve, for 3 months to 30 years (at 3, 6, 12 months, 2, 5, 10, 30 years)



2.4 Assuming the expectations hypothesis of the term structure holds (i.e., there is no term premium), do you expect the US economy to go into recession in the next year? Why or why not?

As of 10/15, the 10yr-3mo term spread is 1.53% (=1.57%-0.04% > 0). If there is no term premium, since the yield curve is upward sloping, this means short rates in the near future are expected to be higher than short rates today (this is *not* necessarily true if there is a positive risk premium). This condition is not consistent with an imminent recession.

3. Consider the following picture of corporate bond spreads (as calculated by Gilchrist and Zakrajšek), corrected for maturity differences.

3.1 Explain why the spread exhibits the pattern it does, with respect to the business cycle.

> Defaults rise during recessions, so to the extent that current interest rates depend on future, then risk spreads should rise in anticipation of recessions. Also, investors might become more risk averse during recessions.

3.2 Is the entire movement in the spread due to changes in probability of default over time?

> No. Movements in the spread could arise due to either increases in perceived default risk, or due to changes in risk aversion. However, the significant coefficient for explaining recessions is on excess bond premium (EBP), which depends on the (time-varying) degree of investor risk aversion.

4. Asset prices. Suppose:

$$P_t = \frac{D_{t+1}}{1+rf+rp} + \frac{E_t P_{t+1}}{1+rf+rp} \tag{2}$$

4.1 Solve for the stock price assuming expectations are rational and there are no bubbles. Show your work as much as possible.

> $$P_t = \frac{D_{t+1}}{1+rf+rp} + \frac{E_t D_{t+2}}{(1+rf+rp)^2} + \frac{E_t D_{t+3}}{(1+rf+rp)^3} + \ldots + \frac{E_t D_{t+\infty}}{(1+rf+rp)^\infty} + \ldots = \sum_{n=1}^{\infty} \frac{E_t D_{t+n}}{(1+rf+rp)^n}$$

4.2 Calculate the price of a share of stock, assuming dividends are expected to be constant at $D_0 = 1$ and $(rf + rp)$ is also expected to be constant at 0.10. Show your algebraic work.

$$P_t = \frac{D_{t+1}}{1+rf+rp} + \frac{E_t D_{t+2}}{(1+rf+rp)^2} + \frac{E_t D_{t+3}}{(1+rf+rp)^3} + \ldots + \frac{E_t D_{t+\infty}}{(1+rf+rp)^\infty} + \ldots = \sum_{n=1}^{\infty} \frac{E_t D_{t+n}}{(1+rf+rp)^n}$$

$$P_t = \frac{D}{1+rf+rp} + \frac{D}{(1+rf+rp)^2} + \frac{D}{(1+rf+rp)^3} + \ldots + \frac{D}{(1+rf+rp)^\infty} + \ldots = \frac{D}{(rf+rp)}$$

$$\boxed{P_t = \frac{1}{0.1} = 10}$$

4.2 Suppose that you revise your expectations regarding ($rf + rp$) downward by 4 percentage points. What immediately happens to the price of the share of stock? Once again, show your work.

$$P_t = \frac{D}{1+rf+rp} + \frac{D}{(1+rf+rp)^2} + \frac{D}{(1+rf+rp)^3} + \ldots + \frac{D}{(1+rf+rp)^\infty} + \ldots = \frac{D}{(rf+rp)}$$

$$\boxed{P_t = \frac{1}{0.06} = 16.67}$$

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