Final Exam Review

ECON 30020: Intermediate Macroeconomics
Professor Sims
University of Notre Dame, Spring 2018

The exam will take place from 1:45-3:45 on Friday, May 11 in 101 DeBartolo Hall. The exam is *cumulative* but will *focus* primarily on material covered since the second midterm. These chapters in the GLS textbook are Chapters 21, 22, 23, 24, 25, 26, 28, 30 (only generally – do not worry about the specific model), and 33. As a *rough* guide, the point allocation for the exam should correspond to about two-third new material and one-third review. This is only rough, and it may understate the extent to which you should focus on newer material because much of the newer material builds off of, and is related to, material covered earlier in the term.

The exam will be scored out of 100 points. There will be three parts – multiple choice, true/false, and free response questions. There will be twenty multiple choice questions and twenty true/false questions, each worth one point. The free response questions will account for a total of 60 percent of the exam score. There will be several such questions. The questions will make it clear which graphs you need to draw and which you do not (if the question is graphical in nature).

This review is structured as follows. I begin with a quick summary of the relevant material *since the last midterm*. I then provide thirty practice multiple choice questions and thirty practice true/false questions. Then there are several practice longer questions. I will provide solutions to this review sheet, with the aim that these will be posted by midnight on Saturday May 5.

1 Quick Cliffs Notes Summary

- The NK model is summarized by the following eight equations:

$$C_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t)$$

$$N_t = N^s(w_t, \theta_t)$$

$$P_t = \bar{P}_t + \gamma(Y_t - Y_t^f)$$

$$I_t = I^d(r_t, A_{t+1}, f_t, K_t)$$

$$Y_t = A_t F(K_t, N_t)$$

$$Y_t = C_t + I_t + G_t$$

$$M_t = P_t M^d(i_t, Y_t)$$

$$r_t = i_t - \pi_{t+1}^e$$

The endogenous variables are Y_t, C_t, I_t, N_t, w_t, r_t, i_t, and P_t (eight endogenous variables and eight equations). The exogenous variables are A_t, A_{t+1}, K_t, θ_t, G_t, G_{t+1}, M_t, f_t, and π^e_{t+1}. Y_{t+1} is "pseudo-exogenous" as previously defined. Y^f_t is the equilibrium level of output which would emerge in the neoclassical model. The neoclassical model is a special case of this model in which labor demand ($N_t = N^d(w_t, A_t, K_t)$) replaces the AS curve. We can think about $\gamma \to \infty$ as collapsing to the neoclassical model (since $Y_t = Y^f_t$). $\gamma = 0$ is the "simple sticky price model" (AS curve completely horizontal).

- The model is graphically analyzed via the IS, LM, AD, and AS curves.
- The IS curve graphically summarizes:

$$C_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t)$$

$$I_t = I^d(r_t, A_{t+1}, f_t, K_t)$$

$$Y_t = C_t + I_t + G_t$$

The IS curve is downward-sloping in (r_t, Y_t) space. It shifts right if A_{t+1} increases, f_t decreases, G_t increases, or G_{t+1} decreases.

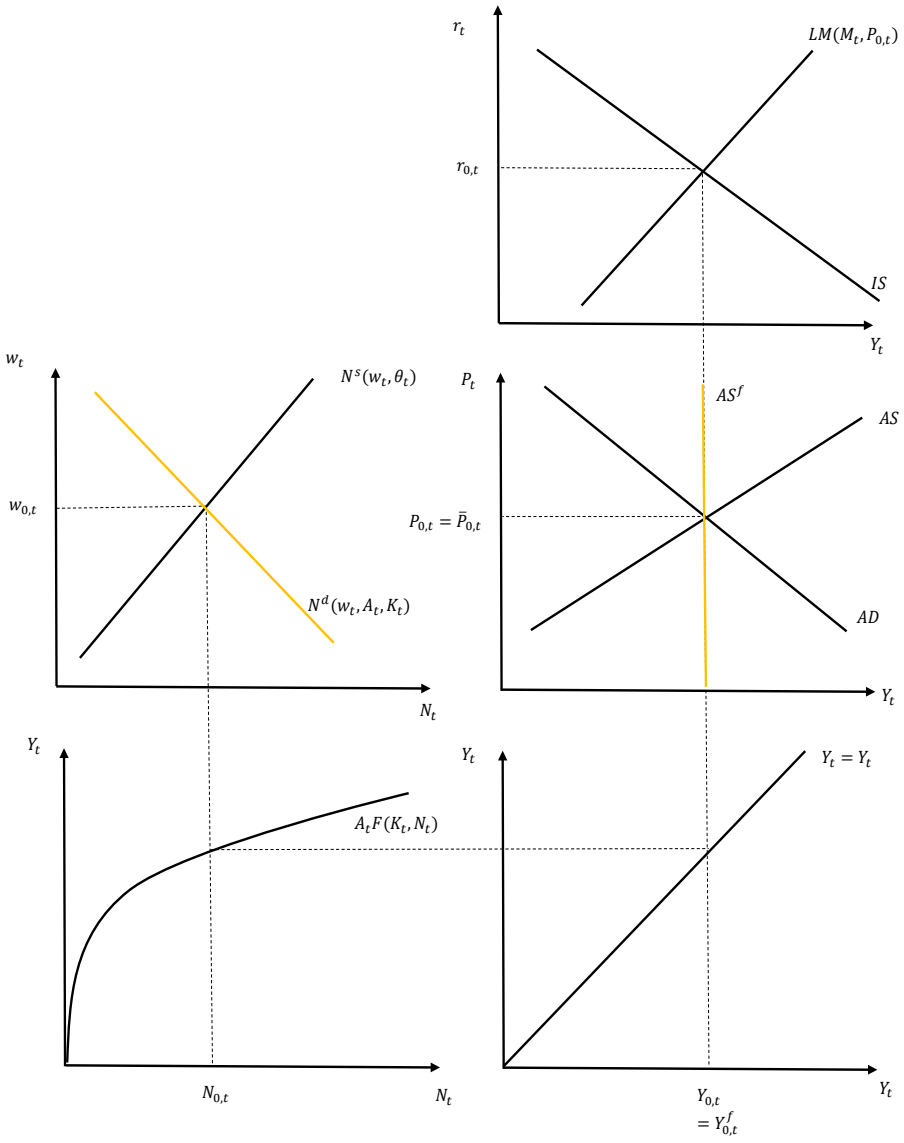
- The LM curve graphically summarizes:

$$M_t = P_t M^d(i_t, Y_t)$$

$$r_t = i_t - \pi^e_{t+1}$$

The LM curve is upward-sloping in (r_t, Y_t) space. It shifts right if $\frac{M_t}{P_t}$ increases (so M_t increases or P_t decreases). It also shifts right if π^e_{t+1} increases.

- The AD curve summarizes being on both the IS and LM curves. It is downward-sloping in (P_t, Y_t) space. It does not rely upon any Keynesian features and can be used to summarize the demand side of the neoclassical model as well. The AD curve shifts right if the IS curve shifts right or if the LM curve shifts right (due to exogenous changes; changes in P_t are movements along the AD curve).
- The AS curve is simply a plot of $P_t = \bar{P}_t + \gamma(Y_t - Y^f_t)$. It crosses through the point $(\bar{P}_t, Y^f_t)$. Increases in $\bar{P}_t$ cause it to shift up; increases in Y^f_t cause it to shift right.
- Graphically, the model is summarized where the AD and AS curves intersect:



The labor demand curve is *not* relevant for the equilibrium of the model. We draw it in because it allows us to graphically determine Y_t^f (the level of Y_t consistent with the production function and being on both labor demand and supply).

"Demand shocks" are things which cause the IS or LM curves to shift, and hence the AD to shift. Relevant exogenous variables as demand shocks are A_{t+1}, G_t, G_{t+1}, f_t, M_t, and π_{t+1}^e. "Supply shocks" are things which cause the AS curve to shift. Relevant exogenous variables are A_t and θ_t (which cause Y_t^f to change) and $\bar{P}_t$.

- Relative to the neoclassical model, demand shocks have *bigger* effects on output in the New Keynesian model and supply shocks have *smaller* effects. These differences are bigger the *smaller* is γ (i.e. the flatter is the AS curve; the stickier are prices).

- Although we typically assume that the economy starts at the neoclassical equilibrium (i.e.

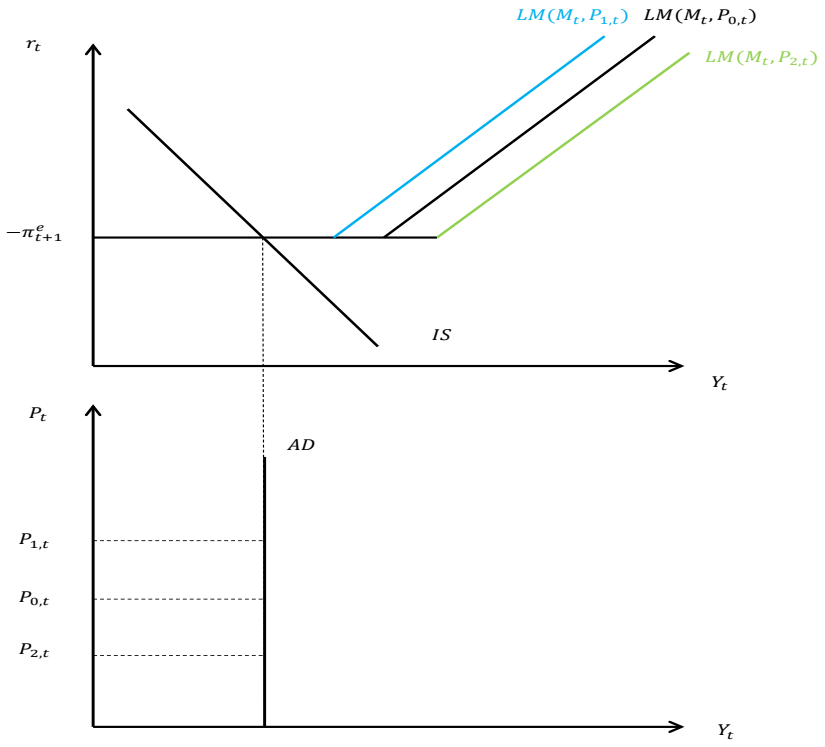
$Y_t = Y_t^f$), nothing guarantees this, and starting from this point shocks will cause Y_t to react differently than Y_t^f – i.e. positive or negative output gaps ($Y_t - Y_t^f$) will open up. Positive or negative output gaps mean that the firm is producing a *non-optimal* amount – i.e. it is off its labor demand curve. If $Y_t < Y_t^f$, then the firm is producing less output than it would like to (i.e. it is off its labor demand curve). What prevents the firm from producing the optimal level of output is the friction preventing it from lowering prices sufficiently. The converse would be true for a positive output gap. Think about a "period" t as being divided into five years – the short run (years 0-3, say) and the medium run (years 4-5, say). In the short run the AS curve is operative and in general non-vertical. In the medium run, $\bar{P}_t$ adjusts so that the AS curve shifts to intersect the AD curve at $Y_t = Y_t^f$ (i.e. to close the gap). So the AS curve shifts in the medium run to close the gap.

- Keynes famously said that "in the long run we are all dead." The *optimal* (or *efficient*) equilibrium is one where the output gap is zero (i.e. $Y_t = Y_t^f$). We can hence think about *optimal* monetary policy as endogenously adjusting M_t to support $Y_t = Y_t^f$ as the short run equilibrium of the model. This entails *contractionary/countercyclical* policy in response to demand shocks, but *accommodative/expansionary* policy conditional on supply shocks.

- Conditional on all but shocks to $\bar{P}_t$, a policy of *price stability* implements the neoclassical, flexible price equilibrium. Under a policy of price stability, we can think about M_t being endogenous in such a way that the AD curve is horizontal (what we call the AD^e curve). This is an example of the Divine Coincidence – stabilizing prices stabilizes the output gap automatically. The Divine Coincidence does *not* hold conditional on shocks to $\bar{P}_t$ – trying to stabilize the price level conditional on these shocks requires fluctuations in the output gap.

- The natural rate of interest, r_t^f, the real interest consistent with the neoclassical equilibrium. If $r_t > r_t^f$, then $Y_t < Y_t^f$, and vice-versa.

- Conventional wisdom is that nominal interest rates cannot go below zero; $i_t \geq 0$. More generally we think about there being a lower bound on nominal rates, which one could call the effective lower bound (ELB) instead of zero lower bound (ZLB). At any rate, what is relevant for the economy is not the level of nominal interest rates, but rather that interest rates are constant (at least for sufficiently small exogenous shocks) in such a world. Let's stick with the ZLB interpretation. This means that $r_t = -\pi_{t+1}^e$, which is exogenous. Given this, we can determine Y_t *directly* from the IS curve – the LM curve is horizontal, and the AS curve is irrelevant for the determination of output. When the ZLB binds, the AD curve is vertical:



The ZLB *magnifies* the differences between the neoclassical and New Keynesian models. IS shocks have *bigger* effects, and AS shocks have smaller effects. Changes in the money supply have no effect on output at the ZLB, however.

- The ZLB is costly because (i) normal stabilization policy is not available, and the economy is particularly susceptible to negative IS shocks, and (ii) the economy will not tend to get better on its own. If the economy finds itself with a negative output gap (i.e. $Y_t < Y_t^f$) at the ZLB, then the normal medium run dynamics will not close the output gap – shifts of the AS curve have no effect on output if the AD curve is vertical. Further, things could get worse. If agents begin to anticipate falling prices, this can shift the flat portion of the LM curve up and the vertical AD curve in. The real interest rate rises if expected inflation falls, which reduces output from the IS curve. This is called a deflationary spiral.

- To escape the ZLB, a government either needs to engage in fiscal expansion (so as to shift the IS curve sufficiently to the right so that the ZLB no longer binds) or it needs to somehow engineer *higher* expected inflation, which would shift the flat portion of the LM curve down and lower the real interest rate.

- Financial intermediaries funnel savings from households to firms. We will generically refer to such intermediaries as "banks" though not all financial intermediaries are considered banks from a regulatory perspective. Banks play a useful role for two principal reasons: asymmetric information and liquidity transformation. Asymmetric information is a situation in which two

parties to a transaction are not equally well-informed about one another. For example, as a household considering *direct finance*, you may not be able to tell a risky firm apart from a safe firm. This could result in your requiring so high an interest rate / return that you drive the safe firm out, and then you may not want to lend to the risky firm, and no firms could get funding. This is an example of adverse selection. Alternatively, you may be concerned that a firm will gamble with funds once acquired in a way that you (the lender) find undesirable. This would be an example of moral hazard. Banks, or financial intermediaries more generally, serve a useful role because they become experts at evaluating potential borrowers (dealing with adverse selection) and become good at monitoring lenders (dealing with moral hazard).

The other useful role banks play is liquidity transformation. The liquidity of an asset refers to the ease with which that asset can be used in exchange (i.e. converted to money). To the extent to which households are uncertain over when they will need to spend money, they will have a preference to invest in comparatively liquid assets (like cash, checking accounts, etc). Most investment projects are illiquid in the sense that the funds are tied up for a long time before the project generates any cash flows. If uncertain over when they will need to spend their wealth, households may not be willing to directly fund longer term, illiquid projects, even if those projects offer comparatively high returns. Here is where financial intermediaries can step in. By aggregating funds from many different households, banks can simultaneously invest in longer term illiquid projects while creating liquid assets (i.e. checking accounts). Essentially the bank is betting that only a small and predictable fraction of depositors will need their funds back in any period; it can therefore afford to tie most of the funds up in a longer term illiquid project.

The credit spread variable in our model notation, f_t, can be thought of as a return to financial intermediation. f_t will be high whenever information asymmetries are high or when the demand for liquidity is particularly high. In such situations the supply of credit to firms will be restricted. We think of such periods as financial crises.

- We can summarize the financial condition of a bank (or any entity) with a T-account. On the left hand side we list assets; on the right hand side we list liabilities. Equity (or sometimes financial capital) is the residual category (equity = assets - liabilities) and it is placed on the right hand side. The following is a hypothetical balance sheet for a bank:

Assets	Liabilities plus Equity
Loans: \$110	Deposits: \$100
Cash Reserves: \$10	Equity: \$20

Some terms. The equity multiplier is the ratio of total assets to equity. The leverage ratio is the ratio of liabilities to equity. One plus the leverage ratio is the equity multiplier. The liquidity ratio is the ratio of liquid assets (principally cash) to total liabilities. The return on equity is profit divided by equity; the return on assets is profit divided by total assets. One

plus the leverage ratio (i.e. the equity multiplier) times the return on assets equals the return on equity. The objective of the bank is to maximize its return on equity. Hence banks have a natural incentive to "lever up" (i.e. finance their assets via liabilities instead of equity).

The flip side of this is that banks have to manage their balances sheets to manage both credit and liquidity risk. Credit risk refers to the possibility that assets may underperform (i.e. loans may go into default, and losses must be realized). Liquidity risk refers to the possibility that there will be unexpectedly high withdrawals (more generally, a drying up of liabilities) which could force the bank to sell assets. To the extent to which these assets are illiquid, selling them on short notice may necessitate selling at a discount. Hence, liquidity risk refers to the fact that the bank may have to sell assets at "firesale" prices and realize losses. A bank is insolvent if it has negative equity.

- Credit risk refers to the possibility that assets held by a bank (e.g. loans issued) may underperform. An example of this would be loans going into default and forcing an equity write down. Take the initial balance sheet as described above. Suppose that \$10 worth of loans go into default. The new balance sheet would be:

Assets	Liabilities plus Equity
Loans: \$100 (-10)	Deposits: \$100
Cash Reserves: \$10	Equity: \$10 (-10)

  Assets underperforming results in equity losses. Generally speaking, the less leveraged a bank is (i.e. the more equity it holds relative to total assets), the more resilient it will be in the precise sense that it can withstand more asset underperformance than can a bank that is highly levered.

- Liquidity risk refers to the possibility that a bank could face unexpectedly high withdrawal demands (more generally a drying up of liabilities). If the bank lacks sufficient initial liquidity (i.e. it isn't holding sufficient cash), it may have to sell assets in order to raise cash. If the assets are highly illiquid, it may be difficult to sell assets in short order at the price at which the assets are valued on the balance sheet. Suppose that a bank begins with an initial balance sheet of:

Assets	Liabilities plus Equity
Loans: \$110	Deposits: \$100
Cash Reserves: \$10	Equity: \$20

  Suppose that loans issued are illiquid in the sense that if they must be sold quickly it must be done at a 50 percent discount (i.e. raising \$1 in cash requires selling \$2 in loans and realizing a \$1 loss in equity). Suppose the bank faces a \$20 withdrawal. It has \$10 cash on hand and must raise \$10 in additional cash, which requires selling \$20 of loans and realizing a \$10 loss. The new balance sheet would be:

Assets	Liabilities plus Equity
Loans: \$90 (-20)	Deposits: \$80 (-20)
Cash Reserves: \$0 (-10)	Equity: \$10 (-10)

- We say that a bank is insolvent if it has negative equity – i.e. if its liabilities are valued at more than its assets are. A bank (or any financial institution for that matter) can become insolvent because of credit or liquidity risk. With credit risk, if assets lose enough value, the bank could end up with negative equity. With liquidity risk, if the bank faces a sufficiently large withdrawal demand and does not have enough cash on hand, it may have to sell assets in order to raise cash. Even if the assets are fundamentally sound, doing so quickly may require realizing losses, which could also lead the bank into insolvency.

- We think about a "bank run" as a situation of heightened liquidity risk for banks and other financial institutions. There is a general drying up of liabilities (i.e. deposit withdrawals). A bank run could be triggered about fears about the underlying value of assets held by the banking system or just by the fear that other depositors are going to run. Since banks do not (and should not, if they are engaging in liquidity transformation) hold lots of cash on the balance sheet, a sufficiently big withdrawal shock could force them to sell assets to raise cash. Doing so quickly, particularly if lots of banks are doing the same thing, could result in "fire sale" dynamics wherein prices of assets become depressed, which could in turn lead to equity losses and insolvency, and which in turn could heighten the run (i.e. there's a certain element of self-fulfillment – a bank run causes banks to become insolvent, which fuels the run).

- Bank runs were a recurrent theme in American economic history, often with disastrous economic consequences. Prior to the founding of the Fed, bank runs were principally dealt with via a consortium of banks agreeing to "suspend convertibility," by which is meant that banks agree to not exchange currency for deposits for a period of time. The logic behind this policy is straightforward – the banking system as a whole (nor an individual bank) simply cannot meet all withdrawal demands. Problems occur when banks try to sell assets to raise cash in "fire sale" dynamics (see above). By suspending convertibility, the pressure to sell assets is eliminated, and the panic plaguing depositors has a chance to subside.

- The Federal Reserve was founded in 1913, principally in response to the Panic of 1907. The objective of the Fed (among other things) was to serve as a "lender of last resort" – i.e. to lend cash to the banking system during periods of liquidity crises / bank runs. The idea behind the lender of last resort function is sound. In a panic, the central bank can lend to commercial banks, which allows the commercial to bank to meet withdrawal demands without having to sell assets or loans. If the bank under a run is able to meet all withdrawal demands, the run should stop – depositors should observe that the bank has enough cash and should be confident that their deposits are safe. It is generally believed that the Fed failed in its lender of last resort role during the Great Depression, which witnessed widespread bank failures.

- The Federal Deposit Insurance Corporation (FDIC) was founded in 1933 in the wake of the rampant bank failures during the Depression. The idea was for the government to insure deposits up to a certain amount. With this insurance in place, depositors would not need to fear losing their money in a bank failure, and thus would have no incentive to "run" on a bank. In practice, deposit insurance has been very successful, largely eliminating traditional banking panics. Banks pay a small fee to purchase the insurance up front. In practice, the FDIC rarely has to pay anything out because the existence of the insurance has eliminated the need to run on deposits. Because this insurance (and the presence of the lender of last resort in the form of the Fed) encourages bank to take on risks (i.e. there is moral hazard), banks are heavily regulated in terms of the kinds of assets they can hold and investments they can make.

- The banking system has evolved in important ways in the last several decades. Traditional banking is where banks fund themselves primarily via deposits (i.e. their main liability source are demand deposits) and make conventional loans, holding the loans on their balance sheet and earning interest income on the loans. For several reasons, this business model is less and less profitable and is going out of existence, being replaced by a system of "securitized" or "shadow" banking. These reasons include regulatory arbitrage. Traditional banks face regulatory capital ratios, the inverse of the equity multiplier, which, other factors held equal, lowers the return on equity. This makes it unprofitable to make loans and sit on them. In addition, there are now large institutional investors (pension funds, insurance companies) that have large sums of money and demand highly liquid, short term "demand deposit like" assets since the sums these firms are dealing with are far above what is insured by the FDIC. A repurchase agreement involves one party "depositing" funds at date t in exchange for some collateral. It is agreed between the two parties that the collateral will be sold back at a future date (say, $t+1$) at a pre-negotiated price. The difference between the amount deposited and the pre-negotiated price at which the collateral is sold back amounts to "interest" for the lender (formally the implied interest rate on this transaction is known as the "repo rate"). The repo can be "rolled" in the sense that a new repo can be negotiated when the time of the first repo is up; this is tantamount to keeping the funds "deposited." What makes the repo safe is the existence of the collateral. For the Repo market to work well, there needs to be relatively safe collateral. Securitization arose in part to meet the demand for this "safe" collateral, because securitized mortgage products and other securitized asset classes were/are thought to be relatively safe. A haircut occurs when one party "deposits" less than the value of the collateral to be exchanged. One party might demand a haircut if he/she is concerned about the other party being able to buy the collateral back, or that the collateral may lose value in the event the lender gets stuck with it. Prior to the financial crisis, haircuts were zero. Haircuts rose markedly during the crisis. Rising haircuts effectively amounts to "withdrawals" from the shadow banking system. If one firm is financing \$500 million in MBS with \$500 million in repo, haircuts rising to 40 percent effectively amounts to a "withdrawal" of \$200 million – the party financing the MBS has to come up with \$200 million cash.

- The tell-tale sign of a financial crisis is a marked increase in credit spreads (f_t in our model-based notation). Credit spreads rise in response to a banking panic. Funders of the banking system (deposit holders in a traditional banking system; repo investors in the more modern system) begin to be concerned about the assets the banking system is holding. Because of this fear they are less willing to lend to the banking system; depositors try to withdraw funds, large institutional investors demand high haircuts. This forces the banking system to raise cash. This necessitates them selling assets and loans, rather than purchasing assets and extending credit. The decline in the supply of credit drives up credit spreads. Because of the general panic, information asymmetries are exacerbated, which also contributes to higher credit spreads.

- The Great Depression is dated from 1929-1933. The precipitating factor was a decline in the stock market. This gave way to general fears about the soundness of financial institutions, which led to traditional bank runs. Many banks failed and the lifetime savings of many depositors were wiped out. Credit spreads rose. There was a general collapse in demand (the increase in f_t triggering an inward shift of the IS and AD curves). Short term nominal interest rates went to zero and deflation took hold, implying high real interest rates. Economic activity contracted by as much as 50 percent. It is generally believed (the Friedman and Schwartz hypothesis) that the Fed contributed to the severity of the Great Depression. It did not serve well as a lender of last resort, allowing many banks to fail. It allowed the money supply to contract and allowed deflation to take hold.

- The Great Recession began at the end of 2007 and is "officially" dated to have ended in the middle of 2009. The precipitating factor was a run up and subsequent decline in house prices in the US. Because of innovations in mortgage finance (i.e. low downpayment, adjustable rate mortgages), default rates were particularly susceptible to house price declines. When house prices began to decline the cash flows from mortgage backed securities (MBS) became suspect. This led to nervous counterparties being unwilling to extent credit in short term financing markets like the Repo market. In essence, there was a run on the shadow banking system. It was not a traditional run like in the Great Depression, but rather a run by institutions on other institutions. Credit spreads rose and investment activity collapsed. This was exacerbated by the ZLB becoming binding at the end of 2008. A rough chronology of the crisis is:

  1. Decline in house prices
  2. Concerns about value of backing collateral in Repo market
  3. Run on Repo
  4. "Fire sales" of assets
  5. General decline in supply of credit and increase in credit spreads

  The cause of the crisis was collapse in house prices, but this wasn't enough on its own to cause a major recession. It was the interaction between house prices and interbank lending markets

that drove up credit spreads and resulted in a general collapse in economic activity.

- Although the Great Recession was severe, it was not nearly as bad as the Depression. Relative to a pre-recession trend, output declined by somewhere between 10-15 percent, which pales in comparison to what happened during the Depression. We attribute at least some of the better performance during the crisis to better policy. Indeed, policymakers acted in extraordinary and new ways to the crisis, quite the opposite of what happened during the Depression, when the Fed largely sat idly by. In the early 2000, Ben Bernanke (who was chairman of the Fed during the Great Recession) had famously said to Milton Friedman concerning the Great Depression: "You're right, we did it. We're very sorry. But thanks to you, we won't do it again." The Fed acted swiftly, extending credit and liquidity to key financial markets during the "run phase" of the crisis (2008 into the beginning of 2009). The emergency lending was the Fed fulfilling its lender of last resort function. The object was to stop the run in its tracks and reverse the increase in credit spreads that was taking place. Subsequent policy actions included using forward guidance (signalling the expected future time path of short term nominal interest rates) and quantitative easing (purchasing large quantities of longer maturity government debt and private sector debt). The objective of these policy actions was to further bring credit spreads down. We can think of conventional monetary policy as trying to lower the interest rates relevant for investment decisions by lowering short term riskless interest rates; unconventional monetary policy instead tries to lower credit spreads to impact investment decisions. There was a also a large fiscal stimulus – the American Recovery and Reinvestment Act – passed which aimed to inject roughly $800 billion in stimulus over a ten year period. Fiscal stimulus makes decent sense when the zero lower bound binds.

2 Terms

You should be familiar with, able to define, and able to discuss the following (non-exhaustive list) of terms:

- Sticky prices
- Phillips Curve
- Costless disinflation
- Taylor rule
- Price stability
- Divine coincidence
- ZLB
- Effective lower bound

- Deflationary spiral
- Asymmetric information
- Adverse selection
- Moral hazard
- Liquidity
- Liquidity transformation
- Asset
- Liability
- Credit risk
- Liquidity risk
- Return on equity
- Return on assets
- Leverage ratio
- Equity multiplier
- Bank run
- Repurchase agreement
- Mortgage backed security (MBS)
- Forward guidance
- Quantitative easing
- American Recovery and Reinvestment Act

3 Practice Multiple Choice

1. Relative to the neoclassical model, demand shocks have _____ effects and supply shocks _____ effects on output in the sticky price New Keynesian model.
   (a) Bigger; bigger
   (b) Smaller; smaller
   (c) Bigger; smaller

(d) Smaller; bigger

2. A monetary policy rule focusing on price stability will stabilize the output gap on all of the following exogenous shocks *except*:

   (a) θ_t

   (b) A_t

   (c) f_t

   (d) $\bar{P}_t$

3. A binding zero lower bound means that demand shocks have even _____ effects on output and supply shocks have _____ effects on output in comparison to the standard New Keynesian model:

   (a) Bigger; smaller

   (b) Smaller; bigger

   (c) Bigger; bigger

   (d) Smaller; smaller

4. Suppose that a bank has the following balance sheet:

Assets	Liabilities plus Equity
Loans: \$100	Deposits: \$100
Cash Reserves: \$20	Equity: \$20

   Its leverage ratio is:

   (a) 5

   (b) 6

   (c) 0.1

   (d) 0.2

5. Continue with the same balance sheet above. Loans earn $r^I = 0.1$, and deposits cost $r = 0.05$. Assuming nothing unexpected happens, the bank's return on equity will be:

   (a) 25 percent

   (b) 10 percent

   (c) 5 percent

   (d) 20 percent

6. Continue with the same balance sheet above. The bank's liquidity ratio is:

(a) 0.1

(b) 0.2

(c) 5

(d) 0.25

7. In response to an increase in θ_t, a central bank wishing to stabilize the output gap ought to:

   (a) Do nothing

   (b) Increase the money supply

   (c) Decrease the money supply

   (d) Say ten Hail Marys and two Our Fathers

8. In the New Keynesian model, if there is a negative output gap in the short run (i.e. $Y_t < Y_t^f$), then as the economy transitions to the medium run, the AS curve will:

   (a) Shift down

   (b) Shift up

   (c) Become vertical

   (d) Do nothing

9. In the New Keynesian model, if there is a positive output gap in the short run (i.e. $Y_t > Y_t^f$), then the equilibrium real interest rate is _____ the natural rate of interest:

   (a) Greater than

   (b) Less than

   (c) Equal to

   (d) Not enough information

10. In theory, the Phillips Curve shows a _____ relationship between inflation and the output gap:

    (a) Positive

    (b) Negative

    (c) Indeterminate

    (d) Vertical

11. In the New Keynesian model, the parameter γ measures:

    (a) The elasticity of labor supply

    (b) The interest sensitivity of investment demand

    (c) The cost of the firm adjusting price

(d) The interest sensitivity of money demand

12. If money demand does *not* depend on the interest rate, then:

    (a) The LM curve will be vertical

    (b) The LM curve will be horizontal

    (c) The LM curve will not shift in response to a change in the money supply

    (d) The IS curve alone will determine the equilibrium level of output

13. In the New Keynesian model, a pre-announced decrease in the money supply would likely have a _____ effect on output than a surprise decrease in the money supply:

    (a) Smaller

    (b) Bigger

    (c) Similar

14. Which of the following is likely the best way to reduce the incidence of the zero lower bound?

    (a) Conduct monetary policy according to a Taylor rule

    (b) Conduct monetary policy according to a price level target

    (c) Conduct monetary policy using an exogenous rule for the money supply

    (d) Raise the average longer term inflation target

15. The tell-tale sign of a financial crisis is:

    (a) Deflation

    (b) Rising credit spreads

    (c) A binding ZLB

    (d) Contractionary fiscal policy

16. The precipitating factor behind the Great Depression was:

    (a) A stock market crash

    (b) A housing market crash

    (c) A wave of bank failures

    (d) A binding ZLB

17. The output decline during the Great Depression was _____ than the output decline during the Great Recession:

    (a) Roughly the same as

    (b) Smaller than

(c) Larger than

(d) Significantly larger than

18. Suppose in a Repurchase Agreement (Repo) a firm pays $100 million in exchange for $200 million in mortgage backed securities. Then the haircut is:

(a) 0 percent

(b) 100 percent

(c) 50 percent

(d) 200 percent

19. In the neoclassical model, an increase in productivity results in a _____ in labor hours. In the New Keynesian model with exogenous money supply, the effect of a positive productivity shock on hours is _____.

(a) Positive; positive

(b) Positive; negative

(c) Positive; ambiguous

(d) Ambiguous; negative

20. The zero lower bound on the Federal Funds Rate became binding in the US at the end of:

(a) 2009

(b) 2008

(c) 2007

(d) 2006

21. The Fed "lifted off" from the zero lower bound at the end of:

(a) 2012

(b) 2013

(c) 2014

(d) 2015

22. Forward guidance involves:

(a) Purchasing large quantities of long term government and private sector debt

(b) Selling large quantities of long term government and private sector debt

(c) Signalling the central bank's expected future time path of short term nominal interest rates

(d) Purchasing large quantities of short term government debt

23. The American Recovery and Reinvestment Act was designed to inject roughly _____ in stimulus over a ten year period.

    (a) $800 million
    (b) $800 billion
    (c) $80 billion
    (d) $8 trillion

24. During the Financial Crisis, haircuts increased by roughly:

    (a) 4 percentage points
    (b) 40 percentage points
    (c) 100 percentage points
    (d) 20 percentage points

25. Formally, in the aftermath of the Great Recession there were _____ waves of quantitative easing:

    (a) 1
    (b) 2
    (c) 3
    (d) 4

26. At the height of the Great Recession, the inflation rate in the US was:

    (a) significantly higher than normal
    (b) significantly lower than normal
    (c) slightly higher than normal
    (d) about normal

27. Conventional monetary policy attempts to impact interest rates relevant for investment by adjusting _____, whereas unconventional monetary policy tries to impact interest rates relevant for investment through adjusting _____.

    (a) short term interest rates; short term interest rates
    (b) short term interest rates; credit spreads
    (c) credit spreads; short term interest rates
    (d) credit spreads; credit spreads

28. In the simple sticky price New Keynesian model, the _____ is the LM curve, the _____ fiscal multiplier:

    (a) steeper; bigger

    (b) steeper; smaller

    (c) flatter; smaller

    (d) none of the above

29. In the New Keynesian model, the fiscal multiplier ought to be bigger when the ZLB binds because:

    (a) there is no crowding out

    (b) inflation falls

    (c) Ricardian equivalence does not hold at the ZLB

    (d) the money supply increases in response to the increase in government spending

30. If the central bank is following an endogenous monetary policy aimed at price stability in the New Keynesian model, then the fiscal multiplier will be _____ compared to what it is in the neoclassical model:

    (a) smaller

    (b) bigger

    (c) the same

4 Practice True/False Questions:

1. During the Great Recession, there was a run on deposits at commercial banks.

2. If a large institutional investor is only willing to lend $200 million in exchange for collateral valued at $500 million in a Repo transaction, then the haircut is 40 percent.

3. In the wake of the Great Recession, emergency lending by the Fed remained significantly elevated through 2015.

4. A bank with a liquidity ratio of 0.2 is more likely experience trouble after a large withdrawal than is a bank with a liquidity ratio of 0.05.

5. The *bigger* is the parameter γ in the AS curve ($P_t = \bar{P}_t + \gamma(Y_t - Y_t^f)$), the *smaller* will be the differences between the neoclassical and New Keynesian model in how Y_t reacts to shocks.

6. In the simple sticky price New Keynesian model, an increase in productivity results in a decline in labor hours.

7. In the New Keynesian model, if $Y_t > Y_t^f$, then the AS curve will shift left as the economy transitions to the medium run.

8. In the New Keynesian model, if $Y_t < Y_t^f$, then at the equilibrium real wage there is an excess supply of labor over demand.

9. In the wake of the Great Recession, there were six rounds of quantitative easing.

10. The tell-tale sign of a financial crisis is pessimism about future productivity, A_{t+1}.

11. Being unable to control how a borrower uses funds once lent to him as an example of adverse selection.

12. Liquidity transformation entails financial intermediaries becoming experts on potential borrowers and monitoring borrower behavior to overcome informational asymmetries.

13. An asset's liquidity refers to the ease with which it can be used in exchange.

14. The real interest rate increases *less* in response to positive IS shocks in the New Keynesian model relative to the neoclassical model.

15. Convincing the public of higher *future* expected inflation may be an effective way to deal with a negative output gap at the ZLB.

16. A binding ZLB will tend to *magnify* the response of the real wage to shocks to θ_t.

17. The Fed significantly increased the money supply during the Great Depression.

18. In the New Keynesian model, an increase in expected inflation, π_{t+1}^e, results in an increase in the equilibrium level of output.

19. A period of a binding ZLB is usually a period of *low* nominal interest rates but *high* real interest rates.

20. The bigger is the parameter γ in the New Keynesian model's AS curve, the *more* output will react to exogenous changes in $\bar{P}_t$.

21. The price level reacts *less* to an increase in M_t in the New Keynesian model compared to the neoclassical model.

22. The price level reacts *more* to an increase in A_t in the neoclassical model comparerd to the New Keynesian model.

23. In the New Keynesian model if there is a positive output gap, then the equilibrium real interest rate is *too high* compared to the natural rate of interest.

24. If the central bank wants to stabilize the output gap, then it needs to adjust M_t in response to shocks *more* the stickier are prices.

25. In the New Keynesian model, prices being very sticky corresponds to a *high* value of the parameter γ.

26. The steeper is the IS curve, the steeper is the AS curve.

27. When the ZLB binds, the LM curve is vertical.

28. The unconditional correlation between inflation and an empirical measure of the output gap is fairly weak over a long sample of data in the US.

29. The Taylor rule provides a good positive description of monetary policy in the US over the period 2008-2015.

30. Unconventional monetary policy uses different tools than conventional monetary policy but has the same goal – impacting short term riskless nominal interest rates.

5 Practice Longer Questions

1. What are the exogenous variables in the standard New Keynesian model? What are the endogenous variables?

2. What restriction on the parameter γ yields the simple sticky price model? What restriction yields the neoclassical model?

3. Consider the simple sticky price model. Using the full five part graph, show how r_t, Y_t, N_t, w_t, and Y_t^f react to a decrease in θ_t.

   (a) Suppose that the central bank wishes to implement the neoclassical, no gap equilibrium in the short run. How must it adjust the money supply after a decrease in θ_t in order to do so? Show the effects graphically.

   (b) Suppose instead that the central bank does nothing. As the economy transitions to the medium run, what will happen to $\bar{P}_t$? Graphically show how this will affect the positions of the different curves and the values of the endogenous variables.

4. Consider the partial sticky price model. Using the full five part graph, show how r_t, Y_t, N_t, w_t, and Y_t^f react to an increase in A_{t+1}.

   (a) Graphically show how the effect on the output gap, $Y_t - Y_t^f$, is impacted by the value of γ.

   (b) Suppose that the central bank wishes to implement the neoclassical, no gap equilibrium in the short run. How must it adjust the money supply after an increase in A_{t+1} in order to do so? Show the effects graphically.

(c) Suppose instead that the central bank does nothing. As the economy transitions to the medium run, what will happen to $\bar{P}_t$? Graphically show how this will affect the positions of the different curves and the values of the endogenous variables.

5. Algebraically, the LM curve is characterized by:

$$\frac{M_t}{P_t} = M^d(r_t + \pi^e_{t+1}, Y_t)$$

(a) Define the natural rate of interest, r^f_t.

(b) How does an increase in G_t impact r^f_t? How does an increase in M_t impact r^f_t?

(c) Based on this equation, briefly explain (in words) why adjusting M_t to implement $Y_t = Y^f_t$ is a well-defined thought experiment, whereas adjusting G_t is not.

6. Consider a bank with the following balance sheet:

Assets	Liabilities plus Equity
Loans: \$100	Deposits: \$100
Cash Reserves: \$20	Equity: \$20

Loans are illiquid in the precise sense that they must be sold at a discount of $1 - q$ percent. If $q = 0.5$, for example, raising \$1 of cash requires selling $\frac{1}{1-q} = \$2$ in loans. In contrast, if $q = \frac{1}{3}$, raising \$1 in cash requires selling $\frac{1}{1-q} = \$1.5$ in loans.

(a) For an arbitrary value of q, solve for the *maximum* withdrawal a bank can withstand before becoming insolvent.

(b) If you were managing this bank's balance sheet, would you likely want to maintain a higher or lower liquidity ratio the bigger is q? Explain briefly in words.

7. Suppose that there are two entrepreneurs – call them Wilcox and Zach. Both are in search of \$1 of funding for an investment project. If Zach gets \$1 of funding, his project will return \$1.25 with certainty. If Wilcox gets funding, his project will return \$1.80 with probability $\frac{1}{2}$, and will return \$0 (i.e. he loses everything) with probability $\frac{1}{2}$. You are looking to make an investment for a net interest rate of r – i.e. if you lend \$1, provided the project succeeds, you get $1 + r$ (interest plus principal) back. Should the project fail, you lose the \$1 investment. You will make a loan provided the expected net return is non-negative. Wilcox and Zach will take a loan provided their expected profit is non-negative.

(a) Suppose that you can perfectly tell Wilcox and Zach apart. Above what value of r would you be willing to lend to Zach? Below what value of r would Zach be willing to take a loan from you? Above what value of r would you be willing to lend to Wilcox? Below

which value of r would Wilcox be willing to take a loan. Who will get a loan and who will not?

(b) Suppose instead that you cannot tell Wilcox and Zach apart. You encounter an entrepreneur and believer there is a q percent chance it is Wilcox and a $1-q$ percent chance it is Zach. Solve for the *maximum* value of q at which you would be *both* willing and *able* to make a loan when you cannot perfectly tell the type of the entrepreneur you are encountering.

8. Consider a bank with the following balance sheet:

Assets	Liabilities plus Equity
Loans: \$100	Deposits: \$100
Cash Reserves: \$20	Equity: \$20

Loans earn $r = 0.1$ interest and deposits cost $r = 0.05$.

(a) Calculate the leverage ratio, the equity multiplier, and the liquidity ratio.

(b) Assuming nothing unexpected happens to loans or deposits, calculate the profit the bank will earn. What is the return on equity?

Suppose that the bank attracts another \$100 in deposits and uses all of this to make additional loans. The new balance sheet is:

Assets	Liabilities plus Equity
Loans: \$200	Deposits: \$200
Cash Reserves: \$20	Equity: \$20

(c) Calculate the leverage ratio, the equity multiplier, and the liquidity ratio.

(d) Assuming nothing unexpected happens to loans or deposits, calculate the profit the bank will earn. What is the return on equity?

(e) Why is the return on equity in part (d) higher than in part (b)? Explain briefly.

9. Write down and describe in words a brief chronology of the financial crisis and ensuing Great Recession. Map the historical events into changes in the exogenous variables of the New Keynesian model and graphically show what happened.

10. You should be able to recreate Table 23.4 (pg. 483) in the text.

11. GLS Ch. 21, questions 1-4.

12. GLS Ch. 21, exercise 1.

13. GLS Ch. 22, questions 1-2.

14. GLS Ch. 23, question 1.

15. GLS Ch. 24, questions 2 and 4.

16. GLS Ch. 24, exercise 2.

17. GLS Ch. 26, questions 1-4.

18. GLS Ch. 28, questions 1-3 and question 5.

19. GLS Ch. 30, questions 1-2.