Econ 102
Finance and Unemployment
Solutions

2. It is January 1, 2010, and you have $1,000,000 to place in either or both of two assets. The assets are called Alphabots and Betabots, and they promise to pay you the amounts listed in the table at the right on January 1 of each of the three years 2011, 2012, and 2013. Use a calculator or (better) a computer spreadsheet program like Excel, together with the handout on bond prices and interest rates, to answer the following questions.

	Alphabots	Betabots
2011	$50.00	$200.00
2012	$50.00	$200.00
2013	$1050.00	$727.13

a. Which asset will pay you back the largest amount of money?

Alphabots pay the most if we just add up the dollars: $1150.00 compared to $1127.13.

b. If the interest rate is 7% per year, what are the present values of the two assets, and which is larger?

PV(Alphabots) = $50.00/(1.07) + 50.00/(1.07)^2 + 1050.00/(1.07)^3 = 947.51$
PV(Betabots) = $200.00/(1.07) + 200.00/(1.07)^2 + 727.13/(1.07)^3 = 955.16$
So at the interest rate of 7%, Betabots have the higher present value. That's because their payoff, even though it is smaller, comes earlier. If the future is discounted by a lot, then an earlier payoff is worth more.

c. If the interest rate is 3% per year and these assets are bonds, what will be their market prices, assuming that the market believes that both will pay what they promise?

Bond prices are the present values of what they promise to pay, if that promise is believed.
PV(Alphabots) = $50.00/(1.03) + 50.00/(1.03)^2 + 1050.00/(1.03)^3 = 1056.57$
PV(Betabots) = $200.00/(1.03) + 200.00/(1.03)^2 + 727.13/(1.03)^3 = 1048.12$
(Notice that at this lower interest rate, Alphabots now have a higher present value, and therefore a higher price, than Betabots.)

d. Suppose now that the interest rate is 5% per year and that the market prices of both assets are their present values.

First calculate again the present values, to learn how many units of the assets (how many bonds) you can buy with $1,000,000:
PV(Alphabots) = $50.00/(1.05) + 50.00/(1.05)^2 + 1050.00/(1.05)^3 = 1000.00$
PV(Betabots) = $200.00/(1.05) + 200.00/(1.05)^2 + 727.13/(1.05)^3 = 1000.004 \approx 1000.00$
So both assets cost $1000, and you can buy 1000 of either.

i. If you use your entire $1,000,000 to buy Alphabots, then hold what they pay you as cash, how much will you have at the end of January 1, 2013?

Buying 1000 Alphabots, you will get $50,000 in 2011, $50,000 in 2012, and $1,050,000 in 2013. Since you hold the early payments as cash, these just add up, totaling $1,150,000.

ii. If you use your entire $1,000,000 to buy Betabots, then hold what they pay you as cash, how much will you have at the end of January 1, 2013?

Similarly, buying 1000 Betabots gets you $200,000 in 2011, $200,000 in 2012, and $727,130 in 2013, for a total of $1,127,130. The Betabots paid you earlier, but since you didn't do anything useful with the early payments, they didn't help you, and you end up with less.

iii. How would your answers to (i) and (ii) differ if you put what they paid you into a savings account earning 5%?

Now if you buy Alphabots, the $50,000 that they pay you in 1011 will grow in the savings account to $\$50{,}000(1.05)^2 = \$55{,}130$***, and the $50,000 that they pay you in 1012 will grow to $50,000(1.05) = $52,500. Added to the final payment, you end up with 55,130 + 52,500 + 1,050,000 = $1,157,630.***

If you buy Betabots, the first $200,000 will grow to $\$200{,}000(1.05)^2 = \$220{,}500$***, and the second $200,000 will grow to $200,000(1.05) = $210,000, for a total of 220,500 + 210,000 + 727,130 = $1,157,130.***

As you see, you end up with the same amount regardless of which asset you buy. The reason is that the present value is defined so that the asset yields a return of 5%, so it doesn't matter whether you put your money into one asset, the other asset, or the savings account. Any way you do it, your million dollars grows to $\$1{,}000{,}000(1.05)^3$***. (OK, if we do this exactly, this last calculation actually gives you $1,157,125, not $1,157,130. That's because of the rounding error when I said that the PV of Betabots was $1000.)***

3. The table below gives some labor statistics for years 1995, 2000 and 2005. Use these data to answer the following questions.

Variable	1995	2000	2005
Population	26,000,000	27,000,000	28,000,000
Adult population	18,000,000	19,000,000	20,500,000
Adult population able to work	17,900,000	18,800,000	20,000,000

Adult population able and wanting to work	15,700,000	16,500,000	18,000,000
Number employed	14,000,000	14,500,000	15,000,000
Number unemployed	1,000,000	1,500,000	2,500,000

(a) Define labor force. For each year find the labor force.

The labor force covers everyone who is employed and unemployed. Note however, that the unemployed refers to people without jobs, and looking for jobs, or waiting for the start of a new job.

Accordingly the labor force in 1995 is 14,000,000 + 1,000,000 = 15,000,000. Similarly it is 16,000,000 in 2000, and 17,500,000 in 2005:

Variable	1995	2000	2005
Labor force	15,000,000	16,000,000	17,500,000

(b) Define the term "discouraged workers". For each year find the number of discouraged workers.

Discouraged workers are the people who tried to find a job, but have given up after unsuccessful search. Since they are no longer looking for jobs they are not considered as unemployed. Therefore, they are not part of the labor force.

Discouraged labor is able to work, and they want to work. But they are discouraged in their job search, so that they are no longer looking for jobs. So, the part of the adult population who is able to work and who wants to work, but who are not in the labor force are discouraged workers.

For example in 1995, 15,700,000 adults were able and wanted to work, but some were not part of the labor force (15,000,000), therefore they were discouraged workers. So, there were 700,000 discouraged workers in 1995. Similarly, in 2000 out of 16,500,000 adults able to work, and wanting to work, only 16,000,000 are in the labor force. So, there are 500,000 discouraged workers. The number of discouraged workers remained the same, at 500,000 in 2005.

Variable	1995	2000	2005
Discouraged workers	700,000	500,000	500,000

The difference between adult population and adults able to work gives the number of disabled adults.

The difference between adults able to work, and adults able and wanting to work, gives the adults who do not want to work for other reasons than being discouraged.

(c) Define the labor-force participation rate. Calculate it for each year.

The labor-force participation rate is the percentage of the adult population that participates in the labor force, either employed or unemployed.

This rate in 1995 is therefore, 15,000,000/18,000,000 = 83.3%. Similarly it is 16/19 = 84.2% in 2000, and 17.5/20.5 = 85.4% in 2005.

Variable	1995	2000	2005
Participation rate	83.3%	84.2%	85.4%

(d) Calculate the unemployment rate for each year.

The unemployment rate gives the percentage of the labor force that is unemployed.

Accordingly, it is 1,000,000/15,000,000 = 6.67.% in 1995.

The unemployment rate is 1,500,000/16,000,000 = 9.38% in 2000, and it is 2,500,000/17,500,000 = 14.29% in 2005.

Variable	1995	2000	2005
Unemployment rate	6.67%	9.38%	14.29%

(e) Define natural rate of unemployment.

Natural rate of unemployment is the rate around which the unemployment rate historically fluctuates.

(f) Suppose that unemployment in 1995 was at its natural rate. Define and calculate the cyclical unemployment in years 2000 and 2005.

Cyclical unemployment is the deviation of the unemployment rate from its natural rate. Therefore, it is 9.38 – 6.67 = 2.71% in 2000, and 14.29 – 6.67 = 7.62% in 2005.

Variable	1995	2000	2005
Cyclical unemp. rate	0%	2.71%	7.62%

4. The equilibrium rate of unemployment is the rate of unemployment at which the number of workers losing a job is equal to the number of workers finding a job, so that the unemployment rate stays constant over time. Suppose that the labor force, L, is constant, and consists of the number of employed workers, E, and the number of unemployed workers, U, as in the previous exercise. Suppose that each week a fraction s of the employed workers separate from their jobs (quit or are fired), while a fraction f of the unemployed workers find jobs. Then equilibrium requires that $sE = fU$. This can be rewritten as $s(L–U) = fU$, which can be rearranged to yield the unemployment rate, u:

$$u = U/L = s/(s+f)$$

That is, the equilibrium rate of unemployment depends positively on the rate of job separation and negatively on the rate of job finding.

a) Suppose that the unemployment rate is constant over time at u = 10%. Suppose also that, every week, 6 in every 1000 employed workers quit their job to look for another, and another 4 in every 1000 are fired. Then what percentage of the unemployed workers becomes re-employed each week?

From the information given, u=0.1 and s=0.006+0.004=0.01. Putting these numbers into the formula for equilibrium unemployment (since the unemployment rate is stated to be constant), 0.1 = 0.01/(f+0.01). This can be solved for f as follows:

$$0.1(f+0.01) = 0.01$$
$$0.1f + 0.001 = 0.01$$
$$100f + 1 = 10$$
$$f = 9/100 = 0.09 = 9\%$$

b) How long do these workers remain unemployed, on average? (To keep it simple, suppose that they are all the same, and that the unemployed who find jobs each week are those who have been unemployed the longest. Then unemployment is like a queue, and you can figure out how long it takes to get to the front of the line.)

Suppose that you have just become newly unemployed. During the first week, 9% of the other unemployed will find jobs, in the second week another 9%, and so forth. After ten weeks, 90% will have found jobs, leaving only 10% ahead of you in the queue. In one more week, after a total of eleven weeks, 99% of those who were unemployed before you will be employed, and you will find a job yourself early in the next week. So with 9% of the unemployed finding jobs each week, a newly unemployed will remain unemployed for just over eleven weeks. In fact the duration of unemployment here is simply 1/f.

c) Suppose that Congress were to abolish unemployment compensation for workers. Suppose that this causes only half as many workers to quit their jobs as before, with no change in the rates that workers are fired or the unemployed find new jobs. What will be the new unemployment rate?

Previously 6 in 1000 workers were quitting, and this now falls to 3 in 1000. So s falls from 0.01 to 0.007. Still using f=0.09, the unemployment rate becomes u = s/(s+f) = 0.007/(0.007+0.090) = 0.007/0.097 = 7.2%

d) How might you expect the abolition of unemployment compensation to also change the rates that employed workers are fired and the rates that unemployed workers find new jobs? How would these changes alter the effect on the equilibrium unemployment rate?

Knowing that the hardship of unemployment has increased, employers (if they are humane) might be less likely to fire their workers. And even if they are not humane, the workers themselves might try harder to avoid being fired due to the greater fear of unemployment. So this could further reduce the rate of job separation, s, and further reduce the equilibrium unemployment rate.

Also, to the extent that workers previously were not taking the first job offered, hoping to find something better by looking longer, the greater hardship of unemployment may induce them to be less selective and take available jobs more quickly. This would increase the rate of job finding, f, and further reduce the unemployment rate.

e) In addition to the effects on the unemployment rate that you identified in parts (c) and (d), what are some of the other arguments for and against eliminating unemployment compensation?

The hardship experienced by the unemployed is the most obvious reason for **not** ***eliminating compensation, since without it the unemployed workers and their families will suffer, some of them grievously.***

To the extent that workers stay longer in less desirable jobs than they might otherwise find, or that the unemployed accept such jobs rather than searching further, both the workers and society will suffer from having achieved a poorer match between workers and jobs.

On the other hand, if the threat of unemployment makes workers work harder, it will increase productivity and incomes.

5. According to the Bureau of Labor Statistics (BLS), the U.S. unemployment rate in 2005 (average for the year) was 5.1%, with a civilian labor force of 149.3 million. (See, for example, ftp://ftp.bls.gov/pub/special.requests/lf/aat1.txt) Use the data reported on the BLS web site (http://stats.bls.gov/cps/home.htm#tables) to answer the following questions:

a) How much higher would the unemployment rate have been if it had included all those who are not in the labor force but who said that they did want a job? (See ftp://ftp.bls.gov/pub/special.requests/lf/aat35.txt)

That number is reported for 2005 as 4.985 million, according to the BLS table. The number of unemployed was 7.591 million (from the previous BLS table, or approximately by multiplying 149.3 by 0.051). Adding 4.985 to both this and the labor force we get an unemployment rate of (7.591+4.985)/(149.3+4.985) = 8.15%

b) How many of the workers classified as "employed" in 2005 were working part time (less than 35 hours per week) because they could only find part-time work or because of "slack work or business conditions"? How much larger would the unemployment rate have been if these workers had been classed as unemployed? (See ftp://ftp.bls.gov/pub/special.requests/lf/aat20.txt)

From this BLS table, 1.341 million workers were part time because that's all they could find, and 2.684 because of slack work or business conditions. Adding these two numbers to the number classed as unemployed, we get 7.591+1.341+2.684 = 11.616 million, or an unemployment rate of 11.616/149.3 = 7.8%. (Note that unlike part (a), here we do not add these workers to the labor force, since they were already included.)

c) What fraction of the unemployed in 2005 were people who had just joined the labor force for the first time ("new entrants")? What fraction were "reentrants," and what does that mean? (I'll let you find this one for yourself.)

According to ftp://ftp.bls.gov/pub/special.requests/lf/aat27.txt, ***of the total unemployed of 7.591 million, 0.666 million were new entrants and 2.386 million were reentrants, so the percentages were 0.666/7.591 = 8.8% and 2.386/7.591 = 31.4%. The reentrants are those who had previously left the labor force and were now once again looking for work. That, however, would include both workers who left the labor force voluntarily (to go school, for example, or in retirement) and those who left because they were discouraged.***