It’s a recession when your neighbor loses his job; it’s a depression when you lose yours.

Harry Truman, as quoted in Jones (2008)

1 Labor Market

We typically draw an upward sloping labor supply curve. However this is just a convenient assumption. (Economic theory implies conflicting income and substitution effects.)
Figure 1: Neoclassical Model of a Competitive Labor Market
Source: Jones (2008)
Figure 2: Effect of a Tax on Wage Income
Source: Jones (2008)

The labor-supply curves look parallel but are not (since wages are taxed, not hours).
Labor demand:

\[ Y = 100L - L^2/2 \]  \hspace{1cm} (1)

\[ MPL = 100 - L \]  \hspace{1cm} (2)

Set \( MPL = w \)

\[ 100 - L = w \]  \hspace{1cm} (3)

\[ L^d = 100 - w \]  \hspace{1cm} (4)

Labor supply:

\[ L^s = w(1 - \tau) \hspace{1cm} 0 \leq \tau < 1 \]  \hspace{1cm} (5)

So an increase in \( \tau \) reduces labor supply.

Equilibrium:

\[ L^d = L^s \]  \hspace{1cm} (6)

\[ 100 - w = w(1 - \tau) \]  \hspace{1cm} (7)

\[ w = 100/(2 - \tau) \]  \hspace{1cm} (8)

E.g, if \( \tau = 1/3 \), then \( w = 60 \), but of course workers only receive 40.
The functioning of the labor is crucial to the well being of most individuals.

How much time will you spend working? If we guess 45 years at 2000 hours per year, that is 90,000 hours of employment. As we will see, you will probably earn more than $1M over that period.
1.1 Present Value

Consider an asset that will pay you $2,000, but not until three years from now. We calculate its present value by “discounting” at the available interest rate.

\[ \text{pdv}(1 + R_n)(1 + R_n)(1 + R_n) = 2000 \]  
\[ \text{pdv}(1 + R_n)^3 = 2000 \]  
\[ \text{pdv} = \frac{2000}{(1 + R_n)^3} \]

For example, if \( R_n = 10\% \) p.a. then

\[ \frac{2000}{(1 + 0.10)^3} = \frac{2000}{1.10^3} = \frac{2000}{1.331} = 1502.63 \]

More generally, a future value \( f_{v_T} \) that you will receive \( T \) years from now has a present value of

\[ \text{pdv} = \frac{f_v}{(1 + R_n)^T} \]
New asset: five payments of $400 per year every year for 5 years, starting today. This has the same nominal payment of $2000.

\[ pdv = pdv_0 + pdv_1 + \ldots + pdv_4 \]
\[ = \frac{400}{(1 + R_n)^0} + \frac{400}{(1 + R_n)^1} + \ldots + \frac{400}{(1 + R_n)^4} \]
\[ = 400 \left[ \frac{1}{(1 + R_n)^0} + \frac{1}{(1 + R_n)^1} + \ldots + \frac{1}{(1 + R_n)^4} \right] \]  \hspace{1cm} (14)
\[ = 400 \left[ \left( \frac{1}{1 + R_n} \right)^0 + \left( \frac{1}{1 + R_n} \right)^1 + \ldots + \left( \frac{1}{1 + R_n} \right)^4 \right] \]

Recall that we can add up a sequence of powers of a number \( a \). Specifically, assuming \( a \neq 1 \), suppose we want to know the value \( S \) of the sum of the \( n + 1 \) terms

\[ S = a^0 + a^1 + a^2 + \ldots + a^n \]
\[ aS = a^1 + a^2 + a^3 + \ldots + a^{n+1} \]
\[ S - aS = a^0 - a^{n+1} \]
\[ (1 - a)S = 1 - a^{n+1} \]
\[ S = \frac{1 - a^{n+1}}{1 - a} \]

Applying this to our new asset, we let \( a = 1/(1 + R_n) \).

\[ pdv = 400 \left[ \left( \frac{1}{1 + R_n} \right)^0 + \left( \frac{1}{1 + R_n} \right)^1 + \ldots + \left( \frac{1}{1 + R_n} \right)^4 \right] \]
\[ = 400 \left[ \frac{1 - \left( \frac{1}{1 + R_n} \right)^5}{1 - \frac{1}{1 + R_n}} \right] \]  \hspace{1cm} (15)

For example, if \( R_n = 10\% \) p.a. then

\[ 400 \left[ \frac{1 - \left( \frac{1}{1 + R_n} \right)^5}{1 - \frac{1}{1 + R_n}} \right] = 400 \left[ \frac{1 - \left( \frac{1}{1.10} \right)^5}{1 - \frac{1}{1.10}} \right] = 400 \times 4.17 = 1667.95 \]  \hspace{1cm} (16)
1.2 Human Capital

In 2008, GDP is about $14T, and about 2/3 of GDP is labor income. The population is about 300M, and roughly half the population works, So we have

\[
\frac{2}{3} \frac{14T}{150M} \approx 62,000
\]  

(17)

We will simplify by saying you earn this “average” each year for 45 years with a real interest rate of 3%. Someone in their first year of work then has a present value of labor income around

\[
pdv = 62,000 \left( \frac{1 - \left( \frac{1}{1+0.03} \right)^{45}}{1 - \frac{1}{1+0.03}} \right) \approx 62,000 \times 25.25 \approx 1.6 \times 10^6
\]  

(18)

So an “average” worker has lifetime income with present discounted value of $1.6M. (As your book puts it: you are a millionaire!)
1.3 Education

A primary source of human capital is education.

In the US, the college education premium has increased over time, with a brief downturn in the 1970s.

The premium for higher education has been increasing over time.
An MA can double your wage over a high school education. A BA adds about $20,000 per year in earnings.

### 1.4 Value of a BA

Suppose you earn an additional $20k each year for 45 years. What is that worth. We can use the same formula as before to approximate this.

Again we use a 3% rate of interest for discounting, which gave us a factor of about 25.25.

\[ 20k \times 25.25 = 505k \]  \hspace{1cm} (19)

So your education is worth about half a million dollars (in present value)! (Your book produces and even higher number.)
Figure 6: Earning and Education: 2006
1.5 Employment

The US has seen large increases in the civilian labor-force participation rate as women became more active in formal labor markets.
Clearly your education is correlated not only with how much you are paid, but also with how likely you are to be in the labor force.
1.6 Unemployment

If we look at the employment-population ratio, we see a similar but not identical story. The US has seen large increases in the employment-population ratio as women became more active in formal labor markets. But the series is more volatile, because during recession some of the labor force is not employed.
While we do not see a “natural rate”, unemployment does tend to fluctuate within a fairly narrow band of values.

Figure 10: Unemployment Rate (US)
Your level of education is correlated with how likely you are to be unemployed.
Figure 12: Reduction in Labor Demand with Rigid Wage

Source: Jones (2008)

Note that our earlier labor market equilibrium story leaves us with a puzzle as to why there is any unemployment.

One popular story involves rigid wages.
2 Kinds of Unemployment

Actual unemployment

- cyclical
- natural
  - frictional
  - structural

Cyclical unemployment: associated with short-run macroeconomic fluctuations. The difference between the actual rate and the “natural” rate.

Natural unemployment: the rate that prevails when the economy is at rest (i.e., not in a boom or bust).

Decomposition of “natural” unemployment:

- frictional unemployment: the unemployment that results from the normal job search process
- structural unemployment: unemployment that persists due to labor market institutions that cannot appropriately match workers with jobs. (May be due to hiring and firing costs, a minimum wage, or high unemployment benefits.)

Many economists suggest that most US “natural” unemployment is frictional, but that Europe has substantial structural unemployment.
Figure 13: Varieties of Unemployment Experience  
Source: Jones (2008)  

Unemployment outcomes differ by country.
2.1 Stories about Unemployment

We need to modify our earlier story at the very least by introducing frictional unemployment. This is the popular RBC approach to explaining measured unemployment, but most people and all Keynesians think that some unemployment is involuntary.

When we think about frictional unemployment we are thinking about the *flows* of hires and fires.

Efficiency wage theory is a new Keynesian explanation of why there might be excess supply of labor at the prevailing wage: firms set wages higher so that the cost of being fired goes up. If this is effective at reducing “shirking” then it can be a rational strategy on the part of the firm. Efficiency wage theory explains why we might see a real wage that is “too high” in this sense.

Nominal rigidities may be introduced by customer relations considerations, menu costs, or wage contracting.
Figure 14:
Source: Jones (2008)
Figure 15:
Source: Jones (2008)