Investments: An introduction

To be read with: BKM Chapters 1-5

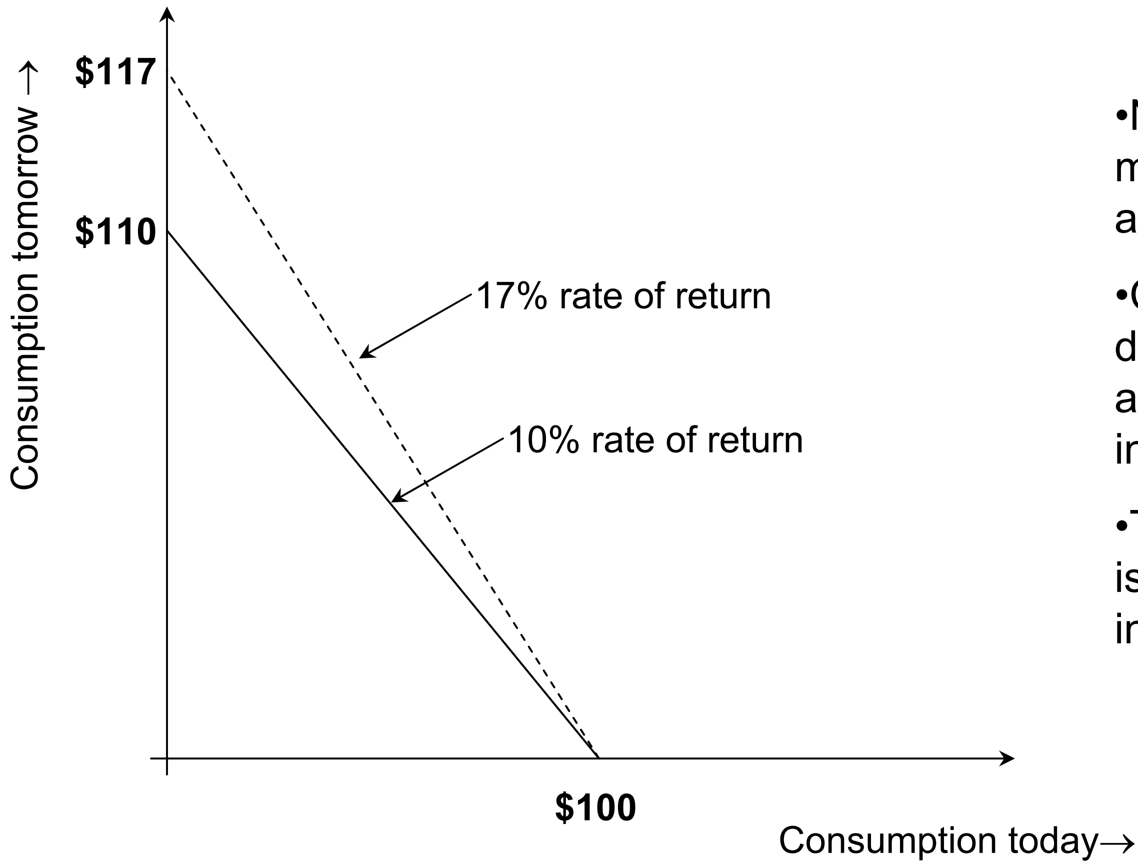
Investments: A road map of study

- Why invest?
- How do we measure risk and return?
- What can we learn from history about risk/return on investments?
- What are the big questions we need to ask?

Why invest?

- Households (people like you and me), earn *income*. Typically, there are two things we can do with our income:
  - consume
  - save (and invest)
- Why save and not just consume it all?
  - because we want to "store" income from higher-earning periods to lower-earning periods
  - In the absence of investment alternatives, we would simply store dollar bills under one's mattress.
  - In our world, we can do better: we can earn a *return* on our investment, and make our money work for us
- *Saving (and investment) is simply a way of postponing today's consumption to tomorrow*

Investments trade consumption across time



- Not suprisingly, there are many alternative investments available
- Chapter 2, 3, and 4 of BKM describe details of some available financial instruments and markets
- This picture hides a key issue: the differing *risk* of the investments

Real and Nominal rates of return

- Assume you have $100 in your pocket. Further, say each pizza costs $10 today.
- Instead of consuming all your income, say you wish to invest this money for a year, in a bank Certificate of Deposit (CD), which promises a rate of return of 15.5% in one year (clearly, this example is not set in 2003!). This 15.5% is called the *nominal rate of return*
- The problem is that in one year, pizzas are expected to cost 5% more, i.e. $10.50 each. This 5% is the *expected rate of inflation* over the next year.
- As an investor, you care about the tradeoff of pizzas you can consume today versus pizzas you can consume tomorrow:
  - Today, you can consume: $100/$10= 10 pizzas
  - Tomorrow, you can consume $115.5/$10.50=11 pizzas
- Thus, this CD allows you to earn a pizza rate of return of (11/10)-1=10%. This 10% is called the *real rate of return*.

The Fisher equation: **(1+ nominal rate)=(1+real rate)(1+exp. inflation)**

Here: (1+0.155)=(1+0.10)(1+0.05)

- *This is frequently abbreviated as:* **Nominal rate= real rate + expected inflation rate**

Nominal rates and inflation

- Figure 5.2 of text
- 30-day T-bill rates and inflation rates have moved closely with each other

The market watches for signals

- On Aug 12, 2003 at 2:15 PM, the FOMC:
  - announced that they would lead the fed funds rate unchanged at 1%. They also pledged to keep the fed funds rate at 1% for a "considerable period“.
  - “The Committee judges that, on balance, the risk of inflation becoming undesirably low is likely to be the predominant concern for the foreseeable future”

- Market reaction
  - *“Reflecting the fixed-income market's distaste for the Fed's apparent intention of reviving inflation, the price of the benchmark 10-year Treasury fell 1 4/32 to 97 14/32, its yield rising to 4.57%, its highest level since July 18, 2002”*
  - *“Mainly overlooking the tumult in Treasuries, equity investors focused on the seemingly benign combination of an accommodative Fed, which spurred the week's biggest rally on Tuesday, and the aforementioned economic data”*

- How do we interpret such data and the consequent market reactions?

Measuring risk and return

- Forward looking measures
  - Expected return
  - Standard deviation

State	Probability	Return
Good	0.30	20%
OK	0.40	10%
Bad	0.30	-20%

  - Expected return= (0.30×20%)+(0.40×10%)+(0.30×-20%)=4%
  - Variance=$[0.30\times(0.20-0.04)^2]+[0.40\times(0.10-0.04)^2]+[0.30\times(-0.20-0.04)^2]=0.0264$
  - Standard Deviation= $\sqrt{0.0264}=16.25\%$

- *Note 1 : For computing these statistics, we need the probabilities of each state*
- *Note 2: A certain (risk-free) investment has a variance and a std. dev. of zero*

Measuring risk and return

- Historical measures
  - Average return: Arithmetic mean
  - Average return: Geometric mean
  - Standard deviation

Date	Return
1	20%
2	10%
3	-20%

  - Arithmetic return= (20%+10%-20%)/3=3.33%
  - Geometric mean= $[(1+0.20)(1+0.10)(1-0.20)]^{1/3} - 1 = 1.83\%$
  - Variance=$[(0.20-0.033)^2+(0.10-0.033)^2+(-0.20-0.033)^2]/2=0.0433$
  - Standard Deviation= $\sqrt{0.0433}$= 20.82%

- *Note: Geometric mean < Arithmetic mean always*

Risk and return: Historical record (1926-1999)

Asset Class	Geometric Mean	Arithmetic Mean	Standard Deviation
Small company stocks	12.57%	18.81%	39.68%
Large company stocks	11.14%	13.11%	20.21%
Long-term govt. bonds	5.06%	5.36%	8.12%
U.S. treasury bills	3.76%	3.82%	3.29%
Inflation	3.07%	3.17%	4.46%

- Clearly, the larger the risk, the higher the average return over the past 75 years
- The relationship between std. deviation and average return has been monotonic

- Question: Why does a *risk-free investment* (T-bills) have a standard deviation different from zero?

Big Questions in investments

- Is the US data a mere stroke of luck? In other words, is there a survivorship bias?
  - Idea of efficient markets
- Are average historical returns a good indicator of future expected returns?
  - Statistical techniques
- How are we sure that the average return is commensurate with risk?
  - Is 12.57% (18.81%) annual return adequate (fair) for 39.68% risk (standard deviation)?
  - Leads to asset pricing models (what are the sources of priced risk?)
  - *Absolute pricing* versus *relative pricing*
- Is there any value to active management of a portfolio?
  - Efficient markets strictly imply there is none