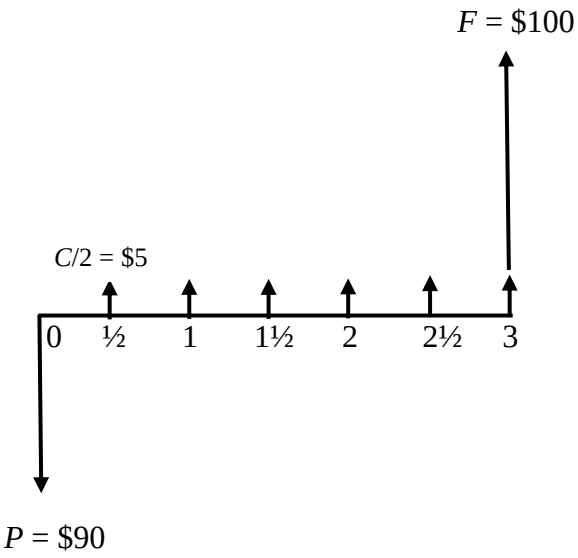
Chapter 7 Rate of Return Analysis: Single Alternative (2)

- **Bonds**
  - Bonds represent the major source that governments and companies use to obtain debt financing.
  - A bond is an obligation by the bond issuer to pay money in the future to the bond holder (buyer), in exchange for money paid now, the price of the bond.
  - A bond pays its *face value* or at its maturity date.
  - In addition, bonds usually pay periodic coupon payments, typically every 6 months.
  - The coupon amount is described in percent of face value.
  - Clearly, bonds are conventional investments.
  - For example, consider a a 10% coupon, 3-year, bond with a face value of $100, currently selling for $90
  - This bond will pay $10 coupon per year. If payment is semiannual, the coupon payment will be $5, and there will pay six of these coupons.
  - The cash flow diagram of this bond is as follows.



- A bond can be traded freely in the market place. Its price varies continuously.
- A bond's *yield to maturity* (YTM) is the interest rate at which the PV of coupon and face value payments are equal to the bond price. This is always quoted on an annual basis.
- YTM is actually the ROR of the bond quoted in nominal terms on an annual basis. (like the nominal rates in Ch. 4)
- Consider a bond with a price of P and a face value F, making m coupon payments per year of C/m, with a total of n payments. (In the example above, $n = 6$ and $m = 2$.)
- the YTM is the value of λ such that

$$P = \frac{F}{(1+\lambda/m)^n} + \sum_{k=1}^{n} \frac{C/m}{[1+(\lambda/m)]^k} .$$

- In this "price-yield" equation, the interest is compounded every coupon payment period.
- Equivalently, the price-yield equation can be written as,

$$P = F(P/F, \lambda/m, n) + (C/m)(P/A, \lambda/m, n).$$

- Upon simplification,

$$P = \frac{F}{[1+(\lambda/m)]^n} + \frac{C}{\lambda}\left(1 - \frac{1}{[1+(\lambda/m)]^n}\right).$$

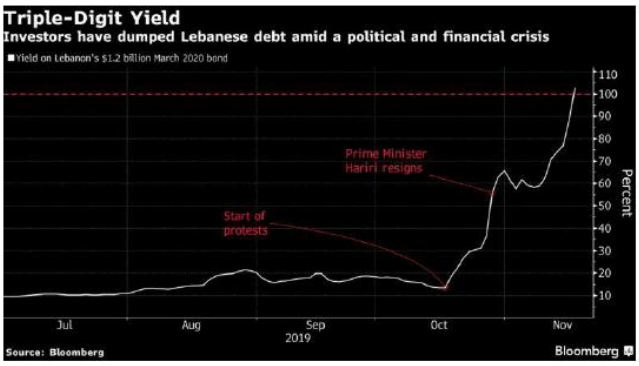
- The price-yield equation implies that the price of the bond is decreasing in its yield.
- That is, a high-yield bond will have a "low" price.
- Bond yields are quoted in the financial media.
- E.g., Lebanese treasury bills yield (source: BLOM brief & BDL)

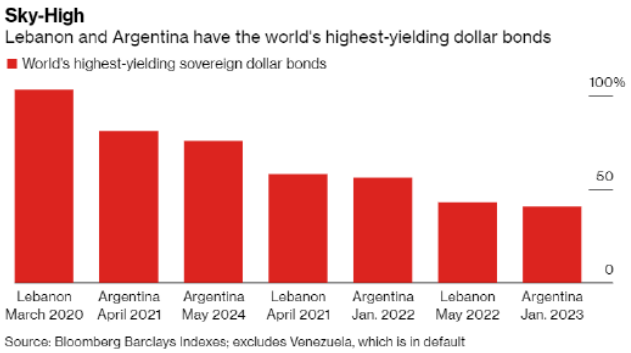
Treasury Yields

	26/09/2014	19/09/2014	Change bps
3-M TB yield	4.39%	4.39%	0
6-M TB yield	4.87%	4.87%	0
12-M TB yield	5.08%	5.08%	0
24-M TB coupon	5.84%	5.84%	0
36-M TB coupon	6.50%	6.50%	0
60-M TB coupon	6.74%	6.74%	0

Date	3 months TBs	6 months TBs	12 months TBs	24 months TBs	36 months TBs	60 months TBs
	Yield					
Latest						
23-Apr-20		4			5.50	
16-Apr-20	3.50		4.50			6.00
09-Apr-20		4		5.00		
02-Apr-20	3.50		4.50			6.00

- **Lebanese Government Bonds**
  - These are at the heart of the current economic crisis.
  - Post-war government issued bonds to borrow money to rebuild the country, in the hope of an economic rebound that never really happened.
  - Lack of real revenues and corruption pushed the government to borrow more and more, by issuing more bonds.
  - National debt in terms of GDP reached world record, and it is mainly in two forms treasury bills in LBP like the above one, and Eurobonds in dollars.
  - Main bond holders (both TBills and Eurobonds) are Lebanese banks who used depositors money to invest in high-yield government bonds.
  - Long-story short, the government could not pay back its obligations in bond, and could not borrow more (i.e. issue new bonds to pay old bonds).
  - Earlier this year, after a mini-revolution, banks run, and (justified) collapse of trust in the financial system, the government "defaulted" on Eurobond.
  - Then, came the worst economic crisis in our history …





Bank Audi

BONDS	BIDS $	OFFERS $	ISSUE DATE	ISSUE SPREAD (BP)	OFFER SPREAD (BP)	OFFER YIELD
Republic of Lebanon 8 1/4 April 2021	17.500	19.500	12 Apr 06	337		324.10%

- **Bond example**
  - What is the price of a 10% (coupon, paid semiannually), 30-year US Treasury bond with yield 4%? Assume a face value of $100.
  - In this example, F = \$100, C = 0.1×100=\$10, and λ = 4%, n = 30× 2= 60.

$$P = \frac{F}{[1+(\lambda/m)]^n} + \frac{C}{\lambda}\left(1 - \frac{1}{[1+(\lambda/m)]^n}\right)$$

$$= \frac{100}{(1+0.04/2)^{60}} + \frac{10}{0.04}\left(1 - \frac{1}{(1+0.04/2)^{60}}\right) = \$204.28$$