

Standards and annualized interest rates

266: Financial Markets and Institutions

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► Intro: Standards

- In the first lectures we emphasized that one condition for perfect competition leading to a good outcome is that there are lots of buyers and sellers trading in a **homogeneous good**
- In reality, individuals trading financial assets or any other good or service might all like something slightly different.
- In this case, there would never be lots of buyers and sellers of any particular item.

► Standardization

- But the forces of standardization are very important
- Thus, even though we might all like to trade slightly different stuff, the market provides some standard ones

Say, small, medium and large (or in modern parlance, grande, etc.)

- And we all compromise a bit in order to come closer to the case where there are lots of buyers and sellers of what is offered.

► Laws

- Many of these standards become legally enforced
- For example, the U.S. has an Office of Weights and Measures

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<http://www.nist.gov/pml/wmd/>

- And their website begins with this:

The Office of Weights and Measures promotes uniformity in U.S. weights and measures laws, regulations, and standards to achieve equity between buyers and sellers in the marketplace.

► **So too in finance.**

- There are lots of private and public sector conventions and laws about financial instruments.
- This note touches on some of these.

► **Annualized interest rates and associated conventions**

► ...

- We have stated a particular way to convert percent changes over time into annualized interest rate

(reminder: raise $1 +$ the percent change to the $1/h$ power.)

► **Other conventions**

- There are several things we could reasonably call an ‘annualized rate’ causes confusion to students
- Unscrupulous lenders also exploit this confusion in the real world.
- So we get laws about such things.

► **Wikipedia**

- The Wikipedia entry on annual percentage rate begins:

The terms annual percentage of rate (APR), nominal APR, and effective APR (EAR) describe the interest rate for a whole year (annualized), rather than just a monthly fee/rate, as applied on a loan, mortgage loan, credit card, etc. It is a finance charge expressed as an annual rate. Those terms have formal, legal definitions in some countries or legal jurisdictions. . .

► **Wikipedia**

- What they don’t emphasize is that these terms have different definitions in different jurisdictions.
- In general all these definition give about the same answer
- But when lots of money is at stake, ‘about the same’ can be enough different to really matter.

► **Laws**

- California Department of Real Estate reg. 248 requires lenders tell borrowers both ‘an annual percentage rate’ and a ‘simple annual interest rate.’

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<http://www.dre.ca.gov/pdf%5Fdocs/relaw/regs2011.pdf>

- The Federal Reserve's Regulation Z (Truth in Lending) has further requirements of this sort.
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<http://www.federalreserve.gov/bankinfo/regzcg.htm>

► Simple annual rate

- Suppose you give me \$6 and in return I say that I will pay you interest monthly at a simple annual rate of $i = 0.05$
- This means that each month, I will pay you

$$\$5 \times i/12 \approx 0.00416$$

- That is, the monthly rate times 12 gives the annual rate
- The 'compound' rate that is our benchmark in this class is,

$$(1 + 0.05)^{1/12} - 1 \approx 0.00407$$

For small interest rates, these are about the same

► Approx.

- We can relate our simple and compound rates using our trusty $\ln(1 + z) \approx z$ approximation
- If i is the annualized rate and i_{cm} is the compound monthly rate:

$$\begin{aligned} 1 + i_{cm} &= (1 + i)^{1/12} \\ \ln(1 + i_{cm}) &= \ln\left((1 + i)^{1/12}\right) \\ &= \frac{\ln(1+i)}{12} \end{aligned}$$

- Or using our approximation,

$$i_{cm} \approx i/12$$

- So our compound and simple approaches give about the same answer.

► Approximations

- These approximations hold for small i

- Even for small i , the approximation error can mean a great deal of money if the i is being applied to a very large investment amount.

► **Practical fact**

- For bonds that pay coupons multiple times a year we often state a coupon rate at a simple annual rate
- So if the bond has face = 100 and pays a coupon rate of 5 percent you would be paid

$$100 \times 0.05/2 = 2.50$$

twice each year.