Unit12.
Income, Consumption, Saving, and Borrowing

Introduction

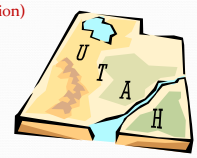
- First we will look at the current U.S. situation in household income, expenditure, saving, and borrowing.
  - Here when we talk about savings we are using this term as the opposite of consumption. Whatever you don't consume is considered saved. So this is different from the usage of the term in the unit on financial investment.

Household income over Time

- For income, we often use the median household income as a measure. Because there is a large income disparity in the U.S, mean income is very skewed.
- Patterns over time for real median household income in the U.S.:

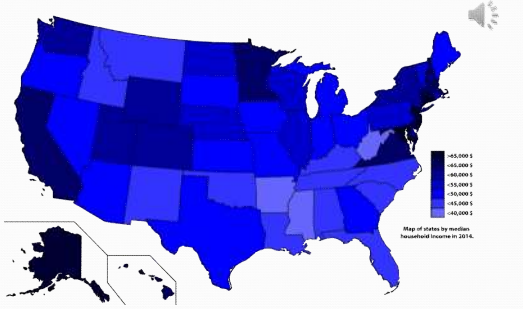
Median Household Income by State (Census)

- Most recent data (2014)
  - U.S. : $53,657
    - Utah: $ 60,922 (ranked 14th in the nation)
  - Highest and lowest
    - Maryland: $ 73,971 – highest
    - Mississippi: $ 39,680 – lowest
  - Neighboring states
    - Idaho: $ 47,861 (38th)
    - Colorado: $61,303(13th)
    - Nevada: $51,450 (28th)



- **http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_1YR_R1901.US01PRF&prodType=table**

Map of States by Median Household Income in 2014



Author: Ali Zifan using Census data. Graph at https://upload.wikimedia.org/wikipedia/commons/7/74/Map_of_states_by_median_household_income_in_2014.svg

Income by Age: Median household income in 2014 (Census data)

Column →	United States
Total:	$53,657
Householder under 25 years	$27,047
Householder 25 to 44 years	$58,970
Householder 45 to 64 years	$65,018
Householder 65 years and over	$39,186

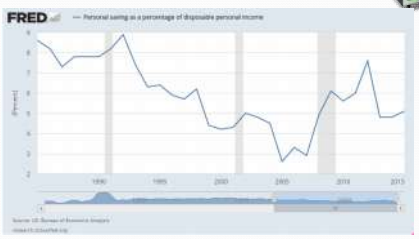
- Note the pattern of income over life-span. Income is low at young age, increases and reaches peak in middle age, and decreases after retirement.

Expenditure Data (2013) from Consumer Expenditure Survey (BLS)

Item	Expenditure ($)	Budget share
Average annual expenditures	$51,100	
Food	$6,602	12.9%
Housing	$17,148	33.6%
Apparel and services	$1,604	3.1%
Transportation	$9,004	17.6%
Health care	$3,631	7.1%
Entertainment	$2,481	4.9%
Education	$1,138	2.2%
Insurance and pension	$5,528	10.8%
All others	$3,964	7.8%

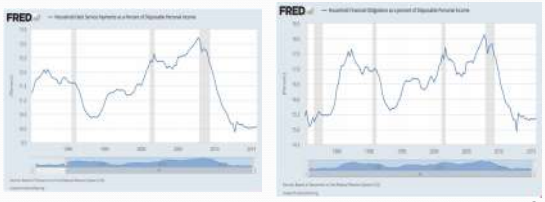
Savings Data

- Personal saving as a percentage of personal disposable income by year
  - 1990: 6.5%, 2000: 2.9%, 2005: 1.4%
  - 2010: 5.8%, 2015: 5.1%



Borrowing Data

- Household debt service ratio is an estimate of the ratio of debt payments to disposable personal income. Debt payments consist of the estimated required payments on outstanding mortgage and consumer debt.
  - Selected years: 1990: 12.03%, 2000: 12.59%, 2005: 13.77%, 2010: 11.75%, 2015: 10.07%
- The financial obligations ratio adds automobile lease payments, rental payments on tenant-occupied property, homeowners' insurance, and property tax payments to the debt service ratio.
  - Selected years: 1990: 17.46%, 2000: 17.66%, 2005: 18.46%, 2010: 18.64%, 2015: 15.38%



Explaining the Relationship between Consumption and Saving

- Over time economists have developed several theories trying to explain how people make decisions about consumption vs. saving.
- Among them, the life-cycle saving's hypothesis and its improved forms such as the behavioral life-cycle saving's hypothesis are most popular.

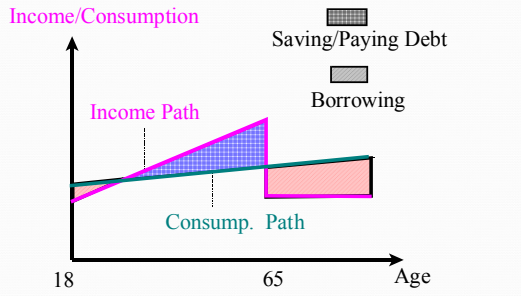
Life-Cycle Saving's Hypothesis

- In the 1950s, Franco Modigliani and Milton Friedman independently developed what became known as the life-cycle saving's hypothesis.
- The idea is that people borrow and save in order to smooth out their consumption over lifespan.

Life-Cycle Saving's Hypothesis

- A typical income path over life time
  - low income at young age --> increasing --> decrease after retirement
- A desirable consumption path
  - To maximize life time satisfaction, a consumer would want to have a smooth path of consumption over their life cycle.
- To achieve a smooth path of consumption, consumers may rationally use the tool of credit and saving
  - Young age: low income, expect higher future income -> Borrow
  - Middle age: high income, expect lower income after retirement -> Pay debt, save for retirement
  - Old age: low income -> Use retirement savings

Life-Cycle Saving's Hypothesis



Behavioral Life-Cycle Saving's Hypothesis

- Over the years scholars have added to that idea, mostly noticeably behavioral life-cycle models, which states that people mentally separate income from different sources and spend them at different rates.
- As such the saving and consumption patterns are not as simple as the original life-cycle saving's hypothesis would predict.

Additional Issues of Income

- Is income given or can you do something about it?
  - Yes you can.
  - Education, choice of work hours, balance between family and work. These all affect your income.
- What are the most important determinants of income?
  - As we covered in Unito9: human capital and number of hours one works are the main factors.

Additional Issues of Consumption

- What are necessity goods?
  - When income increases, people spend less of a budget share on these goods
  - Example: Food at home is a necessity.
- What are luxury goods?
  - When income increases, people spend more of a budget share on these goods
  - Example: heated towels, luxury cars
- What are status goods?
  - Goods that convey status – visible to others or easily talked about in social conversations (they also have utilitarian functions)
  - Example: Sunroof, designer clothing, vacations.

Additional Issues of Saving

- There are many reasons for saving, but the main ones are:
  - Retirement
  - Purchase of big-ticket items
  - Special expenses (vacation, wedding, education, etc.)
  - Prepare for unforeseen emergencies like illness and job loss
- In the next several slides we will focus on the decision of saving for retirement.

How to Do Retirement Planning?

- Step 1. Determine the annual consumption level you want when you retire – be sure to adjust for inflation
- Step 2. Determine how much annual income you will have in retirement from Social Security and/or pension
- Step 3. Determine the gap between what you need and what SS provides – this is the amount you will need to get from your own retirement saving
- Step 4. Determine the retirement saving amount (nest egg) you need in order to generate that annual income.
- Step 5. Determine how much to save each year in order to have that nest egg

An Example of Retirement Planning

- You are currently 22, and you plan to retire at 67 (eligible for full Social Security benefits)
- You start working at 22 after college. Your income will be $30,000 when you first start working. Income will increase at the average rate of wage increase.
- Assume Annual inflation rate = 4%

An Example of Retirement Planning

- Step 1. You need to know how much annual consumption you want to have after retirement. Often you can use your current consumption level as a reference point and adjust it as needed. Typically housing expenditure probably will go down, but medical expenditure will go up.
- In this example suppose you want a consumption level in retirement that is similar to $30,000 can provide today.
- Then you need to adjust for inflation. Assume 4% inflation rate per year, then

  Retirement need per year =30,000*(1+4%)^45=175,235
  - It may look shocking but at 4% inflation rate, you will need $175,235 after 45 years (45=67-22) to get the same standard of living you have today for $30,000.

- Step 2. Go to Social Security Website at http://www.ssa.gov/planners/calculators.htm to estimate your social security benefits when you retire
  - Suppose you find out that you will have about $72,000 (6,000 per month) in inflated value, or $12,000 (1,000 per month) in current value.
  - If you have pension, add it to Social Security as well. Suppose in this case you do not have pension

- Step 3. You need to have $ 175,235 per year for retirement. But Social Security + Pension will only give you $72,000 per year. You have a gap to fill:
- Gap = 175,235 – 72,000 = 103,235

- Step 4. Suppose your life expectancy is 82. You can purchase annuity that will pay you $103,235 per year to fill the gap.
- Most annuities act like insurance: Even if you outlive the average life expectancy you still get paid.
- How much of a nest egg do you need in order to generate an income of $103,235 per year with a 6% annuity interest rate? Remember annuity computation we did in Unit04 (Use EOM formula).
  - Nest egg = 103,235*PVFS(n=15, r=6%)
    = 103,235*9.712249=1,002,644
  - Note n=82-67=15, r=6% is the annuity interest rate

- I know this looks quite scary – you need about a million dollars by the time you retire in order to keep a $30,000 / year current standard of living.
- Don't worry. If you start saving early, it is not too bad ….

- Step 5. Figure out a saving plan – recall saving plan computation in Unito4 (Use EOM formula).
  - If you start saving now at age 22, with 6% interest rate, how much do you need to save each year?
    - Saving per year = 1,002,644/FVFS(n=45, r=6%)
      =1,002,644/212.743514=4,713
  - What if you start at the age of 35?
    - Saving per year = 1,002,644/FVFS(n=32, r=6%)
      =1,002,644/90.889778=11,031
  - What if you start at the age of 45?
    - Saving per year = 1,002,644/FVFS(n=22, r=6%)
      =1,002,644/43.392290=23,107

- Note the big difference between starting to save early and starting to save later. Why? – That is the power of compounding.
- This is a very simplified situation. The real planning has to take tax into consideration. But you get the conceptual idea here.

Additional Issues of Borrowing

- Different types of consumer credit loans
  - Close-ended - Credit that must be repaid in a specific term.
    - Examples: mortgage loan, car loan.
  - Open-ended - Loans that do not have to be repaid in a specific term.
    - Examples: credit card loans, charge card loans
    - Related term: Monthly minimum payment - open-ended loan often have monthly minimum payments so the debt does not go forever unpaid.

Compare Consumer Loans

- We use something called Annual Percentage Rate (APR) to compare loans of different terms and different up-front fees.
  - APR includes costs other than interest payment as a cost of the loan, such as up-front fees.
  - The Consumer Credit Protection Act of 1968 requires that lenders follow specified procedures in calculating the APR and presenting it to consumers.
- What if rebates, variable interest rates, and other complicated terms are involved? How do we compare loans then?
  - In complicated situations, convert everything to present value.

APR for Close-Ended Loans

- Example: Loan=2,000, up-front loan fee =100, n=12 months, r=12%
  - Monthly payment = 2000 / PVFS (n=12, monthly r=1%)
    = 2000 / 11.255078 = 177.70
  - Given the up-front cost, you only borrowed $1,900 instead of $2,000 (because you paid $100 to borrow $2000)
  - APR calculation
    - 177.70 = 1900 / PVFS (n=12, rm=APR)
    - Solve using numerical methods
    - APR = 21.6%
    - I will not ask you to do an exact computation of APR due to the need of using numerical methods. However, I will ask you to set up the problem.

APR for Open-Ended Loans

- APR varies depending on the borrowing pattern and whether there is any cash advance and/or annual fee charge
  - If there is no cash advance or annual fee, then the annual APR is just the annual interest rate.
  - Usually daily APR and average daily balance are used for interest charge computation

Comparing Loans in Complicated Situations

- Convert all future payments into PV.
- We did this comparison in Unit 04 when we compared different car loans. Here is another example:
  - Loan 1: Loan = $10,000, APR=3%, Term=12 months
  - Loan 2: $1000 rebate (Loan=$9,000), APR=10%, Term=18 months
  - Personal discount rate=8%

Comparing Loans in Complicated Situations

- Loan 1:
  - Monthly payment = 10000/PVFS (n=12, rm=0.03/12) = 10000/11.807254 = $846.94 (actual interest rate used)
  - PV = 846.94 * PVFS (n=12, rm=0.08/12) = 846.94 * 11.495782 = $9736.23 (discount rate used)
- Loan 2:
  - Monthly payment = 9000/PVFS (n=18, rm=0.1/12) = 9000/16.650826 = $540.51 (actual interest rate used)
  - PV = 540.51 * PVFS (n=18, rm=0.08/12) = 540.51 * 16.908944 = $9139.45 (discount rate used)
- Loan 2 is a better deal because it has a lower PV.

What are credit scores?

- Most people in the US have credit scores.
  - The most widely used credit scores are FICO scores, created by Fair Isaac Corporation (FICO).
  - FICO scores are calculated based solely on information on consumer credit reports maintained at the credit reporting agencies: Experian, TransUnion, and Equifax.
  - Your FICO scores consider: current amounts owed, new credit, payment history, and credit mix.
  - Base FICO scores have a 300-850 score range. The higher, the better. Better scores mean that you can get lower interest rate when you apply for a loan.
- You are entitled to a free credit report from each of the three credit reporting agencies once every 12 months at this website https://www.annualcreditreport.com/index.action.
- You should check once in a while to make sure your credit information is accurate.

How Much Credit is Too Much?

- No theoretically plausible rule
- Financial planners use 20% as a warning signal
  - If your credit payment (excluding mortgage) exceeds 20% of your after-tax income, you are in trouble
- Other factors to consider: individual differences, different stages of life cycle.

Last Resort if You are Over-Extended? - Bankruptcy

- There are two forms of personal bankruptcy:
  - Chapter 7: straight bankruptcy
  - Chapter 13: wage earner plan

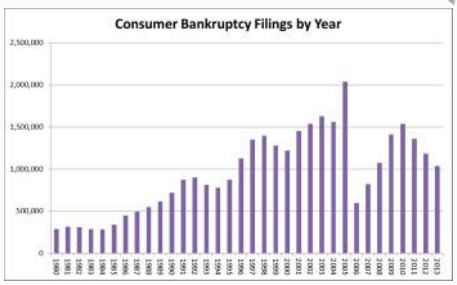
Chapter 7 Straight Bankruptcy

- Primary form of bankruptcy.
- Discharges all debts and provides a fresh start.
- Homeowner's equity and some personal assets may be partially protected.
- Cannot file again for 6 years.
- Record remains on credit report for 10 years.

Chapter 13 Wage Earner Plan

- Repayment schedule established by court.
- Debtor may retain property.
- Lenders receive partial or total repayment over 3-5 year period.
- Remains on credit report for 7 years.

Bankruptcy Trends



Data from American Bankruptcy Institute: www.abi.org