Topics in applied Economics and Finance

Lecture 1

What is Household Finance About

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EIEF
Who am I

- Luigi Guiso
- Professor of economics
- Research interests:
  - Household financial decisions
  - Banking
  - Financial institutions
  - Firms decisions
  - Culture and economics

- Email: luigi.guiso@eief.it

- On course web page=> find course slides
Course details: 1

- Meet normally on (but many jumps):
  - Monday
  - Tuesday
  - Wednesday from 11 AM to 1 PM
  There are exceptions

- Course has no textbook

- It is based on
  - A reference chapter: *Household Finance. An Emerging Field*, with Paolo Sodini (Stockholm University)
    - My lecture notes
  - Articles from the reading list

- Lecture notes will be available on the web page
- You are required to download and print it
Performance evaluation:

- An outline of a research project related to any one of the topics discussed in the course
- No final exam

Final grade will be based on:

- Quality of the idea
- The evidence if any is provided
Research outlines

- Research Outline:
  - A clear question and a motivation for asking it
  - How you are going to execute/test it
  - Up to 6-7 pages (but 3-5 is fine)
  - Some evidence, either descriptive or regression-based or in alternative a clear description of the data you plan to collect and how you are going to use them (problem may emerge and how you will be dealing with them)
  - Return within 20 days after end of course
What is this course about

1. Household Finances
   - Households make various decisions
   - How much to consume
   - How much to work
   - How much to invest in education
   - Whether and when to buy a house
   - To achieve their objectives households rely on financial markets
     - How do households use financial markets to make their decisions?
Financial markets can be used to

- Decide **how to save one's wealth**: that is to choose *how* to transfer resources from the present to the future => portfolio choice
- Decide whether and how much **debt to raise**: that is the media to get resources now from the future => debt choice
- Provide **insurance** against some risk => insurance demand and risk management
- How to settle **transactions** => liquidity management
Our definition of household finances

“HF is about the use of financial markets by households to attain their objectives (Campbell 2005)”

- Is analogous to Corporate Finance which deals with firms reliance on financial markets to attain their objectives
  - Finance investment
  - Constrain managers discretion by appropriate choice of capital structure (resolve agency problems)
  - Manage liquidity etc.
Specificities..

- Household financial problems raise specific issues:
  - Households usually plan over very long horizons, i.e. over their life cycles
  - They have lots of non traded assets – in particular human capital - that interfere and constrain their financial choices
  - Main source of income – labor income - is typically non-insurable
  - They hold illiquid assets (housing)
  - They face constraints in their ability to borrow
  - Many have limited knowledge of finance and many have no knowledge at all
How good are households at making financial decisions?

- **Two approaches**
  - **Normative:** deals with how households should behave and make financial decisions
  - **Positive:** deals with how households actually behave and make financial decisions
  - They are not mutually exclusive/alternative
  - Comparison between the two gives a hint on how good are households at using financial markets (or on how good financial markets are at serving households needs)
A challenge

- Existence of a gap between normative and positive behavior poses a challenge
  - If households do not (as we will see they do not) behave as normative theories predict why is it so?
Two approaches

● Behavioral theories:
  ● Abandon "rationality" (on which normative models are based) and rely on behavioral models that may describe better actual if not optimal behavior

● Limited knowledge approach
  ● Maintain rationality but allow for the possibility that households can deviate from optimal behavior because they can make mistakes=> if properly “educated”, mistakes could disappear and normative and positive behavior would coincide
Plan of this course

- Lec. 1: Facts about households financial decisions
- Lec. 2: Normative theory: portfolio choice
- Lec. 3: Measuring risk aversion
- Lec. 4: The stockholding puzzle
- Lec. 5: Topics: the portfolio of the rich, financial information and portfolio decisions, cognitive ability and (a bit of) behavioral finance
- Lec. 6: Trust and financial decisions
- Lec. 7: Dynamic portfolio decisions: life cycle
- Lec. 8: Trading and rebalancing
- Lec. 9: Raising debt and default
- Lec. 10: cash management and insurance
Definitions and preliminaries

What are capital markets and what are they for?
What are capital markets?

- *Real assets* (investments) require an input of resources today and deliver an output of resources later.
- *Financial assets* (investments) are claims to the output produced by real assets.
- *Capital markets* (financial markets) are the markets in which financial assets are traded.
- *Time and uncertainty* are crucial!
Classifying financial assets

- **Fixed-income securities** promise to make fixed payments in the future.
  - bills (short-term), bonds (longer-term)
- **Equities** (stocks) are claims to a share of the profit of a corporation.
- **Derivative securities** (derivatives) make payments that depend on the prices of other financial assets.
  - futures, swaps, options
Classifying financial assets

- Options
- Bills (money market)
- Stocks
- Bonds

Uncertainty of payoff vs. Time to payoff

1 year
What are financial markets for?

- **Shift the timing of consumption** so it need not coincide with the timing of income
- **Allocate risk** (e.g. share it among many people, or transfer it to those who are most willing to bear it)
- **Allocate resources** to most productive real investments (e.g. by separating the ownership and management of companies)
- **Aggregate the information** of market participants, thereby revealing it to others through prices
A Sketch of the financial system

**Suppliers of capital**
- Households
- Firms with cash

**Markets**
- Bond market
- Equity market
- Asset backed securities
- Derivatives

**Intermediaries**
- commercial banks
- pension funds
- Venture capital funds
- Mutual funds
- Insurance companies

**Users of capital**
- Firms that invest
- Government
- Household that buy a house
Our task

- We will be mostly concerned with **Households** as *suppliers* of funds and *users* or financial instruments=> this is HF
- Corporate finance=> **firms** demands and supplies of funds
- **Banking**=> theory of financial intermediation
  - Why do banks exists, what is their role
- **Contract theory**=> relation between investors (e.g. households) and intermediaries or users of funds
Household Finances: facts & definitions
Features of household financial choices

There are a number of important questions we want to ask:

1. Who owns the wealth?
2. How do households allocate their wealth among different assets?
3. How does the financial portfolio of the average household looks like?
4. Which financial instruments they invest in?
5. How clever are households at making their financial choices?
What Types of Wealth?

Three components of total wealth: $W$

1. **Human wealth** = $H$: is the present discounted value of the net labor income an investor expects to earn over his life cycle

$$H = \sum_{a = a_0}^{T} \beta^{a - a_0} y_a$$

2. **Financial wealth** = $F$: the market value of financial assets (net of financial debt): safe assets + risky assets – financial debt

3. **Real wealth** = $R$: the market value of real assets: housing wealth + land + own business wealth
Human wealth: $H$

Is equal to

$$H = \sum_{a=a_0}^{T} \beta^{a-a_0} y_a$$

where:
- $\alpha = \text{investor’s age}$
- $0 < \beta < 1 = \text{discount factor}$
- $y = \text{labor income}$
Human wealth

Features:

- **is non-marketable**: with a few exceptions, cannot be sold in a market (slavery is an exception, soccer players another) => hard to measure
- Can be accumulated only by investing in training or education, hence slowly; but cannot be liquidated
- **Is risky**, because wages and earnings may vary and because of unemployment; human capital risk depends on the type of occupation
- May co-vary with the stock market especially at low frequency
- Its return is non-insurable => acts as a background risk
- Its value evolves over the life cycle: high when young, low when old
- For many, especially the poor, it is the main component of their total wealth
Example of human wealth over the life cycle

- Annual earnings = Euro 30,000
- Earnings are constant over the life cycle
- No discounting (beta=1)
- Retirement age = 65
More realistic picture

Earnings age profile

Human wealth age profile

Age groups of five years

1992 US dollars

No high school
High school
College degree
Non-Human Wealth: financial assets

Financial wealth includes several assets which differ in terms of riskiness and return:

- bank accounts
- postal deposits
- short term T-bills  
  \{ low but safe nominal return \}

- Medium and long term t-bills
- Foreign currency denominated t-bills  
  \{ riskier but higher return \}

- Corporate bonds
- Foreign currency denominated bonds  
  \{ higher risk but higher return \}

- Stocks
- Stock mutual funds  
  \{ risky but high return \}
- Derivatives
Non-Human Wealth: financial assets

Features of financial assets

- Are **highly liquid**: can be easily traded in highly developed markets

- **Degree of liquidity differs** => currency and deposits are extremely liquid; some type of bonds are less liquid, but normally can be sold or bought within a short lapse of time

- **Number of financial assets is very large** and increasing due to financial innovation:
  - Many types of stocks, one for each listed firm
  - Many types of mutual funds, differ in the way stocks/bonds are combined
  - Many types of corporate bonds, one for each issuer

- **Information on assets performance** available publicly and “easily”

- **Differ in difficulty**: features of returns structure of some financial assets are not easy to grasp and understand for many investors: checking accounts are easy, stocks are difficult
Non-Human Wealth: real assets

- Housing
- Land and other properties
- Durable goods
- Valuables (paintings, jewelry, gold etc.)
- Business wealth

Features:

- **Involve high trading costs:**
  - buying a house involves search costs, intermediation costs, taxes, investigation and information costs, legal costs (notary fees)
- **Are relatively illiquid** or have high costs of liquidation (Housing and business wealth is costly to sell due to specificity, durables because of lemons problems)
- **Return is often not only monetary:**
  - Housing and durables provide consumption and utility services
  - Business wealth may have a utility return (pride of ownership, power)
Human and non-human wealth over the life cycle

- Human wealth
  - Accumulation of assets before retirement
  - Dissaving of assets after retirement

- Non-human wealth
  - Dissaving of assets after retirement

Starting working age | Retirement | Death
Who Owns the Wealth?

Figure 1: The US Wealth Distribution

Mean Assets ($) vs. Percentile of distribution of total assets

- **Total Assets**
- **Financial Assets**
- **Net Worth**
Who owns the wealth?

1. Wealth ownership in very highly concentrate

- The top 10% of the population owns most of the assets. Average holdings >$ 1,000,000
- The richest 10% own about 50% of total assets
- The value of assets for the 10% poorest at the bottom is less than $10,000
How is wealth allocated to assets?

- The large chunk of non-human wealth are real assets

Source: Giuso & Jappelli, The portfolio of Italian Households, 2002

[Bar chart showing the composition of total assets among Italian Households]
How is wealth allocated to assets?

- Housing is the largest component of real assets

Source: Guiso & Jappelli, The portfolio of Italian Households, 2002

<table>
<thead>
<tr>
<th></th>
<th>1989</th>
<th>1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-financial assets</td>
<td>84.49</td>
<td>85.41</td>
</tr>
<tr>
<td>Primary residence</td>
<td>36.03</td>
<td>48.84</td>
</tr>
<tr>
<td>Investment real estate</td>
<td>25.80</td>
<td>16.97</td>
</tr>
<tr>
<td>Business</td>
<td>7.28</td>
<td>8.95</td>
</tr>
<tr>
<td>Stock of durable goods</td>
<td>12.82</td>
<td>8.87</td>
</tr>
<tr>
<td>Other non-financial assets</td>
<td>2.55</td>
<td>1.77</td>
</tr>
</tbody>
</table>
But with differences across wealth deciles
How does the financial portfolio of the average household looks like?

- Liquid and safe assets dominate the financial portfolio

Source: Guiso & Jappelli, The portfolio of Italian Households, 2002

<table>
<thead>
<tr>
<th>Financial assets</th>
<th>1989</th>
<th>1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currency</td>
<td>2.95</td>
<td>1.41</td>
</tr>
<tr>
<td>Transaction and savings accounts</td>
<td>50.15</td>
<td>38.08</td>
</tr>
<tr>
<td>Certificates of deposits</td>
<td>2.48</td>
<td>2.15</td>
</tr>
<tr>
<td>Short term gov. bonds (T-bills)</td>
<td>27.80</td>
<td>9.70</td>
</tr>
<tr>
<td>Long-term gov. bonds and other bonds</td>
<td>3.50</td>
<td>7.84</td>
</tr>
<tr>
<td>Stocks</td>
<td>2.78</td>
<td>7.45</td>
</tr>
<tr>
<td>Mutual funds and managed investment accounts</td>
<td>3.36</td>
<td>19.47</td>
</tr>
<tr>
<td>Defined-contribution pension funds</td>
<td>2.27</td>
<td>3.49</td>
</tr>
<tr>
<td>Cash value of life insurance</td>
<td>4.69</td>
<td>10.4</td>
</tr>
</tbody>
</table>

| Clearly safe financial assets                 | 55.59| 41.64|
| Fairly safe financial assets                 | 32.49| 20.11|
| Risky financial assets                       | 11.91| 38.25|
The portfolio of the rich differs from that of the poor

Figure 3: Asset Class Shares in Household Portfolios

The Poor:
- cash and cars

The Rich:
- Equity
- Business
- real estate
Which financial instruments they invest in?

- Not all households invest in the whole spectrum of assets
- Some households have no real estate or housing wealth
- Most (all) have cash
- But only a fraction has bonds and even fewer invest in stocks
- In general there is **limited participation** to financial markets
- One of our tasks will be to argue that this is a puzzle and try to explain how the puzzle can be explained

**Definition:** Participation rate = fraction of investors in a population who invest in a given asset (or asset class, e.g. stocks)
Participation rates in financial assets by wealth deciles

Figure 2: Participation Rates by Asset Class

- **safe assets**
- **real estate**
- **private business**
- **vehicles**
- **public equity**
Who participates in what?

- The rich participate in all asset classes, hence participation is increasing in wealth for all asset classes.
- The very poor only participate in safe assets.
- An 80% participation rate in safe assets and cars is achieved for wealth levels at about the 10th percentile of the distribution.
- For housing, the 80% participation requires wealth at around the 40th percentile and for public equity at above the 80th percentile.
- Only the rich participate significantly in private business.
How clever are households in managing their financial choices?

- Financial/investment decisions require a lot of information and ability to process it. How clever are households?
- Evidence that they have
  - Limited information about available assets
  - Limited ability/knowledge to make financial choices

=> Can make serious mistakes (examples abound from recent scandals)
Households assets knowledge

- Almost all know the existence of simple assets such as checking accounts.
- Many ignore the existence of more sophisticated assets.
- 1/3 is not aware of the existence of stocks.

<table>
<thead>
<tr>
<th>Financial asset</th>
<th>Proportion of individuals aware of the asset (1998), SHIW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1998</td>
</tr>
<tr>
<td>Checking accounts</td>
<td>93.3</td>
</tr>
<tr>
<td>Saving accounts</td>
<td>88.6</td>
</tr>
<tr>
<td>Postal accounts</td>
<td>82.7</td>
</tr>
<tr>
<td>Certificates of deposit</td>
<td>61.8</td>
</tr>
<tr>
<td>Government bonds: BOT</td>
<td>86.3</td>
</tr>
<tr>
<td>Government bonds: CCT</td>
<td>73.7</td>
</tr>
<tr>
<td>Government bonds: BTP</td>
<td>54.5</td>
</tr>
<tr>
<td>Government bonds: CTZ</td>
<td>30.3</td>
</tr>
<tr>
<td>Postal bonds</td>
<td>76.8</td>
</tr>
<tr>
<td>Corporate bonds</td>
<td>55.8</td>
</tr>
<tr>
<td>Mutual funds</td>
<td>55.5</td>
</tr>
<tr>
<td>Investment accounts</td>
<td>37.1</td>
</tr>
<tr>
<td>Stocks</td>
<td>63.7</td>
</tr>
</tbody>
</table>
In most countries households have limited economic literacy

<table>
<thead>
<tr>
<th>Country</th>
<th>Economic literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>4.64</td>
</tr>
<tr>
<td>Germany</td>
<td>5.11</td>
</tr>
<tr>
<td>Italy</td>
<td>3.98</td>
</tr>
<tr>
<td>Netherlands</td>
<td>7.21</td>
</tr>
<tr>
<td>Sweden</td>
<td>7.21</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>4.44</td>
</tr>
<tr>
<td>United States</td>
<td>6.35</td>
</tr>
</tbody>
</table>

Example 1: Ability to make calculations

“Suppose you have EUR 100 in a checking account and that annual interest rate is 2%. How much will you have accumulated in your account after 5 years?

i) More than 102;
ii) Exactly 102;
iii) Less than 102;

More than half gives a wrong answer
Example 2. **Yield on a mutual fund**

This figure shows the value of two mutual funds over the past 4 years. In your view, which fund has produced the highest yield over the period under consideration? A) Fund 1; B) Fund 2; C) equivalent; D) I do not know

Valore di mercato

FONDO COMUNE 1

FONDO COMUNE 2

One fourth provides the correct answer
Example 3: **Compound interest**

Suppose you have an outstanding debt of EUR 1,000 on your credit card. Interest rate is 20% annual and is compounded. If you do not repay any debt how many years does it take for the debt to double?

- 2 years
- Less than 5 years
- Between 5 and 10 years
- More than 10 years

Only 36% gives the correct answer, 32% overstates it
Combining answers to 8 similar questions in a single index : Guiso & Jappelli

- 8 tests
- 55% get at best 3 right
- Almost none guesses all 8
- Mean is 40% right
- => strong evidence of lack of financial knowledge
- Correlated with education and wealth
- Lower for women, young boys and the elderly
Summary thus far

- The single most important feature is the **heterogeneity** that characterizes households' investments.
- Households differ a lot in the **ownership** of specific financial assets.
- Hold very **different portfolios**.
- Differ **greatly in their assets knowledge and financial education**.
Assets Returns and Volatility
Defining assets returns and volatility

- Assets differ in how much they yield and how risky is the investment, i.e. how sure is that it delivers the promised or expected yield.

- Look at three financial instruments:
  - T-bills
  - T-Bonds
  - Stocks
Defining returns:1

- Return is how well a security performs over a certain time horizon

Let:

\( P(t) \) = price today of the security

\( P(t+1) \) = price tomorrow (say in one year if we are measuring annual returns) for the security

\( d(t) \) = cash flow paid by the security over the year (dividend if a stock, coupon if the security is a coupon bond)
Defining returns: 2

**Gross return** =

\[ R_t = \frac{d_t + P_{t+1}}{P_t} \]

*Example:* buy a share at \( t \) worth \( P(t) = \) EUR 200, at the end of the year it is worth \( P(t+1) = \) EURO 250 and pays a dividend EUR 10 => \( R(t) = \frac{10+250}{200} = \frac{260}{200} = 1.3 \)

We often work with net returns

**net return** =

\[ r_t = R_t - 1 = \frac{d_t + P_{t+1}}{P_t} - 1 \]

In our example \( r(t) = 1.3 - 1 = 0.3 \) or 30%
Return components: 1

\[ \text{net return} = r_t = \frac{d_t}{P_t} + \frac{P_{t+1} - P_t}{P_t} = \]

= income yield + capital gain/loss

**Income yield**: \( d(t)/P(t) \): is the cash payout received by the investor over the relevant horizon

**Capital gain**: \( P(t+1)-P(t)/P(t) \): change in the security market price

In our example return is 2.5% income yield and 27.5% capital gain
What is known in advance depends on the type of security

1. **T-bills**
   1. \( d = 0 \) (no coupon)
   2. \( P(t+1) \) known if \( t+1 \) is the maturity date, otherwise is unknown

2. **T-bonds**
   1. \( d = \) coupon payment, known from contract
   2. \( P(t+1) \) known if \( t+1 \) is the maturity date, otherwise is unknown

3. **Stocks**
   1. \( d = \) dividend, unknown
   2. \( P(t+1) \) unknown
Expected and realized returns

At the start of period some variables may not be known so that we can only compute expected returns

\[ E(r_t) = E\left( \frac{d_t}{P_t} + \frac{P_{t+1} - P_t}{P_t} \right) \]

1. At the end of period (ex post) we can compute the realized return

\[ r_t = \frac{d_t}{P_t} + \frac{P_{t+1} - P_t}{P_t} \]

2. Watch! The two may be very different
Returns volatility

- Risk is uncertainty about the future
- While stocks may do better in almost all years, in any one year they can do much worse than bonds => stock returns are volatile, i.e. they are risky
- One common way to measure volatility is with the standard deviation of return
- If \( r_1, r_2, \ldots r_T \) are yearly returns, first compute the sample variance
  \[
  \sigma^2 = \sum_i (r_i - \overline{r})^2
  \]
  using the sample means of the returns
  \[
  \overline{r} = \frac{1}{T} \sum_i r_i
  \]
  and the sample standard deviation is just
  \[
  \hat{\sigma} = \sqrt{\sigma^2}
  \]
To make financial decisions, one needs some information on the returns (and volatility) of the various assets.

Where do we get them from?
A statistical view of financial history
Frequency and probability

- If we repeat an experiment, the frequency of an event is the fraction of times it occurs.
- As we increase the number of experiments, the frequency of an event approaches its probability.
- A probability distribution is the set of possible outcomes along with their associated probabilities.
- A histogram shows events on the horizontal axis, and the frequency or probabilities on the vertical axis.
Economists (and practitioners) view of history

- Economists view history as a sequence of experiments.
- Historical evidence gives us frequencies which tell us about event probabilities.
- Very different from the narrative approach to history.
- **Danger**: we cannot assume that probabilities always equal frequencies. Things can happen that haven’t yet happened =>
  - critical to understand this financial crisis (a drop in house prices was granted 0 probability as no such a thing was ever observed in the post WWII US time series)
Return frequencies: T-bills

1 month T-bills: Real return 1926 - 2002
Return frequencies: 10 year-bond

10-year bond: Real return, 1926-2002

Number of Years

Return (%)
Return frequencies: stocks

S&P500: Real return, 1926-2001
Stocks, bonds and bills

- It appears that stocks are more volatile than bonds, which are more volatile than bills.
- It also appears that stocks returns are higher on average than bonds returns which have on average higher returns than bills.
- This all seems sensible until we look at another assets …
Return frequencies: gold

Gold: Real return, 1926 - 2002

Number of years

Return (%)
Stocks, Bonds, Bills and Gold

Gold has a lower return than bonds and higher volatility! Should one invest in gold?

<table>
<thead>
<tr>
<th>REAL RETURN</th>
<th>Gold</th>
<th>T-bills</th>
<th>10-yr bonds</th>
<th>S&amp;P 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arithmetic mean</td>
<td>1.0214</td>
<td>1.0064</td>
<td>1.0264</td>
<td>1.0959</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>0.1959</td>
<td>0.0398</td>
<td>0.0934</td>
<td>0.2151</td>
</tr>
<tr>
<td>Geometric mean</td>
<td>1.0059</td>
<td>1.0056</td>
<td>1.0223</td>
<td>1.0746</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IN PERCENT UNITS</th>
<th>Gold</th>
<th>T-bills</th>
<th>10-yr bonds</th>
<th>S&amp;P 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arithmetic mean</td>
<td>2.14%</td>
<td>0.64%</td>
<td>2.64%</td>
<td>9.59%</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>19.59%</td>
<td>3.98%</td>
<td>9.34%</td>
<td>21.51%</td>
</tr>
<tr>
<td>Geometric mean</td>
<td>0.59%</td>
<td>0.56%</td>
<td>2.23%</td>
<td>7.46%</td>
</tr>
</tbody>
</table>
Stocks, Bonds, Bills and Gold

Gold returns co-vary negatively with stock returns=> provide insurance
Investors behave in a very heterogeneous way

Assets differ greatly in their characteristics.
- Degree of liquidity
- Return
- Riskiness

Riskier assets tend to have higher returns but not always

Next time: how should investors make their portfolio decisions? Take a normative approach