Lecture 1: Intro

Wednesday, January 18, 2023 2:37 PM

1-intro

QTM 385 Quantitative Finance

Lecture 1: The investment environments

Instructor: Ruoxuan Xiong

Suggested reading: Investments Ch 1

Questions from Google form

- Question: Is there a weekly schedule for this course? Like what are we going to learn during each lecture.
- Answer: Tentative schedule is available here. Link is also available on Canvas
- Question: Will you be posting recordings of the lectures online?
- Answer: The recordings are available at the Panopto tab on Canvas

Real assets vs financial assets

- **Real assets**: land, buildings, machines, and knowledge that can be used to produce goods and services
- **Financial assets**: stocks, bonds, derivatives, and other claims to the income generated by real assets

Real assets can be tangible or not tangible
Tangible: land, buildings houses
Not tangible: knowledge and patents

Real and financial assets to the economy

- **Real assets**
  - Determine the productive capacity of the economy
  - Generate net income to the economy
- **Financial assets**
  - Do not directly contribute to the productive capacity of the economy
  - Define the allocation of income or wealth among investors

Balance sheets

- *US households*: balance sheets include financial assets
- *US*: composition of national wealth does not include financial assets

Households also have liabilities
When can households be the borrowers? If people buy a house, they'll have a mortgage, so that is an example of a liability for a household. Same with credit cards.

Assets	$ Billion	% Total	Liabilities and Net Worth	$ Billion	% Total
Real assets			**Liabilities**		
Real estate	$ 28,816	23.5%	Mortgages	$ 10,437	8.5%
Consumer durables	5,411	4.4	Consumer credit	3,865	3.2
Other	628	0.5	Bank and other loans	1,207	1.0
Total real assets	$ 34,855	28.4%	Other	219	0.2
			Total liabilities	$ 15,727	12.8%
Financial assets					
Deposits and money market shares	$ 12,442	10.1%			
Life insurance reserves	1,647	1.3			
Pension reserves	26,069	21.3			
Corporate equity	18,106	14.8			
Equity in noncorporate business	13,044	10.6			
Mutual fund shares	8,764	7.1			
Debt securities	6,210	5.1			
Other	1,521	1.2			
Total financial assets	$ 87,802	71.6	*Net worth*	106,929	87.2
Total	$122,657	100.0%		$122,657	100.0%

Table 1.1

Balance sheet of U.S. households
Note: Column sums may differ from total because of rounding error.
Source: *Flow of Funds Accounts of the United States*, Board of Governors of the Federal Reserve System, September 2018.

What counts as a household?

Assets	$ Billion
Commercial real estate	$22,642
Residential real estate	32,539
Equipment and intellectual property	9,350
Inventories	2,741
Consumer durables	5,411
Total	$72,683

Table 1.2

Domestic net worth

Note: Column sums may differ from total because of rounding error.
Source: *Flow of Funds Accounts of the United States*, Board of Governors of the Federal Reserve System, September 2018.

National level aggregates households and firms, so liabilities are cancelled out (houses owe the firms so it cancels out), and there are no financial assets. Only real assets are left. The total amount is the net worth of a country. The larger net worth, the stronger the economy.

Real assets or financial assets?

Are the following assets real or financial?

a. Patents
b. Lease obligations
c. Customer goodwill
d. A college education
e. A $5 bill

a. Real - knowledge
b. Financial - money coming in from ppl paying their lease
c. Real - intangible reputation and can be useful for firms to sell more products
d. Real - knowledge
e. Financial

Financial markets and the economy

- Financial assets and markets play crucial roles in developed economy

- *Role 1*: **Information rule**
  - Resource allocation through financial markets
    - Higher stock price -> easier to raise capital for the firm
    - But may not be most efficient all the time
  - Stock prices reflect investors' collective assessment of a firm's current performance and future aspects

For different bonds/equities, they have different prices. What does the price mean? It means that the firms get that amount of money by issuing bonds/equities. The money is then used to grow their assets.

e.g. for tech firms, prices are much higher than stock prices for other firms. It's easier for these tech firms to raise money. This also means that investors expect tech firms to grow more in the future in their net worth

If one firm's stock price > another firms, the higher priced firm has more resources than the other firm. So different stock prices mean resource allocation across firms.

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Financial markets and the economy

- *Role 2*: **Consumption of timing**
  - Some individuals earn more than they currently wish to spend
    - In high-earning periods, invest savings in financial assets such as stocks and bonds
  - Others, for example, retirees, spend more than they currently earn
    - In low-earning periods, sell financial assets to provide funds for consumption needs
  - "Shift" your consumption over the course of your lifetime

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Financial markets and the economy

- *Role 3*: **Allocation of risk**
  - Investors can select security types with the risk-return characteristics that best suit their preferences
  - *Example*: Toyota raises the funds to build its auto plant by selling both stocks and bonds to the public
    - Optimistic or risk-tolerant investments buy shares of stock
      - More risk, more rewards
    - Conservative ones buy bonds
      - Provide fixed payments

Young: better to allocate assets to equities
For more elderly, better to invest more in fixed income securities (lower risk) bc they may need short term money

Say toyota stock increases by 10%, investors earn 10%

The second option to grow capital through stock is that if toyota makes profits in the next few years, they may pay revenue to the investors (maybe a few percent every year, percent will be determined by profit and revenue made by toyota)

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The investment process

- An investor's *portfolio*: collection of investment assets

- Once the portfolio is established, it is rebalanced by
  - Selling securities and buying new securities
  - Adding funds to increase portfolio size
  - Selling securities to decrease portfolio size

- Investors make two types of decisions in constructing their portfolios
  - **Asset allocation**: choose among broad asset classes
  - **Security selection**: choose which securities to hold *within* each asset class
  - "*Top-down*" strategy: first asset allocation, then security selection
  - "*Bottom-up*" strategy: first security selection (may heavy represent one industry)

Portfolio has collection of assets e.g. 20% bonds 80% stocks
In remaining time period, portfolio can be balanced

Asset allocation: how percentage you want to allocate in equities, fixed income securities, derivatives, each asset class (like 30% in bonds, 60% in equities, 10% derivatives)
Remember dad says 80% S&P 20% cash
Security selection: do I want to buy a 3 year bond or 30 year bond? Do I invest in Meta or Google?

Bottom up not recommended

Markets are competitive

- "No-free-lunch" proposition:
  - Expect to find few securities that are so underpriced/overpriced and represent obvious bargains
  - Two implications

- *Implication 1*: **Risk-return tradeoff**
  - There is always risk associated with return
  - Actual returns will always deviate from the expected return
  - E.g., S&P 500 index fell by 46% in 1931, gained 55% in 1933

Most stocks are priced fairly

Difference between return and expectation is the risk
High fluctuation is high risk (like you expect 10% but it fluctuates between 4% and 20%)

Markets are competitive

- *Implication 2*: **Efficient markets**
  - "Efficient market hypothesis": Security price reflects market consensus estimate of the security value

- Choose between two investment opportunities
  - **Passive management**: holds highly diversified portfolios without attempting to improve investment performance through security analysis
  - **Active management**: improves performance by identifying mispriced securities or by timing the performance of broad asset classes

Passive:
Expect no arbitrage opportunity
Used by mutual funds

Active: do spend lots of time analyzing prospects of firms
Used by hedge funds
In an efficient market, no use to consider an active management strategy. So why are there so many hedge funds out there- and how do you justify their profits?
There might exist some mispricing opportunities and because there is a group of analysts who can easily identify these and trade on it. After a short amount of time, the price will be corrected.
So basically, the price of the correct level is because of the effort of people who use the active strategy.

Three major players in the financial market

- **Firms** are net demanders of capital
- **Households** typically are net suppliers of capital
- **Governments** can be borrowers or lenders
  - Tax receipts less than expenditure: borrower (since World War II)
  - Otherwise: lender (latter part of 1990s)

Firms - net demanders in that these are the people you pay mortgages to, etc.

Governments: use income to construct infrastructure and help growth of different industries

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Financial intermediaries

- *Financial intermediaries* stand between security issuer (e.g., firm) and security owner (e.g., individual investor)
  - E.g., banks, investment companies, insurance companies, and credit unions
  - Issuers and owners do not need to directly contact each other

Stand between borrowers and lenders

Like borrowers being firms and lenders being investors

Easier for borrowers to borrow and investors to lend

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Balance sheet of financial intermediaries

- Assets and liabilities are overwhelmingly financial

Assets	$ Billion	% Total	Liabilities and Net Worth	$ Billion	% Total
Real assets			**Liabilities**		
Equipment and premises	$ 126.7	0.7%	Deposits	$13,468.7	76.8%
Other real estate	7.6	0.0	Debt and other borrowed funds	1,201.5	6.9
Total real assets	$ 134.3	0.8%	Federal funds and repurchase agreements	252.2	1.4
			Other	626.6	3.6
			Total liabilities	$15,549.0	88.7%
Financial assets					
Cash	$ 1,832.2	10.5%			
Investment securities	3,633.3	20.7			
Loans and leases	9,733.3	55.5			
Other financial assets	1,036.1	5.9			
Total financial assets	$16,234.9	92.6%			
Other assets					
Intangible assets	$ 391.7	2.2%			
Other	771.9	4.4			
Total other assets	$ 1,163.6	6.6%	*Net worth*	$ 1,983.8	11.3%
Total	$17,532.8	100.0%		$17,532.8	100.0%

Table 1.3

Balance sheet of FDIC-insured commercial banks and savings institutions
Note: Column sums may differ from total because of rounding error.
Source: Federal Deposit Insurance Corporation, www.fdic.gov, October 2018.

Assets	$ Billion	% Total	Liabilities and Net Worth	$ Billion	% Total
Real assets			**Liabilities**		
Equipment and intellectual property	$ 7,590	16.7%	Bonds and mortgages	$ 6,810	15.0%
Real estate	13,607	29.9	Bank loans	1,095	2.4
Inventories	2,481	5.5	Other loans	1,519	3.3
Total real assets	$23,678	52.1%	Trade debt	2,595	5.7
			Other	8,145	17.9
			Total liabilities	$20,165	44.4%
Financial assets					
Deposits and cash	$ 1,396	3.1%			
Marketable securities	2,958	6.5			
Trade and consumer credit	3,430	7.5			
Other	14,003	30.8			
Total financial assets	$21,786	47.9%	*Net worth*	$25,299	55.6%
Total	$45,464	100.0%		$45,464	100.0%

Table 1.4

Balance sheet of U.S. nonfinancial corporations
Note: Column sums may differ from total because of rounding error.
Source: *Flow of Funds Accounts of the United States*, Board of Governors of the Federal Reserve System, September 2018.

Notice that in fdic insured banks and stuff, real assets make up a much smaller percentage
So for financial intermediaries, assets and liabilities are overwhelmingly financial

For nonfinancial corporations, real assets are more

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Investment companies

- Pool and manage money of many investors
- Arise out of **economies of scale**: lower brokerage fees and research costs
- **Mutual funds**: have the advantage of large-scale trading and portfolio management

It isn't possible to have 0 brokerage fee because how can they make money? So you may have some uninvested funds that they may be able to invest and generate
(e.g. u have 10% cash, they can use their 10% cash to make investment decisions)
Or the price u buy it at is higher?

Market order and limit order

Market orders are transactions meant to execute as quickly as possible at the current market price. Limit orders set the maximum or minimum price at which you are willing to complete the transaction, whether it be a buy or sell.

From <https://www.google.com/search?q=market+order+vs+limit+order&rlz=1C1UEAD_enUS931US931&oq=market+order+&aqs=chrome.1.69i57j0i512l9.2623j0j7&sourceid=chrome&ie=UTF-8>

- **Mutual funds**: have the advantage of large-scale trading and portfolio management
  - charge a fixed percentage of assets under management
- **Hedge funds**: pursue complex and higher risk strategies
  - Open to institutional investors, keep a portion of trading profits

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From <https://www.google.com/search?q=market+order+vs+limit+order&rlz=1C1UEAD_enUS931US931&oq=market+order+&aqs=chrome.1.69i57j0i512l9.2623j0j7&sourceid=chrome&ie=UTF-8>

What is ask order

If they claim a "zero brokerage fee": For institutions who would like to buy at a certain price, they usually have access to a better deal than individual investors. For individual investors, they want to buy the stock, if they are the institutions, they may have access to better selling bids than individual

Hedge funds charge much higher than mutual funds

Investment bankers

- Advise the issuing corporation on the prices of the issued securities, appropriate interest rates, and so forth
- Marketing the securities in the primary market
  - **Primary market**, where new issues of securities are offered to the public
  - **Secondary market**, where investors trade previously issued securities among themselves
- Investment banks originally separated from commercial banks last century by law, and then combined after 2008
  - E.g., Goldman Sachs, Merrill Lynch, and Lehman Brothers

IPO happens at the primary market

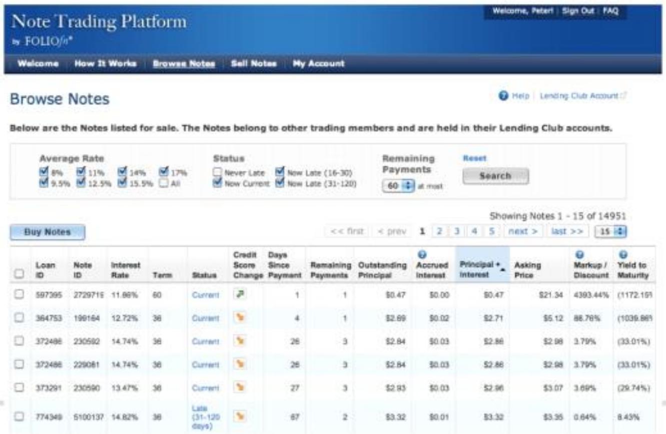
Fintech and financial innovation

- Applies technology to financial market
- **Peer-to-peer lending**: Link lenders and borrowers directly, without need of an intermediary like a commercial bank, e.g., LendingClub
- **Cryptocurrencies**: payment systems that bypass traditional channels such as credit cards, debit cards, or checks, e.g, bitcoin
- **Roboadvisors**: utilize algorithms to automate investment advice

Fintech, a portmanteau of "**financial technology**", refers to firms using new technology to compete with traditional financial methods in the delivery of financial services.[1][2][3] Artificial intelligence, blockchain, cloud computing, and big data are regarded as the "ABCD" (four key areas) of fintech.[4] The use of smartphones for mobile banking, investing, borrowing services,[5] and cryptocurrency are examples of technologies designed to make financial services more accessible to the general public. Fintech companies consist of both startups and established financial institutions and technology companies trying to replace or enhance the usage of financial services provided by existing financial companies. A subset of fintech companies that focus on the insurance industry are collectively known as **insurtech** or **insuretech** companies.[6][7]

From <https://en.wikipedia.org/wiki/Fintech>

LendingClub



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Below are the Notes listed for sale. The Notes belong to other trading members and are held in their Lending Club accounts.

Average Rate: 8% 11% 14% 17% 9.5% 12.5% 15.5% All

Status: Never Late, Now Late (16-30), Now Current, Now Late (31-120)

Remaining Payments: 60 at most

Reset | Search

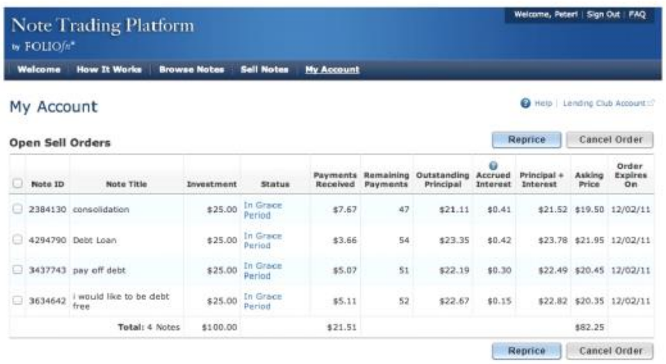
Showing Notes 1 - 15 of 14951

Buy Notes

<< first | < prev | 1 | 2 | 3 | 4 | 5 | next > | last >> | 15

Loan ID	Note ID	Interest Rate	Term	Status	Credit Score Change	Days Since Payment	Remaining Payments	Outstanding Principal	Accrued Interest	Principal + Interest	Asking Price	Markup / Discount	Yield to Maturity
597395	2729719	11.86%	60	Current		1	1	$0.47	$0.00	$0.47	$21.34	4393.44%	(1172.15
364753	199164	12.72%	36	Current		4	1	$2.69	$0.02	$2.71	$5.12	88.76%	(1039.86
372486	230592	14.74%	36	Current		26	3	$2.84	$0.03	$2.86	$2.98	3.79%	(33.01%)
372486	229081	14.74%	36	Current		26	3	$2.84	$0.03	$2.86	$2.98	3.79%	(33.01%)
373291	230590	13.47%	36	Current		27	3	$2.93	$0.03	$2.96	$3.07	3.69%	(29.74%)
774349	5100137	14.82%	36	Late (31-120 days)		67	2	$3.32	$0.01	$3.32	$3.35	0.64%	8.43%

LendingClub



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My Account

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Open Sell Orders

Reprice | Cancel Order

Note ID	Note Title	Investment	Status	Payments Received	Remaining Payments	Outstanding Principal	Accrued Interest	Principal + Interest	Asking Price	Order Expires On
2384130	consolidation	$25.00	In Grace Period	$7.67	47	$21.11	$0.41	$21.52	$19.50	12/02/11
4294790	Debt Loan	$25.00	In Grace Period	$3.66	54	$23.35	$0.42	$23.78	$21.95	12/02/11
3437743	pay off debt	$25.00	In Grace Period	$5.07	51	$22.19	$0.30	$22.49	$20.45	12/02/11
3634642	i would like to be debt free	$25.00	In Grace Period	$5.11	52	$22.67	$0.15	$22.82	$20.35	12/02/11
	Total: 4 Notes	$100.00		$21.51					$82.25	

Reprice | Cancel Order

LendingClub data

- Available at Kaggle: 2007 through current Lending Club accepted and rejected loan data
- Loan default/charge-off prediction

```
data = pd.read_csv("/kaggle/input/lending-club-dataset/lending_club_loan_two.csv")
data.head()
```

	loan_amnt	term	int_rate	installment	grade	sub_grade	emp_title	emp_length	home_ownership	annual_inc
0	10000.00	36 months	11.44	329.48	B	B4	Marketing	10+ years	RENT	117000.00
1	8000.00	36 months	11.99	265.68	B	B5	Credit analyst	4 years	MORTGAGE	65000.00
2	15600.00	36 months	10.49	506.97	B	B3	Statistician	< 1 year	RENT	43057.00
3	7200.00	36 months	6.49	220.65	A	A2	Client Advocate	6 years	RENT	54000.00
4	24375.00	60 months	17.27	609.33	C	C5	Destiny Management Inc.	9 years	MORTGAGE	55000.00

LendingClub

- Switched focus to institutional investors and shut down its retail investing platform

> " As we move towards becoming a full-spectrum fintech marketplace bank, we have looked closely at our current and future product suite and have started development of new products to help our members keep more of what they earn and earn more on what they keep. Unfortunately, under a prospective banking framework, it is not economically practical for LendingClub to continue to offer Notes. So, we had to make the difficult decision to **retire the Notes platform effective December 31, 2020**.