Macro-Finance

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Tonight's Lecture

- Historical lineage of macro-finance
- Puzzles
- The equity premium puzzle
- Financial intermediation

Required Reading

- Cochrane, J.H., 2017. Macro-finance. Review of Finance, 21(3), pp.945-985.
- Woodford, M., 2010. Financial intermediation and macroeconomic analysis. Journal of Economic Perspectives, 24(4), pp.21-44.
- Lengwiler, Y., 2004. Microfoundations of financial economics: an introduction to general equilibrium asset pricing. Chapter 1.

History of thought

- General equilibrium theory, in the tradition of Arrow & Debreu, was the cornerstone of microeconomics by the 1950s.
- This was advanced by Hirshleifer and Radner, who built financial markets into the model in the 1960s and 1970s.
- Their work provided the foundations for incomplete markets, where not all risks can be traded.
- The rational expectations revolution in macroeconomics resulted from the empirical failure surrounding stagflation in the 1970s.
- This led to general equilibrium theory being assimilated into macroeconomics to explain business cycle fluctuations.
- Finance theory started out as a field of business administration.
- Markowitz's mean-variance mechanics, and Sharpe's subsequent CAPM model building on this, sophisticated the field.

Macro-finance

- Macro-finance is the unification of all these things: **a general-equilibrium-asset-pricing-business-cycle-theory**.
- We move from the traditional general equilibrium setting to a *finance economy* setting, where we simplify away the things we don't need.
- In macrofinance the objective is to explain financial market data with aggregate or macroeconomic shocks.
- Macrofinance provides microeconomic foundations for more conventional theories of finance.
- This microeconomic foundation helps us to gain deeper insights
- We can relate because it relates asset price data to individual preferences over risk and time and aggregate consumption fluctuations.
- We can therefore interpret asset prices in terms of structural data of the economy.

Puzzles

- Our general model can be used to make a number of predictions resulting from microfounded behaviour.
- For example, we might make predictions that an impatient person's optimal consumption path is decreasing, so that they would rather consume early than late.
- But because people's incomes grow every year, they dissave in order to transfer consumption from the future to the present.
- But since not everyone can dissave at the same time, the equilibrium interest rate must be high enough to incentivise some people to postpone consumption.
- Standard assumptions—a discount factor not exceeding one, moderate risk aversion—imply that the equilibrium interest rate should be much larger than the current market rate.
- This is the **risk-free rate puzzle**.

Puzzles

- These puzzles are effectively failures of our theoretical predictions, since we are trying to *understand why things happen*.
- The puzzles in financial economics have initiated an extraordinary research effort.
- The way we resolve the puzzles ultimately influences our thinking about the mechanics of growth and business cycles.
- The way in which the model has to be changed to match the empirical data will also affect our view about the average attitude toward risk and the social cost we attribute to aggregate risk.

The Equity Premium Puzzle

- One big puzzle is the **equity premium puzzle**.
- Stocks have much higher returns than bonds on average (the difference is the equity premium).
- Theory predicts that the equity premium should be very low—almost zero.
- We observe, however, an estimated equity premium between 4% and 8%.
- Why don't people invest more in stocks than bonds, given the power of compound returns to increase wealth over long horizons?

The Equity Premium Puzzle

- It might be that stocks are particularly risky, in a special way—stock values fall at particularly inconvenient times and in particularly inconvenient states of nature.
- In the canonical theory of finance, expected returns are high because stocks fall when investors have high marginal utility—because consumption has fallen.
- Recessions are an obvious "bad state of nature".
  - Losing money in the stock market is especially bad if you're lost your job, or your business is losing money, or you might be losing your house.
  - The correlation of these bad outcomes is what we really fear.

The Equity Premium Puzzle

- Macro-finance studies the link between asset prices and economic fluctuations.
- Macro-finance is about being able to precisely measure/quantify:
  - Exactly what event it is that people fear so much.
  - How we measure that event.
  - What this fear tells us about the macroeconomics of recessions.
- Consider the simplest power-utility consumption-based model of macro-finance:

$$E(R^e_{t+1}) = \gamma \text{cov}(\Delta c_{t+1}, R^e_{t+1})$$

  where γ is the risk aversion coefficient and Δc is consumption growth.
- We can precisely measure what it is about recessions that induces fear: **consumption falls**.

The Equity Premium Puzzle

- The true puzzle arises when we find that consumption simply is not volatile enough to generate the observe equity premium in our model.
- That is, consider measuring people's risk aversion levels, their changes in consumption and its covariance with stock prices.
- Then imagine plugging these into the model to get a clear prediction for what the equity premium should be.
- We find that in order for our model to generate high enough equity premia, we would need to have very large risk aversion coefficients.
- That is, standard theory might justify this only if people face very large risks or if they are very averse to being exposed to risk.

The Equity Premium Puzzle

- To see this quantitatively, rearrange the previous expression to get:

$$\frac{E(R^e)}{\sigma(R^e)} \leq \gamma\sigma(\Delta c_{t+1})$$

- With market volatility of 16%, and an average of 4% to 8% average annual returns on stocks, we find a Sharpe ratio between 0.25 and 0.5
- In contrast, aggregate consumption growth only has a standard deviation of 1% to 2% each year.
- This implies we would need a coefficient of relative risk aversion of around $\gamma = 25$.

The Equity Premium Puzzle

- What is it about recessions that make people particularly afraid that stocks will fall during bad times, requiring such a large premium to take on that risk?
- What is it about recessions that makes the risk premium rise, implying that people are even more afraid of taking the same risk going forward?
- Recessions seem to combine both current pain and additional risk aversion about future prospects.
- To answer these questions in concrete, quantitative and theoretically explicit ways, macro-finance has explored a wide range of alternative preferences and market structures.

The Equity Premium Puzzle

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The Equity Premium Puzzle: Habits

- A "habit" is a minimum level of consumption that, if the investor's consumption falls below that level, they suffer great disutility.[2]
  - External habit: keeping up with the Joneses
  - Internal habit: getting accustomed to a specific lifestyle

$$u(C) = (C - X)^{1-\gamma}/(1-\gamma)$$

- Habits imply an investor's risk aversion is now effectively time-varying:

$$-\frac{Cu''(C)}{u'(C)} = \gamma\left(\frac{C}{C-X}\right)$$

- In bad times, their consumption falls precariously close to their habit level, making them extremely risk-averse.
- Note that this doesn't give us a low risk-aversion (even if $\gamma = 2$), but rather explains why it goes so high.

[2] http://revfin.org/macro-finance/

Other explanations

- Long-run risks: bad times are defined by receiving bad news about the long-term health of the economy.
- Idiosyncratic risk: bad times are when investors face a lot of idiosyncratic (personal risk) to their consumption.
- Heterogeneous preferences: less risk-averse investors hold more stocks, and when stocks fall this implies that more risk-averse investors mechanically make up a greater share of aggregate investment.
- Intermediary asset pricing: bad times are when intermediaries are close to bankruptcy and become risk averse as a result.
- Behavioural models: bad times are when expected future returns are irrationally low.

The approach to solving puzzles

- Notice that there is an underlying unity of these approaches: they attempt to identify microeconomic mechanisms to explain macroeconomic phenomena.
- We solve puzzles by trying to understand what microeconomic behaviour is being mischaracterised.
- The agenda adds richly to our understanding of recessions: recessions are driven by time varying risk premiums and risk aversion, and by precautionary saving, and by changes in the allocation of investment.

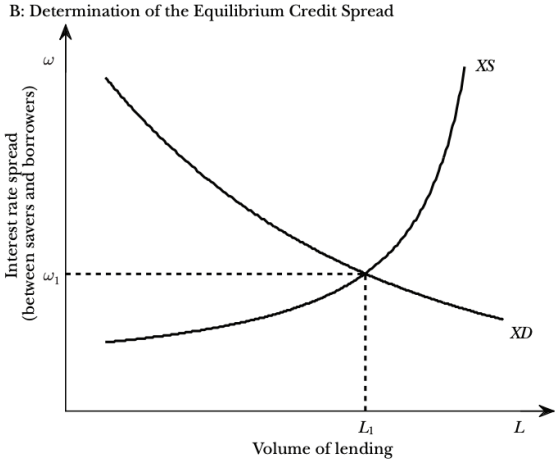
Financial Intermediation

- Note that the term macro-finance is slowly becoming to mean something else: macroeconomic models with financial frictions.
- Prior to the financial crisis, our macroeconomic models were inadequate for understanding the role of finance in macroeconomic outcomes.
- For example, if house prices fall, there is no aggregate change in wealth since the a fall in house prices also reduces the cost of buying the stream of housing services for another group.
- Our standard models were unable to identify why large losses by financial institutions would have significant effects on the real economy.

Financial Intermediation

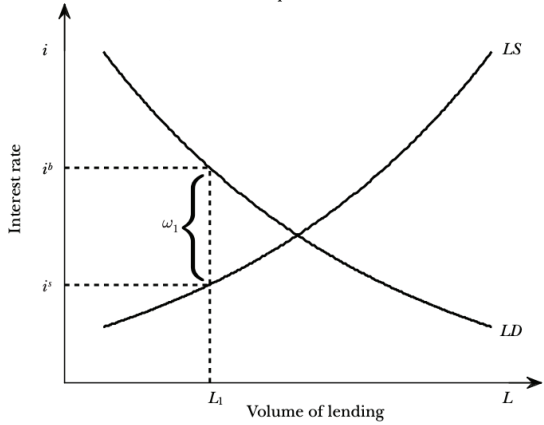
- The central addition we needed to consider to our standard macroeconomic models is the addition of financial frictions.
- We can introduce it in the simplest way possible: by considering a credit spread between lending and borrowing rates.
- Financial intermediaries now need to be induced to intermediate credit by this spread (XS is the supply of intermediation).
- Borrowers will pay a premium over the savings interest rate, given by the schedule XD.
- This determines the premium $\omega = i^b - i^s$, which then determines the final credit market equilibrium.

Credit Market Equilibrium with Credit Supply Frictions



Credit Market Equilibrium with Credit Supply Frictions

A: Effect of a Credit Spread ω_1 on the Equilibrium Interest Rates for Borrowers and Savers, and on the Equilibrium Volume of Credit

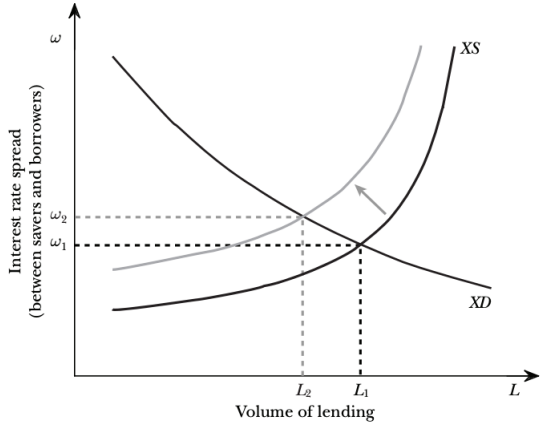


Disruptions in Intermediation

- Now imagine that there is a disruption in the supply of intermediation.
- This shifts the XS schedule upward so that financial intermediaries supply less credit at every level of the credit spread.
- We end up with a higher equilibrium credit spread ω.
- This implies a lower volume of lending, implying a contraction in real activity.
- In the end, i^s will be smaller since the policymaker responds with a decline in the policy interest, and i^b will be higher.

Disruptions in Intermediation

A: Effects on the Equilibrium Credit Spread ω and Volume of Lending L for a Given Level of Aggregate Income Y



Disruptions in Intermediation

- Any disturbance that impairs the capital of the banking sector will have the discussed outcome.
- This means that shocks that seem only modestly significant to the aggregate economy can have significant aggregate effects if the losses are concentrated in highly leveraged intermediaries.
- This helps us to explain the dramatic aggregate effects of the U.S. subprime mortgage crisis.

Monetary Policy with Credit Friction

- The most obvious implication for monetary policy is that decisions about interest-rate policy should take account of changes in financial conditions, specifically **interest rate spreads**.
- The interest rate consistent with output equal to potential output can be determined by:
  - the current value of the "natural rate of interest", which is the real rate required to clear the market in the absence of financial frictions
  - the current interest rate spread ω.
- This suggests that the target interest rate should be lower than would be otherwise chosen, if we observe that credit spreads are larger.

Additional Readings

- Pflueger, C., Siriwardane, E. and Sunderam, A., 2020. Financial market risk perceptions and the macroeconomy. The Quarterly Journal of Economics, 135(3), pp.1443-1491.
- Bernanke, B.S., Gertler, M. and Gilchrist, S., 1999. The financial accelerator in a quantitative business cycle framework. Handbook of macroeconomics, 1, pp.1341-1393.
- Jermann, U. and Quadrini, V., 2012. Macroeconomic effects of financial shocks. American Economic Review, 102(1), pp.238-71.
- Brunnermeier, M.K. and Sannikov, Y., 2014. A macroeconomic model with a financial sector. American Economic Review, 104(2), pp.379-421.

The End.