International Money and Banking: 14. Default Risk and Collateral, Quantitative Easing

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Autumn 2023

Moving Beyond Risk-Free Interest Rates

- We have discussed how monetary policy affects the benchmark interest rates on government bonds, such as US Treasury bonds.
- These bonds are considered essentially risk-free.
- These interest rates tend to influence the interest rates on all other types of lending. If one can obtain an $x\%$ return on a risk-free investment over N years, then an N-year investment that involves risk will have to provide a higher return.
- In this lecture, we will look at risky lending: What determines the lending rates paid by corporations and households and governments?
- We will also briefly discuss why governments can find themselves "shut out" of the bond market, with people unwilling to lend to them.

Default Risk and Borrowing Rates

- An alternative to investing in risk-free bonds is to lend to households and businesses (or governments) who may default on the bond, i.e. fail to pay you back as much as they should.
- Suppose the interest rate on safe risk-free bonds is $S\%$. Now consider an investment that has an interest rate $R\%$ but a probability of complete default (no money paid back) of $p\%$.
- This loan has
  - A probability $1 - 0.01p$ of a return of $R\%$.
  - A probability $0.01p$ of a return of -100%: Losing all your money.
- So, the expected return is

$$[(1 - 0.01p)\, R + 0.01p(-100)]\,\%$$

- $0.01Rp$ will be small so the expected return is approximately $(R - p)\,\%$.
- To deliver the same expected return as the risk-free bond, this investment has to have $R - p = S$, so its interest rate needs to be $R = S + p$.

Collateral and Borrowing Rates

- In some cases, the defaults associated with risky investments don't have to mean losing all your money. For example, if a bank loans money to Janet to purchase a house, the house will usually be used as **collateral** to secure the loan. If Janet doesn't pay back the loan, the bank gets the house.
- Consider the case where a fraction c, with $0 \leq c \leq 1$ of the loan can be recovered from collateral.
- This loan has
  - A probability $1 - 0.01p$ of a return of $R\%$.
  - A probability $0.01p$ of a return of $-100\,(1-c)\,\%$: Losing $100\,(1-c)\,\%$ of your money.
- So, the expected return is

$$[(1 - 0.01p)\,R + 0.01p(-100)\,(1-c)]\,\%$$

- $0.01Rp$ will be small so the expected return is approximately $(R - p\,(1-c))\,\%$.
- To deliver the same expected return as the risk-free bond, this loan has to have $R - p\,(1-c) = S$, so its interest rate needs to be $R = S + p\,(1-c)$. Collateralised loans should have lower interest rates.

Risk Aversion

- In the examples just discussed, investors only cared about the expected average return on their investment.
- In reality, people also care about **risk**. For investors that are **risk averse**, an investment that provides a guaranteed return of 5% is preferred to one that has an equal chance of returning zero or 10%.
- For this reason, an investment with a default risk of p percent and no collateral will usually have to pay a risk premium of greater than p.
- Also, attitudes to risk from investors could change over time. During some periods, investors may be particularly averse to risk while at other times they may be willing to take more risk than usual.
- For these reasons, risk premia on various types of investments can move around over time for other reasons than default risk or expected collateral values.

Section 3 Examples: Default Risk and Collateral

Financial market participants have the option to buy two bonds. One bond is safe and gives a return of 4 percent over one year. The other bond is risky and has a 10 percent chance over the year of all of the investment being lost. If investors are risk neutral and both bonds are purchased by some investors, what will be the approximate rate of return on the risky bond?

- In this case $S = 4$ and $p = 10$.

$$R = S + p = 4 + 10 = 14$$

- The risky bond must have a rate of return of 14%

A risk-neutral banker is making a car loan to Janet. The banker could purchase a safe bond that provides a return of 4% over the next year. Janet has a 5 percent chance of defaulting during this period and, if she does, the banker will end up repossessing the car but losing 10 percent of the money she loaned to Janet. What will be the interest rate on Janet's car loan?

- In this case $S = 4$ and $p = 5$ and $c = 0.9$.

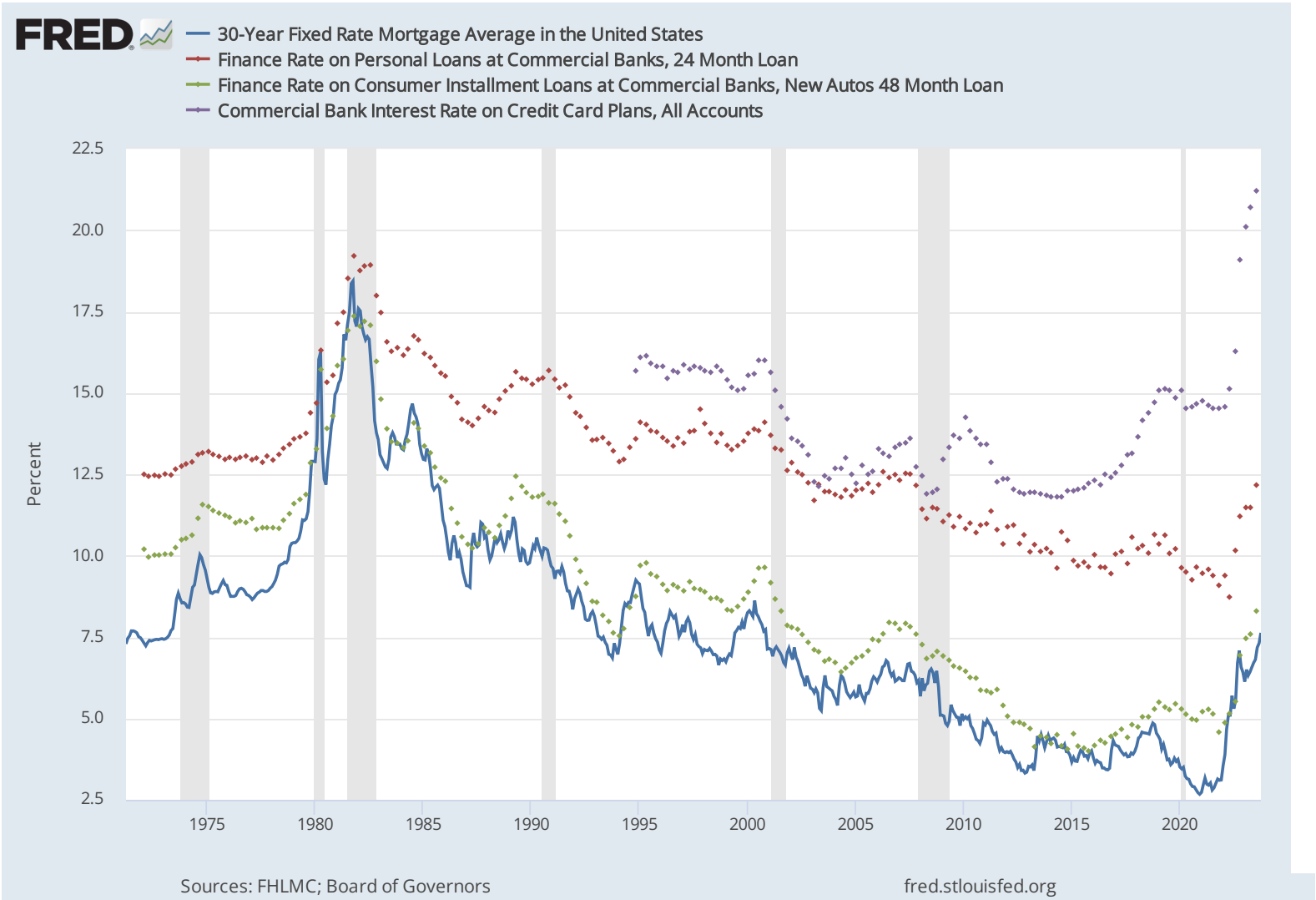
$$R = S + p(1 - c) = 4 + 5(1 - 0.9) = 4.5$$

- Janet's car loan will have an interest rate of 4.5%

Four Types of Household Borrowing

- To assess whether this framework helps to explain variations in interest rates across different categories of borrowers, consider four different types of loans to households:
  1. **Credit Cards**: No collateral. Can be used for any purpose (e.g. shopping for clothes). No set schedule for repayments apart from a small minimum monthly payment. Attractive to irresponsible borrowers who may not pay back.
  2. **Personal Loans**: No collateral. Usually screened by a bank manager as being for a particular purpose. Generally, a set schedule for repayments.
  3. **Car Loans**: The car can be used as collateral. But it's not great collateral: Cars lose value quickly. Set schedule for repayments.
  4. **Mortgages**: The house is used as collateral and usually it's pretty good collateral. Set schedule for repayments and people are generally very reluctant to default and lose their home.
- This suggests interest rates on credit cards should be the highest, then personal loans, then car loans, then mortgages.
- The chart on the next page confirms that this is indeed the case.

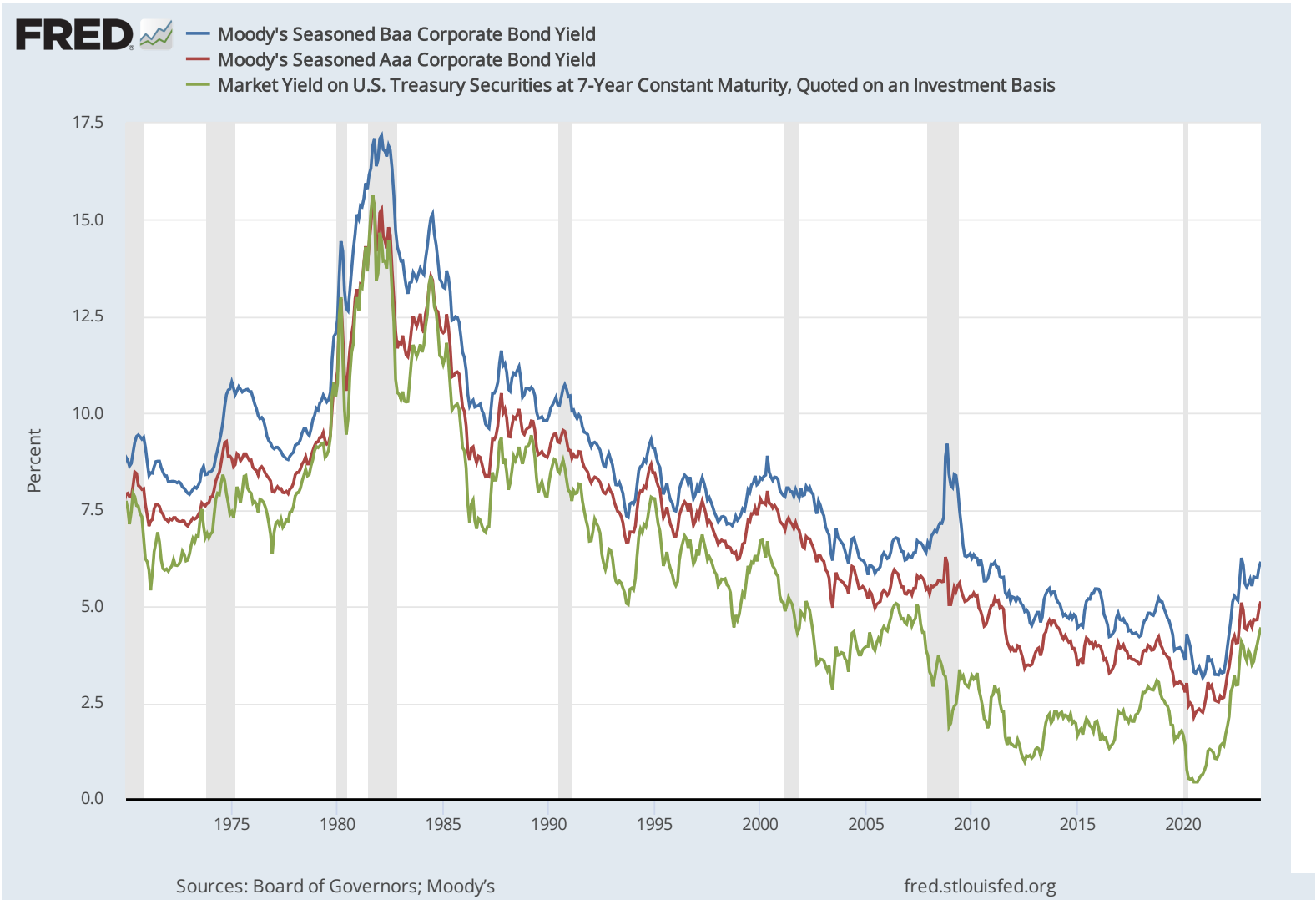
Interest Rates on Different Types of Household Borrowing



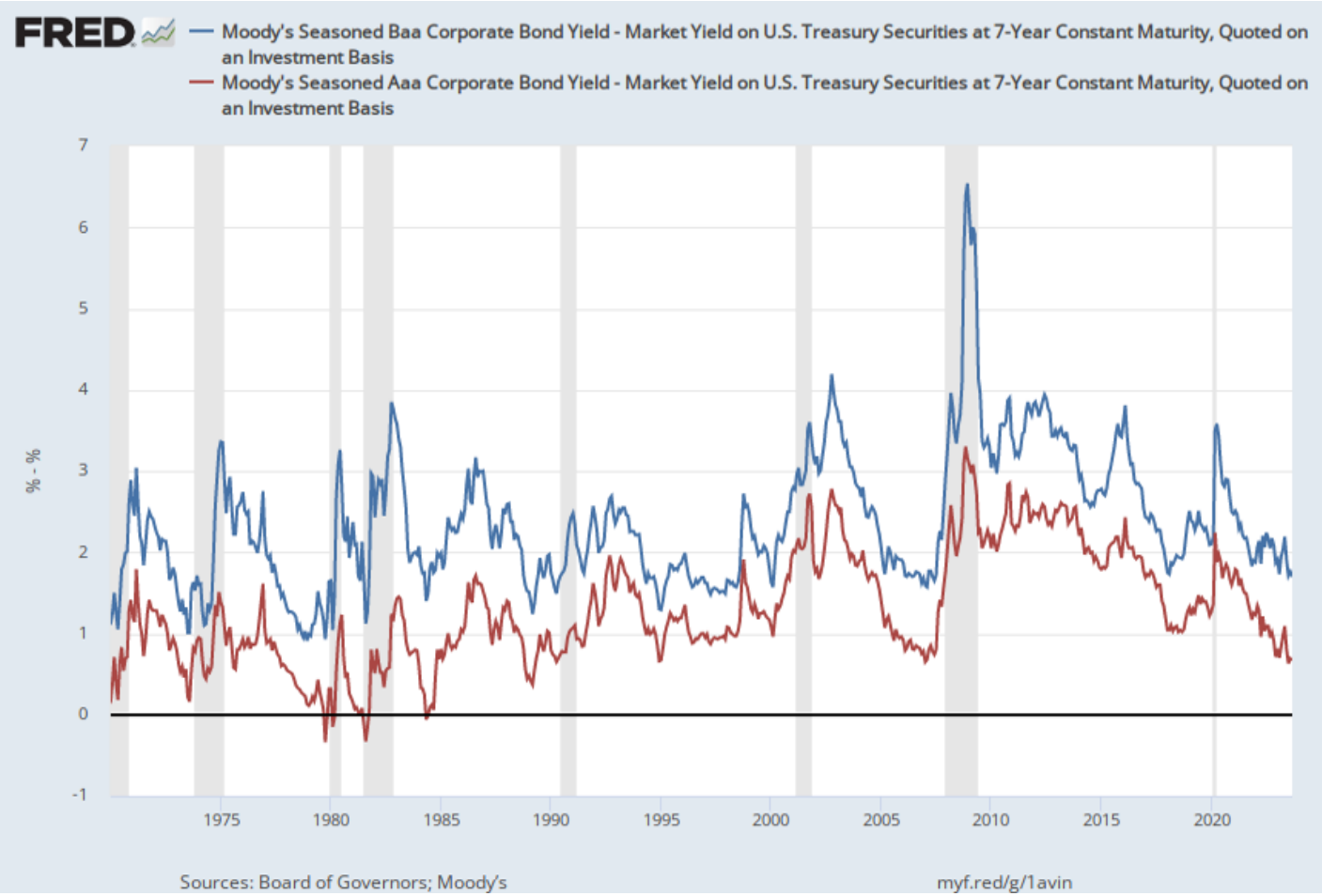
Corporate Bond Rates

- Large public corporations have their credit-worthiness rated by independent ratings agencies such as Moody's and Standard and Poor's.
- Moody's system gives the highest-rated firms get an AAA rating while firms that are an "adequate" credit risk are given a BAA rating.
- Corporate bond yields tend to move in line with yields on Treasuries of similar maturities, usually around seven years.
- But BAA bond yields are higher than AAA rates. This reflects higher perceived default rates.
- Because default risk goes up and down over the cycle, the "risk spreads" associated with these bonds tend to display a cyclical pattern, rising during and after recessions, when corporate default risks are high.
- These risk spreads spiked upwards to all-time highs during the period after the Lehmans bankruptcy in 2008.
- Spreads have actually fallen a bit over the past year despite fears of a possible upcoming recession.

Relationship Between Treasury and Corporate Bonds



Risk Spreads are Cyclical



The Credit Channel of Monetary Policy

- We have described how monetary policy affects risk-free interest rates.
- But to the extent that monetary policy affects household and corporate default risks, monetary policy can affect the actual borrowing rates faced by the private sector by more than the rates seen in money markets or markets for government debt.
- Another issue is the effect of monetary policy on asset prices. We will not have time to discuss this issue in detail here but it is generally accepted that higher interest rates reduce the value of important assets such as house prices. Assets like these often act as collateral in loan agreements. By influencing the value of this collateral, monetary policy can further affect risk spreads on debt.
- These factors mean that central banks need to do more than just watch the money markets and the yield curve. They also need to monitor how default premia and other factors that affect borrowing rates for firms and households.
- This credit channel—and the role that it played in the Great Depression—was one of Ben Bernanke's main areas of research prior to joining the Fed. Read his speech "The Financial Accelerator and the Credit Channel".

Sovereign Default Risk

- The examples so far have focused on households and businesses. However, governments can also default on their obligations.
- Suppose investors go from seeing no chance of default to seeing a ten percent chance that a government will default over the next year, leading to a 50 percent write-down on its outstanding debts.
- This means that they will need to pay a five percent premium on their debt relative to safe assets.
- What happens, however, if this interest cost imposes too large a burden on a government, i.e. if they do not have access to enough funds to make the interest payments associated with these high costs of funding?
- In this case, at some point, the market for these bonds may cease to operate: Markets may quickly decide that the debt burden is unsustainable. Unable to "roll over" its debt, the government's default can go quickly from being unlikely to being likely. This closing of the bond market can often be an abrupt event, a crisis that people did not see coming.
- In many cases, a default and a write-down of debts are required to restore the country to a point where its debts are sustainable.

Part I

Quantitative Easing

What is QE? Why Do It?

- Quantitative Easing refers to large scale asset purchases by central banks with the purchases paid for via credits to reserve accounts of commercial banks.
- QE programmes have been carried out by the Fed, the Bank of England and, most recently, by the European Central Bank: Central banks have used the programmes to buy assets like government bonds, mortgage-backed securities, corporate bonds and so on.
- Why do this?
- One explanation is from the simply money multiplier theory: Open market purchases increase the monetary base and this is then "multiplied up" into large changes in the broader money supply. This will also mean increases in the supply of credit from banks.
- Many popular accounts of QE focus on these ideas: "Pumping money into the economy" or "Pumping money into banks to increase lending."
- In practice, central banks did not necessarily believe QE would provide a significant increase in the supply credit. Their main focus instead was on the impact of bond purchases on bond yields.

Lower Bounds on Interest Rates

- Before the last decade, economists regularly wrote about the "zero bound" on interest rates. They believed that people would hold cash rather than invest in negative yielding assets even if they were safe.
- However, as we have discussed previously, it turns out that large investors with huge portfolios do not want to hold billions of dollars or euros in cash in warehouses. There is the risk the warehouses could burn down or thieves could still the money and taking out insurance against these items costs money.
- But there must be a point where interest rates on safe assets cannot be made any more negative because people will choose cash rather than highly negative yielding assets.
- What does a central bank do if it has "run out of room" in setting policy rates as low as possible?
- Well, given the existence of default risk and other costs associated with servicing loans, we should not expect normal private sector interest rates (e.g. those charged by banks) to ever be below zero.
- And it may be possible to intervene in financial markets to lower these rates.

Can Central Banks Influence Other Interest Rates?

- Even at times when short-term money market interest rates are zero or negative, most key interest rates, such as mortgage rates, are not.
- What can the central banks do to get these rates down?
- As we discussed previously, one thing they do to get long-term risk-free rates down is to signal to financial markets that they are planning to keep short-term rates low for a long time. Most of the important central banks have done this at times over the past decade.
- What else? Well according to the models we developed before there isn't anything else.
- Our framework so far has been:
  N-Year Risky Lending Rate = N-Year Risk Free Rate (determined by expected short rates) + Risk Premium (determined by default risk and quality of collateral).
- This formula sets the bond yield and that's it! In practice, however, there are other ways to influence interest rates beyond what's in this formula.

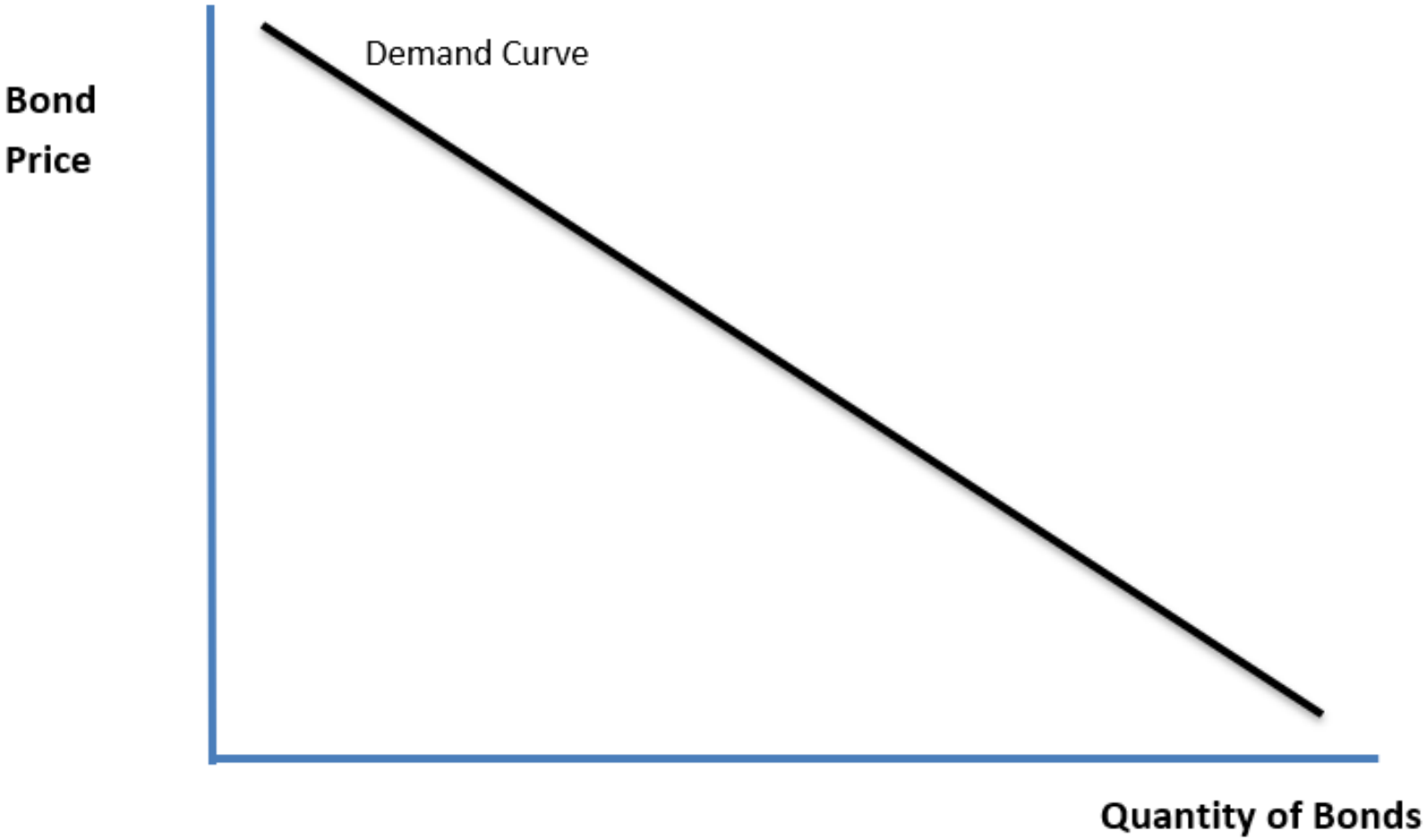
Why There Is a Demand Curve for Bonds

- The "Risk Free Rate Plus Default Risk" effectively assumes that all investors are the same and would only hold a bond if it delivers the interest rate set by this formula.
- In practice, things are a little different. Consider, the case of a bond that was yielding 3% and then, ceteris paribus, it started to yield 2% (The bond price goes up).
- Demand for this bond would fall:
  1. All investors have to make a trade-off between risk and return but investors differ in their willingness to take risks. Some investors that may have been comfortable with the risk-return tradeoff when the bond yielded 3% but now view it as too risky at 2%.
  2. Investors may differ in their assessment of default risk. At 3% some may have viewed the bond as better value than a risk-free bond. At 2% some of these people may change their mind and view it as worse value.
- What we are describing here is a demand curve. As the price of the bond goes up (yield goes down) there is less demand for it.

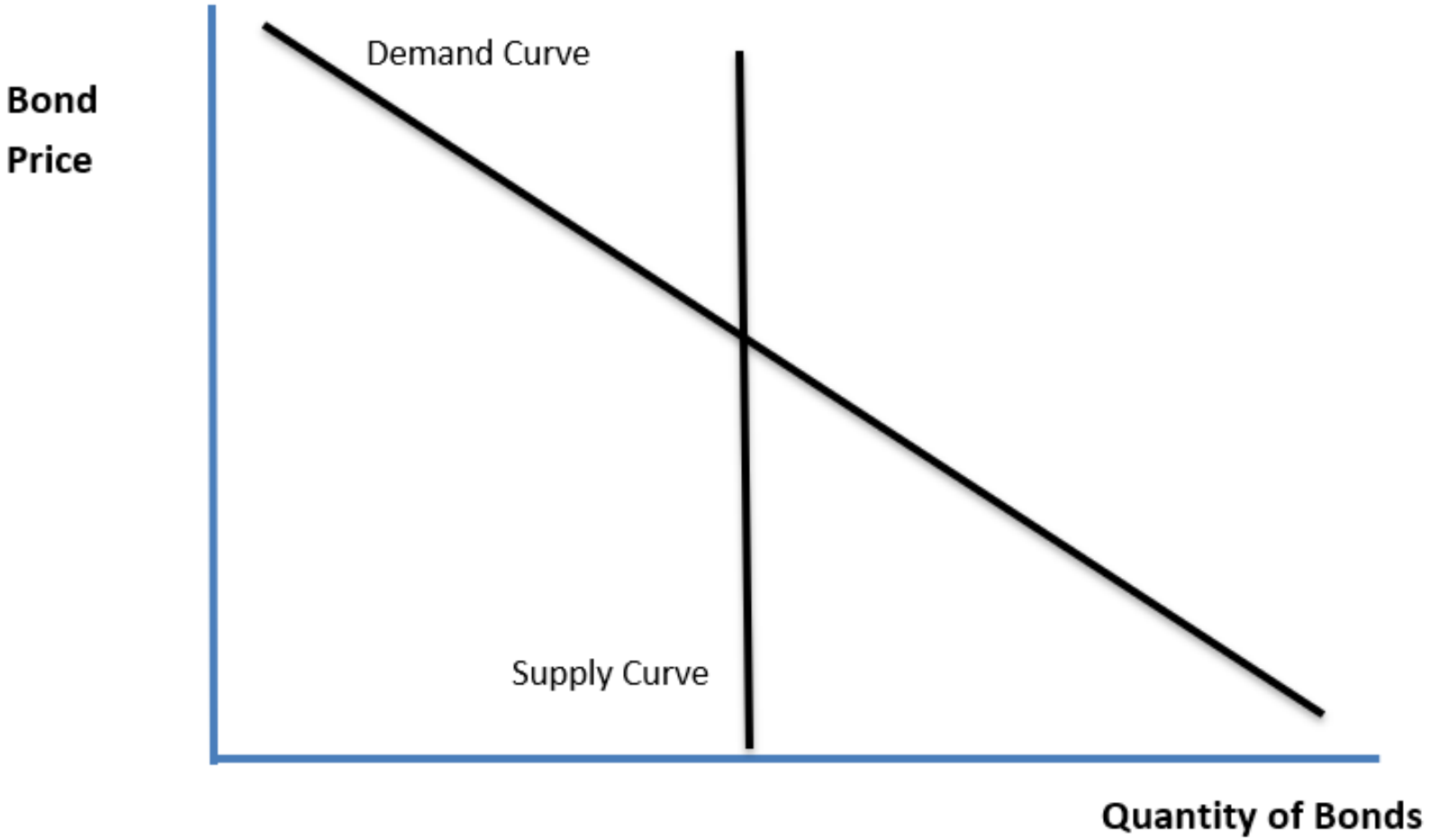
How QE Might Work: Supply and Demand for Bonds

- So how do bond prices get set?
- If there is a fixed supply of the bond and demand is larger the lower the price is (the higher the yield) then the equilibrium bond price is the one that equates supply and demand.
- Now we can see another route through which central banks can affect yields on a particular set of bonds.
- If the central bank decides to purchase a specific quantity of a specific type of bond, then the demand curve for this bond will shift out: This will raise the price of the bond and reduce the yield.
- Alternatively, you could say the "private sector demand curve" is unchanged but the "private sector supply curve" has shifted in, thus raising prices.
- In practice, bond yields are not set by two curves intersecting. They are set on a second-by-second basis by brokers who are matching up those wishing to sell and those wishing to buy.
- But the basic principle still applies: When there is heavy demand to buy the bonds, the broker raises the price to induce people to sell and this lowers the yield.

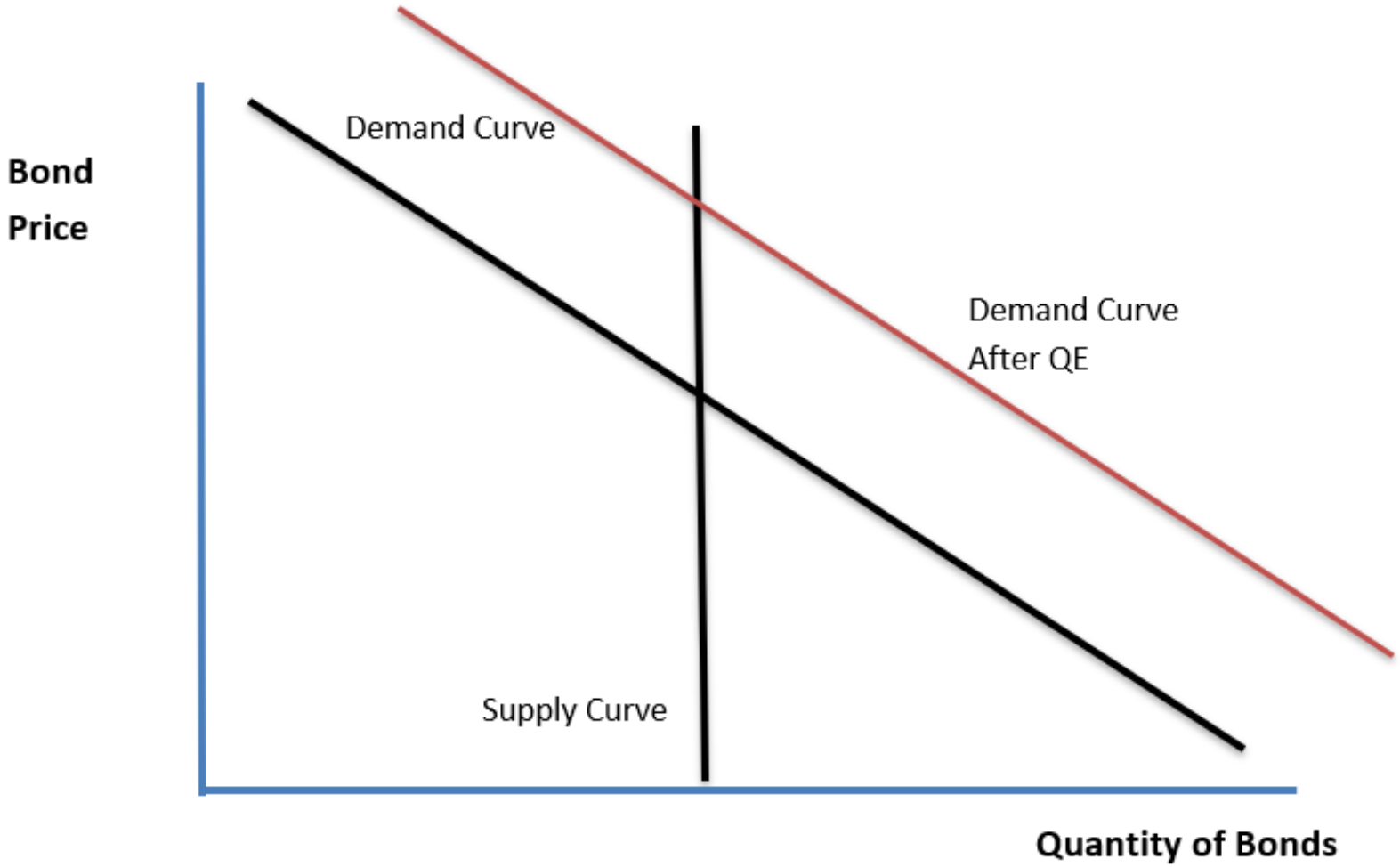
A Demand Curve For Bonds



Bond Prices Set By Supply and Demand



QE Increasing Bond Prices and Reducing Yields

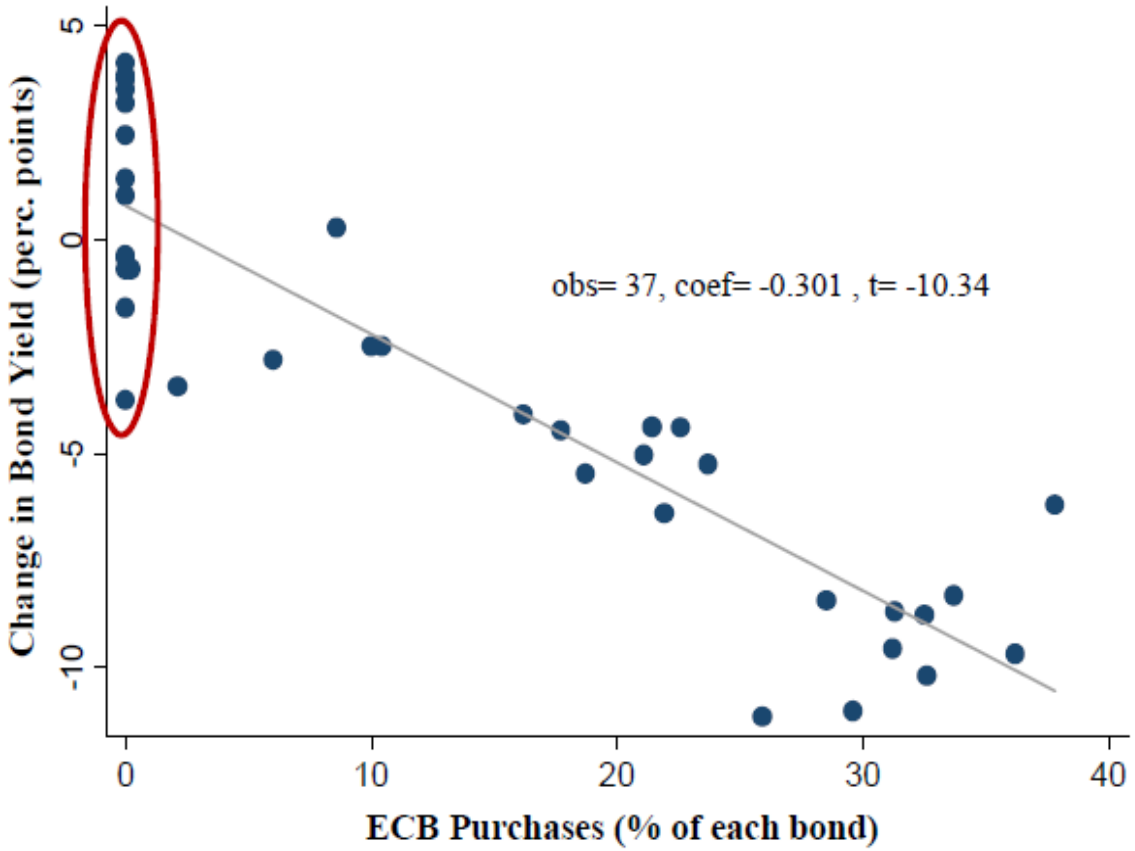


An Example of How Bond Buying Works

- It can be hard to find "clean" examples of how QE bond buying works.
- Interest rates tend to move lower after QE but this could be because QE purchases send a signal that policy rates are going to be lower, i.e. it acts as a kind of forward guidance.
- The next page shows a picture from a great research paper by Christoph Trebesch and Jeromin Zettelmeyer that helps to answer this question.
- It shows the change in yields for a set of Greek government bonds between May 7, 2010 and May 17, 2010. This is when the ECB began purchasing Greek bonds with its Securities Market Program.
- The data points circled by the red line correspond to bond issues that were not purchased by the ECB, while the rest of the data points correspond to bonds that had some ECB purchases.
- The striking result is that only bonds that were purchased by the ECB saw falling average yields. And the more the ECB bought, the more the yields fell.
- See my blog post "How Does QE Work? A Picture Worth a Thousand Words" for more discussion.

How ECB Bond Purchases Affected Greek Bond Yields

Panel A: Drop in yields between
May 7 and May 17 (1 week later)



Evidence on the Effects of the Fed's QE

- Given uncertainty about how it works (Ben Bernanke joked "The problem with QE is it works in practice, but it doesn't work in theory") were Fed officials right to believe the QE programmes have an effect?
- Former Fed chairman, Ben Bernanke, used his 2020 presidential address to the American Economics Association to discuss quantitative easing and other new tools of monetary policy. It is well worth reading.
- Bernanke summarises the evidence on the impact of QE from Ihrig et al (2018) as follows: "*QE1 reduced the 10-year term premium by 34 basis points, the Maturity Extension Program reduced term premiums by an additional 28 basis points, and QE3 reduced term premiums yet more, by 31 basis points on announcement and more over time.*"
- In other words, about \$3.5 trillion dollars worth of money created to buy long-term bonds managed to reduce long-term yields by less than one percentage point.
- So while QE programmes can have an impact on interest rates, it is clear that it takes very large amounts of "money printing" in the form of QE to obtain a relatively small impact on long-term rates.

Recap: Key Points

1. How default risk and the value of collateral affect interest rates.
2. Sovereign default risk.
3. Why bond markets can close quickly leading to default.
4. Why central banks as "sovereign lender of last resort" affects sovereign bond yields.
5. Why there is a lower bound for short-term monetary policy rates.
6. Why there is a demand curve for bonds.
7. How the ECB's bond purchases affect yields on Greek bonds
8. Evidence on the effects of the Fed's QE programme on interest rates.