Government bonds and interest rates
Haworth/Econ 202

Suppose government decides to spend money to fix roads. If so, then that means we will see an increase in government spending (i.e. G↑), and in this example, we'll assume that we're talking about the Federal (U.S.) government. The next step is for government to decide how to pay for their increased spending. If they plan to borrow that money, then they'll do so through the selling of bonds. As people buy these bonds, the government collects the money and then uses it to pay for their change in spending. The purpose of this handout is to explain how bonds work and then relate that understanding to interest rates.

When the government sells bonds, they sell them at a specific price. Therefore, in a sense, bonds are just like any other good or service. You buy the bond at a specific price we'll call P_B, but then hold onto that bond for a set period of time before redeeming the bond. The amount you receive at the end of this set period of time will be an amount which repays you the price of the bond you shelled out to purchase the bond, but with interest.

Here's an example. Let's assume you are looking at buying a $100 bond. I.e., a bond that, when you purchase the bond, pays you $100 after 5 years. Of course, the price of the bond must be less than $100 if you are receiving $100 5 years after buying the bond. The difference between what you pay (i.e. P_B) and that $100 value is how much interest you'll receive after redeeming the bond. Let's assume that the bond carries a 5% interest rate (i.e. r = 5%). If so, then the price of the bond would be $78.35. I.e., you pay $78.35 for the bond and then, after 5 years, redeem the bond for $100. The difference between the $100 and amount you paid, the $78.35, would be the interest you earned from the bond. In this case, you'd get $21.65 in interest. Let's set it up in a table.

Value of the bond (i.e. P_B + overall interest)	Price of bond (P_B)	Interest rate (r)	Overall interest received
$100	$78.35	5%	$21.65

What would happen if the interest rate on this bond increases from 5% to 6%?

First, you would obviously receive more overall interest in a 5 year period with a 6% interest rate than a 5% interest rate. I.e., the gap between the price of the bond and that $100 you get when the bond is redeemed is bigger.

Suppose we recalculate the price. If we have a $100 bond with a 6% interest rate, and this is a bond that you redeem for $100 after 5 years, then the price of that bond would be $74.73 (i.e.

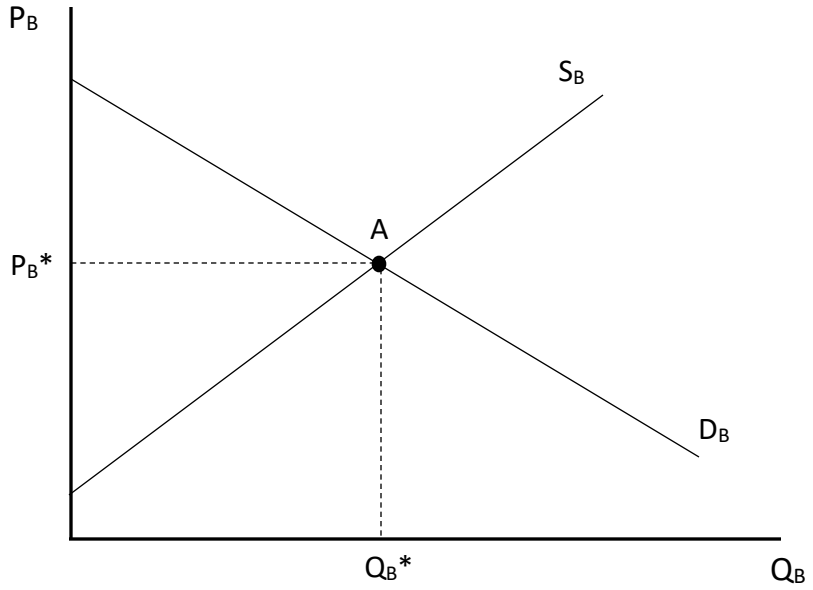
P_B = \$74.73). This suggests that with an interest rate of 6%, we would receive \$25.27 in interest after redeeming the bond in 5 years. Let's include this information in our table above.

Value of the bond (i.e. P_B + overall interest)	Price of bond (P_B)	Interest rate (r)	Overall interest received
\$100	\$78.35	5%	\$21.65
\$100	\$74.73	6%	\$25.27

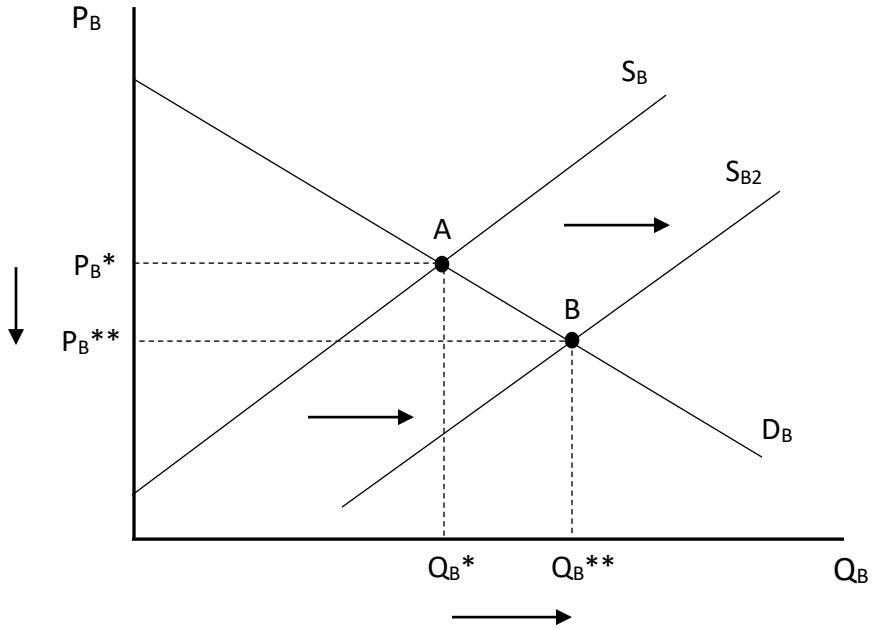
What we have demonstrated is that with bonds, there is a negative relationship between bond prices (P_B) and interest rates (r). When we observe bond prices falling, then we know that the interest rate must be rising. If bond prices are rising, then we know that the interest rate must be falling.

With that information in hand, we can now talk about our original example of what happens when the government borrows money (i.e. sells bonds) to pay for government spending.

Let's assume we can characterize the sale of bonds through what we'll call "the bond market". I.e., a market made up of the buyers and sellers of bonds. Government is a seller of bonds, and so government would be a bond supplier. For the sake of simplicity, we'll assume that this market only involves one type of bond, the \$100 bond discussed in our example above. The demanders of these bonds would be anyone who chooses to buy a bond (e.g. as a personal investment), so let's say households (i.e. people) are demanders. Our bond market graph has a demand (D_B) and supply (S_B) curve, and the axis of the graph includes the price of bonds (P_B) and quantity of bonds that are bought and sold in this market (Q_B). All of that gives us the graph below, and we get an equilibrium price and quantity of P_B* and Q_B* at pt A. Let's assume that P_B* = \$78.35, which of course implies that the current interest rate is 5%.



If the government wants to spend money fixing roads and the government decides that they will borrow this money, then the government must sell bonds in order to do that. As a bond supplier, when the government chooses to sell additional bonds, then there will be a shift in the supply curve within the bond market. That shift is illustrated in the graph below, where the market relocates to a new equilibrium point at pt B.



Our new equilibrium at pt B gives us a new price of bonds (P_B**), which we'll assume is $74.73. Quite obviously, the price of bonds has fallen. This makes sense, because if you have something you want people to buy, one way to make that happen is by lowering the price. In other words, when government sells bonds, we tend to observe bond prices falling.

How does this change in the price of bonds relate to interest rates? We already know that there's a negative relationship between bond prices and interest rates, and so this increase in the supply of bonds, a shift we get when the government chooses to sell bonds to pay for its spending, that increase in the supply of bonds will be associated with lower bond prices and higher interest rates. In our example above with the graph, if the price of a $100 bond is $78.35, then the interest rate must be 5%. If the price of a $100 bond is $74.73, then we know that's only possible when the interest rate is 6%. Again, a decrease in bond prices implies an increase in interest rates.

If we assume that all interest rates tend to move in the same direction, i.e. when one interest rate rises, they all rise, then this suggests higher interest rates across the economy. At the very least, we can say that this action at least puts upward pressure on interest rates.