Monetary Economics
Supervision 2

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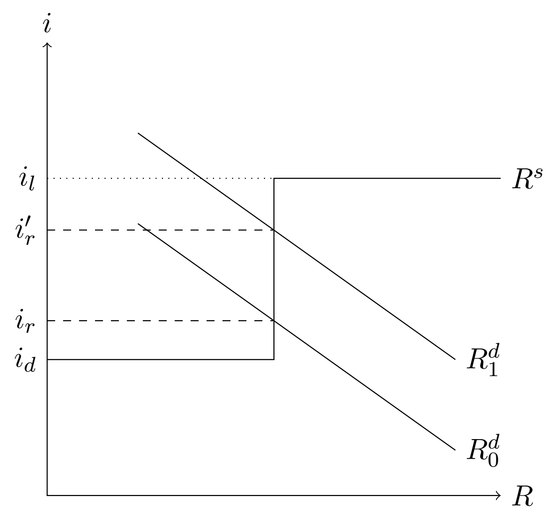
Section A

A.1

In a simplified model of the monetary system, banks hold reserves $R = R_{min} + R_e$. $R_{min} = \tau D$ is the minimum reserve requirement for a required reserve ratio τ of deposits D, and $R_e = \theta D$ is the balance of excess reserves expressed as a proportion θ of total deposits, $0 < \tau + \theta < 1$. The amount of currency held by the public is a fraction γ of deposits, such that $C = \gamma D$. With the money stock $M = C + D$, and monetary base $B = C + R$, we have that

$$\frac{M}{B} = \frac{C+D}{C+R} = \frac{\frac{C}{D}+1}{\frac{C}{D}+\frac{R_{min}}{D}+\frac{R_e}{D}} = \frac{\gamma+1}{\gamma+\tau+\theta}$$

The final expression is the money multiplier. An increase in the minimum reserve requirement τ decreases the money multiplier, leaves the monetary base B unchanged, and increases the demand for reserves R^d provided banks wish to continue holding the same fraction of deposits as excess reserves. This can lead to an increase in the interbank lending rate, as illustrated below:



As above, with an interest rate corridor system, an increase in the demand for reserves leads to an increase in the equilibrium interbank lending rate from i_r to i'_r.

A.2

The gilt and index-linked gilt have yields to maturity of $i = 3.40\%$ and $r = -0.06\%$. Assuming 39 years to maturity, by an arbitrage argument, we must have that

$$\begin{aligned}(1+i)^{39} &= (1+r)^{39}(1+\pi^e_{39})^{39}\\ \pi^e_{39} &= \frac{1+i}{1+r} - 1 \approx 3.462\%\end{aligned}$$

where π^e_{39} is the expected geometric mean of inflation over the 39-year horizon.

(i) If the inflation measure used for index-linked gilts is biased upwards by 1 percentage point, then the arbitrage condition becomes

$$\begin{aligned}(1+i)^{39} &= (1+r)^{39}(1+\pi^e_{39}+0.01)^{39}\\ \pi^e_{39} &= \frac{1+i}{1+r} - 1.01 \approx 2.462\%\end{aligned}$$

which gives the estimated expected inflation as above. The estimated risk-free real interest rate is still given as -0.06%.

(ii) If the index-linked gilt has a liquidity premium of 50 basis points, then $r = r^* + 0.005$, where r^* is the risk-free real interest rate. We just subtract 0.5% from the redemption yield to get the estimated risk-free real interest rate, which is -0.56%. The estimated expected inflation remains as approximately 3.462%.

Section B

B.1

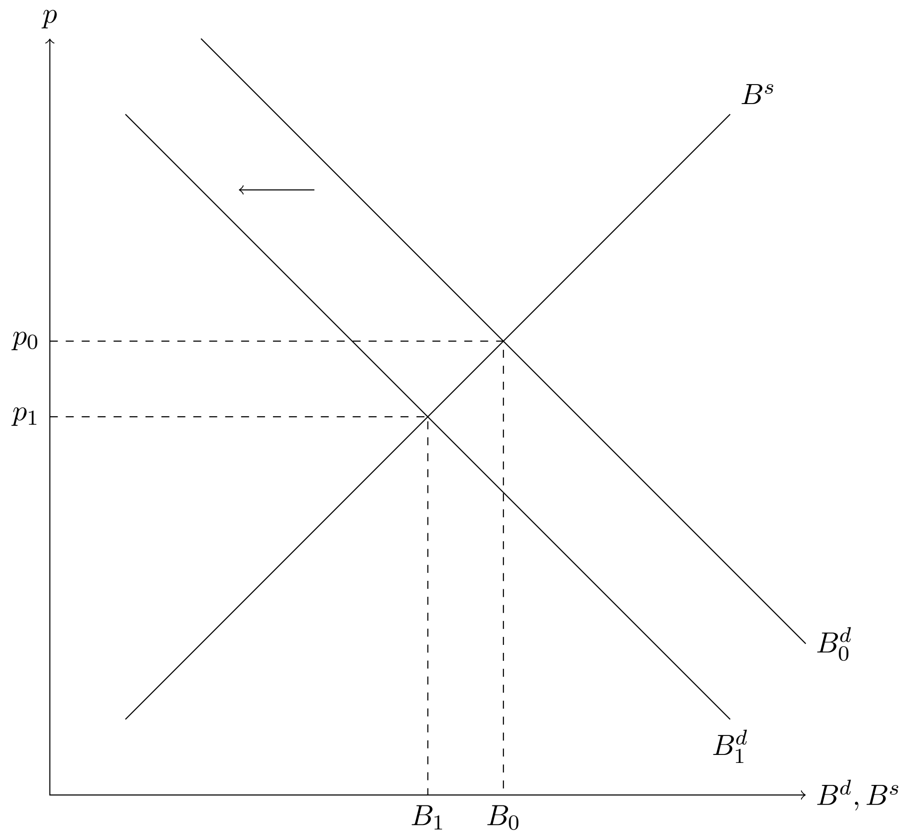
In the asset market model of supply and demand in the bond market, we have the demand for bonds $B^d_t = B^d(\underset{-}{p_t}; \underset{+}{p^e_{t+1}}, \underset{-}{RR^e_{O,t}}, \underset{-}{\sigma_B/\sigma_O}, \underset{+}{liq_B/liq_O}, \underset{+}{W_t})$. In order, the demand of bonds is decreasing in the prices of bonds, increasing in the expected future prices of bonds, decreasing in the expected rate of return from other assetes, decreasing in the volatility of bond price relative to other assets, increasing in the liquidity of bonds relative to other assets, and increasing in wealth.

As for the supply of bonds, we have $B^s_t = B^s(\underset{+}{p_t}; \underset{+}{\pi^e_t}, \underset{+}{\Pi^e_t}, \underset{+}{G_t - T_t})$. Again in order, the supply for bonds is increasing in the prices of bonds, expected inflation (except for index-linked bonds), expected profitability of investment (for corporate bonds), and the government budget deficit (for government bonds).

Gilt prices and yields are inversely related. As such, we have the following interactions:

(a)

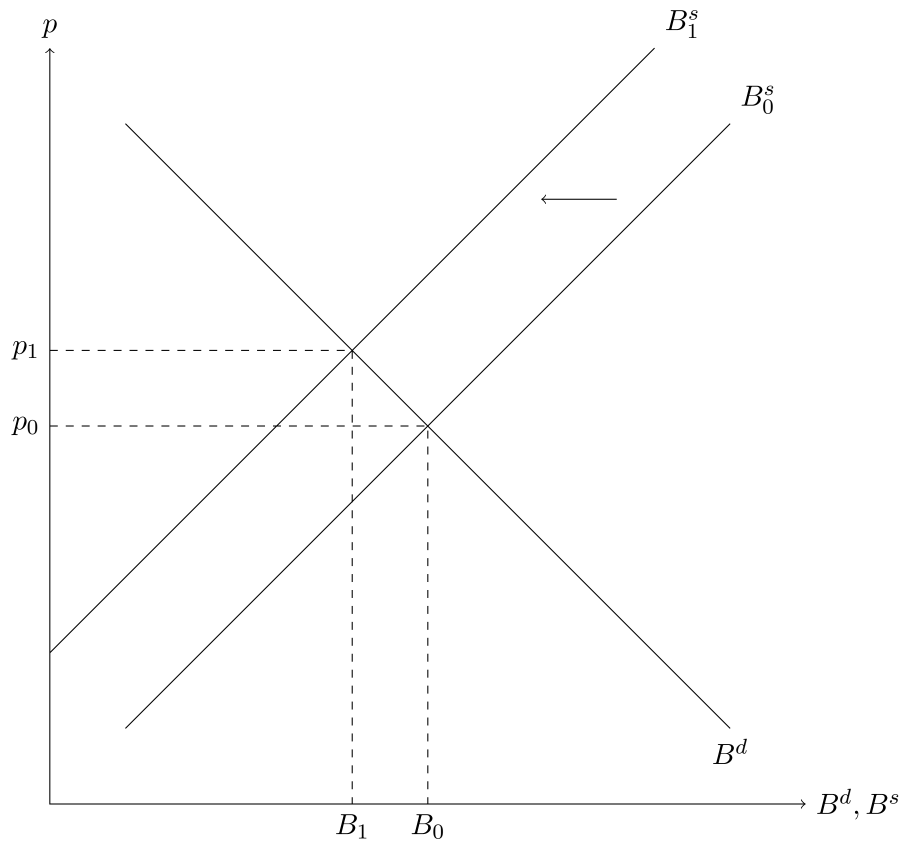
An expectation of lower future gilt prices ($\uparrow p^e_{t+1}$) decreases the demand for bonds.



If financial markets have the sudden expectation that UK gilt prices are to decrease, the expected rate of return from holding gilts is lower than before since it is believed that they will fetch a lower price in the next period. This reduces the demand for gilts, and as shown above, leads to a decrease in gilt prices in average from p_0 to p_1. As mentioned, bond prices and bond yields are inversely related, so the yields to redemption for gilts will increase. Intuitively, a cheaper gilt now means a higher yield when held to maturity since the redemption payment is nominally fixed.

(b)

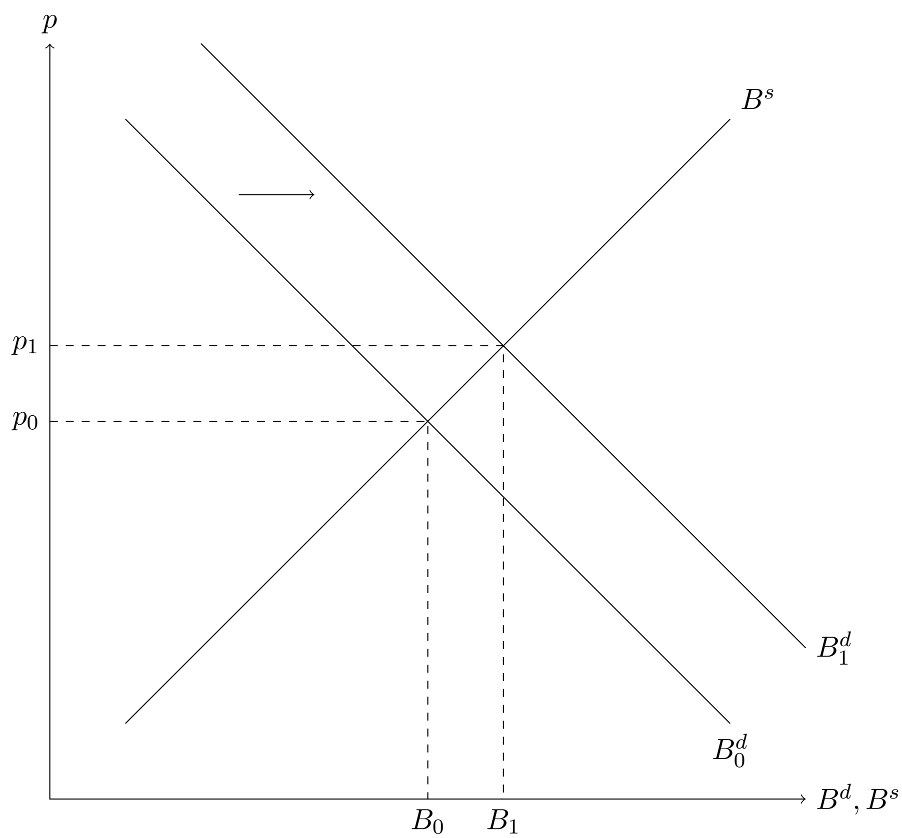
With a reduction in inflation expectations ($\downarrow \pi^e_{t+1}$), the supply of bonds decreases. The reason for this is basically that future coupon and redemption payments (for non-index-linked bonds at least) are denominated in nominal values, and a lower expected inflation means a higher expected real value of future payments. With this, we have



As shown above, the reduction in supply induced by lower inflation expectations leads to an increase in gilt prices from p_0 to p_1. With an argument analagous to the one before, the yields to maturity for gilts decreases.

(c)

A reduction of liquidity in foreign bond markets leads to an increase in the liquidity of UK gilts relative to other assets ($\uparrow \sigma_B/\sigma_O$), which leads to a greater demand for UK gilts. Investors essentially find foreign bonds with the same yields too risky and opt to hold UK gilts instead. We thus have



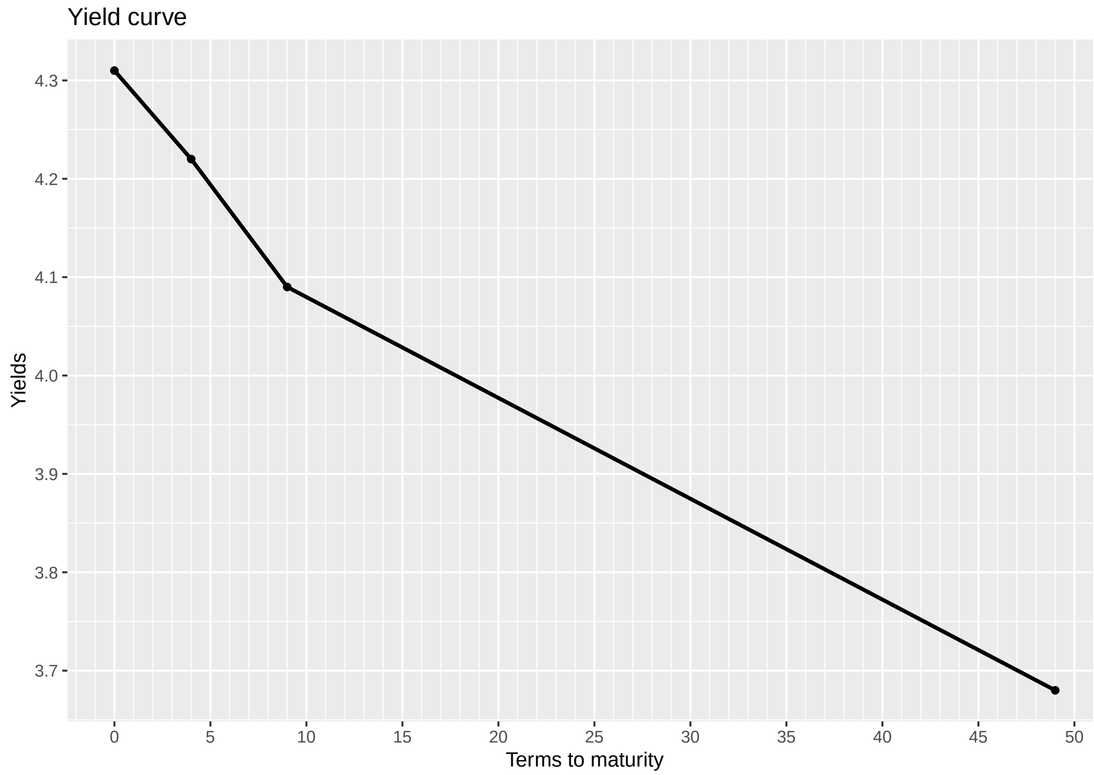
And we end up with higher UK gilt prices and lower UK gilt yields.

B.2

(a)

Assuming the current year is 2006, the price of the 7½ pc '06 Treasury gilt is the sum of the coupon payment in 2006 and the face value of the gilt. Therefore the price of the gilt is £107.50. Then we have the Bank of England reducing the repo rate by 25 basis points. This will lead to an increase of the price of the '06 gilt. This is because the bank lending rate is typically a mark-up over the policy rate (in this case the repo rate), and a reduction of the repo rate leads to a reduction in the lending rate as well. The option for lenders outside of bonds is now less profitable as a whole ($\downarrow RR^e_{O,t}$), and thus the demand for the gilt (which is short-term and thus likely to be a reasonably close substitute for a deposit account) increases. The price of the gilt increases and its yield decreases alongside the repo rate.

(b)



If we assume the expectations theory of the interest rate term structure, $i_{n,t}$ which is the n-period interest rate at time t must satisfy

$$(i_{n,t})^n = (1 + i_t)(1 + i^e_{t+1}) \dots (1 + i^e_{t+n-1})$$

Taking the n-th root of the n-period interest rate above, we can see that yields can be decreasing in the terms to maturity if investors expect future one-year interest rates to get successively lower. One reason could be that investors are expecting slower or negative growth, and anticipate lower interest rates in response in the future. Another reason could be that investors are a lot more uncertain about the behaviour of bond prices in the near-term than the behaviour of bond prices further into the future. This would imply a larger risk premium for short-term bonds and could lead to an inverted yield curve.

(c)

Just like before, with the expectations theory of the term structure, we have

$$(1 + i_{9,2006})^9 = (1 + i_{4,2006})^4 (1 + i^e_{5,2010})^5$$

$$i^e_{5,2010} = \left(\frac{1.0409^9}{1.0422^4}\right)^{\frac{1}{5}} - 1 \approx 3.986\%$$

which is the estimate of the 5-year interest rate in 2010 assuming asset prices incorporate all public information. It is possible that there is a term premium that increases with the term to maturity, if investors find holding longer-term bonds more risky due to the movements in bond prices that could take place before the bond reaches maturity. If so, this will bias the estimates for $i^e_{5,2010}$

upwards, as the estimate now also incorporates the risk premium. Formally, for a risk premium $\theta_{n,t}$ increasing in n, we have

$$(1 + i_{9,2006} + \theta_{9,2006})^9 = (1 + i_{4,2006} + \theta_{4,2006})^4 (1 + i^e_{5,2010} + \theta^e_{5,2010})^5$$

The term on the left-hand side and the first bracketed term on the right-hand side are observed in the market, so the risk premium does not affect the calculations for those two quantities. But what we are left with is $1 + i^e_{5,2010} + \theta^e_{5,2010}$ and if we estimate the expected 5-year return in 2010 based on this it will be overstated.

Section C

C.1

Journalists often point out that an inverted yield curve has preceded every recession since World War II. But there may be reasons to stop short of saying that the yield curve is an indicator of future economic activity. To say that the slope of the yield curve is a good indicator of expected future economic activity would probably be less controversial, for the reasons mentioned in B.2. This notwithstanding, there may be some merit in in seeing the slope of the yield curve as an indicator of future economic activity if one believes that markets are well-informed enough for asset prices to reflect future states to a reasonable degree of accuracy. Furthermore, one does not necessarily need well-informed markets for the yield curve to be a decent indicator of future economic activity; expectations may be self-fulfilling and cause the very outcome that is predicted. Still, because of the risk premium attached to longer-term bonds as discussed in B.2, it is difficult to extract expectations from a positively sloping yield curve; one cannot definitively tell if the slope of the yield curve is positive only because of the risk premium while expected future interest rates are lower. So the channel of self-fulfilling expectations is probably less applicable when the yield curve is upward-sloping. When it is downward-sloping, this usually means that interest rate expectations for the future are unambigiously lower than the same expectations for the near-term.