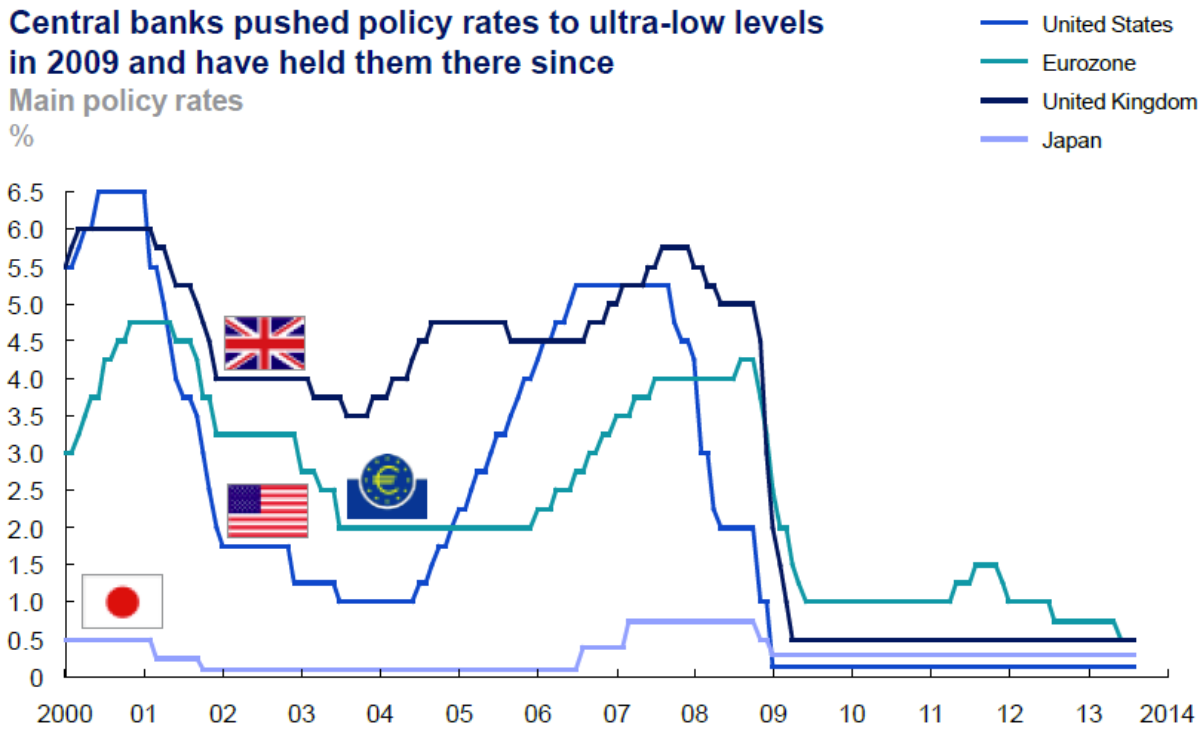
Part 2 – Financial Markets

The recent financial crisis started in 2007 and intensified in 2008.

Response measures of the Central Banks in the US, the Eurozone, the United Kingdom and Japan included:

- Providing liquidity and credit facilities
- Lowering interest rates to unprecedented levels (conventional monetary policy)

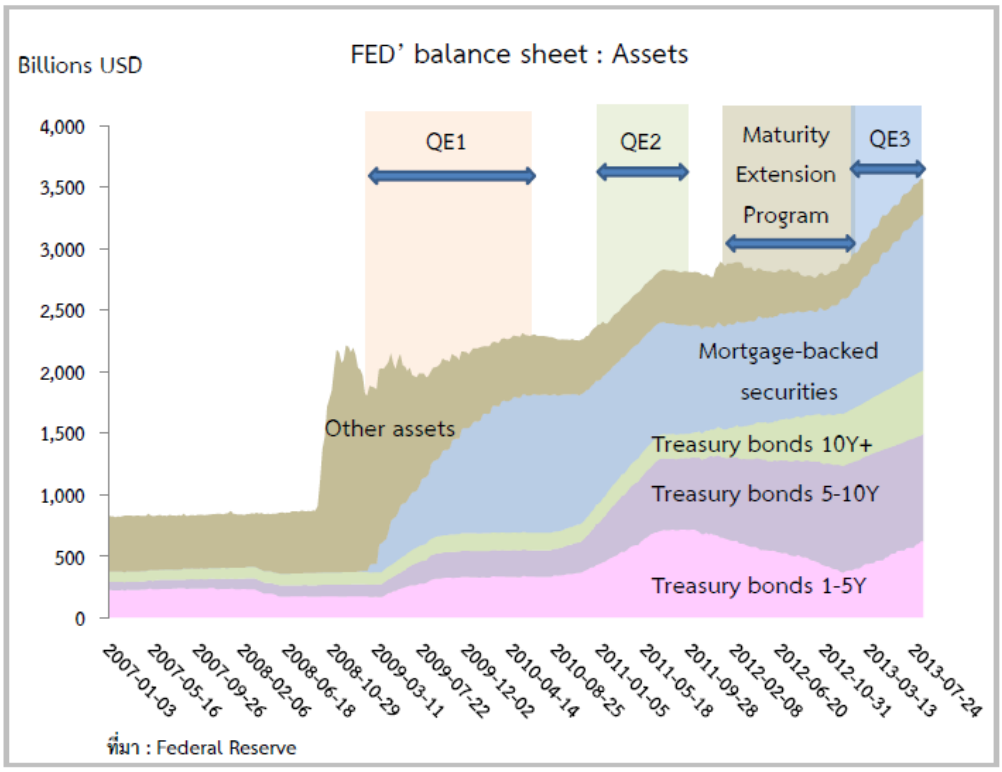


SOURCE: US Federal Reserve; European Central Bank; Bank of England; Bank of Japan; McKinsey Global Institute analysis

- Unconventional monetary policy

1) Quantitative easing

- LSAPs or QE is implemented by buying specified amount of long term financial assets from commercial banks and other private institutions
- Goal is to increase put downward pressure on longer term yields to ease financial conditions and support economic growth



Note: Central Bank balance sheets in the US, UK, the Eurozone and Japan expanded by $4.7 trillion dollars by 2007, approximately equal to the GDP of the UK and France combined!

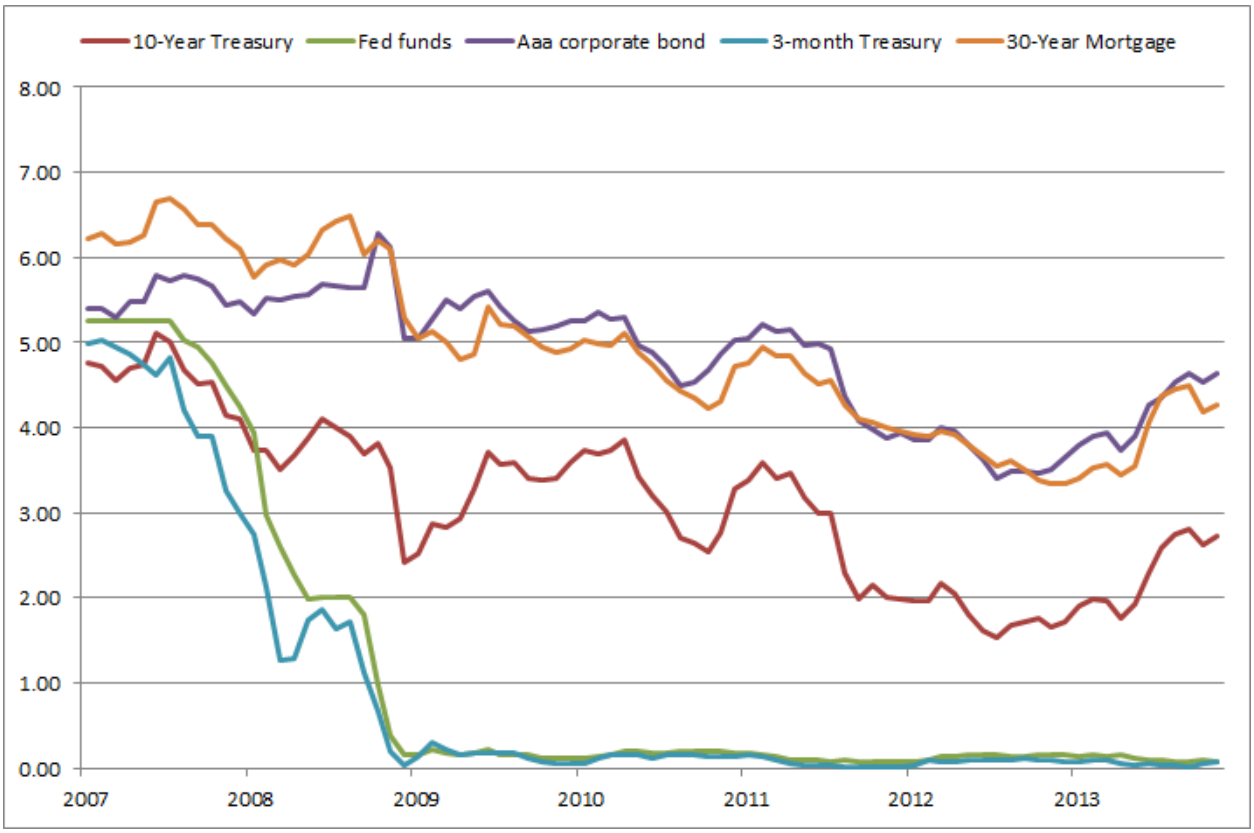
2) Forward Guidance

A tool used by a central to influence market expectations of future levels of interest rates. With forward guidance, the central bank promises to keep interest rates very low for a specified period, which may be contingent on a certain target to be reached for inflation and unemployment rates.

3) Operation Twist or Maturity Extension Program

A monetary policy where the central bank buys longer term Treasury bonds and simultaneously selling some shorter term Treasury bonds it already holds in order to bring down long-term interest rates.

Effects of QE on US interest rates



Chapter 4 - Understanding Interest Rates

- **Measuring Interest rates**

Present Value - the value today of a payment that is promised to be made in the future

- A dollar paid to you one year from now is less valuable than a dollar paid to you today.

Why?

Discounting the Future

First, need to understand future value (FV)

Let i = 0.10 (10 percent)

In one year: \$100 +(.10 x \$100) = \$100 x (1+.10) = \$110

In two years: \$110+(.10 x \$110) = \$110 x (1+.10) = \$121

OR $100 x $(1+.10)^2$ = \$121

In three years: \$121+(.10 x \$121)= \$121x(1+.10) = \$133

OR $100 x $(1+.10)^3$ = \$133

In n years:

Future value of an investment is PV in n years at interest rate i (measured as a decimal, or 10% = .10)

Note: When computing Future Value, both ***n*** and ***i*** must be measured in same time units—if ***i*** is annual, then ***n*** must be in years.

Examples:

1) The future value of \$100 in 18 months at 5% annual interest rate is:

2) The future value of \$100 in one month at a 5% annual interest rate is:

Basis Point

- A basis point is one-one hundredth of a percentage point
- One basis point (bp) =
- eg: 0.41% is

Present Value

Where PV = today's present value, CF = future cash flow. Here, i is referred to in the PV calculation as a discount rate.

Examples:

1) PV of $100 received in one year at i=5%

2) PV of $100 received in 5 years discounted at an interest rate of 8%

3) PV of $20,000 received 20 years from now discounted at 8% is:

Discounted at 9%:

In general, present value is higher:

- The shorter the time period until payment (n).
- The higher the future value of the payment (*CF*).
- The lower the interest rate. (i)

Yield to Maturity

The interest rate that equates the present value (*PV*) of cash flow payments (*CF*) received from a debt instrument with its value today

$PV = CF / (1+i)^n$

Four types of credit market instruments

1) Simple Loan

The lender provides the borrower with an amount of funds, which must be repaid to the lender at the maturity date along with an interest payment.

2) Fixed Payment Loan (fully amortized loan)

The lender requires the borrower to make the same payment every period consisting of part of the principal and interest for a set number of years. These include installment loans e.g. auto loans and mortgages.

3) Coupon Bond: pays the owner periodic interest payments and repays the principal at maturity e.g. US Treasury bonds and most corporate bonds. The final amount paid is called the face value or par value.

Present Value of Coupon Bond (P_B) = Present value of Yearly Coupon Payments (C) + Present Value of the Face Value (FV)

where: i = interest rate and n = time to maturity

Example 1: Say Coupon Payment =\$100, Face value = \$1,000, and n = 10, i=0.1

What is the coupon rate?

See Excel Example

Example 2: Suppose n = 10, P_B = \$950, C = \$100 and FV = \$1000.

What's the coupon rate? What's the YTM?

$$Approx\,YTM = \frac{C + \frac{F-P}{n}}{\frac{F+P}{2}}$$

$C = Coupon/Interest\ Payment$
$F = Face\,Value$
$P = Price$
$n = years\,to\,maturity$

TABLE 1 Yields to Maturity on a 10%-Coupon-Rate Bond Maturing in Ten Years (Face Value = $1,000)

Price of Bond ($)	Yield to Maturity (%)
1,200	7.13
1,100	8.48
1,000	10.00
900	11.75
800	13.81

- When the coupon bond is priced at its face value, the yield to maturity equals the coupon rate
- The price of a coupon bond and the yield to maturity are negatively related
- The yield to maturity is greater than the coupon rate when the bond price is below its face value

Special case of Coupon bond: Consol or Perpetuity

A consol is a perpetual bond with no maturity date and no face value. It has a fixed coupon payment of C forever.

As t goes to infinity this collapses to:

Note: i_c is the current yield

Two Characteristics of Current Yield

1. Is a better approximation of yield to maturity, the nearer price is to par (face value) and the longer is the maturity of the bond
2. Change in current yield *always* signals change in same direction as yield to maturity

4) Discount Bond/ Zero Coupon Bond: This is a bond sold at some price *P*, and pays a larger amount (*FV)* after *t* years. There is no periodic interest payment.

Let P = price of the bond, *i*= interest rate, n = years to maturity, and FV = Face Value (the value at maturity):

Note: For any one year discount bond:

Where F = Face value of the discount bond, P = current price of the discount bond. The YTM is negatively related to the current bond price

Examples: Assume *i*=4%

- Price of a One-Year Treasury Bill with FV = $1,000:

- Price of a Six-Month Treasury Bill with FV = $1,000:

- Price of a 20-Year zero coupon bond at 8% and FV = $20,000:

YTM of Zero Coupon Bonds

Example: For a discount bond with FV = $15,000 and P = $4,200, and n = 20, the interest rate (or yield to maturity) would be:

Note: This is the formula for compound annual rate of growth

From a Coupon Bond to Strips (Zero Coupon Bonds)

$$P_B = \left[\frac{C}{(1+i)^1} + \frac{C}{(1+i)^2} + \frac{C}{(1+i)^3} + ... + \frac{C}{(1+i)^n} \right] + \frac{FV}{(1+i)^n}$$

Creates n+1 discount bonds