Financial Functions in Excel

1. **NPV** (Net Present Value) of the cash flow \( C_1, C_2, \ldots, C_n \) with the interest rate \( r \) (per period):

\[
NPV = \frac{C_1}{(1 + r)^1} + \frac{C_2}{(1 + r)^2} + \ldots + \frac{C_n}{(1 + r)^n}
\]

Excel name: **NPV**
Excel arguments: **Rate** – interest rate \( r \) per period
**Value1** - cash flow \( C_1, C_2, \ldots, C_n \)

*Note: Cash flows start at period 1 here. If you have a cash flow at time 0, add it manually. If you do not have cash flow during some periods, you must enter zero – otherwise Excel ignores the time period.*

**Value2** – optional (never used in this class)

2. **IRR** (Internal Rate of Return) of the cash flow \(-C_0, C_1, C_2, \ldots, C_n\). IRR finds an interest rate \( r \) (per period) that solves the equation:

\[
C_0 = \frac{C_1}{(1 + r)^1} + \frac{C_2}{(1 + r)^2} + \ldots + \frac{C_n}{(1 + r)^n}
\]

Excel name: **IRR**
Excel arguments: **Values** - cash flow \(-C_0, C_1, C_2, \ldots, C_n\)

*Note: Make sure that the cash flow at time zero is negative.*

**Guess** – your best guess of what IRR might be (usually a small positive number like 0.01 (1%))
3. **Yield** $y$ of the bond that makes coupon payments $k$ times per year over $n$ periods in the amount $C$, and has a face value (or redemption value) $V$. Yield finds the value $y$ that solves the equation:

$$\text{Price} = \frac{C}{\left(1 + \frac{y}{k}\right)^1} + \frac{C}{\left(1 + \frac{y}{k}\right)^2} + \ldots + \frac{C + V}{\left(1 + \frac{y}{k}\right)^n}$$

*Note: The Yield function in Excel corresponds to the Bond Equivalent Yield (BEY) in the case of semi-annual payments.*

Excel name: **Yield**  
Excel arguments:  
Settlement – bond settlement date  
Maturity – bond expiration date  
*Note: If you are only given time to maturity, choose settlement and maturity dates to match the time to expiration.*  
Rate – bond annual coupon rate  
Pr – current bond price per $100 face value  
Redemption – bond redemption value at maturity per $100 face value  
Frequency – number of coupon payments per year  
Basis - optional (never used in this class)

4. **Price** of the bond that has the current yield $y$, makes coupon payments $k$ times per year over $n$ periods in the amount $C$, and has a face value (or redemption value) $V$. The bond price is given by

$$\text{Price} = \frac{C}{\left(1 + \frac{y}{k}\right)^1} + \frac{C}{\left(1 + \frac{y}{k}\right)^2} + \ldots + \frac{C + V}{\left(1 + \frac{y}{k}\right)^n}$$

Excel name: **Price**  
Excel arguments:  
Settlement – bond settlement date  
Maturity – bond expiration date  
*Note: If you are only given time to maturity, choose settlement and maturity dates to match the time to expiration.*  
Rate – bond annual coupon rate  
Yld – current bond annual yield  
Redemption – bond redemption value at maturity per $100 face value  
Frequency – number of coupon payments per year  
Basis - optional (never used in this class)
5. **Macaulay Duration** \((D)\) of the bond with the current price \(P\), and the present value of the period \(j\) coupon given by \(PVC_j\):

\[
D = \frac{1 \times PVC_1}{P} + \frac{2 \times PVC_2}{P} + \ldots + \frac{n \times PVC_n}{P}
\]

Excel name: **Duration**
Excel arguments:
- **Settlement** – bond settlement date
- **Maturity** – bond expiration date
  - *Note*: If you are only given time to maturity, choose settlement and maturity dates to match the time to expiration.
- **Coupon** – bond annual coupon rate
- **Yld** – current bond annual yield
  - *Note*: Excel does not use the current bond price \(P\), but uses the current bond yield.
- **Frequency** – number of coupon payments per year
- **Basis** - optional (never used in this class)

6. **Modified Duration** \((D^*)\) of the bond with the Macaulay duration \(D\), current yield \(y\), and number of coupon payments per year \(k\):

\[
D^* = \frac{D}{\left(1 + \frac{y}{k}\right)}
\]

Excel name: **MDuration**
Excel arguments:
- **Settlement** – bond settlement date
- **Maturity** – bond expiration date
  - *Note*: If you are only given time to maturity, choose settlement and maturity dates to match the time to expiration.
- **Coupon** – bond annual coupon rate
- **Yld** – current bond annual yield
  - *Note*: Excel does not use the Macaulay duration, but uses the current bond yield, and the number of payments per year.
- **Frequency** – number of coupon payments per year
- **Basis** - optional (never used in this class)