Exchange Rate Analysis Report

1. My Proposed Formula (Statistical Analysis and Historical Data)

Objective:

To calculate the price range based on historical exchange rate data and statistical analysis.

Formulas:

- **Mean Rate (Average Rate)**:

$$\text{Mean Rate} = \frac{\sum_{i=1}^{n} \text{Rate}_i}{n}$$

  - Rate_i: The exchange rate on day i.
  - n: The number of days.

- **Standard Deviation**:

$$\text{Standard Deviation} = \sqrt{\frac{\sum_{i=1}^{n} (\text{Rate}_i - \text{Mean Rate})^2}{n}}$$

- **Price Range**:

$$\text{Price Range} = \text{Mean Rate} \pm (\text{Standard Deviation} \times \text{Confidence Factor})$$

  - Confidence Factor: A number between 1 and 3, representing the confidence level (e.g., 1.96 for 95% confidence).

Example:

Assume the historical exchange rates (AED to IRR) for the last 10 days are:

$$\text{Rates} = [21,800, 22,000, 22,200, 21,900, 22,100, 22,300, 21,950, 22,050, 22,150, 22,000]$$

- **Calculate the Mean Rate**:

$$\text{Mean Rate} = \frac{21,800 + 22,000 + 22,200 + 21,900 + 22,100 + 22,300 + 21,950 + 22,0}{10}$$

- **Calculate the Standard Deviation**:

$$\text{Standard Deviation} = \sqrt{\frac{(21,800 - 22,045)^2 + (22,000 - 22,045)^2 + \cdots + (22,000 - 2}{10}}$$

- **Calculate the Price Range**:

$$\text{Price Range} = 22,045 \pm (150 \times 1.96) = 22,045 \pm 294 = 21,751 \text{ to } 22,339 \text{ IRR}$$

- **Calculate the Price Range for 2000 AED**:

$$\text{Price Range} = 2000 \times 21,751 \text{ to } 2000 \times 22,339 = 43,502,000 \text{ to } 44,678,000 \text{ IRR}$$

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2. Covered Interest Rate Parity (CIRP)

Objective:

To calculate the forward exchange rate based on interest rates in two countries.

Formula:

$$F = S \times \frac{1 + i_d}{1 + i_f}$$

- F: Forward exchange rate.
- S: Spot exchange rate (current rate).
- i_d: Domestic interest rate.
- i_f: Foreign interest rate.

Example:

Assume:

- Spot rate (S): 22,000 IRR per AED.
- Domestic interest rate (i_d): 20% (0.20).
- Foreign interest rate (i_f): 5% (0.05).
- **Calculate the Forward Rate (F)**:

$$F = 22,000 \times \frac{1 + 0.20}{1 + 0.05} = 22,000 \times 1.1428 = 25,142 \, \text{IRR}$$

- **Price Range**:

  The forward rate represents the upper bound of the price range.

$$\text{Price Range} = 22,000 \, \text{to} \, 25,142 \, \text{IRR}$$

- **Calculate the Price Range for 2000 AED**:

$$\text{Price Range} = 2000 \times 22,000 \, \text{to} \, 2000 \times 25,142 = 44,000,000 \, \text{to} \, 50,284,000 \, \text{IRR}$$

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3. Purchasing Power Parity (PPP)

Objective:

To calculate the exchange rate based on the difference in inflation rates between two countries.

Formula:

$$S = \frac{P_f}{P_d}$$

- S: Exchange rate.
- P_f: Price level in the foreign country.
- P_d: Price level in the domestic country.

Inflation Impact:

$$\text{Inflation Impact} = \left(\frac{\pi_f - \pi_d}{1 + \pi_d} \right) \times S$$

- π_f: Inflation rate in the foreign country.
- π_d: Inflation rate in the domestic country.

Example:

Assume:

- Spot rate (S): 22,000 IRR per AED.
- Inflation in Iran (π_d): 40% (0.40).
- Inflation in UAE (π_f): 2% (0.02).
- **Calculate the Exchange Rate (S)**:

$$S = \frac{1 + \pi_f}{1 + \pi_d} = \frac{1.02}{1.40} \approx 0.7286$$

$$S = 22,000 \times 0.7286 \approx 16,029 \, \text{IRR}$$

- **Calculate the Inflation Impact**:

$$\text{Inflation Impact} = \left(\frac{0.02 - 0.40}{1 + 0.40} \right) \times 22,000 = -0.2714 \times 22,000 = -5,971 \, \text{IRR}$$

- **Price Range**:

$$\text{Price Range} = 22,000 \pm 5,971 = 16,029 \text{ to } 27,971 \, \text{IRR}$$

- **Calculate the Price Range for 2000 AED**:

$$\text{Price Range} = 2000 \times 16,029 \text{ to } 2000 \times 27,971 = 32,058,000 \text{ to } 55,942,000 \, \text{IRR}$$

4. Mundell-Fleming Model

Objective:
To analyze the impact of monetary and fiscal policies on the exchange rate.

Steps:

- **Expansionary Monetary Policy**:
  A decrease in the domestic interest rate weakens the domestic currency.
  Example: If the interest rate decreases by 2%, the currency may depreciate by 10%.
- **Calculate the New Exchange Rate**:

$$\text{New Rate} = \text{Spot Rate} \times (1 - \text{Depreciation Rate})$$

  Assume a 10% depreciation:

$$\text{New Rate} = 22,000 \times 0.90 = 19,800 \,\text{IRR}$$

- **Price Range**:

$$\text{Price Range} = 19,800 \,\text{to}\, 22,000 \,\text{IRR}$$

- **Calculate the Price Range for 2000 AED**:

$$\text{Price Range} = 2000 \times 19,800 \,\text{to}\, 2000 \times 22,000 = 39,600,000 \,\text{to}\, 44,000,000 \,\text{IRR}$$

Final Table with Price per AED

Formula	Price Range (IRR)	Price per AED (IRR)
My Proposed Formula	43,502,000 to 44,678,000	21,751 to 22,339
Covered Interest Rate Parity (CIRP)	44,000,000 to 50,284,000	22,000 to 25,142
Purchasing Power Parity (PPP)	32,058,000 to 55,942,000	16,029 to 27,971
Mundell-Fleming Model	39,600,000 to 44,000,000	19,800 to 22,000