# International Finance Notes

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March 2026

## 0.1 Asymmetric Information Effect

- Currencies are traded among firms and financial institutions that possess different information/knowledge about them.
- Traders will adjust their states according to their perception of demand.
- A study found an effect of 0.00014 per $10 million USD traded.

**Short-term** exchange rate movements are commonly believed to be affected by inventory control or the asymmetric information effect. These beliefs disappear on the **Long-term**.

## 0.2 Exchange rate vs Tariff

The domestic price of an imported good consists of: foreign price, CIF, exchange rate, and tariff, among others.

$$p^{\$} = (1 + tf)\frac{1}{E}p^{X} \tag{1}$$

Meaning the $tf$ (tariff rate) and $E$ (exchange rate, $X/\$$) can offset each other in one way or another.

## 0.3 Trade flow model

**Demand for a foreign currency**: Imports of goods from abroad, holding the price unchanged, the higher the price of the currency, the less demand for these goods. i.e., when exchanging rates, if the price of a good remains unchanged, the appreciation of the currency decreases the demand for the currency.

**Supply of a foreign currency**, Exports of a country that earns foreign currency, the higher the price of the currency, the greater the supply of the currency.

It's hard to compare the value of a currency since it can appreciate/depreciate at the same time against different currencies.

### 0.4 Trade-weighted exchange rate indexes

Effective Exchange Rate: A trade-weighted exchange rate index reflects a currency's movement against a basket of foreign currencies during a period of time.

$$\text{NEER}_t = \sum w_i \frac{s_{it}}{s_{ft}} \tag{2}$$

# 1 Monetary System

**Monetary base**: On what standard does a country issue its currency?

Are there any rules regarding monetary policy and exchange rate policy and what are they?

## 1.1 Gold standard

Before the late 19th century, most countries would run a commodity money system where gold and silver were used as currency.

Gold standard means, gold alone is used as the reserve base for banking system.

As such Central Bank plays a limited role of monetary policy.

The government has no restriction on cross-border flows of gold and capital.

# 2 Balance of Payments

A system of accounts which is subset of the National Income and Production Accounts.

- Debit Entries: Transactions that generate a payment outflow (e.g. imports).
- Credit Entries: Transactions that generate a payment inflow (e.g. exports).

The unit of measurement is the US dollar or the home currency.

Frequency: Quarterly or Annually Basis

## 2.1 Current account vs Financial account

**Current Account** in BOP. Summary record of all inflow and outflow of goods and services into a country, it **includes** all primary and secondary income to residents.

- Trade in goods: Tangible items, manufactured goods.
- Trade in service: Banking, insurance, consulting, tourism.
- Income: Investments abroad, or foreign-owned assets in the home country.
- Unilateral transfer: Gov. grants abroad, private remittances, private grants abroad.

Three situations of the current account balance:

- Surplus: $\sum$ CA credit items $>$ $\sum$ CA debit items
- Deficit: $\sum$ CA credit items $<$ $\sum$ CA debit items
- Balance: $\sum$ CA credit items $=$ $\sum$ CA debit items

**Capital and Financial Account** in BOP. Summary record of all financial transactions, including property transfer into a country.

- Capital migration (In Credit Terms +/-)
- Direct investment
  - home investment abroad (ODI) -
  - foreign investment at home (FDI) +
- Portfolio investment
  - Assets: equity, bond -
  - Liabilities: equity, bond +
- Other investment
  - Assets: trade credit, loan, currency and deposit. -
  - Liability: trade credit, loan, currency and deposit, and other +

**Change in official reserves**
**Errors and Omissions**

Observations about **CA balance**. Trade in goods is usually the main determinant of a country's CA.

The CA will affect the outlook of the currency (exchange rate movement in the future). It determines the external debt accumulation.

## 2.2 Identity in the BOP

In principle all countries should follow the identity:

$$CA_t + FA_t + \Delta R_t + EO_t \equiv 0 \tag{3}$$

Now, suppose $EO_t = 0$, then

$$CA_t + FA_t + \Delta R_t = 0 \tag{4}$$

which means

$$-\Delta R_t = CA_t + FA_t \tag{5}$$

FX accumulation arises from the sum of current account and financial account surpluses.

Now, suppose $\Delta R_t = 0$ (floating exchange rate regime in effect), then

$$CA_t = -FA_t \text{ or } -CA_t = FA_t \tag{6}$$

Interpretation. **Currency Accounts surplus** means an increased foreign investment to overseas. **Current Account deficit** means an increased inflow of foreign investments.

NIIP: Net International Investment Position.

Direct investment, market value; Portfolio investment; Other investment; Financial derivatives, fair value; Official reserves.

Relation with CA

- Definition. $\text{NIIP}_t \equiv \text{Assets} - \text{Liabilities}$
- $\text{CA}_t = \text{NIIP}_t - \text{NIIP}_{t-1}$
- Estimation. $\hat{\text{NIIP}}_t = \sum \text{CA}$
- Valuation $= \text{NIIP} - \sum CA$

CA is the flow variable. NIIP is the stock variable.
When $CA_{\text{country A}} = -CA_{\text{country B}}$, suggests international mutual dependence.

# 3 Forward-looking Market Instruments

The forward exchange rate or forward price is the exchange rate at which a bank agrees to exchange one currency for another at a future date when it enters into a forward contract with a customer, either a business firm or an investor.

**Receivables** in foreign exchange for exporters.

**Payables** in foreign exchange for importers.

Is the market for contracts that ensure the future delivery of a currency at a specified exchange rate. Typically, for a maturity of 1, 3, 6, 9, and 12 months.

The forward rate is determined by the forces of supply and demand in the forward market.

Forward markets are a sophisticated development of trade and commerce based on long-term contracts.

## 3.1 Forward Premium Discount

This is the difference between the forward exchange rate and the spot rate, expressed as a percentage of the spot rate.

$$\frac{F_N - S}{S} \cdot \frac{12}{N} \tag{7}$$

If the $F_N < S$, then we say the currency is being sold in discount.

Because the forward rate is determined by the supply and demand for the future delivery of a currency, it may convey information about the future spot rate.

The forward exchange rate $F_t$ at time $t$ is the expected spot exchange rate at time $t + k$. I.e.

$$F_t = \mathbb{E}[S_{t+k}] \tag{8}$$

## 3.2 SWAP

These are financial contracts that obligate each party to the contract to exchange a set of payments (not assets) it owns for another set of payments owned by another party.

Usually, a swap takes place between two large banks or multinational firms.

### 3.2.1 Currency Swaps

Involve the exchange of a set of payments in one currency for a set of payments in another currency, usually for a long period of time. **When two entities wish to borrow money from a foreign currency, say a Canadian company wishing to buy Japanese yen, and a Japanese company wishing to buy Canadian dollars, they can agree to engage in a deal of currency exchange, often assisted by a bank**.

### 3.2.2 Interest Rate Swaps

These involve the exchange of one set of payments for another set of payments, all denominated in the same currency.

### 3.2.3 Credit Default Swaps

It is a type of insurance scheme that protects a buyer from a default in payments. The buyer pays a fee to the seller during the term of the CDS.

Many lending agencies expanded their loans in the subprime market, and bought CDS for their loans for AIG, among others.

Mortgage lenders increased their creditworthiness by buying CDS and then reselling them in the market through a process called securitization.

## 3.3 Futures

Are standardized forward contracts that can be resold by their holders to others in an organized exchange.

Like forward contracts, futures contracts have fixed expiration dates, at the expiration date, the price of the contract converges to the price of the price of the underlying asset to be delivered.

They can avoid problem of liquidity and default.

When engaging in a futures contract, one may not need to pay the full amount of the transaction, rather a small **margin**. Usualy, before the contract expires, the actual exchange rate moves in a position opposite to your bid. To reduce the risk of defaul, the counterpart may ask for an increase in the security payment–**margin call**.

## 3.4 Options

Contracts give the purchaser option to buy/sell the specified instrument at a specified price (**exercise or strike price**) within a specific period of time (**term to expiration**).

The seller of an option, is obligated to buy or sell the financial instrument if the buyer of the option exercises its right to buy/sell.

The buyer, however, does NOT have to exercise the option.

- *American option*: can be exercised anytime up to the expiration date.
- *European option*: can only be exercised on the expiration date.
- *Call options*: are buy options (instruments at a given price or currencies at a specific exchange rate).

- *Put options*: are sell options (instruments at a given price or currencies at a specific exchange rate).

#### 3.4.1 Bull's vs Bear's view

The ups and downs of the market its the nature of trading markets. Making the right prediction does not gurantee profits.

The profits of **buyer** and **seller** of options are negatively correlated. When the prices of the futures increase, that's linearly correlated with the buyer of call options and the buyer of future's profits. Similarly, the buyer of put options and seller of future's will decrease their profits as the price at expiration increases.

#### 3.4.2 Differences: Options vs Futures

The futures are traded several times and change hands constantly, while options only change hands when the option is exercised.

Profits in **futures contracts** grow 1$ per 1$ of increase in the price of the financial instrument. However, profits in **options contracts** won't grow the same way because of the protection afforded from losses.

In Options, only the seller pays a margin, but not the seller, different from futures where you pay a margin when you buy/sell.

#### 3.4.3 New Developments

**FOX** Break Contract Forward: A right to break the contract forward.

**Bidding on contracts**. Selling foreign exchange in a bidding process.

**FTT tax (Financial Transaction Tax)** aka Tobin Tax, or Currency Transaction Tax imposed by the EU. Is a tax impossed on every instance of buying or selling financial assets such as stocks, bonds, or derivatives.

### 3.5 Domestic finance, international finance and offshore finance

### 3.6 Arbitrage in commodity markets and financial markets

Arbitrage in commodity markets: price equalization and purchase power parity.

Arbitrage in financial markets: interest rate equalization and interest rate parity.

There are four factors involved herewith in arbitrage of two currencies (e.g. US dollar and UK pound):

- $i_\$$ interest rate in USD.
- $i_p$ interest rate in UK pound.
- $S_0$ spot rate
- $S_0$ spot rate in the future

Benchmark interest rate.
Covered interest parity.

$$1 + i_{\$} = (1 + i_p)F/E \tag{9}$$

Since $(1 + i_{\$})/(1 + i_p) \approx 1$ The approximate covered interest rate parity equation is

$$i_{\$} = i_p + (F - E)/E \tag{10}$$

## 3.7 Interest rate and inflation: Fisher effect

$$i = r + \pi^e \tag{11}$$

Where $i$ is the nominal interest rate on a security for a year, $r$ is the real interest rate or nominal interest rate adjusted for inflation for the same year, $e$ expected inflation (in people's mind).

## 3.8 Exchange rates, interest rates, and inflation

$$i_{\$} = r_{\$} + \pi^e \text{ for the USD} \tag{12}$$

Global investors want to have a high as possible real returns from their investments. If global markets allow free flow of capital one might expect real returns to equalize.

The interest parity condition indicates that the interest differential is also equal to the forward premium.

$$i_{\$} - i_p = \pi^e_{\$} - \pi^e_p = (F - S)/E \tag{13}$$

## 3.9 Real interest rate equalization

The real interest rate can be an assumption.

- Fisher effect in home and foreign countries.

$$i = R + \pi^e;\ i^* = R^* + \pi^{*e} \tag{14}$$

- International Fisher effect:

$$i - i^* = (R - R^*) + (\pi^e - \pi^{*e}) \tag{15}$$

- Uncovered interest rate parity:

$$i - i^* = \Delta s^e \tag{16}$$

- Purchasing Power Parity:

$$\Delta s^e = \pi^e - \pi^{*e} \tag{17}$$

As a result $R = R^*$

#### 3.9.1 Yield curve

The markets for **short-term** and **long-term** interest rates are different.

Long-term bonds may be riskier, so investors may require a higher interest on those bonds. While short-term bonds are more liquid.

If two countries' yield curves are in the same shape (upward, downward, or flat), the moves in spot and forward exchange rates may be instant.

Interest rate parity is most applicable to a market environment where countries' financial markets are near-perfectly open and integrated.

This concept is most applicable to short-term.

# 4 Prices and Exchange Rates

## 4.1 Arbitrage and the law of one price (LOOP)

Arbitrage in commodity markets: Goods are bought where they are priced low and sold where they are priced high.

If there is adequate competition and perfect information, in the absence of transport costs, a same good of the same quality tends to have a common prices everywhere in the world.

LOOP is denoted as $P_i = EP_i^*$.

## 4.2 Purchasing Power Parity: Absolute

Class notes: Generalization of price $i$: $P = \sum w_i P_i$ where $i = 1, 2, ..., n$; and $\sum w_i = 1$

Likewise, $P^F$ is formed in the same way.

If LOOP holds for all commodities, when we have $E = \frac{P}{P^F}$.

This states that the exchange rate between two currencies is determined by the relative prices of commodities in two countries.

Gemini notes:

Absolute PPP states that the nominal exchange rate $S$ is determined by the ratio of absolute price levels between two countries.

$$S = \frac{P}{P^*} \tag{18}$$

Where:

- $S$: Spot exchange rate (domestic currency per unit of foreign currency).
- $P$: Price level of a representative basket in the domestic country.
- $P^*$: Price level of the same basket in the foreign country.

## 4.3 Relative Purchasing Power Parity (RPPP)

Class notes: $\hat{E} = \hat{P} - \hat{P}^F$

Relative PPP relates the change in the exchange rate to the inflation differential between two nations.

$$\frac{S_t}{S_{t-1}} = \frac{1 + \pi_d}{1 + \pi_f} \implies \%\Delta S \approx \pi_d - \pi_f \tag{19}$$

Where:

- $\pi_d$: Domestic inflation rate.
- $\pi_f$: Foreign inflation rate.

## 4.4 Key Concepts for Analysis

1. **The Real Exchange Rate ($q$):** Defined as $q = S\frac{P^*}{P}$. If APPP holds, $q = 1$. Persistent deviations in $q$ represent departures from PPP.
2. **Balassa-Samuelson Effect:** Explains why PPP often fails; high-productivity growth in tradable sectors leads to higher wages across the economy, increasing the price of non-tradables and causing real exchange rate appreciation.
3. **Empirical Evidence:** PPP generally fails in the short run due to price stickiness but shows significant "mean reversion" over the long run (3–5 year half-lives).

## 4.5 Deviations from Purchasing Power Parity (PPP)

Empirical evidence shows that PPP is a long-run equilibrium condition rather than a short-run reality. The following factors explain the persistent deviations:

### 4.5.1 1. The Balassa-Samuelson Effect

This is the most significant structural deviation. It posits that productivity growth differentials between tradable and non-tradable sectors lead to higher price levels in developed countries.

$$P = \gamma P_T + (1 - \gamma)P_N \tag{20}$$

Where $P_T$ (tradables) follows the Law of One Price, but $P_N$ (non-tradables) is determined by domestic labor productivity.

### 4.5.2 2. Trade Frictions and Transaction Costs

The presence of:

- **Transportation Costs:** Create a "neutral band" where arbitrage is not profitable.
- **Trade Barriers:** Tariffs, quotas, and non-tariff barriers segment international markets.
- **Pricing to Market (PTM):** Firms with market power adjust markups based on destination, preventing $P$ from equalizing across borders.

### 4.5.3 3. Nominal Rigidities and Overshooting

According to the *Dornbusch Overshooting Model*, since goods prices ($P$) are sticky and exchange rates ($S$) are flexible, monetary shocks cause $S$ to deviate sharply from its long-run PPP equilibrium in the short run to clear the money market.

#### 4.5.4 4. Statistical Measurement Biases

- **Index Weighting:** Different countries use different weights in their CPI baskets.
- **Quality Adjustments:** Differences in how countries account for technological improvements in goods.

### 4.6 Summary of Empirical Evidence

The *"PPP Puzzle"* (Rogoff, 1996) highlights the paradox between high short-term volatility of real exchange rates and the very slow speed of mean reversion (half-lives of 3 to 5 years).

## 5 Measuring Overvaluation and Undervaluation

To quantify the degree of misalignment of a currency relative to PPP, we compare the theoretical PPP exchange rate with the observed market exchange rate.

### 5.1 1. The PPP Exchange Rate ($S_{PPP}$)

The theoretical rate that equalizes the cost of a specific good or basket between two countries:

$$S_{PPP} = \frac{P_d}{P_f} \tag{21}$$

Where $P_d$ is the price in domestic currency and $P_f$ is the price in foreign currency.

### 5.2 2. Percentage Valuation Change

The degree of overvaluation or undervaluation ($\delta$) is calculated as follows:

$$\delta = \frac{S_{PPP} - S}{S} \times 100 \tag{22}$$

Where $S$ is the nominal spot exchange rate (units of domestic currency per unit of foreign currency).

### 5.3 Interpretation Criteria

- **If $\delta > 0$:** The domestic currency is **overvalued**. The local price is higher than the international price when converted at the market rate.
- **If $\delta < 0$:** The domestic currency is **undervalued**. The local price is lower than the international price, suggesting the currency is "cheap" relative to its purchasing power.

### 5.4 Limitations

In a master's context, this calculation is a "raw" measure. A more sophisticated analysis would use **Econometric Regressions** to adjust for GDP per capita (Balassa-Samuelson adjustment), acknowledging that lower-income countries naturally have lower price levels.

# 6 Eurocurrency Markets

## 6.1 Categorizing Financial Flows

International finance is fundamentally composed of three overlapping spheres: **Domestic Finance**, **Foreign Finance**, and **Offshore Finance**[cite: 234, 235].

- **Domestic Finance:** Standard financial activities utilizing the domestic currency within a country's borders[cite: 244].
- **International Finance:** Typically utilizes **hard currencies** (or *vehicle currencies*) that are widely accepted globally[cite: 245].
- **Offshore Finance:** Transactions where non-residents use international currencies while locals continue using the local currency[cite: 246]. For example, London acts as a major offshore center for the U.S. Dollar while UK residents use Sterling domestically[cite: 247].
- **Dollarization:** A specific case of domestic finance where a foreign currency is used for internal transactions[cite: 244].

## 6.2 Conceptual Definitions

### 6.2.1 Offshore Currencies and Markets

**Offshore currencies** (interchangeable with offshore accounts) are currencies held and used by non-residents (and occasionally residents) outside the currency's home territory[cite: 249].

- **Onshore Finance:** Transactions in the home currency conducted within the home country, subject to domestic regulations[cite: 284].
- **Offshore Finance:** Transactions (deposits, loans, securities) conducted outside the jurisdiction of the home country's currency, exempt from that country's regulations[cite: 284].
- **Eurocurrency:** Any currency circulating outside its home territory (e.g., Eurodollars, Euroyen, or the more recent Euro-renminbi)[cite: 285, 297, 301].

### 6.2.2 Types of Financial Hubs

- **International Financial Centers:** Large-scale locations for concentrated domestic and international transactions with sophisticated services[cite: 277].
- **Tax Havens:** Locations providing banking/business services primarily to foreigners, characterized by extremely low taxes and high secrecy[cite: 278, 279].
- **Offshore Financial Centers (OFCs):** Hubs where transactions occur primarily between foreign residents in foreign currencies[cite: 280].

## 6.3 Historical Evolution and Origins

The rise of the Eurodollar market was driven by several 20th-century geopolitical and regulatory factors:

- **Cold War Geopolitics (1950s–70s):** The Soviet Union held USD but avoided U.S. banks due to political risk, depositing them in European (mostly British) banks instead[cite: 268, 269].
- **European Capital Controls:** UK banks, restricted from lending in Sterling to foreigners, pivoted to lending in Dollars[cite: 270].
- **U.S. Regulation: Regulation Q** (interest rate ceilings) and the **Interest Equalization Tax** prompted U.S. banks to expand operations abroad to remain competitive[cite: 272].
- **Petrodollar Recycling (1970s–80s):** OPEC windfall gains in USD were deposited in Europe and recycled into international loans[cite: 273, 274].

## 6.4 Eurocurrency Instruments

Common instruments in the offshore market include[cite: 304]:

- **Euro-deposits/Loans:** Fixed-term transactions in non-local currency, exempt from local regulations[cite: 305, 306].
- **Eurobonds:** Bonds denominated in a currency that is not the investor's home currency[cite: 307].
- **Euronotes & Eurocommercial Paper:** Short-term debt securities or discount bills issued by multinational firms[cite: 308, 309].
- **Eurodollar Syndicate Loans:** Large-scale project financing involving groups of banks[cite: 310].

## 6.5 Market Dynamics and Interest Rates

### 6.5.1 The Regulatory Advantage

The Eurocurrency market thrives because it is **least regulated**—falling outside the regulatory reach of both the country issuing the currency and the country where the transaction occurs[cite: 318, 319]. This bypasses costs like reserve requirements and deposit insurance[cite: 320].

### 6.5.2 Interest Rate Determination

Offshore rates are typically determined using a benchmark (formerly LIBOR, now **SOFR**) plus various risk premiums[cite: 334, 336]:

$$i_{borrower} = \text{SOFR} + \text{Term Factor} + \text{Country Risk} + \text{Industry/Credit Factors} \tag{23}$$

#### 6.5.3 Interest Rate Spreads

The **spread** is the difference between deposit and loan rates[cite: 338]. Eurobanks often operate with a **lower spread** than domestic banks due to high competition, high liquidity, and lack of regulatory costs[cite: 324, 332].

### 6.6 Case Study: RMB Internationalization

Offshore markets are critical to China's strategy for RMB internationalization[cite: 214].

- **Dual Exchange Rates:** Segmentation creates two rates for RMB/USD: **CNY** (Mainland, restricted) and **CNH** (Hong Kong, free)[cite: 219, 221].
- **Arbitrage:** Differentials between CNY and CNH drive cross-border fund flows and create arbitrage opportunities[cite: 223, 225].
- **Evolution:** RMB offshore deposits in Hong Kong grew significantly after 2004, particularly after 2009 when trade-related RMB transactions were permitted[cite: 210, 211].

### 6.7 Summary of Offshore Markets

Offshore markets serve as a vital global funding source for residents and non-residents alike[cite: 226]. Their growth is primarily attributed to their status as the least regulated financial environments, facilitating global arbitrage and efficient capital re-channelling[cite: 228, 229].

## 7 Exchange Rates, Interest Rates, and Interest Parity

### 7.1 Conceptual Framework of Arbitrage

The principle of parity stems from arbitrage—the process of equalizing prices or returns across different markets.

- **Commodity Markets:** Arbitrage leads to **Purchasing Power Parity (PPP)** and price equalization.
- **Financial Markets:** Arbitrage leads to **Interest Rate Parity (IRP)** and the equalization of returns.

### 7.2 Foundations of Interest Rate Parity (IRP)

Cross-border arbitrage involves comparing returns on domestic vs. foreign liquid securities (e.g., risk-free government bonds).

#### 7.2.1 Key Variables

To analyze the relationship between the U.S. ($) and the U.K. (£):

- $i_{\$}$: Interest rate in the United States.
- $i_{£}$: Interest rate in the United Kingdom.

- $E$: Spot exchange rate (USD per GBP).
- $F$: Forward exchange rate (USD per GBP).

#### 7.2.2 Benchmark Rates

When comparing international rates, one must use **benchmark rates**, typically the yield on risk-free government bonds (e.g., 3-month or 10-year Treasury yields), to ensure "default risk" is neutralized.

### 7.3 Covered Interest Parity (CIP)

**Covered Interest Parity** occurs when an investor uses a forward contract to "cover" or eliminate exchange rate risk.

#### 7.3.1 The CIP Equation

The equilibrium condition where returns are equalized regardless of the currency of investment:

$$1 + i_{\$} = (1 + i_{£})\frac{F}{E} \tag{24}$$

This can be approximated for practical use as:

$$i_{\$} \approx i_{£} + \frac{F - E}{E} \tag{25}$$

Where $\frac{F-E}{E}$ represents the **forward premium** (if positive) or **forward discount** (if negative) of the foreign currency.

#### 7.3.2 The "No-Arbitrage" Condition

If $1 + i_{\$} > (1 + i_{£})\frac{F}{E}$, capital flows into the USD. This pressure eventually increases $E$ or decreases $F$ and $i_{\$}$ until equality is restored.

### 7.4 Uncovered Interest Parity (UIP)

**Uncovered Interest Parity** applies when investors do not use forward contracts, instead basing decisions on the **expected future spot rate** ($E^e$).

#### 7.4.1 The UIP Equation

The relationship relies on expected depreciation or appreciation:

$$i_{\$} \approx i_{£} + \frac{E^e - E}{E} \tag{26}$$

- If $i_{\$} > i_{£} + \frac{E^e-E}{E}$, there is an incentive to move capital into USD.
- Unlike CIP, UIP involves **exchange rate risk**, as the future spot rate is not guaranteed.

## 7.5 The Relationship Between CIP and UIP

If both CIP and UIP hold, it implies:

$$F = E^e \tag{27}$$

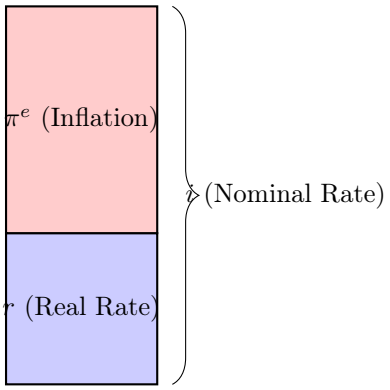
This suggests the **Forward Rate is an Unbiased Predictor** of the future spot rate. However, empirical evidence (the "Forward Premium Puzzle") often shows that forward rates are poor predictors due to risk premiums and market inefficiencies.

## 7.6 Empirical Applicability and Complications

- **Market Integration:** IRP is most applicable in near-perfectly open and integrated financial markets.
- **Transaction Costs:** In reality, small deviations from parity exist due to brokerage fees and bid-ask spreads.
- **Political & Sovereign Risk:** Capital controls or the threat of future taxes can prevent arbitrage from equalizing rates.
- **Liquidity:** Differences in the liquidity of domestic vs. foreign bonds can create a liquidity premium.

## 7.7 The Fisher Effect and Exchange Rates

The Fisher Effect establishes the relationship between nominal interest rates, real interest rates, and inflation.




Fisher Equation: $i = r + \pi^e$

### 7.7.1 The Fundamental Fisher Equation

The nominal interest rate ($i$) is composed of the real interest rate ($r$) and the expected inflation rate ($\pi^e$):

$$i = r + \pi^e \tag{28}$$

In an international context, if real interest rates are equalized across countries, the difference in nominal interest rates between two nations should reflect the difference in their expected inflation rates.

### 7.7.2 International Fisher Effect (IFE)

The IFE suggests that differences in nominal interest rates between countries reflect differences in expected inflation, which in turn dictate expected changes in the spot exchange rate.

$$\frac{E^e - E}{E} \approx i_h - i_f \approx \pi_h^e - \pi_f^e \tag{29}$$

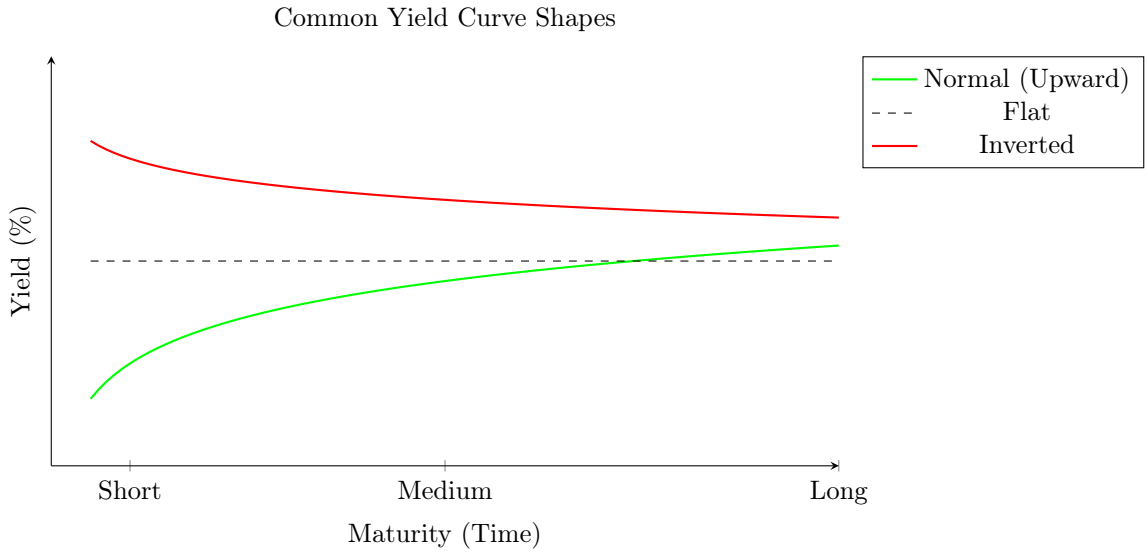
## 7.8 Real Interest Rate Equalization

If both Uncovered Interest Parity (UIP) and Relative Purchasing Power Parity (PPP) hold, real interest rates across countries should converge:

- **Logic:** If capital is perfectly mobile and investors seek the highest real return, any discrepancy in $r$ will lead to capital flows that eliminate the gap.
- **Implication:** In the long run, the expected real cost of borrowing should be the same globally, regardless of the currency used.

## 7.9 The Yield Curve and Term Structure of Interest Rates

The yield curve plots the relationship between the interest rate (yield) and the time to maturity for debt instruments of the same credit quality.



### 7.9.1 Expectations Theory

This theory posits that long-term interest rates are determined by the market's expectations of future short-term interest rates.

- An upward-sloping curve implies the market expects short-term rates to rise in the future.
- A flat curve implies expectations of stable rates.

### 7.9.2 Liquidity Preference (Liquidity Premium) Theory

Investors generally prefer liquidity and perceive longer-term bonds as riskier (due to interest rate risk).

- **Premium:** To induce investors to hold long-term debt, a "liquidity premium" must be added to the expected future short-term rates.
- This explains why the yield curve is typically upward-sloping even when short-term rates are expected to stay constant.

### 7.9.3 Preferred Habitat & Market Segmentation Theory

These theories suggest that different investors have different maturity preferences (habitats) and do not easily switch between them.

- **Market Segmentation:** The interest rate for each maturity is determined by the specific supply and demand within that "slice" of the market (e.g., pension funds demand long-term bonds, while banks demand short-term).
- **Preferred Habitat:** Investors can be coaxed out of their preferred maturity only if a sufficient yield spread (risk premium) is offered.

## 7.10 Summary and Implications

- **Monetary Policy:** IRP implies that under a fixed exchange rate ($F = E$), a country loses monetary independence as its interest rate must match the anchor country's rate ($i_h = i_f$).
- **Capital Mobility:** High capital mobility is both a cause and a result of interest rate parity.
- **Short-term Focus:** The concept is most relevant for short-term financial market analysis rather than long-term structural changes.

# 8 Prices and Exchange Rates: Purchasing Power Parity

## 8.1 The Law of One Price (LOOP)

The Law of One Price is the microeconomic foundation of Purchasing Power Parity. It states that in competitive markets with perfect information and no transport costs, identical goods must sell for the same price when expressed in a common currency.

$$P_i = E \times P_i^* \tag{30}$$

Where:

- $P_i$: Price of good $i$ in domestic currency.
- $P_i^*$: Price of good $i$ in foreign currency.
- $E$: Nominal exchange rate (domestic/foreign).

## 8.2 Purchasing Power Parity (PPP)

### 8.2.1 Absolute PPP

Absolute PPP extends LOOP to a general price level (basket of goods). It suggests the exchange rate between two currencies equals the ratio of the countries' price levels.

$$E = \frac{P}{P*} \tag{31}$$

### 8.2.2 Relative PPP

Relative PPP accounts for market frictions (transport costs, tariffs) by focusing on *changes* in price levels (inflation) rather than absolute levels. It states that the rate of depreciation of a currency is equal to the difference in inflation rates between the two countries.

$$\frac{\Delta E}{E} = \pi - \pi^* \tag{32}$$

Where $\pi$ is the domestic inflation rate and $\pi^*$ is the foreign inflation rate.

## 8.3 The Real Exchange Rate ($q$)

The real exchange rate measures the purchasing power of one currency relative to another, or the relative price of a basket of goods.

$$q = \frac{E \times P^*}{P} \tag{33}$$

- If $q = 1$: PPP holds exactly.
- If $q > 1$: The foreign basket is more expensive; the domestic currency is **undervalued** (high competitiveness).
- If $q < 1$: The foreign basket is cheaper; the domestic currency is **overvalued** (low competitiveness).

## 8.4 The Balassa-Samuelson Model

This model explains why PPP often fails to hold, particularly between developed and developing nations, by distinguishing between **Tradables** (T) and **Non-tradables** (N).

### 8.4.1 Key Assumptions

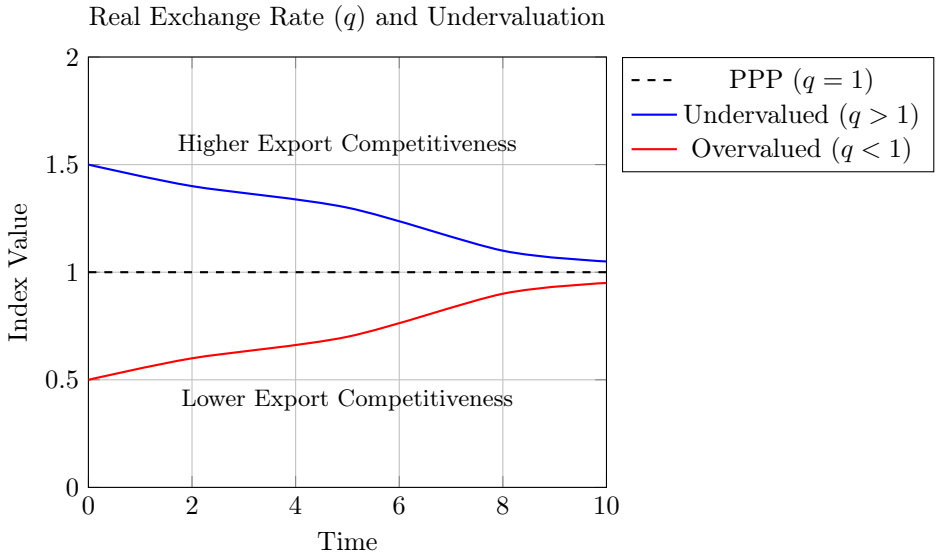
- LOOP holds for tradable goods ($P_T = EP_T^*$).
- Labor is mobile between sectors within a country, equalizing wages ($W = W_T = W_N$).
- Productivity in tradables grows faster in developing countries during catch-up phases.

### 8.4.2 The Productivity Mechanism

High productivity growth in the **Tradable sector** leads to higher wages. Because labor is mobile, wages also rise in the **Non-tradable sector** (where productivity may not have grown). To maintain zero profits, the price of non-tradables ($P_N$) must rise.

**Result:** Rapidly growing economies tend to experience higher domestic price levels and an **appreciation of the real exchange rate** over time.

## 8.5 Visualizing Real Exchange Rate Dynamics




## 8.6 Summary and Discussion

- **Short-run vs. Long-run:** PPP is generally a poor predictor of short-run exchange rate movements but serves as a useful long-run anchor.
- **Structural Factors:** Exchange rates are influenced not just by prices, but by productivity differentials (Balassa-Samuelson), trade barriers, and consumer preferences.
- **Competitiveness:** While undervaluation ($q > 1$) can boost exports, its long-term effect depends on structural factors like product quality and global demand.