Uncovered Interest Parity

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Introduction

With a floating exchange rate, what determines E?

In the short run, E is mainly an **asset price**.

- Most FX trades buy foreign assets, not foreign goods.
- Exchange rates move with capital flows.
- Capital flows are driven by **rates of return**

Uncovered interest parity (UIP) models how this works.

1 Comparing Returns

1.1 Where Would You Invest?

You have \$1,000 to invest for one year.

- U.S. bond: pays $i = 5\%$
- Japanese bond: pays $i^\star = 1\%$

Where do you invest?

With a **fixed exchange rate**, the answer is easy

- $i > i^\star \implies$ invest at home.

What if the exchange rate **floats**?

1.2 Comparing Dollar Returns

We cannot compare i and $i^\star$

- US bonds pay in dollars
- Japanese bonds pay in yen

What we care about is the **dollar return** of investing in yen.

That dollar return has two parts:

1. the interest rate $i^\star$
2. the capital gain from holding yen (yen appreciation)

1.3 The Dollar Return of Investing in Yen

Invest \$1 in the Japanese bond:

Step	**You hold**
Today: buy yen at price E_t	$1/E_t$ yen
Next year: add interest	$(1+i^\star)/E_t$ yen
Next year: sell yen at price E_{t+1}	$(1+i^\star)E_{t+1}/E_t$ dollars

The yen bond earns interest $i^\star$ **plus** any appreciation of the yen.

Notation:

- E is the price of one yen in dollars ($\$/¥$).
- $E\uparrow$: the ¥ appreciates.
- Careful: Blanchard defines E the other way around (¥ per \$).

1.4 Example

$i = 5\%, \quad i^\star = 1\%, \quad E_t = 0.01$ (¥100 per $).

Invest $1,000:

- U.S. bond: $1,050 next year.
- Japanese bond: ¥100,000 today, ¥101,000 next year. In dollars:

¥ next year	E_{t+1}	Payoff
unchanged	0.0100	$1,010
appreciates 4%	0.0104	$1,050
appreciates 10%	0.0110	$1,111

The yen bond wins if the ¥ appreciates by more than $i - i^\star = 4\%$.

1.5 Expected Returns

Problem: when you invest, you do not know E_{t+1}.

Investors compare **expected** returns. They expect the exchange rate E^e_{t+1}.

Expected dollar return on the yen bond:

$$(1 + i^\star)\frac{E^e_{t+1}}{E_t}$$

"Uncovered": the investor bears the exchange rate risk.

- A forward contract could lock in E_{t+1} today. That is "covered" interest parity.
- We focus on the uncovered version.

1.6 Uncovered Interest Parity

Definition. UIP holds when U.S. and Japanese bonds offer the same expected dollar return.

$$1 + i = (1 + i^\star)\frac{E^e_{t+1}}{E_t}$$

Approximately:

$$i \approx i^\star + x$$

where $x = E^e_{t+1}/E_t - 1$ is the **expected appreciation of the ¥**.

In words:

U.S. interest rate = Japanese interest rate + expected ¥ appreciation.

1.7 Why Must UIP Hold?

Suppose $i = i^\star = 2\%$, but investors expect the ¥ to appreciate by 5%.

- Expected returns: U.S. bond 2%, Japanese bond 7%.
- Investors sell \$ and buy ¥.

What adjusts?

- Central banks set i and $i^\star$. We take them as given.
- So the ¥ appreciates today: $E_t \uparrow$.
- For given E^e_{t+1}, that lowers the expected appreciation x.

Capital flows stop when $x = 0$ and $i = i^\star + x$ holds again.

With a floating exchange rate, today's exchange rate does the adjusting.

1.8 Check Your Understanding

$i = 5\%$ $\quad$ $i^\star = 2\%$

If UIP holds, what do investors expect the ¥ to do?

1.9 High Interest Rates and Expected Depreciation

UIP: $5\% = 2\% + x \implies x = 3\%$.

- Investors expect the ¥ to appreciate by 3%.
- Equivalently: the $ is expected to depreciate by about 3%.

Why would anyone hold dollars?

- $ bond: 5% interest − 3% expected depreciation = 2%.
- That is the same as the ¥ bond.

A currency with a high interest rate must be expected to depreciate.

Does that make the $ weak? Not today. Next section.

2 What Moves the Exchange Rate?

2.1 Solving for the Exchange Rate

Solve UIP for today's exchange rate.

Drop time subscripts: $E = E_t$, $E^e = E^e_{t+1}$.

$$1 + i = (1 + i^\star)\frac{E^e}{E} \Longrightarrow E = E^e \frac{1 + i^\star}{1 + i}$$

Shock	E	**Appreciates**
$i \uparrow$: Fed raises rates	$E \downarrow$	\$
$i^\star \uparrow$: BoJ raises rates	$E \uparrow$	¥
$E^e \uparrow$: ¥ expected to be stronger	$E \uparrow$	¥

Intuition: anything that makes ¥ bonds more attractive raises the demand for ¥.

2.2 The Return on ¥ Bonds

How does the expected return on ¥ bonds depend on today's E?

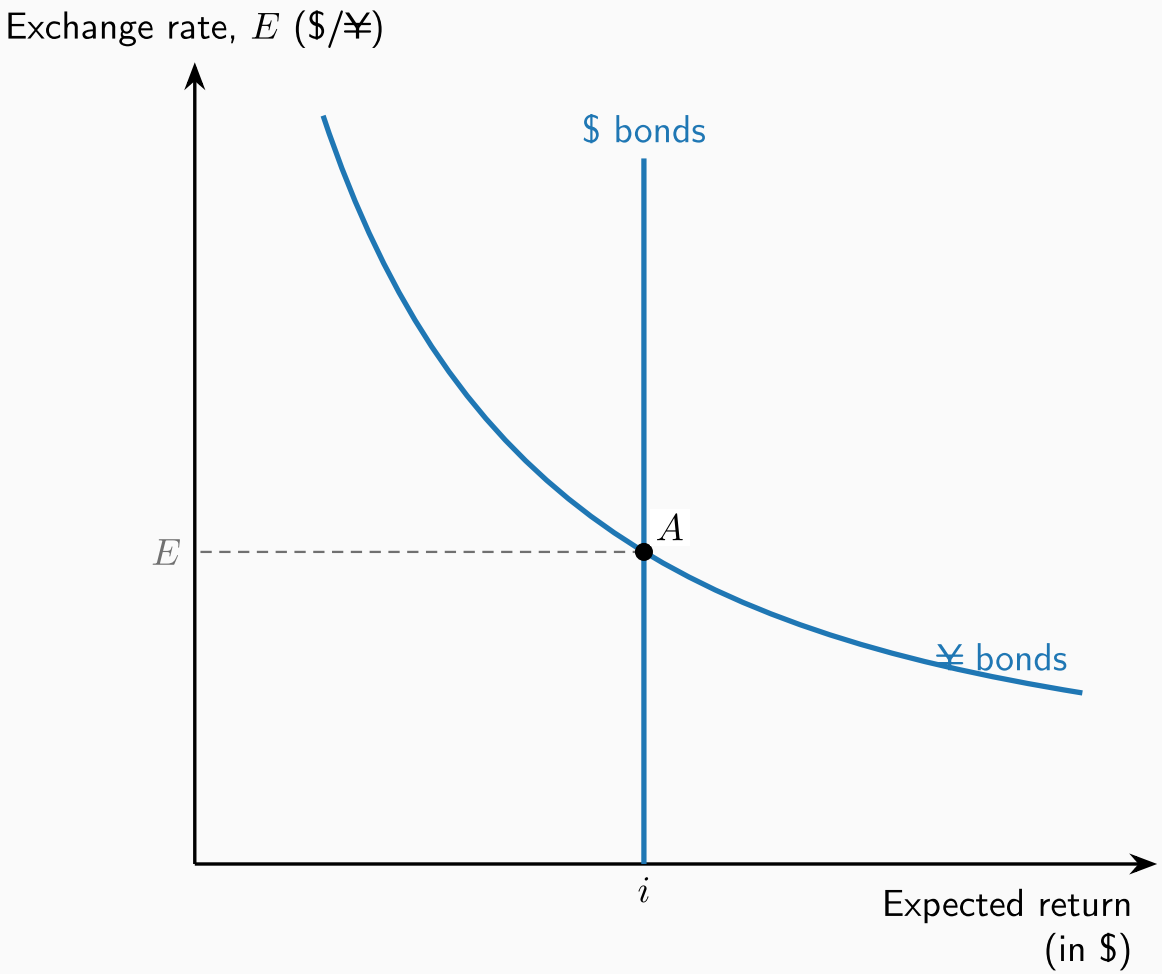
Assume $i^\star = 1\%$ and $E^e = 0.0104$.

Today's E	Expected ¥ appreciation x	Expected return $i^\star + x$
0.0108	-3.7%	-2.7%
0.0106	-1.9%	-0.9%
0.0104	0.0%	1.0%
0.0102	2.0%	3.0%
0.0100	4.0%	5.0%

A pricier ¥ today has less room to appreciate.

With $i = 5\%$, UIP holds at $E = 0.0100$ (our example).

2.3 The FX Market in a Graph



$ bonds: return i.

¥ bonds: expected return $i^\star + x$.

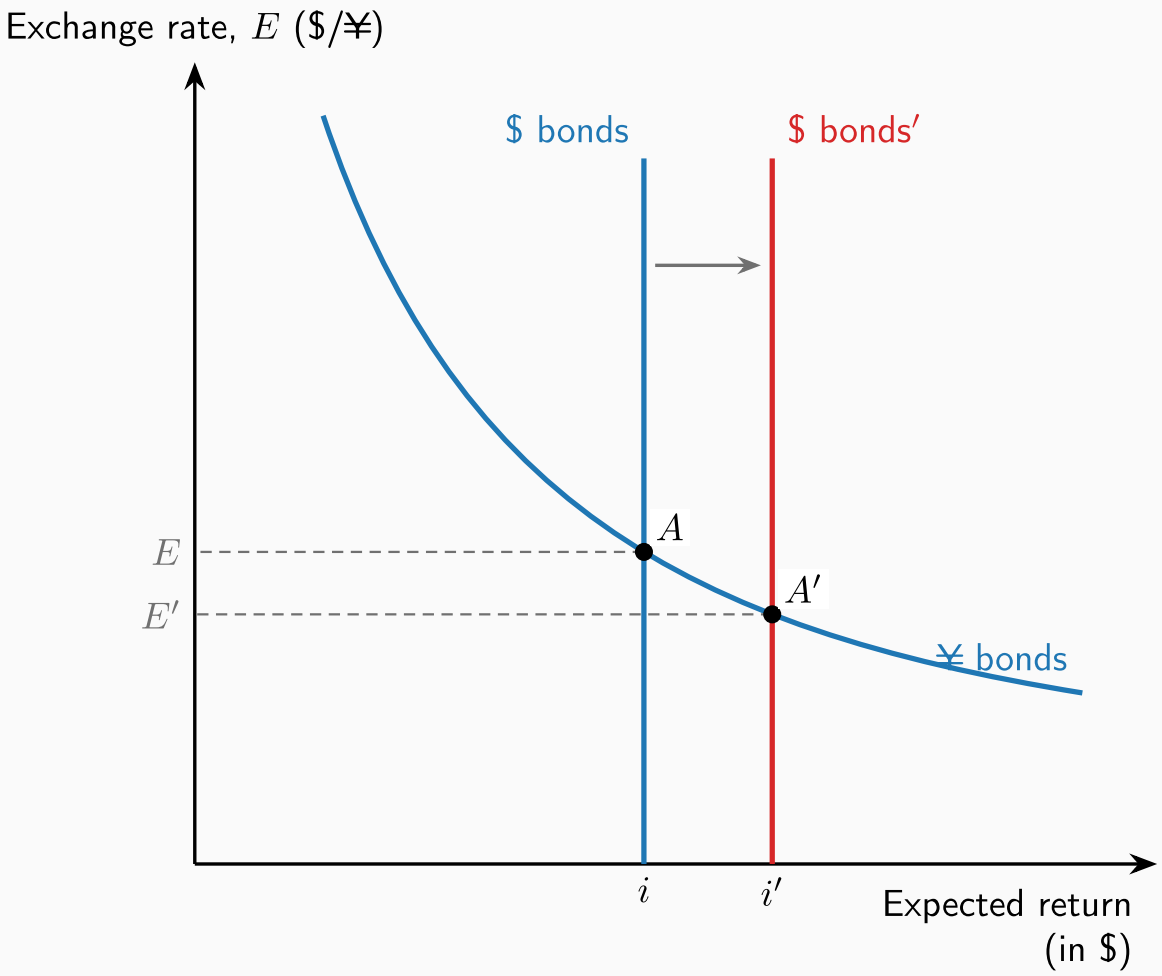
- Falls as E rises (previous slide).

Equilibrium A: equal returns.

Above A: ¥ bonds pay less.
Investors sell ¥. E falls.

Below A: the reverse.

2.4 The Fed Raises Interest Rates



$i \uparrow$: the \$ line shifts right.

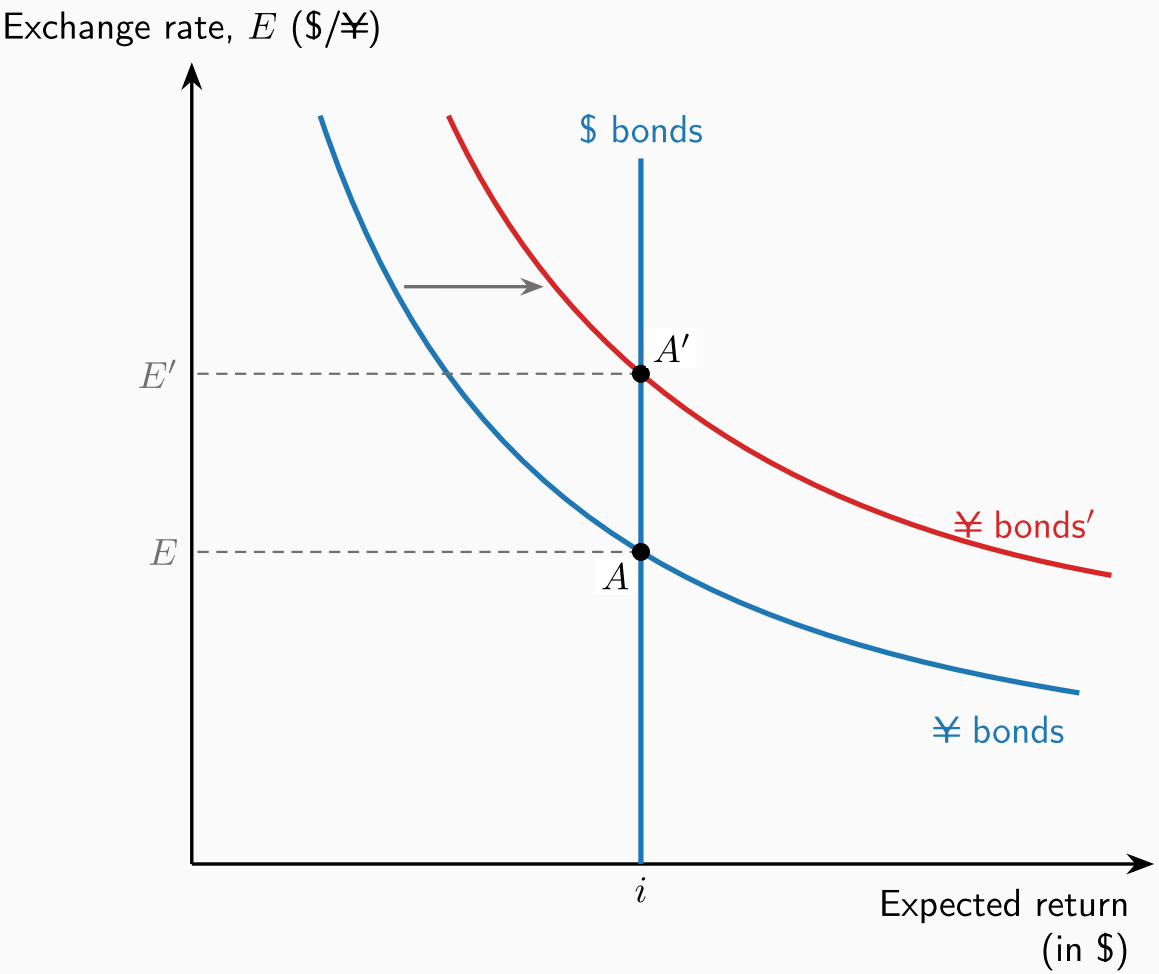
At the old E, \$ bonds pay more.

- capital flows into the U.S.
- investors sell ¥ and buy \$

New equilibrium A':

- $E \downarrow$: the \$ appreciates
- the ¥ is now cheap: $x \uparrow$

2.5 Better News About the ¥



The ¥ curve shifts right when

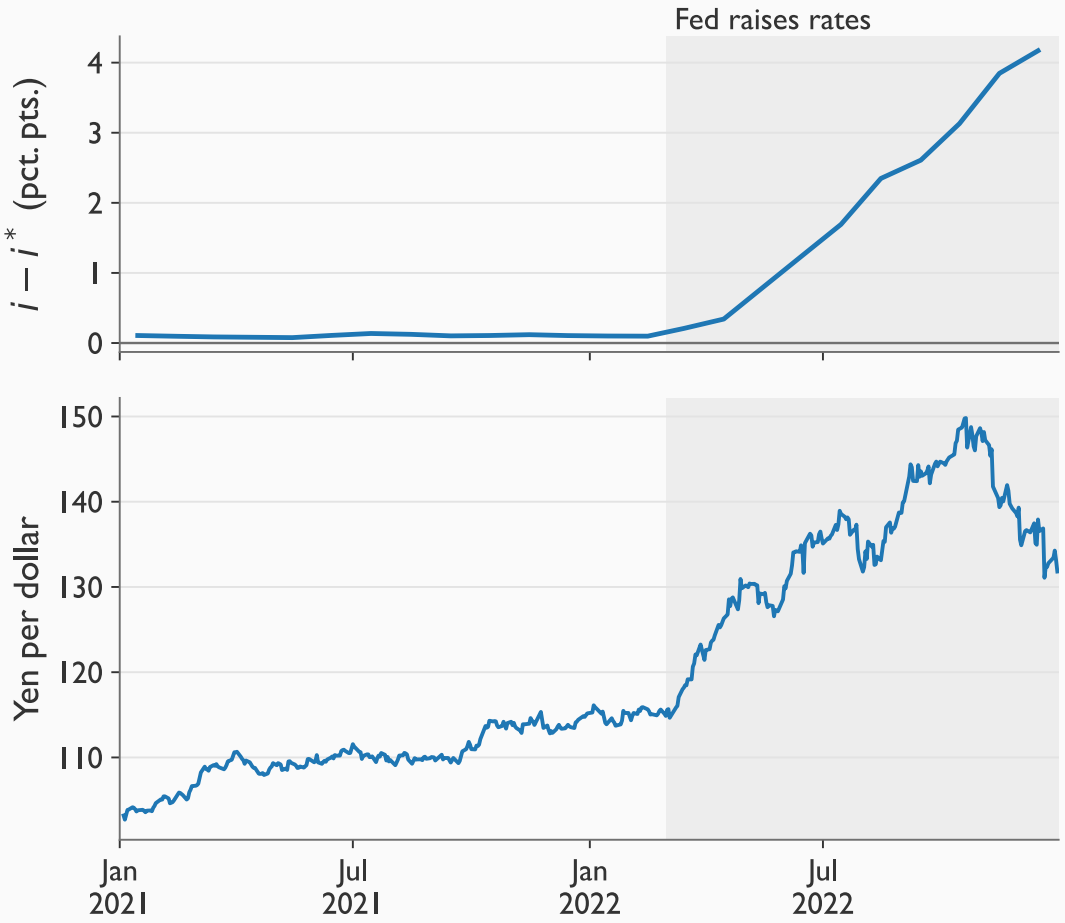
- $E^e \uparrow$: the ¥ is expected to be stronger
- $i^\star \uparrow$: the BoJ raises rates

New equilibrium A':

- $E \uparrow$: the ¥ appreciates today

Expected appreciation becomes appreciation **today**.

2.6 UIP at Work: 2022



2022: the Fed raised rates from 0 to over 4%.

- The BoJ kept its rate near 0.

The $ rose from ¥115 to almost ¥150.

As UIP predicts:

$i \uparrow \implies$ the $ appreciates.

Note: the graph shows $= 1/E$.

- Up: the $ appreciates.

Source: FRED

2.7 High Interest Rate, Strong Currency

Example:

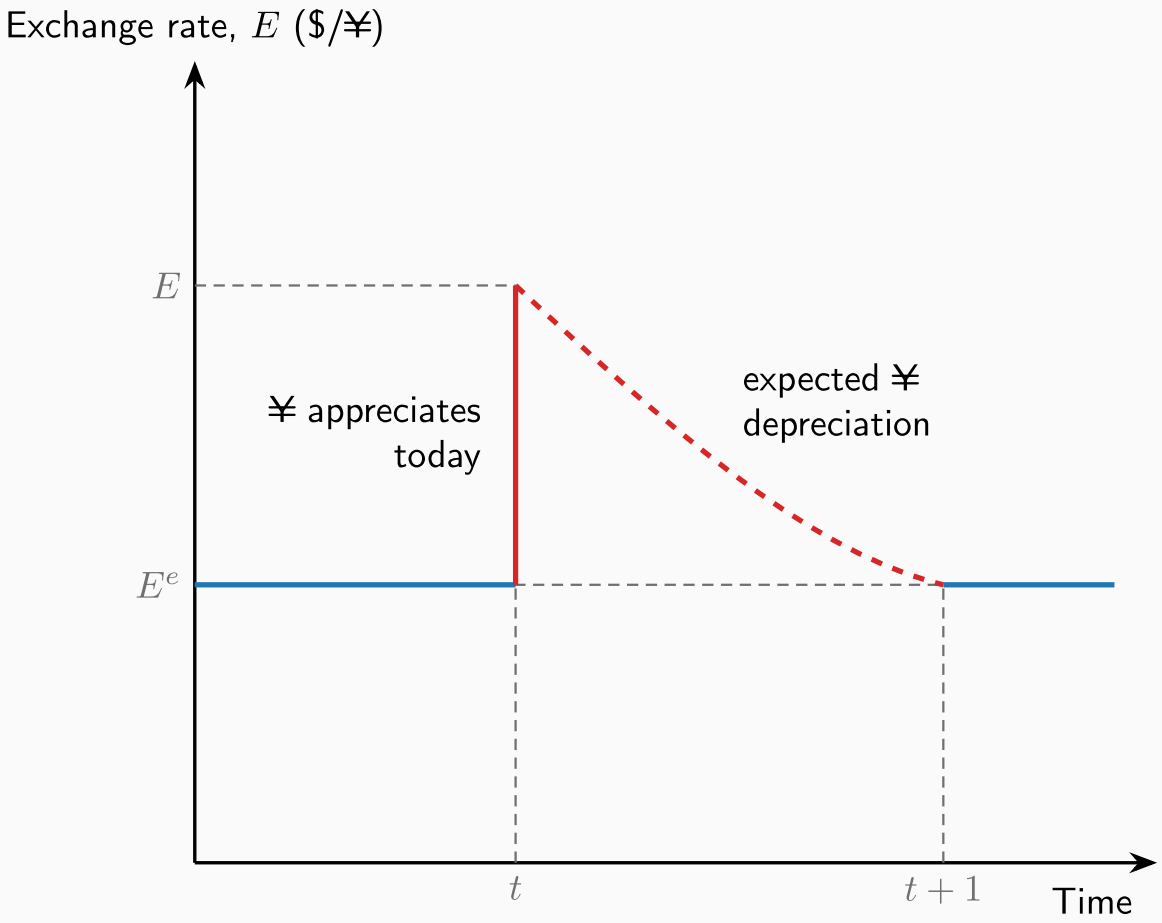
- Start: $i = i^\star = 4\%$ and $E = E^e$. No change is expected.
- The BoJ raises $i^\star$ to 9% for one year.
- Expectations E^e do not change.

UIP:

$$E = E^e \times \frac{1.09}{1.04} \approx 1.05\, E^e$$

- The ¥ appreciates by about 5% **today**.
- Then it is expected to depreciate by about 5%, back to E^e.

2.8 High Interest Rate, Strong Currency



A higher interest rate makes a currency **strong today**.

From there, it is **expected to depreciate**.

Why does the ¥ appreciate by 5%, and not by 20%?

2.9 Expectations Matter

$$E = E^e \frac{1 + i^\star}{1 + i}$$

Today's E moves one-for-one with E^e.

- If investors expect a 10% stronger ¥ next year, the ¥ is 10% stronger today.

News about the future moves E immediately.

- future Fed policy, inflation, growth, …

This is how all asset prices behave (think stock prices).

2.10 What Anchors Expectations?

UIP ties E today to E^e. What determines E^e?

- Next year's E depends on expectations for the year after, and so on.

Long-run anchor: purchasing power parity (PPP).

- Real exchange rates tend to return to normal.
- But slowly: deviations shrink by half in 3–5 years (Rogoff 1996).

The anchor is weak. Consequences:

- Expectations can be self-fulfilling: if everyone expects a weak ¥, the ¥ is weak today.
- Exchange rates are volatile and hard to forecast.

3 Does UIP Hold?

3.1 Testing UIP

UIP predicts: on average, the high-interest currency depreciates by the interest gap.

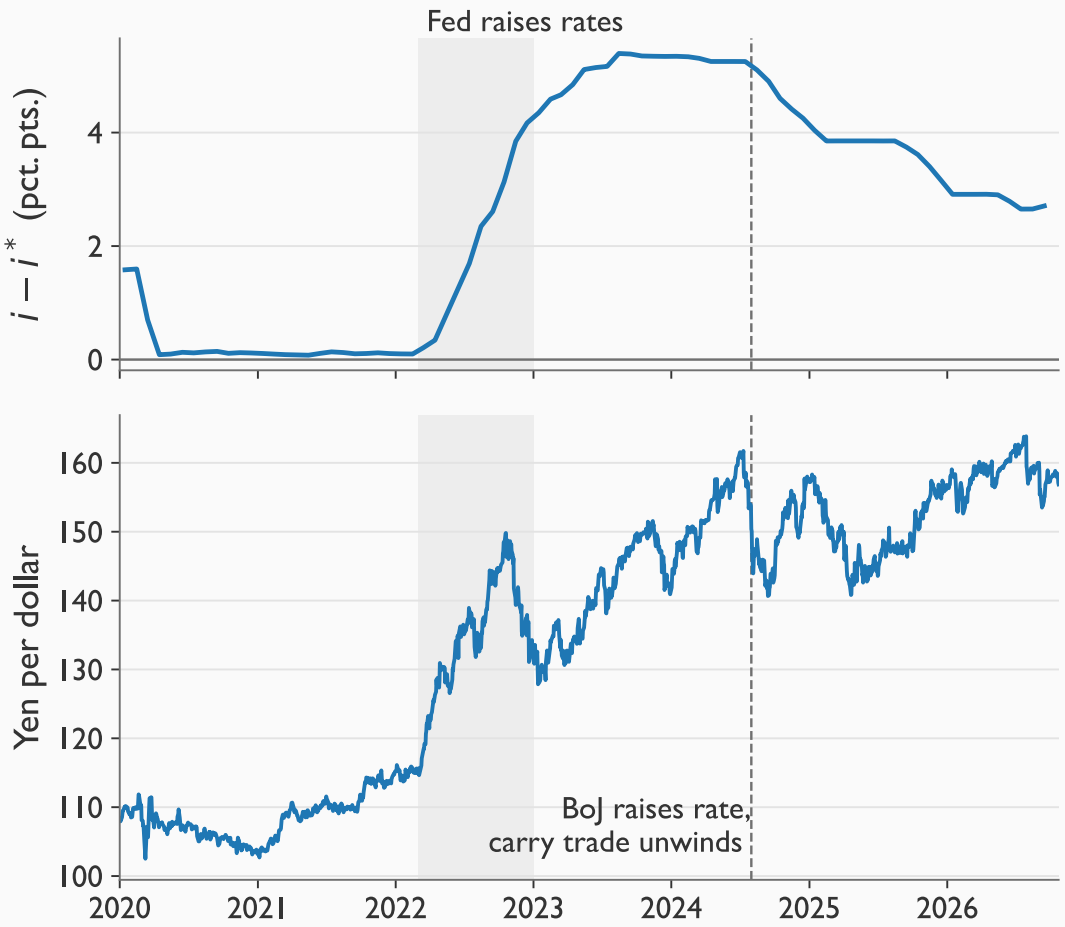
Test: regress the actual change in E on $i - i^\star$. UIP predicts a slope of $+1$.

Findings:

- Fama (1984): 9 currencies, 1973–82. **All slopes are negative.**
- The same holds for most currencies since then (Burnside 2018).
- If anything, high-interest currencies tend to **appreciate**.

Long horizons (5–10 years) look better: slopes have the right sign and are closer to 1 (Chinn and Meredith 2004).

3.2 The Yen Since 2020



2023–24: the interest gap was about 5 points.

- UIP: the $ should depreciate by about 5% per year.
- Instead it kept rising: ¥130 → ¥161.

Aug 2024: the ¥ jumped. ¥161 → ¥144 within four weeks.

2025–26: the gap narrowed. The ¥ did not recover.

Source: FRED

4 Risk Premiums

4.1 Adding Risk

Suppose investors view ¥ bonds as riskier than $ bonds.

Then they require a higher expected return on ¥ bonds: a **risk premium** RP.

UIP with a risk premium:

$$i \approx i^\star - \mathrm{RP} + x$$

$$E = E^e \frac{1 + i^\star - \mathrm{RP}}{1 + i}$$

More risk on the ¥ ($\mathrm{RP} \uparrow$) $\Longrightarrow$ $E \downarrow$: the ¥ depreciates today.

- It works just like a lower $i^\star$.

4.2 Can a Risk Premium Be Negative?

UIP from the U.S. perspective:

$$i = i^\star - \mathrm{RP}_{¥} + x$$

From the Japanese perspective ($-x$ is the expected \$ appreciation):

$$i^\star = i - \mathrm{RP}_{\$} - x$$

Add the two: $\mathrm{RP}_{\$} = -\mathrm{RP}_{¥}$.

One of the two currencies must have a negative risk premium.

How can an asset be less risky than a safe asset?

4.3 What Is Risk?

Is risk just **payoff volatility**?

- Then every risk premium would be positive.

Counterexample:
Which common "asset" has high payout volatility and negative expected returns?

Insight: some types of payoff fluctuations are good.

Which ones are bad (risk)?

4.3 What Is Risk?

Your income fluctuates. Compare two assets:

- Asset A pays \$10,000 when you are poor.
- Asset B pays \$10,000 when you are rich.

Same payoff volatility.

But A is clearly better: it is insurance.

4.4 A Trick Question

The probability of rain is $1/2$

Stock A rises by 10% when it rains. Otherwise it falls by 10%.

Stock B falls by 10% when it rains. Otherwise it rises by 10%.

Which stock is riskier?

Hint: it's a trick question.

4.5 Risk Is Correlation

Risky assets pay when you are already rich (stocks).

Safe assets pay when you are poor (insurance).

Risk is the correlation of an asset's return with your other income.

Risky assets must offer higher expected returns. Insurance can offer lower ones.

4.6 Safe-Haven Currencies

Why do some currencies carry negative risk premiums?

A foreign currency is insurance if it appreciates in bad times.

Safe havens: the U.S. dollar, the yen, the Swiss franc.

Investors accept low expected returns on safe havens: a negative RP.

- Japan and Switzerland have had very low interest rates for decades.

Imagine living in Latin America

- Recurring crises with high inflation and currency depreciation.
- Holding dollars is insurance.

5 UIP in Our Model

5.1 Why Use UIP Anyway?

UIP without risk premiums fails empirically in the short run.

- Why use it?

We want to model the **link between interest rates and exchange rates** in the **simplest** way.

UIP gets the direction right on impact.

- A surprise rate hike tends to appreciate the currency (2022).
- UIP does better at long horizons.

5.2 UIP in Our Model

$$E = E^e \frac{1 + i^\star}{1 + i}$$

or

$$i = i^\star + x$$

We usually set $\mathrm{RP} = 0$.

E^e and $i^\star$ are exogenous.

Fixed exchange rates are a special case:

- A credible peg means $E = E^e = \overline{E}$.
- Then UIP requires $i = i^\star$.

6 Summary

6.1 Summary

1. UIP: investors hold both currencies only if expected returns are equal.

$$i \approx i^\star - \mathrm{RP} + x$$

2. With floating rates, today's exchange rate does the adjusting.
3. A higher interest rate makes a currency strong today.
   From there, it is expected to depreciate.
4. News about the future moves E today.
   The long-run anchor is weak, so E is volatile.
5. Risk is correlation with your other income.
   Safe havens can have negative risk premiums.

6.2 Review Questions

1. Explain UIP in words. Why does $i > i^\star$ require $x > 0$?
2. The Fed raises i. Use the FX market graph to show what happens to E.
3. Is a currency with a high interest rate strong or weak? Explain.
4. UIP holds today. A year later, the ¥ has depreciated by 10%, more than expected. Was UIP violated?
5. Why might investors accept a lower expected return on Swiss francs?

6.3 Reading

Blanchard, Macroeconomics, 7th ed., ch. 17 (interest parity) and ch. 19.

- Note: Blanchard's E is ¥ per \$, the inverse of ours.

Explanations of UIP:

- FRED Blog (2026): UIP with recent data.
- Investopedia
- The Balance

Additional reading:

- Krugman, Obstfeld, Melitz, International Economics, ch. 14 (the FX market graph).
- Jones, Macroeconomics, ch. 15.