

Money Markets

Money Market Instruments:

1. Short term maturity (days, weeks) \Rightarrow not long-term bonds or stocks which don't have maturity
2. Low credit risk (chance of default) \Rightarrow no short-term corporate bonds

Fixed-income instruments.

Ex:

- US treasury bills (short term US bonds)
- FED funds rate
- Repo

Why? Safe place to store large sums of cash. You wouldn't store \$1B in a bank as there's a chance of default, not backed by government etc. You're earning/borrowing at the risk-free rate.

1. FED funds rate

FED = Federal Reserve System = central bank. The bank of all banks.

FED funds rate: Rate that one bank lends to another overnight within the fed.

Specific asset: FED funds. Each bank has a bank account with the FED. Required to hold money in this account.

If bank A ends the day with some amount short of the required amount, it can borrow from bank B overnight (with an interest rate = FED funds rate). It's set to overnight so that bank B can exit the contract whenever instead of having a long term one, and a situation where bank A defaults.

Risk-free Rate: 1. Overnight (can exit contract whenever) 2. You're dealing with another FED-approved bank.

The FED does not set it. It is market determined. But really the FED has so much control over it.

Since the financial crisis in 2009, the FED now pays an interest rate on the reserves (fed funds) - determined by the market, in line with any other safe near-risk-free rates.

Effect: Bank A needs to borrow overnight from bank B. Bank B will demand a rate that is higher than the interest rate the fed pays on the reserves. It determines the lower bound of the FED funds rate

Discount Rate (Think of it as Discount Window Rate):

If bank wants to borrow overnight funds, its the rate the FED lends to the bank.

Banks don't want to use this rate, as it makes them look unreliable. 'Why won't any bank lend to this bank'. The rate is higher than the FED funds rate.

Effect: Bank A wants to borrow overnight from bank B. Bank B cannot demand for a rate higher than the discount window rate, cause then bank A can directly borrow from the fed. Determines the upper bound of FED funds rate.

Most banks today, store way more money in their FED fund reserves than the legal required amount, compared to pre-2009 where the FED would not pay an interest rate on this cash so the banks tried to keep as less cash as possible.

Also it only matters for banks (which are overseen by the FED)

So today not a very important rate, but still used a benchmark ⇒ Most popular risk-free rate.

2. Secured Overnight Financing Rate (SOFR)

Most participants of the financial markets (incl trading) use the SOFR rate.

Not used much until 2022. Before SOFR: LIBOR

LIBOR: Published in many currencies. London banks set it based on a survey, so subjective / manipulation. What a London bank loaning euros/dollars/yen/etc for. Some credit risk (you're lending to another bank)

SOFR: Transaction based (not based on surveys) - based on the previous night's transaction. Historic and overnight.

Secured: Collateralized. Overnight trade of a treasury bond for cash. You take out an overnight loan, and you secure it by giving other party your treasury bonds. The next day, you repay cash, and they give you back your treasuries.

For the lender: It's low risk to lend - overnight and if something happens to the borrower, you now have their treasuries. Good idea when you want to get interest on large sums of money short-term, cannot keep safely in bank account. And other choices are risky. Even buying a bond is risky as its value can decrease (and transaction costs)

For borrower: You want to borrow money in a short term, without selling any of your assets like your treasury bonds.

Over-Collateralized. So to borrow 950M, the collateral is 1B of treasury bonds. So if you go bankrupt, the lender can sell this 1B of treasury bonds and hope to get back the original accounting for transaction costs. ⇒ 5% haircut. [in reality its about 2%]

Also generally when you go bankrupt but you already had so much worth of treasuries (in collateral), its likely cause the value of treasuries went down, so this extra collateral accounts for that dip.

SOFR is called a repo on US treasuries. Means a repurchase. Lawyers call it that because in case of bankruptcy, you cannot actually sell the collateral issued by the company that got bankrupt. So instead of A taking a loan from B: A buys 1B of

treasury bonds for 950 million from B. And tomorrow B must come back to buy back the treasury bonds for 951 million. The 1M difference is basically the interest rate.

SOFR calculation: Look at repo transactions that happened last night, and compute the implied rate

Custodians: Most repo transactions have a custodian, the 2 parties send across cash/bonds to the custodian first instead of directly to each other, to prevent a situation where someone sends over the money but other party didn't send the bonds or vice-versa. Such repos called; tri-party repo.

Desks that trade SOFR are called: Euro-dollar desks [Euro dollars just means dollars outside of US. The term originally used for LIBOR, to refer to dollars in London banks]

Certificates of Deposits (CD)

Bank pays back principal and interest at the end of a fixed term. Market exists for large CDs i.e. worth >100k. Traded CDs have short maturity (3 months or less)

Commercial Paper

Short-term debt issued by firms. Matures in 1/2 months - must be 270 days in order to avoid SEC regulation (i.e. register it as a bond).

Money Market Funds

Provide small investors with access to money market securities. Like a savings account.

T-bill rate Treasury bills 3 Month yields.

There's different types of treasuries: Bills, Notes, Bonds

Most treasuries have been issued within the last 4 years, and most of them mature within the next 5 years.

- T bills are treasuries that mature within a year.
- Do not pay a coupon.
- No cash flow.
- Interest rate is implicit, not stated
- Have fixed maturities like 1m, 2m, 3m, 1y. These are for brand new bills.
They're issued all the time so really you can get any maturity you want (its just that the bill wont be freshly issued)

T-notes have maturity ≥ 2 years and ≤ 10 years

T-bonds have maturity of > 10 years

Notes and Bonds pay a coupon - cash payment every 6 months to holder

Treasuries (public debt): 1/2 is notes, 1/4 is bills, remaining 1/4 is bonds + FRN + TIP

NOTE: These categories like bill, note, bond, is based on how it was issued, and not on how much time it has left to mature. A note with 1 month to mature is still a note.

How do they enter the economy \Rightarrow via Dealers

- Treasuries first auctions debt to the big global banks (~20), which then sell them to others (secondary market). All the ~20 banks must participate in every auction.
- Due to competition between the banks, don't have to worry about them selling debt for mark-up

- Reason: Quite a large task for the treasury to sell bonds to 1000s of institutions so easier to do via banks who are well regulated and trustworthy.

Risk Free Rate

When a trader wants to trade, they compute risk. The pay-off has to be better than simply not taking any risk. So compare the potential % increase of the trade with the current risk free rate. Which is most often used?

T Bill Rate > SOFR > FED Funds rate

For the long term it doesn't matter which you trade out of the 3 (high correlation)

But the short term there are differences (poorly correlated)

Correlation of the levels.

```
refs.corr().style.format('{:.2%}')...
```

[4]:

	DTB3	DFF	SOFR
DTB3	100.00%	99.47%	99.31%
DFF	99.47%	100.00%	99.91%
SOFR	99.31%	99.91%	100.00%

Correlation of the day-over-day changes.

```
refs.diff().corr().style.format('{:.2%}')...
```

[5]:

	DTB3	DFF	SOFR
DTB3	100.00%	0.11%	4.41%
DFF	0.11%	100.00%	47.31%
SOFR	4.41%	47.31%	100.00%

All these 3 rates have a high serial-correlation (auto-regression or auto correlation).

To guess the value of the interest rates, basically what it was yesterday.

R² (how well it actually fits) for such a model is very high (99.99%)

Model for these rates: Today = 0.5% + 1*yesterday