FN 211

Money Markets

Chotima Sitthichaiviset

Outline

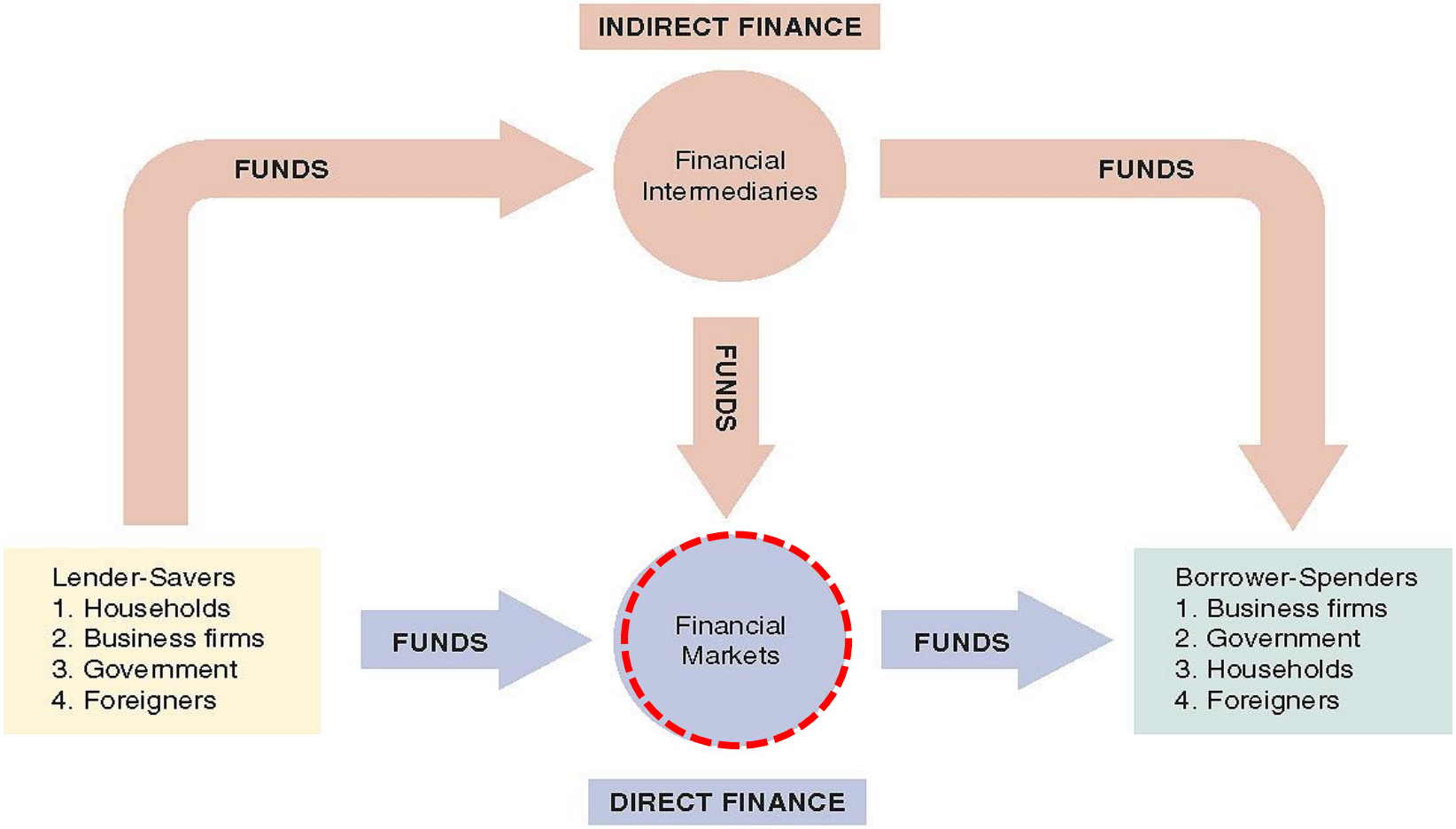
I. The Money Markets
   - Purposes
   - Characteristics
   - Participants

II. Money Market Instruments

III. The Global Money Markets

Flows of Funds through the Financial System

The money market is the mechanism through which holders of *temporary* cash surpluses meet holders of *temporary* cash deficits.



Source: Financial Markets and Institutions, Mishkin and Eakins (2012)

Purpose of Money Markets

- An ideal place for a firm or financial institution to "warehouse" surplus funds until they are needed.
  - **Investors:** to use it as an interim investment that provides a higher return than holding cash or money in banks i.e. to reduce an opportunity cost of holding money/ to wait to take advantage of investment opportunities
  - **Financial Institutions**: to meet investment or deposit outflows
  - **Corporations and Government:** to solve cash-timing problems i.e. the timing of cash inflows and outflows are not well synchronized
  - **Borrowers:** to seek low-cost source of temporary funds

Why do money markets exist?

- The money markets provide a low-cost source of funds to firms, the government, and intermediaries that need a *short-term* infusion of funds.
- In theory, the banking industry should handle the needs for short-term loans and accept short-term deposits since banks have an information advantage on the credit-worthiness of participants.
- Banks do mediate between savers and borrowers; however, they are heavily regulated.

Money Market Cost advantages

- This creates a distinct cost advantages for money markets over banks. Banks face (increasing) regulatory costs.
  - Regulations on the level of interest rate
  - Reserve requirements create additional expense for banks that money markets do not have
- The cost structure of banks limits their competitiveness to situations where their informational advantages outweighs their regulatory costs.
- Thus, money markets exist because
  - *Short-term investors* get returns higher than those of bank deposits.
  - *Short-term borrowers* get borrowing rates lower than those of bank loans.

Money Market Rate vs Deposit Rate

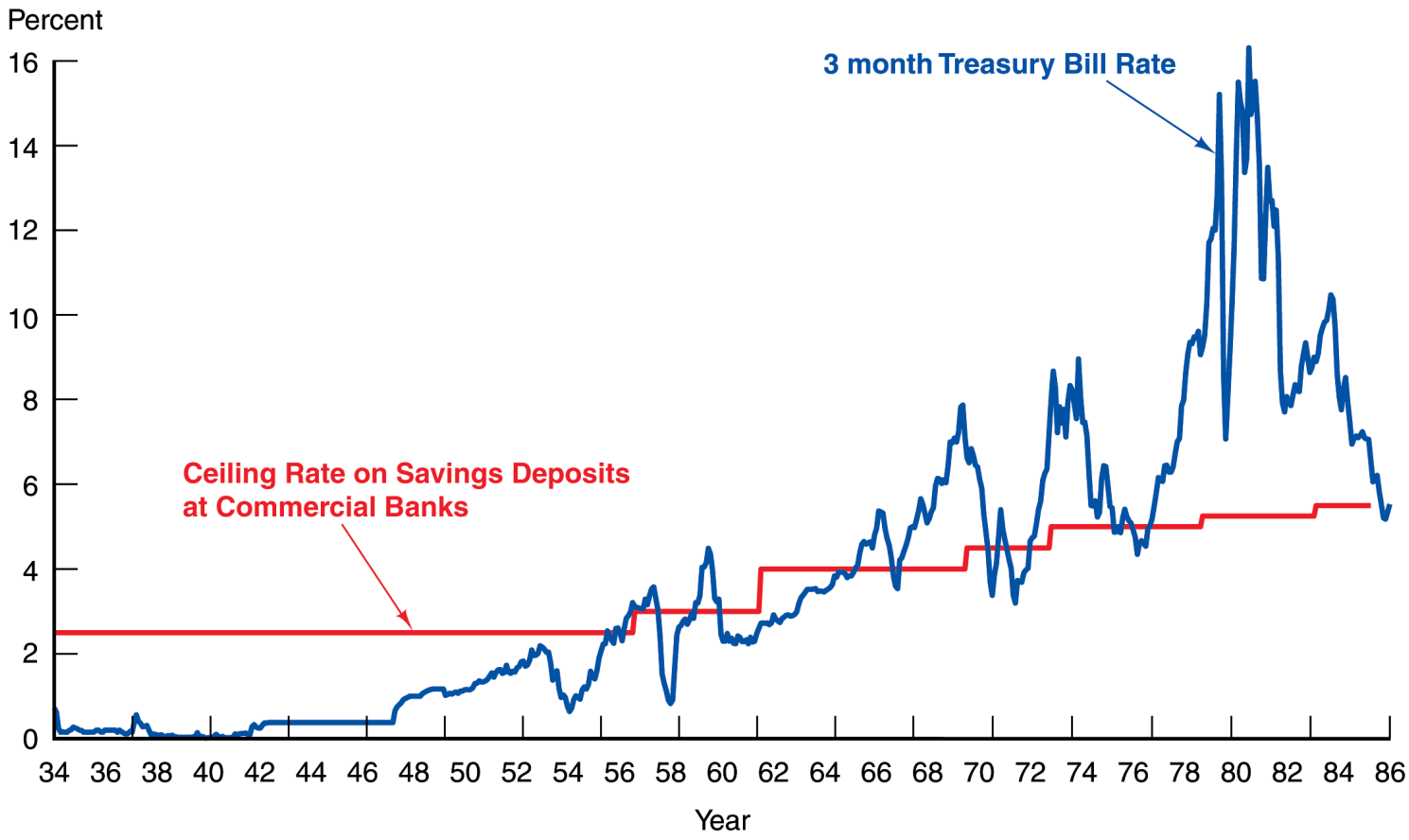


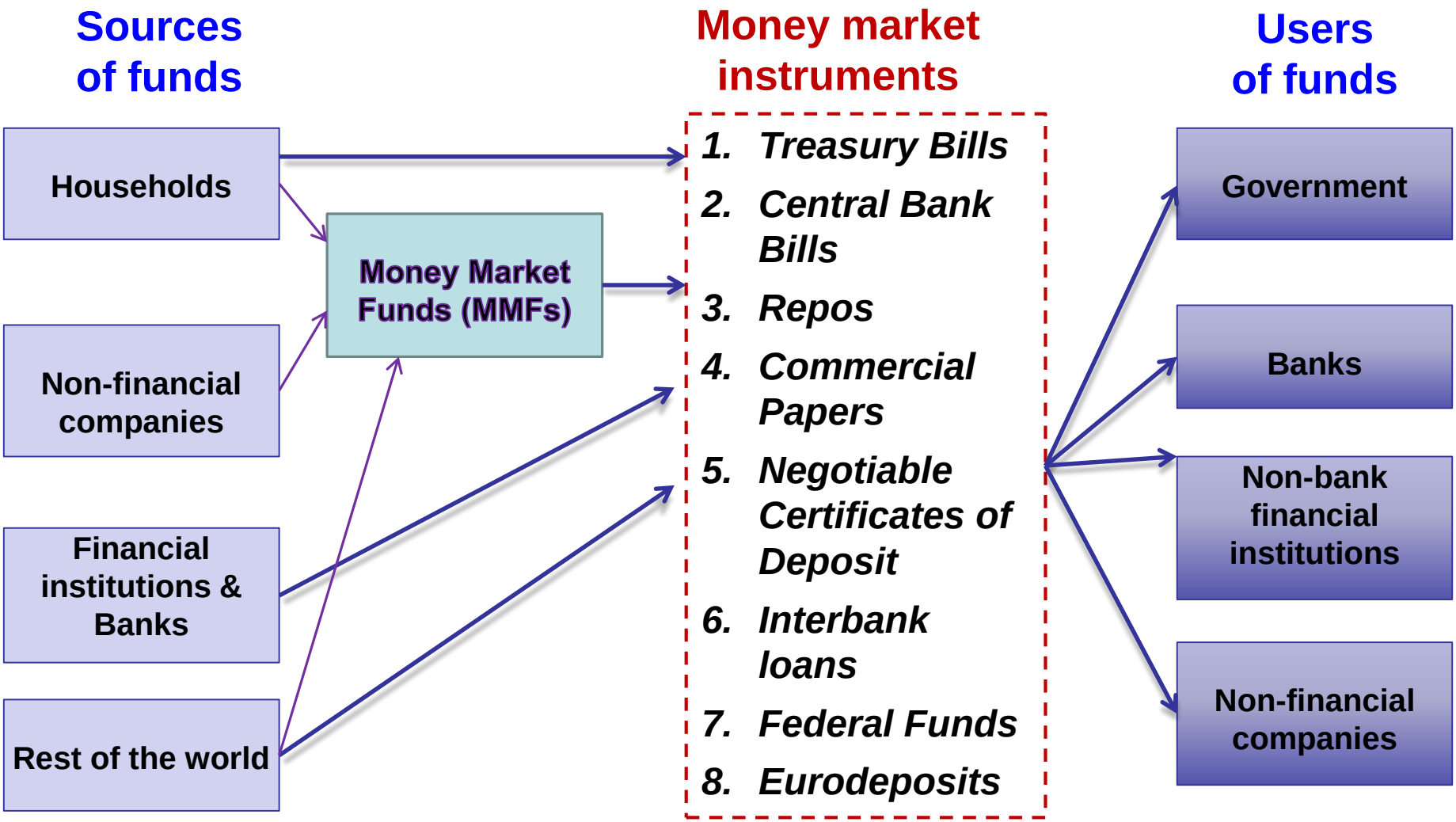
Figure 9.1 3-Month Treasury Bill Rate and Ceiling Rate on Savings Deposits at Commercial Banks

Source: http://www.stlouisfed.org/default.cfm.

Characteristics of the Money Markets

	Money Markets Instruments	Government Bonds	Corporate Bonds
Maturity	**≤ 1 year**	> 1 year	
Denomination	**Large (wholesale market)**	Large	Large, except for public offering
Liquidity	**High**	High	Low
Default Risk	**Very Low**	Very Low	Low – High *(depend on rating)*
Interest Rate Risk *or* Price Risk	**Low**	Medium – High *(depend on duration)*	
Coupon	**Zero coupon, usually sold at discount**	Mostly Semi-annually	

Main players in the money markets



Participants in the Money Markets

Participant	Lender/ Borrower	Roles
Government (Ministry of Finance)	Borrower	Issue *Treasury Bills* to raise funds until tax revenues are received and also to replace maturing issues.
Bank of Thailand	Borrower	• Issue *Central Bank Bills* which are used primarily to absorb excess liquidity in the banking system. • Act as an agent of the MOF to distribute Treasury Bills using e-auction
Commercial Banks	Both	• Issue *Commercial papers and Negotiable Certificate of Deposit (NCD)* to borrow money • Buy and Sell ST instruments to manage liquidity • Borrow and Lend in the Interbank Market • Borrow and Lend in the Private Repurchase (Repo) Market
Finance Companies	Both	• Issue *Promissory Notes* to borrow money • Buy and Sell short-term instruments to manage their liquidity • Lend funds to individuals

Participants in the Money Markets

Participant	Lender/ Borrower	Roles
Businesses	Both	• Issue *Commercial Papers* to borrow money • Invest in ST instruments to warehouse surplus funds • Borrow and Lend in the Private Repurchase Market
Pension Funds/ Insurance Companies	Lenders	• Invest in ST instruments mainly for liquidity purpose of meeting unexpected demands or in readiness for investment in stocks and bonds • Borrow and Lend in the Private Repurchase Market
Asset Management Companies	Lenders	• Invest in ST instruments mainly for their own Money Market Funds
Individuals	Lenders	• Invest through Money Market Funds
Money Market Funds	Lenders	• Allow *small investors* to participate in the money market by aggregating their funds to invest in large-denomination money market securities

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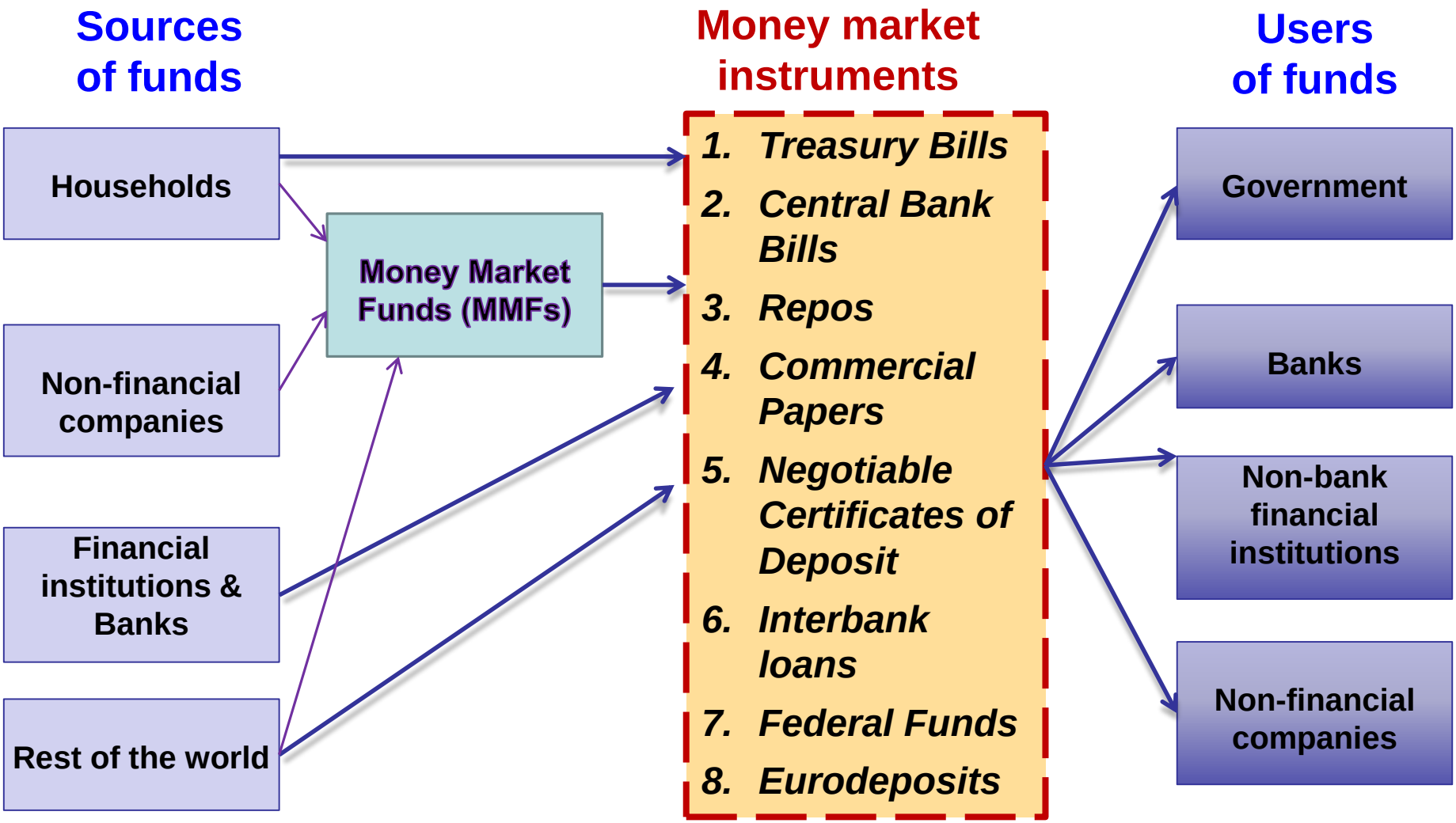
Instruments in the money markets



Instruments: Government Type

1. Treasury Bills (TBs)

- Issued by the *Ministry of Finance* *(Public Debt Management Office or PDMO)*
- Sold in the primary market by auction *at a discount* from face value
  - E.g. T-Bill which has a face value of 1,000 is sold at 998
- No coupon payment
- Upon maturity the face value will be paid to the holder
- TBs typically have *28-day, 91-day, and 182-day* maturity period
- The auction calendar will be quarterly announced in advance

Instruments: Government Type

2. Central Bank Bills (CB)

- Issued by the *Bank of Thailand*
- Sold in the primary market by auction *at a discount* from face value
- No coupon payment
- Upon maturity the face value will be paid to the holder
- CBs typically have *14-day, 91-day, 182-day and 364-day* maturity period.
- The auction calendar will be monthly announced in advance

They are used primarily for conducting monetary policy to manage (absorb/ inject) short-term liquidity in the banking system.

Moreover, they are also used to help develop the Thai bond market by enhancing liquidity and trading activities in the bond market.

Cracking the Codes!

CB	16	1	07	A
(1)	*(2)*	*(3)*	*(4)*	*(5)*

1) **Type of instrument** (in case of government securities) **or name of issuer** (in case of corporate securities)
   - TB = Treasury Bill, CB = Central Bank Bill, etc.
2) **Year of Maturity**
   - 16 = 2016
3) **Month of Maturity**
   - 1 = Jan
   - O = Oct, N = Nov, D = Dec
4) **Date of Maturity** (used only for Money Market instruments)
5) **Series of instrument** (A, B, C, ..), used to indicate in case of more than one instruments have the same maturity

Auction Results

Example of Treasury Bills

- Code : TB16N06A
- Issuer : Ministry of Finance
- Initial Par : THB 1,000
- Issue Size : THB 25,000 million
- Issue Date : 9 October 2016
- Maturity Date : 6 November 2016

Example of Central Bank Bills

- Code : CB17703A
- Issuer : Bank of Thailand
- Initial Par : THB 1,000
- Issue Size : THB 30,000 million
- Auction Date : 4 July 2016
- Maturity Date : 3 July 2017
- Issue Term : 1.0 year
- Yield: 1.45 – 1.52%

Time Value of Money

- Different debt instruments have very different streams of cash payments to the holder (known as cash flows), with very different timing.
- All else being equal, debt instruments are evaluated against one another based on the amount of each cash flow and the timing of each cash flow.
- Present value of a single cash flow:

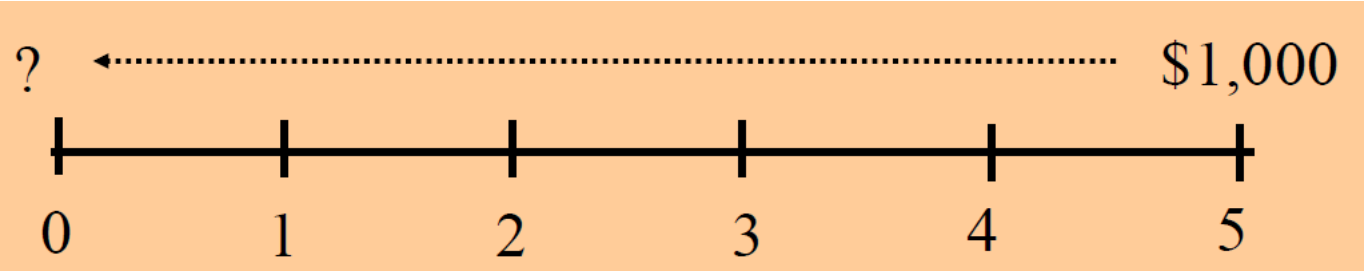
$$PV = \frac{FV}{(1+r)^t}$$

where:

PV = present value
FV = future value (lump sum) received in t years
r = simple interest rate earned per period
t = total number of compounding periods

Basic Bond Pricing: Time Value of Money

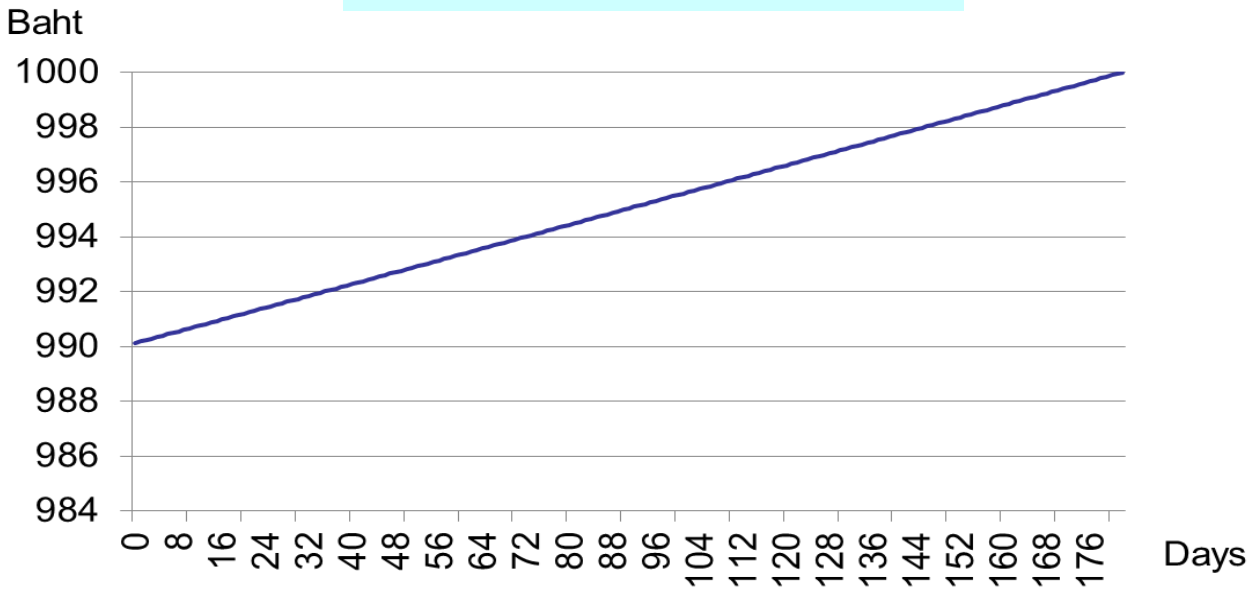
- Find PV of a $1,000 cash flow to be received in five years, given a discount rate of 9%.



Discounting

- When an investor pays *less* for the security than it will be worth when it matures, and the increase in price provides a return.
- This is common to short-term securities because they often mature before the issuer can mail out interest checks.

$$\text{Price} = \frac{\text{Face Value}}{\left(1 + \left(\frac{r}{100} x \frac{d}{365}\right)\right)}$$



Discounted Price Calculation

Suppose today was 24 February 2016 and you bid for CB16827A, the 6-month central bank bill which matures in 182 days, at the auction and you were allocated the bill at the yield of 2.00%. The payment date is 26 February 2016.

Calculate the price per unit to be paid on the settlement date, given that face value is 1,000 Baht.

Discount Rate Calculation

- You pay $996.37 for a 28-day T-bill. It is worth $1,000 at maturity. What is its annualized yield?

Treasury Bill and Central Bank Bills

- TBs and CBs are auctioned by the Bank of Thailand through e-bidding system on a weekly basis.
- Term and size of the auctions will be announced prior to the auction date.
- The auction process is called competitive bidding in which bidder who offers the *lowest yield (highest price)* will have the first priority to be allocated the bills and the rest of the bills will be allocated consecutively to next bidders who offer a higher yield.
- Bid Coverage Ratio (BCR) = The number of bids *received* divided by the number of bids *offered.*

Treasury Bill and Central Bank Bills

- Auctions are held on competitive and non-competitive bidding basis.

1. Competitive (multiple-price) auction:

- Bidder submits both quantities and yields.
- Bidder who offers the lowest yield (highest price) will have the first priority to be allocated the bills and the rest of the bills will be allocated consecutively to next bidders who offer a higher yield.
- Eligible bidders for CB: commercial banks, state-own financial institutions, other financial institutions who have current account at the BOT

2. Non-competitive bid (NCB):

- All bidders submit only quantity in the range of 4-100 million baht but the allocated amount will not exceed 20% of auction amount.
- They get the preferential allocation and will pay at the weighted average yield of accepted competitive bids.
- Eligible bidders for NCB: non-profit organizations e.g. charity, cooperatives, etc.

Money Market Instruments: CB Auction Example

- The BOT auctioned 32,000 million baht par value 182-day central bank bill, the following bids were received:

Bidder	Bid Amount (mil baht)	Bid Yield
A	10,500	1.9900%
B	9,000	1.9840%
C	5,000	1.9900%
D	3,000	1.9930%
E	7,000	1.9800%

- Who will be allocated the central bank bill? At what quantity and yield?

Money Market Instruments: CB Auction Example

- The BOT auctioned 32,000 million baht par value 182-day CB, the following bids were received:

Bidder	Bid Amount (million baht)	Bid Yield
A	10,500	1.9900%
B	9,000	1.9840%
C	10,000	1.9900%
D	3,000	1.9930%
E	7,000	1.9800%

- What if C's offered amount is 10,000 million baht?

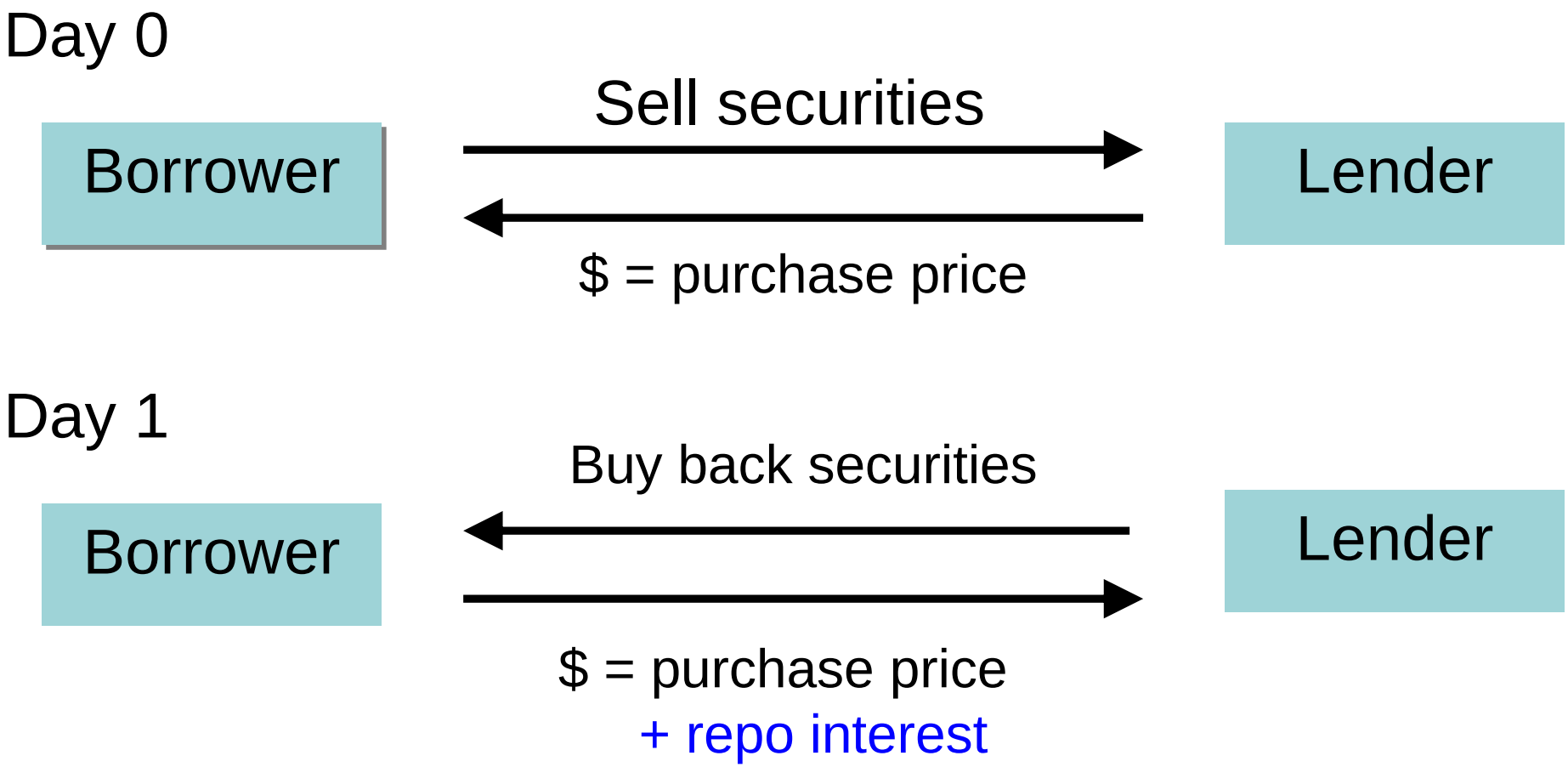
Instruments: Repurchase Agreement

3. Repurchase Agreement (Repo)

- An agreement in which securities are exchanged for cash with an agreement to *repurchase* the securities at a future date.
- The maturity of RP transactions range from *overnight to one-year*
- Repo is simply a short-term loan, *collateralized* by (mostly) government securities.
- Repo allows one party (the lender) to temporarily exchange cash for securities and the other (the borrower) to temporarily exchange securities for cash.
- This legal transfer of ownership for the duration of the contract provides protection against credit risk. Repos become low-risk investments and have lower interest rates than interbank loans.
- Banks use repo market to park their excess liquidity.

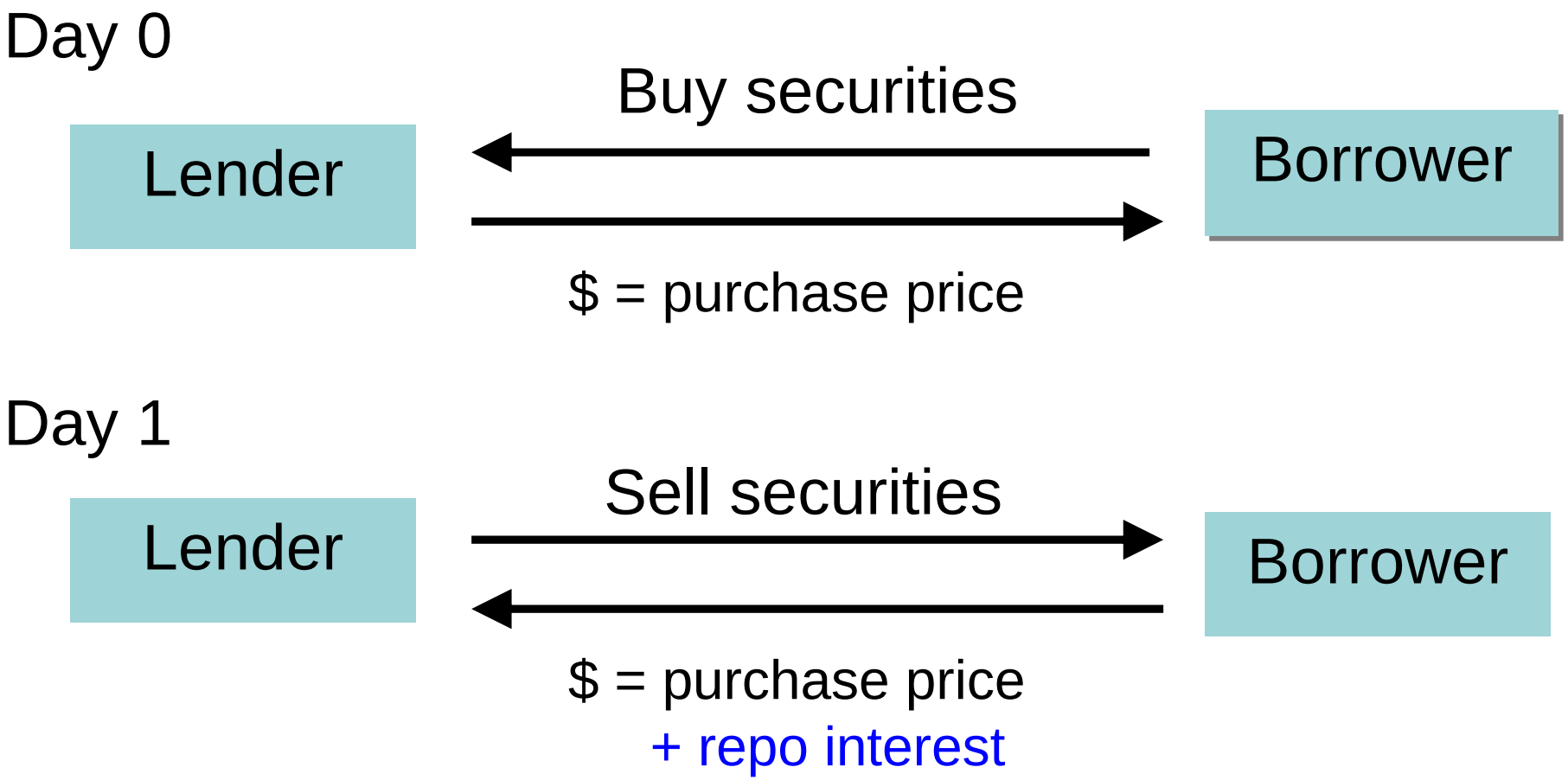
Instruments: Repurchase Agreement

Example of 1-day *Repurchase* Contract



Instruments: Repurchase Agreement

Example of 1-day *Reverse Repurchase* Contract



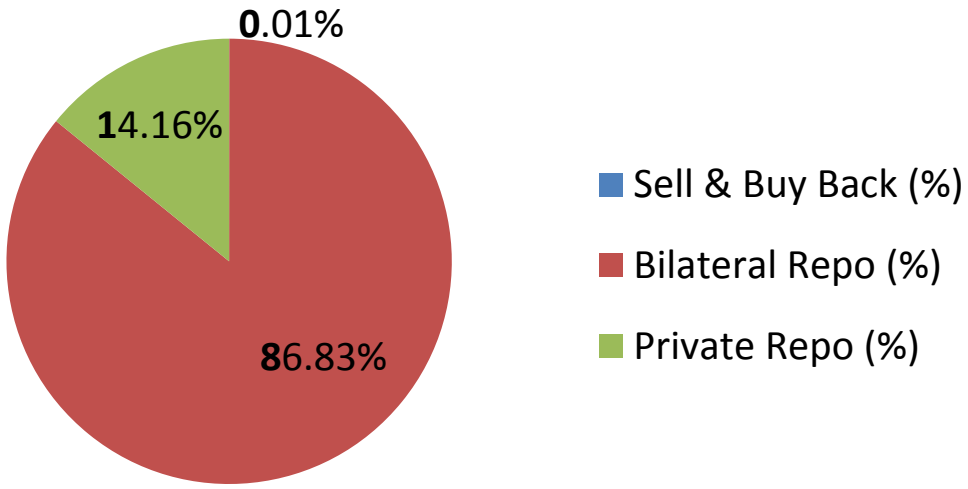
Instruments: Repurchase Agreement

There are three types of repo transactions in Thailand:

3.1 Bilateral Repo (BRP): between BOT and Primary Dealers (banks)

3.2 Private Repo: between private sectors e.g. banks, non-banks, and corporates

3.3. Sell and Buy Back: between private sectors but no standardized contract is needed.



Source: Thai BMA

Instruments: Repurchase Agreement

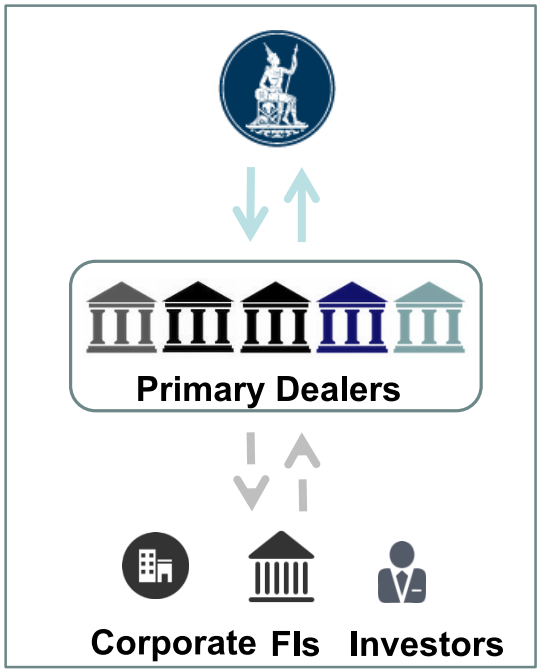
3.1 Bilateral Repo (BRP) – Banks borrow and lend with the BOT

- Since the BOT always act as a counterparty, the counterparty credit risk is very low.
- Standard maturities are 1-day, 7-day,14-day, and 1-month
- Collaterals used are e-P/N for 1-day and 14-day tenor and government/ BOT securities for 14-day and 1-month tenor
- Note that the BOT can use *repurchase* and *reverse repurchase* transactions to temporarily *drain* or add supply of reserves available to the banking system. This is through the Open Market Operations (OMOs)
- This is a large market, with volume around 700-900 billion baht/day

Instruments: Repurchase Agreement

3.1 Bilateral Repo (BRP) – Banks borrow and lend with the BOT

- The Monetary Policy Committee (MPC) set *1-day repurchase rate* as the key policy rate to be used for conducting monetary policy
- Repo operations are conducted through a selected Primary Dealers (PDs) to enhance market mechanism.
- BRP Primary Dealers are financial institutions appointed by the BOT to be the central bank's counterparties in open market operations and to help support private repo market.



Source: BOT

Instruments: Repurchase Agreement

3.2 Private Repo – banks borrow from each other. Non-bank businesses and investors can participate as well.

- Used by banks to meet short-term needs to meet reserve requirements.
- Volume is still small, largely because players are not willing to take credit risk when the counterparty is a private company.
- Standard maturities are overnight to one-year
- Collaterals are mainly government bonds, BOT bonds and bills, and also corporate bonds.

3.3 Sell and Buy Back

- Similar to private repo but may or may not be documented i.e. no standardised contract is needed
- No legally-enforceable margin call
- This makes undocumented sell/buy-backs riskier.

Instruments: Repurchase Agreement

Suppose you have entered a repurchase agreement to borrow 100 million baht for 1 day at the repo rate of 2.00%.

Calculate the interest payment of this contract.

Interest payment = Principal * Repo rate * d/365

Instruments: Corporate Type

4. Commercial Papers are unsecured, short-term debt instruments with fixed maturity of *1 to 270 days*.

- Commercial paper is usually sold at a discount from face value, and carries shorter repayment dates than bonds.
- They are issued by large banks and corporations to get money to meet short term debt obligations (for example, payroll)
- Only backed by issuing bank or corporation's promise to pay the face amount on the maturity date specified on the note.
- Since it is not backed by collateral, *only firms with good credit ratings* from a recognized rating agency will be able to sell their commercial paper at a reasonable price.

Instruments: Corporate Type

4. Commercial Papers

- Thus, the interest rate the corporation is charged reflects the firm's level of risk.
- Most issuers of commercial paper back up their paper with a line of credit at a bank to reduces the risk to the purchasers and so lowers the interest rate
- Two methods of distribution:
  - Public Offering – to the general public
  - Private Placement – to a small number of institutional investors
- Other examples are *Promissory Note (P/N), Bill of Exchange (B/E) and Short Term Debenture*

Instruments: Corporate Type

4. Commercial Papers

- Benefit of CPs
  - For investors:
    - Low interest and liquidity risks due to it's short-term maturity
    - Higher return to investors than T-bills to compensate for higher credit risk
  - For sellers:
    - More flexibility in managing liquidity due to its short-term maturity (they can just roll over the maturing one)
    - Less expensive source of funding than bank loans since there is no need to pledge collateral against the borrowing and no administrative cost of selling through dealers
- Drawbacks to investors:
  - illiquid secondary market makes it harder for investors to sell CPs before the maturity
  - Need to purchase through institutional investors due to its large denomination

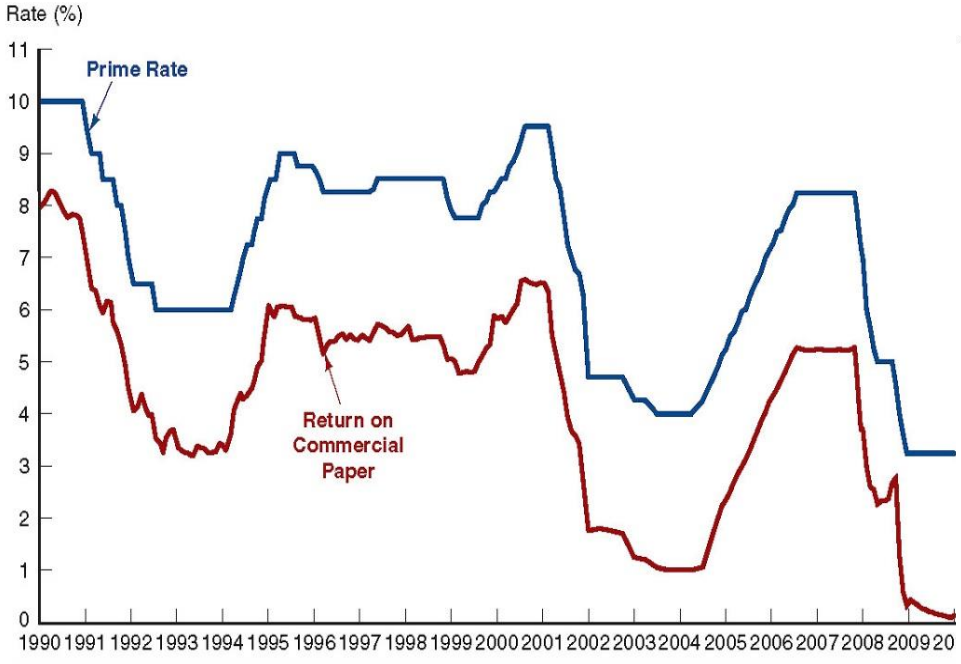
Example of Commercial Papers

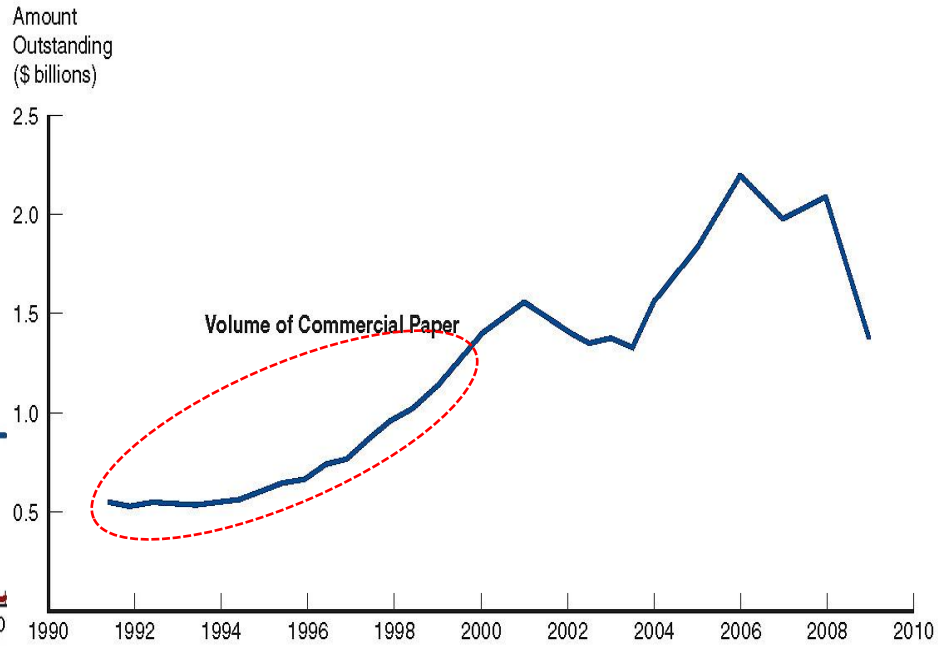
Bill of Exchange

- Code : PS15529B
- Issuer : Preuksa Real Estate Plc.
- Issuer Rating : A (TRIS)
- Initial Par : THB 1,000
- Issue Size : THB 650 million
- Issue Date : 27 February 2015
- Maturity Date : 29 May 2015
- Issue Term : 0.2 Yrs.
- Coupon : 0.00%
- Price: 99.439705%
- Distribution : Private Placement to 13 types of institutional investors plus high net worth investors

Commercial Papers in the US

- The use of commercial paper increased substantially in the early 1980s because of the rising cost of bank loans.
- Commercial banks were the original purchasers of commercial paper. Today the market has greatly expanded to include large insurance companies, nonfinancial businesses, bank trust departments, and government pension funds.





Source: Financial Markets and Institutions, Mishkin and Eakins (2012)

Instruments: Corporate Type

5. Negotiable Certificate of Deposit (NCD) is a bank-issued security that documents a deposit and specifies the interest rate and the maturity date.

- Because a maturity date is specified, NCD is a *Term Security*, as opposed to Savings Deposit which can be withdrawn at any time.
- NCD is also called a *Bearer Instrument*, which means that whoever holds the instrument at maturity receives the principal and interest.
- NCD is *Negotiable*, so it can be bought and sold until maturity.
- NCD is usually sold in large denomination.

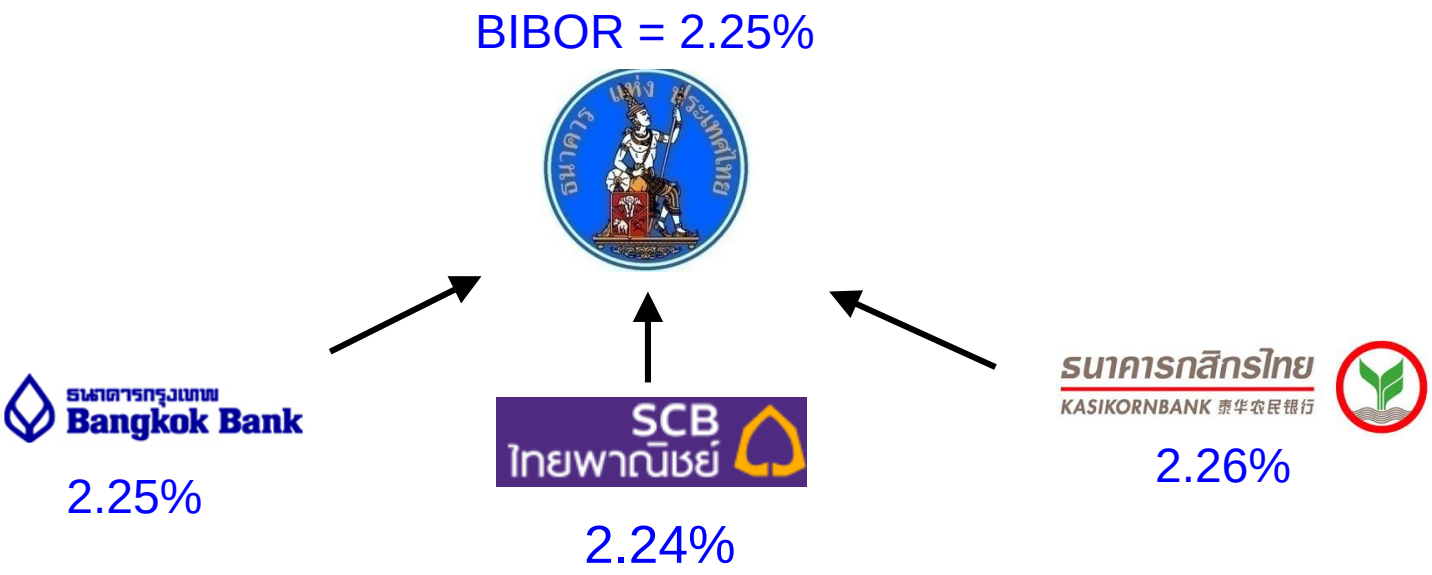
Instruments: Interbank Loan

6. Interbank Loan is short-term loan (usually for a period of *one day* or *overnight*) between commercial banks.

- The Bank of Thailand (BOT) has set *minimum reserve requirements* that all banks must maintain.
  - To meet these reserve requirements, banks must keep a certain percentage of their total deposits (1%) at the BOT.
  - The main purpose is to provide banks with an immediate infusion of reserves should they be short.
- Since excess reserves earn no interests, banks with excess reserves are willing to lend to those with deficit.
  - In 2016, the average volume is about 100 billion baht/day
- Or banks can borrow directly from the BOT at the penalized rate of the policy rate +50 basis point
  - BOT charges a penalized rate to encourage banks to borrow from each other.

Instruments: Interbank Loan

- BIBOR (Bangkok Interbank Offered Rate) are the rates at which contributing banks offer to lend THB funds to prime banks, in a reasonable market size, on an unsecured basis in the Bangkok interbank market, just prior to 11 AM.
  - Participating banks will *quote* there own interbank rates.
  - The BOT then calculates the average quoted rates among banks everyday and publish a set of fixed rates called *BIBOR* to be used by all banks as reference.



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Instruments: Federal Funds

- **Federal funds** are short-term funds transferred (loaned or borrowed) between financial institutions, usually for a period of one day or overnight.
  - Used by banks to meet short-term needs to meet reserve requirements
  - The law requires banks to keep a certain percentage of their customer's money on reserve, where the banks earn no interest on it.
  - Consequently, banks try to stay as close to the reserve limit as possible without going under it, lending money back and forth to maintain the proper level.
  - Most fed funds borrowings are unsecured. Typically, the entire agreement is established by direct communication between buyer and seller.
  - Participating banks will quote there own fed fund rates. So the rates are determined by market forces.
- Notice that the transactions of Federal Funds in the US is equivalent to the Thai interbank loans.

Instruments: Federal Funds

- **Federal Open Market Committee (FOMC)** set the target fed funds rate as the key policy rate. It is used to control the supply of available funds and hence, inflation and other interest rates.
  - *Raising* the rate makes it more expensive to borrow. That lowers the supply of available money, which increases the short-term interest rates and helps keep inflation in check.
  - *Lowering* the rate has the opposite effect, bringing short-term interest rates down
- The Federal Reserve cannot directly control fed funds rates. It can and does indirectly influence them by adjusting the *level of reserves* available to banks in the system.

Instruments: Federal Funds

- **Federal funds**
  - Since October 2008, the Federal Reserve Banks have paid interest on *required* reserve balances and *excess reserve* balances.
  - The interest rate paid on excess balances is determined by the *Federal Open Market Committee (FOMC)* and usually set at the policy rate.
  - The *interest rate paid on excess reserves* gives the Federal Reserve an additional tool for the conduct of monetary policy.

Instruments: Eurodollars

- **Eurodollars** are deposits of U.S. dollars in banks located *outside* the U.S.
  - Most Eurodollar deposits are held in Europe
  - The Eurocurrency market has arisen because of the worldwide demand for funds in stable currencies.
    - The market is essential since many foreign contracts call for payment is U.S. dollars due to the stability of the dollar, relative to other currencies.
  - The market has continued to grow rapidly because depositors receive a higher rate of return on a dollar deposit in the Eurodollar market than in the domestic market.
  - Multinational banks are not subject to the same regulations restricting U.S. banks and because they are willing to accept narrower spreads between the interest paid on deposits and the interest earned on loans.

Instruments: Eurodollars

- Some large London banks act as brokers in the interbank Eurodollar market. Banks around the world park their excess liquidity in this market.
- Essentially, Eurodollars = global interbank market.
- **Eurodollars Rates**:
  - London interbank bid rate (LIBID)
    - The rate paid by banks buying funds (= borrowing)
  - London interbank offer rate (LIBOR)
    - The rate offered for sale of the funds (= lending)
  - Time deposits with fixed maturities
    - Largest short term security in the world

Comparing Money Market Securities

TABLE 11.4 Money Market Securities and Their Markets

Money Market Security	Issuer	Buyer	Usual Maturity	Secondary Market
Treasury bills	U.S. government	Consumers and companies	4, 13, and 26 weeks	Excellent
Federal funds	Banks	Banks	1 to 7 days	None
Repurchase agreements	Businesses and banks	Businesses and banks	1 to 15 days	Good
Negotiable certificates of deposit	Large money center banks	Businesses	14 to 120 days	Good
Commercial paper	Finance companies and businesses	Businesses	1 to 270 days	Poor
Banker's acceptance	Banks	Businesses	30 to 180 days	Good
Eurodollar deposits	Non-U.S. banks	Businesses, governments, and banks	1 day to 1 year	Poor

Source: Financial Markets and Institutions, Mishkin and Eakins (2012)