

# Trading and market microstructure

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FN 451



## Today's outline

- I) What affects equity price movements?
- II) What affects real rates of returns?
- III) Market microstructure
  - Trading systems: Limit order on SET and ASEAN linkage
  - Liquidity measures
  - Trading equity on SET
- IV) What moves the Thai equity market?: An empirical exercise



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## WHAT AFFECTS PRICE MOVEMENTS



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## Example – Pure price-time precedence

Time	Trader	Buy/Sell	Size	Price
12:02	Sammy	Sell	100	\$20.05
12:06	Steve	Sell	200	\$20.06
12:15	Bern	Buy	500	\$20.06
12:16	Susie	Sell	300	\$20.08
12:20	Ben	Buy	200	Infinite
12:21	Bob	Buy	100	\$20.08
12:24	Sandy	Sell	500	\$20.12
12:25	Bev	Buy	500	\$20.08
12:27	Bill	Buy	200	\$20.05
12:27	Seth	Sell	200	\$20.10



## Discussion

- Why do these people have different bidding and selling prices?
- Why are they submitting at different timing?



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## Forms of EMH

- Weak: stock prices reflect all information available from historical market prices
  - Charting and technical analysis won't work
- Semi-strong: stock prices reflect all public information available to investors
  - Using past prices and public information, the investor cannot consistently find undervalued stocks.
- Strong: stock prices reflect all public and private information
  - No-one (insider or outsider) can consistently find undervalued stocks.



## Discussion

- Adverse selection in financial markets
- Different utility ie. Different level of risk aversion, and different liquidity needs.



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## Example – the order book

Sellers			Buyers	
Trader	Size	Price	Size	Trader
Sammy	100	\$20.05	200	Bill
Steve	200	\$20.06	500	Bern
		\$20.08	100	Bob
Susie	300	\$20.08	500	Bev
Seth	200	\$20.10		
Sandy	500	\$20.12		
		Infinite	200	Ben



## Continuous trading @12:02

Sellers			Buyers	
Trader	Size	Price	Size	Trader
Sammy	100	\$20.05		
		\$20.06		
		\$20.08		
		\$20.08		
		\$20.10		
		\$20.12		
		Infinite		



## Continuous trading @12:06

Sellers			Buyers	
Trader	Size	Price	Size	Trader
Sammy	100	\$20.05		
Steve	200	\$20.06		
		\$20.08		
		\$20.08		
		\$20.10		
		\$20.12		
		Infinite		



## Continuous trading @12:15

Sellers			Buyers	
Trader	Size	Price	Size	Trader
Sammy	<del>100</del> 0	\$20.05		
Steve	<del>200</del> 0	\$20.06	500 200	Bern
		\$20.08		
		\$20.08		
		\$20.10		
		\$20.12		
		Infinite		



## Continuous trading @12:16

Sellers			Buyers	
Trader	Size	Price	Size	Trader
Sammy	<del>100</del> 0	\$20.05		
Steve	<del>200</del> 0	\$20.06	<del>500</del> 200	Bern
Susie	300	\$20.08		
		\$20.08		
		\$20.10		
		\$20.12		
		Infinite		



## Continuous trading @12:20

Sellers			Buyers	
Trader	Size	Price	Size	Trader
Sammy	<del>100</del> 0	\$20.05		
Steve	<del>200</del> 0	\$20.06	<del>500</del> 200	Bern
Susie	<del>300</del> 100	\$20.08		
		\$20.08		
		\$20.10		
		\$20.12		
		Infinite	200 0	Ben



## Supply and Demand

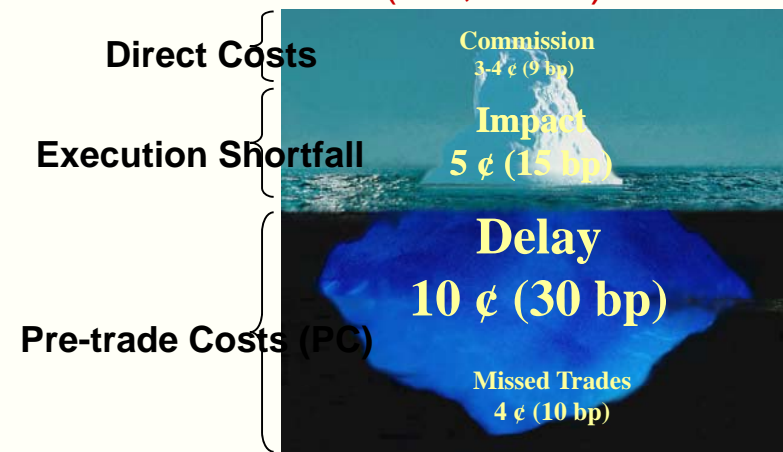
- The single-price auction clears at the price where supply equals demand.
  - At prices below the market clearing price, there is excess demand.
  - At prices above the market clearing price, there is excess supply.



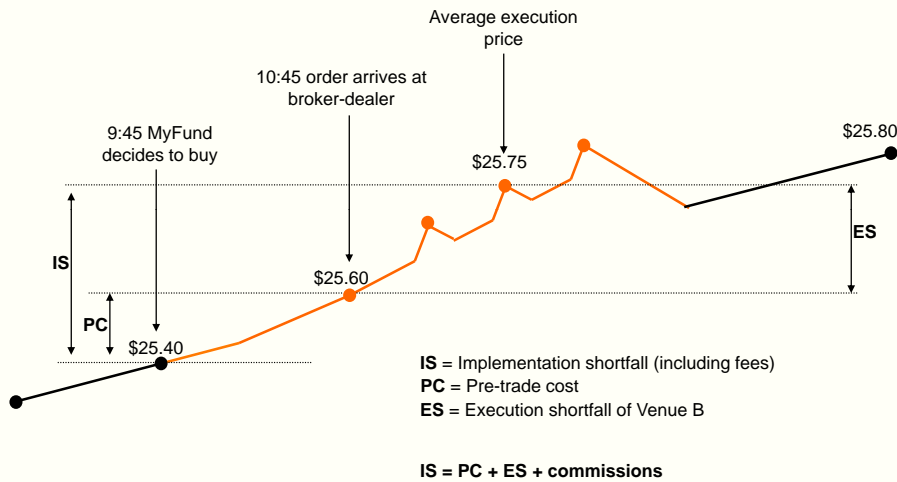
## WHAT AFFECTS RATES OF RETURNS



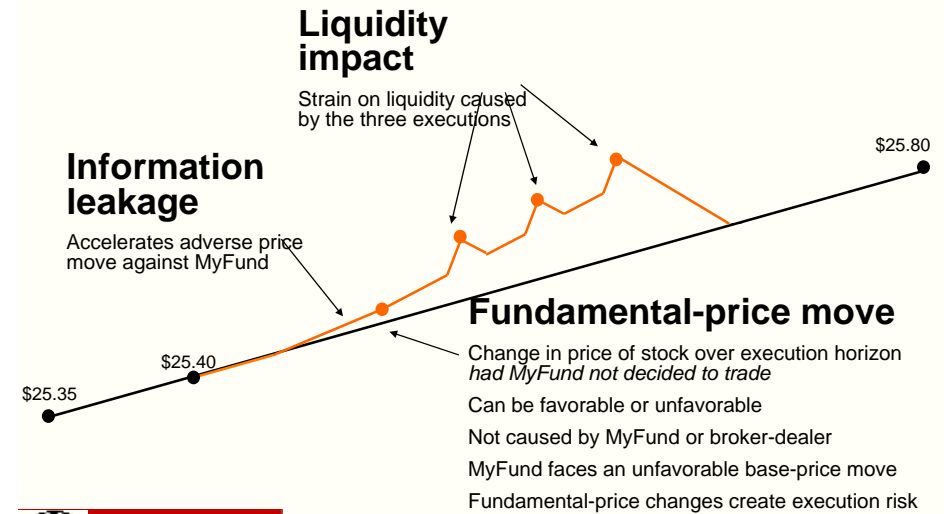
## The Plexus Iceberg of Transaction Costs (US, 2007)



## Implementation Shortfall



## Factors affecting Implementation Shortfall



## Computing volume weight avg price (avg execution price)

- You have received an order to buy 1 mn shares of stock A. Compute VWAP and the end of the day profit/loss position.

Time	Execution price	Quantity	Unfilled	Q x P
9.00 am	100	100,000	900,000	10,000,000
10.00 am	101	150,000	750,000	15,150,000
11.00 am	102	300,000	450,000	30,600,000
12.00 pm	105	100,000	350,000	10,500,000
2.00 pm	104	200,000	150,000	20,800,000
3.00 pm	103	100,000	50,000	10,300,000
4.00 pm	101	50,000	-	5,050,000
4.30 pm	99			

VWAP 102.4  
 Profit/loss per share -3.4

## Price impact

- Thin (illiquid) markets results in larger price impact. What happens to market price when customer submits limit order of Rps 120 to buy 500 shares

Sell	Quantity
120	500
110	300
100	200

## Price impact

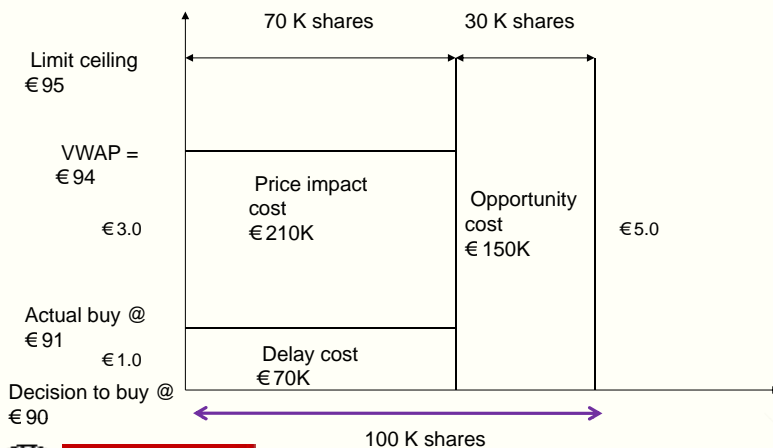
- Deep (liquid) markets results in smaller price impact. What happens to market price when customer submits limit order to buy 500 shares at Rps 120?

Sell	Quantity
114	500
112	300
110	600
109	300
108	400

## A closer look at liquidity and transaction costs

- A fund manager wishes to buy 100,000 shares of **LVMH Moet Hennessy Louis Vuitton SA (MC.PA)**
- Observing last transaction price at €90.50, he places a buy order at €90.0 at 10.01 am.
- However, **LVMH** price kept climbing, at 10.30 am, fund manager revises a limit order to buy from €91 (current market price) and not exceeding €95.
- By the time the market closed, at 4.30 pm, the fund manager only obtained 70,000 shares. The last trading hour price was €96.0 above the limit ceiling.

## What are the costs from implementation shortfall?



## Trading cost with implementation shortfall

Delay	70,000
Price impact	210,000
Commissions (0.1% of VWAP)	6,580
Opportunity cost	150,000
	<b>436,580</b>

Your VWAP cost = 94 x 70K = 6.58 mn

## Which scenario has higher price impact?

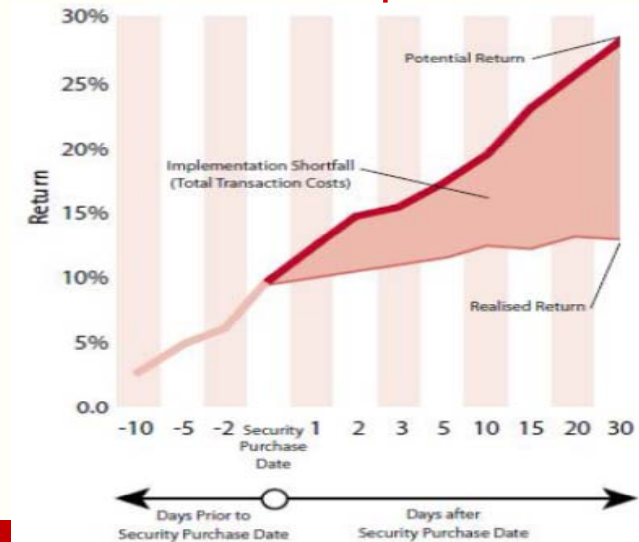
Time	Sell	Quantity
10.05	90.5	2,000
	91	4,000
	91.5	6,000

Time	Sell	Quantity
10.05	90.5	5,000
	91	7,000
	91.5	9,000

- You would like to buy 5,000 shares at market prices?
- Top scenario: VWAP =  $90.5 \times 2,000 + 91 \times 3,000 = 454 \text{ K}$
- Bottom scenario: VWAP =  $90.5 \times 5,000 = 452.5 \text{ K}$

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## Realized return and potential return



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## MARKET MICROSTRUCTURE

- Microstructure research rejects the hypothesis that the transaction process and the organisation of markets have no effect on the prices of securities
- The microstructure literature argues that both information risk due to asymmetric information and differences in liquidity over time and between companies impact on long-term equilibrium prices in the market.

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## Microstructure and efficient prices

- The microstructure literature challenges the hypothesis of efficient markets by studying how prices can deviate from (or converge towards) informationally efficient equilibrium prices as a result of rational participants behaving strategically (Biais et al., 2004)



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## Trading system on SET

- Automatic order matching (AOM) trading performs the order matching process according to price, then time, priority, without human intervention. After brokerage houses electronically send buy or sell orders from their offices to the SET mainframe computer, the CONNECT system queues the orders and arranges them according to a price-then-time priority.



## Order driven market

- Most important exchanges are order-driven markets.
- Most newly organized trading systems are electronic order-driven markets.
- All order-driven markets use *order precedence rule* and *trade pricing rule*.



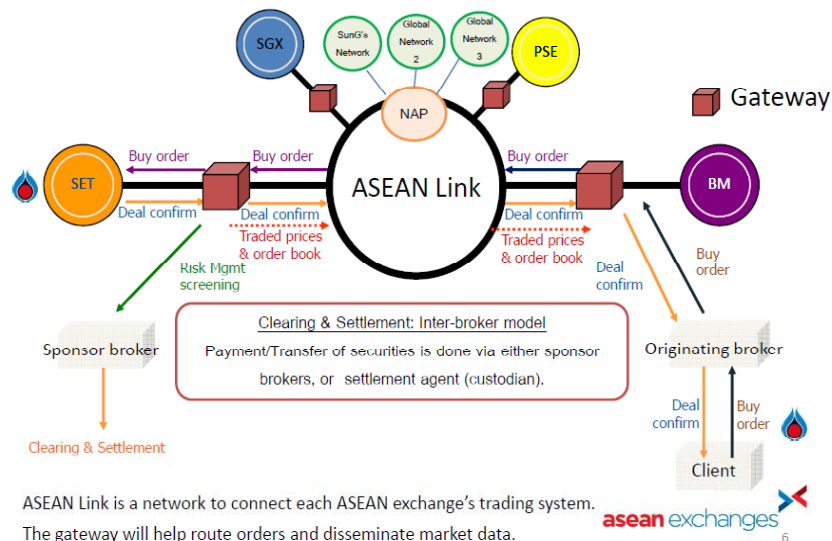
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## Examples of pure order-driven markets

- Tokyo Stock Exchange,
- KRX (previously KSE, KOSDAQ)
- ASEAN markets
- Paris Bourse,
- Toronto Stock Exchange,
- Most Future Markets,
- Most European Exchanges for equities (Milan, Barcelona, Madrid, Bilbao, Zurich,....)



## I) ASEAN Link: Overview and trading model



## Sources of liquidity

- More than 70% of trading in developed markets is done by institutions. In emerging market, this pattern is reversed.
- A block trade is defined (somewhat arbitrarily) as trades > 10K shares.
- Block orders (institutional orders) are in practice significantly larger.
- Institutional traders need liquidity!!!
  - The quote size is typically not sufficient to satisfy their trading needs.
- Displaying large order will result in adverse price impact.
  - How do you tease out non-displayed liquidity without incurring price impact?



## A Definition of Liquidity

A market is *liquid* if

uninformed traders can	(Who)
quickly	(Immediacy)
buy or sell	(Symmetry)
large size	(Depth)
when they want	(Availability)
at low transaction cost	(Spread)

## Other Variables Affecting Liquidity

- Security characteristics
- Recent trading history
  - Resiliency
- The trader
  - Informed or uninformed
- The market structure
  - Competitive or oligopolistic dealers
  - Order- or quote-driven



## Liquidity is Valuable

- Liquidity helps traders solve cash flow problems.
  - People and firms will save more and thereby decrease corporate costs of capital.
- Liquidity facilitates hedging strategies.
  - More risks will be shifted between natural hedgers and production will be more efficient.
- Liquidity facilitates risk sharing schemes.
  - More extremely large risky positive NPV projects will be undertaken.
- Positive externalities...



## Measuring Liquidity

- Quoted spread
- Price impact
- Depth
- Trading volume/Trading value
- Turnover
- Free float
- Frequency of trading
- Etc.



## Who supplies Liquidity?

- Market makers
  - Exchange specialists
  - ETF's market makers
  - Day traders (algo trade)
- Upstairs trading/Block Trading
  - Institutional trade crossing
- Patient pre-committed traders
  - Buy-side institutions
  - Individual traders
- Value-motivated traders
  - Individuals
  - Institutions
- Arbitrageurs
  - Pure arbitrageurs
  - Index enhancement funds
  - Pairs traders



## Who uses Liquidity?

- Institutional traders
- Retail traders
- Professional/Proprietary traders
- Foreign investors



## Algorithmic trading

- Algorithmic trading (also called automated trading, black box trading and robotrading) is used to break up large orders into smaller orders to reduce execution risk, preserve anonymity and to minimize the price impact of a trade.
- Hidden portions of large institutional orders are sometimes referred to as dark liquidity pools.
- Orders are often partially revealed, in which case they are called iceberg or hidden-size orders.



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## Algo strategies

- Algorithmic trading results from mathematical models that analyze quotes and trades, identify liquidity opportunities, and use this information to make intelligent trading decisions.
- Some algo models seek to trade at or better than the average price over a day (e.g. VWAP, volume weighted average price)
- Some seek to execute slowly so as to have minimal price impact.
- Algorithms sometimes are set to produce more volume at market opens and closes when volume is high, and less during slower periods such as around lunch.
- They can seek to exploit arbitrage opportunities or price spreads between correlated securities.
- Thus, more generally, algorithmic trading can be defined as trading based on the use of computer programs and sophisticated trading analytics to execute orders according to pre-defined strategies.



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## WHAT MOVES THE THAI MARKET: AN EMPIRICAL EXERCISE



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