Trades With Price Improvement on ASX

Project Summary

Background:

- Recent concern from regulator (ASIC) on the violation of `Trade With Price Improvement` rule occurred on the `ASX TRADE` (exchange market for stocks)

- TWPI rule amended in May 2013

Purpose:

Understand how effective is the rule change, and understand the pattern of the violation

Data:

ASX200 trading data from 2012 - 2015, source: Securities Industry Research Centre of Asia-Pacific (SIRCA)

Method:

Compare TWPI before and after the rule change, then finding the pattern of violation on May 2013 onward

Result:

TWPI amendment in 2013 did significantly decrease the proportion of `at-market-price` TWPI from 52% to 1.23%. However, the proportion of the violation rose from 1% to 4.5%.

Background - Trading on Stock Exchange

Rule: Equity market products (stocks) must be traded on an **open market**, like ASX trading platform.

Open market / lit pool:

```
-> traders can see the price and volume of all orders on a trading platform, real time
-> ASX trading platform
-> establish fair price, transparency
```

Dark pool:

```
-> details of orders are not disclosed to the public, until a transaction is completed
-> brokers internal system (reported to ASX)
-> less fluctuation to the market
```

Both pools are just trading venues, they are still in a same stock exchange: ASX TRADE

Background - Trading on Stock Exchange
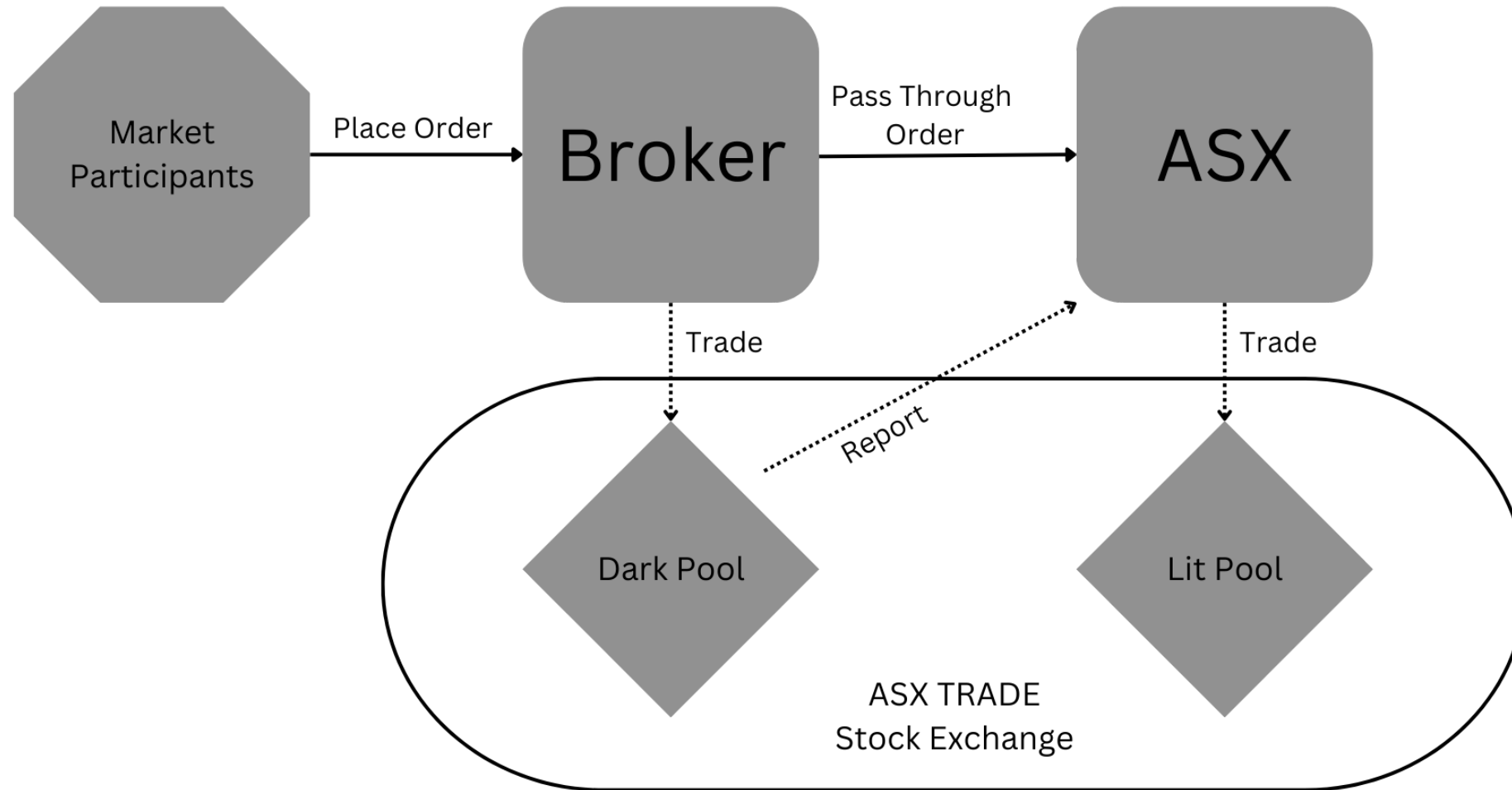
MUST BE In Lit Market?? *not really ..*

When the stocks can be traded in a dark pool?

1. block trade: large volume

2. portfolio trade: a number of different stocks, on a single agreement

3. out-of-hours trade: outside open-session

4. **Trade with price improvement:**

   - crossings (trades within a broker) on a better price than what available on the lit-market

   - benefit traders

   - reported to ASX, not occurred on ASX. Hence, can be violated, e.g. reported as TWPI but actually traded at the spread

Research Problem

Background:

1. Crossings at or within the spread rule was introduced in the late 2011.

2. Amendment in May 2013 -> Trade with price improvement

   - more trading in the lit market, ensuring better price and liquidity - ASIC Report 394
   - Other POV: ASX as a for-profit organisation seeks profit -> Fees from trading on their platform

3. **Recent finding by ASIC: violation of TWPI rule**

FINANCIAL STANDARD.

NEWS | EVENTS | JOURNALS | PODCASTS | VIDEOS | LEARNING | LOG IN | CONTACT

The latest issue of Financial Standard now available as an e-newspaper   READ NOW

Regulatory

Wilsons Advisory fined $550k by ASIC MDP

BY JAMIE WILLIAMSON | FRIDAY, 3 FEB 2023 1:02PM

Wilsons Advisory and Stockbroking paid the significant penalty which was issued by the Markets Disciplinary Panel (MDP) after it found the firm to have incorrectly reported many trades as Trade with Price Improvement (TWPI).

Key Questions

1. Are there any significant decrease on the number of `crossings at the spread` after the rule amendment on May 2013?

2. How many `TWPI` violations after the rule change?

3. Who did the violation?

4. What conditions that make the violation occurred? Develop a model …

Data

- ASX200 data from 2012 to 2015

- Source: Securities Industry Research Centre of Asia-Pacific (SIRCA)

- Extracted with Nectar Cloud Computing

- 10Million+ of `TWPI` observations.

Nectar Cloud Computing

- Developed and maintained by Australian Research Data Commons (ARDC)
- Provide large scale computing infrastructure

Data

Trading Data

mykey	RecordDate	HourMinuteSecond	MilliSecond	RecordType	Price	Volume	Undisclosed
158992400	2015-01-02	10:00:32	854	ENTER	1.190	10000	
158992401	2015-01-02	10:06:28	776	ENTER	1.180	20000	
158992402	2015-01-02	10:06:28	776	TRADE	1.185	1253	
158992403	2015-01-02	10:06:28	776	TRADE	1.180	18747	
158992404	2015-01-02	10:06:49	921	ENTER	1.180	20000	
158992405	2015-01-02	10:06:49	921	TRADE	1.180	10914	

Best Bid/Ask Data

| mykey	RecordDate	HourMinuteSecond	MilliSecond	L1BidPrice	L1BidVolume	L1AskPrice
2440989525	2015-01-02	07:00:00	100	1.140	300	1.185
2440989526	2015-01-02	09:59:46	29	1.190	22000	1.195
2440989527	2015-01-02	09:59:47	403	1.185	1253	1.195
2440989528	2015-01-02	10:00:32	854	1.185	1253	1.190
2440989529	2015-01-02	10:06:28	776	1.180	10914	1.190
2440989530	2015-01-02	10:06:49	921	1.160	3389	1.180

Combined Data

mykey	RecordDate	HourMinuteSecond	MilliSecond	RecordType	Price	Volume	UndisclosedVolume	DollarValue	Qualifiers	BidID	AskID	BuyerBrokerID	SellerBroker
158992400	2015-01-02	10:00:32	854	ENTER	1.190	10000	0	11900.000			6505906787991053321	NA	
158992401	2015-01-02	10:06:28	776	ENTER	1.180	20000	0	23600.000	OB0		6505906787991062575	NA	
158992402	2015-01-02	10:06:28	776	TRADE	1.185	1253	NA	1484.805	Si	6505906787990991241	6505906787991062575	122	6
158992403	2015-01-02	10:06:28	776	TRADE	1.180	18747	NA	22121.460	Si	6505906787990992156	6505906787991062575	140	6
158992404	2015-01-02	10:06:49	921	ENTER	1.180	20000	0	23600.000			6505906787991063494	NA	
158992405	2015-01-02	10:06:49	921	TRADE	1.180	10914	NA	12878.520	Si	6505906787990992156	6505906787991063494	140	1

Result and Discussion

	PERCENTAGE	
Marks	**Before**	**After**
Within	46.94	95.54
At Spread	52.00	1.23
Outside	1.05	3.23

Broker Type	**TWPI**	**Violation**	**Percent**
HFT-Broker	2,014,948	108,635	5.39
HFT-Prop	261,795	7,309	2.79
Institution	1,916,287	71,323	3.72
Retail-Discount	6,126	113	1.84
Retail-Full Service	2,445	86	3.52
Unclassified	5,709	250	4.38

- Significant decrease on the number of `crossings at the spread` TWPI after the rule change, from 52% to 1.23% -> more trades on ASX platform, more fees

- Violation of the rule increased from 1.05% to approximately 4.46% after the rule change -> still marginal

- HFT Brokers have done the most TWPI, as well as violation. Look closer at individual brokers (Top 10):

Crossing Trades Reported as TWPI
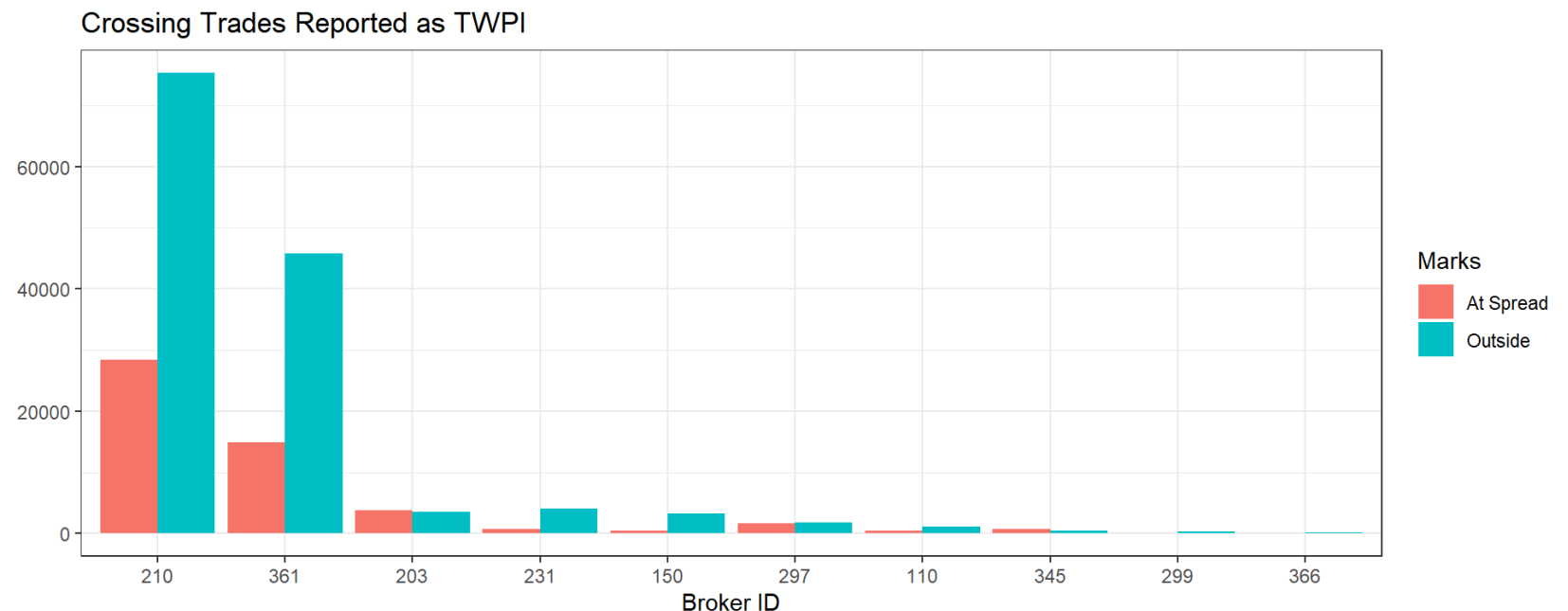
Modelling

- Only TWPI data on the top 5 brokers used to model the **violation**, due to their dominant proportion.

- Preprocessing and cleaning the data, include data scaling

- Choosing relevant variables

- The independent variable is a binary whether violation or not

- Dependend variables:

```
[1] "DollarValue"    "AskVol_before" "BidVol_before" "Volume"
[5] "Hour"           "Year"          "Month"         "Date"
[9] "Dayofweek"
```

Modelling

We try four machine learning modelling to understand violation pattern:

- Logistic Regression

- Decision Tree

- Random Forest

- Boosted Tree (xgboost)

Random Forest gives the best result for this classification problem: highest balance accuracy score on the test set.

Modelling

Logistic Regression

Violation	cl_acc	0	1
0	0.6705368	794747	390493
1	0.6133251	23238	36859

```
1  bal_accuracy_logistic
```
```
[1] 0.6419309
```

Random Forest

Violation	Accuracy	0	1
0	0.7899835	936320	248920
1	0.7721517	13693	46404

```
1  bal_accuracy_rf2
```
```
[1] 0.7810676
```

Variable importance from the Random Forest Model:

	0	1	MeanDecreaseAccuracy	MeanDecreaseGini
DollarValue	161.06057	203.5223	309.9214	12932.043
AskVol_before	435.08456	397.4673	485.4454	23207.125
BidVol_before	417.66525	422.8720	530.8331	23130.516
Volume	164.54704	217.6188	317.2079	12629.889
Date	97.77479	305.8460	301.0975	13255.853
Hour	78.21799	126.6891	136.8460	5907.657
Year	162.17166	616.0610	585.3168	5630.567
Month	114.19433	439.0454	434.0923	8433.228
Dayofweek	67.17229	262.7428	256.8236	5497.704

- `Ask/BidVol_before` are the volume of the best ask/bid price in the lit market. They have the greatest value based on the Gini, meaning they are important for splitting the result between violation or not violation.

- `DollarValue`, `Volume`, and `Date` are also important for splitting the result.

- Meanwhile, `Year` and `Month` have roles on increasing accuracy of the model.

Conclusion

- The purpose of the rule amendment in May 2013 has been met, as the number of `crossings at the spread` drastically reduced. These kind of trades moves to ASX platform.

- Violation of `TWPI` can be associated with the depth of the liquidity available just before the trades. Date, Volume, and the transaction values also play important role in the `TWPI` violation pattern.

- There is no measure from ASX to reject `TWPI` from being reported if the condition is not met -> ASX need to address this issue

Future Work

- Analyse violation pattern with other variables, such as stock's industry sector, market cap, lagged price values, bid-ask spread, etc.

- Try different method to analyse the pattern, such as PCA and factor modelling.

- More research questions:

  - How much profit did ASX make due to the rule amendment in May 2013?

  - Why there were only several brokers dominate the TWPI?

Thank You