

Trade With Price Improvement

Bagas Trilaksonoaji

2024-10-25

Table of contents

1 Abstract	2
2 Introduction	2
2.1 Background and Motivation	2
2.2 Purpose and Key Questions	4
2.2.1 Understand the Impact on At-the-Spread Crossings	4
2.2.2 Identify the Violation Pattern	5
2.3 Significance and Contributions 500	5
2.3.1 Economic Significance	5
2.3.2 Regulatory Significance	6
2.3.3 Academic Significance	6
3 Data and Methodology 1000	6
4 Result and Discussion 2000	6
4.1 Analysis	6
4.1.1 Logistic Regression	6
4.1.2 Random Forest	9
4.1.3 Summary	13
4.1.4 Limitation	13
5 Conclusion 500	13
5.1 Potential Future Work	13
6 References	13

1 Abstract

2 Introduction

There were numerous equities exchanges established in the long history of Australia. Almost every big city in Australia once had their own stock exchange, namely Sydney, Brisbane, Melbourne, Adelaide, Perth, and even Hobart. The Australian Parliament merged all six stock exchanges in 1987, creating the Australian Stock Exchange ([Australian Stock Exchange, n.d.](#)). Two decades later, this equities exchange merged with Sydney Futures Exchange to become the Australian Securities Exchange. Although its official name is now ASX Limited, it is more convenient to simply refer to it as ASX. In this report, however, we will use the term ASX to refer to the company or the equities market.

As a market operator, ASX's main tasks include reviewing listing applications, supervising listed entities as well as listed brokers, operating and maintaining an electronic trading platform for buying and selling stocks, and providing clearing and settlement services. ([Australian Stock Exchange, n.d.](#)).

ASX operates under the regulatory framework of two government agencies, the Australia Securities and Investments Commission (ASIC) and the Reserve Bank of Australia (RBA) ([Australian Stock Exchange, n.d.](#)). ASIC oversees stock market trading and enforces financial market conduct laws, while the Reserve Bank of Australia (RBA) oversees clearing and settlement-related services.

2.1 Background and Motivation

Anyone who wants to buy or sell stocks can place an order on the ASX trading platform. When the price of the buy and sell side matches, the trade can be executed. Outstanding orders will remain on the platform and visible to market participants. This mechanism promotes transparency and market equilibrium in supply and demand, thereby ensuring fair stock price formation ([Australian Securities and Investments Commission, 2022](#)). That is why we often call this trading venue provided by the ASX trading platform `lit market` or `lit pool`.

On the other hand, there are other venues that do not disclose the orders placed, at least until the transaction is executed. We will use the term `dark pool` to refer to this kind of trading venue. There are several `dark pools` available for stock trading in Australia. However, in this project, we will focus on the `dark pool` executed on the broker's internal crossing system.

Crossing system is an electronic platform provided by the brokers to match orders placed by their clients with their other clients or with their own account ([Australian Securities and Investments Commission, 2014](#)). In other words, orders can be matched on the broker's internal system before they are passed through to the ASX trading platform. For the next section, we will use the term `crossing` to refer to the trades in the broker's internal crossing system.

What is the benefit for brokers and traders if they trade on the crossing system instead of the ASX `lit pool`? One of the primary benefits is the significantly lower trading fees. Trades on the ASX platform are charged about 0.15 basis points per trade, whereas internal crossing charges as much as 0.04 basis points per trade, capped at \$1,000 per month ([Australian Securities Exchange, 2024](#)). The difference is quite huge given how much a broker can trade on a daily basis.

It is important to note that the internal crossing rule differed before and after 26 May 2013.

1. Before

Based on Rule 4.2.3(1)(b) of the ASIC Market Integrity Rules (Competition in Exchange Markets) 2011, the trades done in the broker’s internal crossing system are referred to as **Trades At or Within the Spread**. As the name suggests, the executed trade price must be at the same as the best available bid or best available offer of the `lit market` (at-the-spread), or better (within-the-spread). This implies that the price executed in this “dark pool” cannot be lower than the best bid price or higher than the best offer price in the “lit market”.

2. After

The rule had changed, based on Rule 4.2.3 of the ASIC Market Integrity Rules (Competition in Exchange Markets) Amendment 2012 (No. 1), the trades on the crossing system must provide meaningful price improvement ([Australian Securities and Investments Commission, 2014](#)). Trades at the best bid or best offer price of the `lit market` are not in the option anymore. This rule was effective on 26 May 2013. ASIC and ASX refer to this internal crossing trade as **Trades With Price Improvement**, or next we can refer to this as TWPI. This report will specifically focus on this type of dark trading.

The amendment of the rule in May 2013 was to address the negative impact of the dark trades on the price formation, specifically from the **at-the-spread** trades ([Australian Securities and Investments Commission, 2014](#)), due to traders may prefer to do the trades on the `dark pool` as it costs less fees compared to the `lit pool`. The adverse effect on price discovery was one of the main reasons why the regulator wanted more trading to occur in the `lit pool`.

On the other hand, the ASX was also motivated by an economic incentive. On October 14, 1998, ASX became a publicly owned company after demutualising itself. The main analysis behind this was that “*ASX needed to become more flexible, responsive, and commercially focused, capable of quickly taking up emerging commercial opportunities*” ([Australian Securities and Investments Commission, 2004](#)). Therefore, ASX, being an all-for-profit enterprise, would seize any business opportunity to increase its revenue and maximize its returns to shareholders. ASIC amended the rules to provide meaningful price improvements, which would shift a significant portion of dark trades to the ASX platform, thereby increasing its profit from trading fees.

Key Motivation

In May 2022, ASIC published a Market Integrity Update (Issue 137), which included a review of TWPI. In the article, ASIC mentioned that several participants were reporting a significant number of their TWPIs without any price improvement. ASIC emphasized that such trades must be done in the `lit market` because they will promote liquidity and price formation. TWPI is an exception because it offers better prices for the investor—a price that the `lit market` cannot provide.

Following up on the Market Integrity Update, ASIC issued an infringement notice to Wilson Advisory and Stockbroking Pty Ltd, requiring them to pay \$548,328 to ASIC on behalf of the Commonwealth. The notice was given on 16 December 2022, while published on an ASIC media release on 3 February 2023.

The penalty shows that ASIC has started to take the breach of the TWPI rule more seriously. However, despite the rule's lengthy introduction (in 2011 and amended in 2013), ASIC's concern didn't surface until recently. Therefore, I'm intrigued to analyse the TWPI trades following the amendment on 26 May 2013. Were there no violations of the TWPI rule in its early establishment? Or were there other factors that prevented the regulator from taking this issue seriously?

Apparently, according to an ASIC report from 2014 ([Report 394](#)), the rule change in May 2013 increased the proportion of trading on the `lit market`, enhanced the fairness on the market price formation. ASIC seems to be satisfied with this finding and may have become less vigilant, or at least not yet, in enforcing the TWPI rule among market participants.

2.2 Purpose and Key Questions

The main objective of this study is to look into how the rule change in 2013 affected `at-the-spread` crossings reported as TWPI. The way brokers act and trade on the `dark pool` should be greatly affected by this change, as they must move the `at-the-spread` crossings to the `lit pool`. Moreover, this study will also examine the violation of the TWPI after the rule change, as this is the key motivation of this study.

The study will compare transaction data before and after the 2013 regulation change, with a focus on TWPI and `at-the-spread` crossings. Trade volumes, prices, time stamps, broker IDs, and several other variables will be included in the analysis. There will be simple statistical methods used to compare trade distributions, and machine learning methods may be used to find trends of the violations in the TWPI rule.

2.2.1 Understand the Impact on At-the-Spread Crossings

`At-the-spread` crossings were possible before the rule change, which meant that trades could be made at the best bid or best offer price available on the `lit market`. However, the 2013 amendment says that trades must lead to price improvements, in other words, `at-the-spread`

crossings are no longer allowed. The main question is the number of **at-the-spread** crossings among all TWPI-reported trades before and after 26 May 2013. This comparison will help to figure out whether the rule change stopped people from doing **at the spread** crossings at the **dark pool**.

Key Question: Did the number of **at-the-spread** crossings drop significantly after 26 May 2013?

2.2.2 Identify the Violation Pattern

ASIC's media release and publication in the last couple of years suggested that there have been TWPI rule violations in recent years. This study will examine the monetary worth of the violations, identify which brokers do the most violations, and find any pattern by creating a model to help spot non-compliance in the future.

Key Question:

1. How many violations, both in terms of the quantity of trades and the dollar value, occurred following the rule change?
2. What kind of brokers violate the rules the most? Are some brokers more likely to break TWPI rules than others?
3. What conditions contributed to the occurrence of the violations?

2.3 Significance and Contributions 500

There are three main areas in which this study may contribute: academic, regulatory, and economic.

2.3.1 Economic Significance

From a financial point of view, it is essential to comprehend TWPI violations since they have the potential to compromise market integrity in general ([Australian Securities and Investments Commission, 2014](#)). By figuring out how much value in dollar TWPI violations occurred, this study can show how much value was traded not in a legal manner. If these trades had taken place on the **lit market**, then there would be trading fees that should be paid to the market operator (ASX). Internal crossing trades, for example, incur a fee of approximately 0.04 basis points per trade, whereas trades on the ASX platform cost 0.15 basis points per trade ([Australian Securities and Investments Commission, 2024](#)). This significant difference in trading fees indicates additional economic implications.

2.3.2 Regulatory Significance

Understanding the magnitude of the TWPI violation since its amendment in 2013 may provide regulators with new insights to address the TWPI reporting issues at the prevention level rather than through corrective action. Furthermore, if the detection model developed in this study proves effective, regulators might utilize it as part of an automated enforcement mechanism to ensure TWPI reporting follows the regulations.

2.3.3 Academic Significance

There is a lot of academic literature on special orders and hidden orders, but this study adds a new dimension by focusing on TWPI violations. This study's novel contribution is the use of a prediction model to identify patterns and conditions that result in TWPI rule violations. The study might help academics learn more about how rules are enforced in financial markets and the situations where traders are most likely to take advantage of the system loopholes.

3 Data and Methodology 1000

4 Result and Discussion 2000

4.1 Analysis

4.1.1 Logistic Regression

Confusion Matrix and Statistics of ~~at-the-spread~~ violations on the test dataset:

Confusion Matrix and Statistics

Prediction	Reference	
	0	1
0	732681	4539
1	307566	9697

Accuracy : 0.704
95% CI : (0.7031, 0.7049)
No Information Rate : 0.9865
P-Value [Acc > NIR] : 1

Kappa : 0.0335

McNemar's Test P-Value : <2e-16

Sensitivity : 0.70433
Specificity : 0.68116
Pos Pred Value : 0.99384
Neg Pred Value : 0.03056
Prevalence : 0.98650
Detection Rate : 0.69482
Detection Prevalence : 0.69913
Balanced Accuracy : 0.69275

'Positive' Class : 0

Confusion Matrix and Statistics of outside-spread violations on the test dataset:

Confusion Matrix and Statistics

	Reference	
Prediction	0	1
0	614494	10555
1	399606	29828

Accuracy : 0.611
95% CI : (0.6101, 0.612)
No Information Rate : 0.9617
P-Value [Acc > NIR] : 1

Kappa : 0.0613

McNemar's Test P-Value : <2e-16

Sensitivity : 0.60595
Specificity : 0.73863
Pos Pred Value : 0.98311
Neg Pred Value : 0.06946
Prevalence : 0.96170
Detection Rate : 0.58274
Detection Prevalence : 0.59275
Balanced Accuracy : 0.67229

'Positive' Class : 0

4.1.1.1 Apply model to twpi data outside broker 210 and 361

```
[1] 0.670172
```

Confusion Matrix and Statistics of ~~at-the-spread~~ violations on the new dataset:

Confusion Matrix and Statistics

	Reference	
Prediction	0	1
0	726112	3076
1	309217	5445

Accuracy : 0.7008
95% CI : (0.6999, 0.7017)
No Information Rate : 0.9918
P-Value [Acc > NIR] : 1

Kappa : 0.0181

McNemar's Test P-Value : <2e-16

Sensitivity : 0.7013
Specificity : 0.6390
Pos Pred Value : 0.9958
Neg Pred Value : 0.0173
Prevalence : 0.9918
Detection Rate : 0.6956
Detection Prevalence : 0.6986
Balanced Accuracy : 0.6702

'Positive' Class : 0

```
[1] 0.6502005
```

Confusion Matrix and Statistics of ~~outside-spread~~ violations on the new dataset:

Confusion Matrix and Statistics

Reference

Prediction	0	1
0	599398	4200
1	429565	10687

Accuracy : 0.5845
 95% CI : (0.5835, 0.5854)
 No Information Rate : 0.9857
 P-Value [Acc > NIR] : 1

Kappa : 0.0199

McNemar's Test P-Value : <2e-16

Sensitivity : 0.58253
 Specificity : 0.71787
 Pos Pred Value : 0.99304
 Neg Pred Value : 0.02427
 Prevalence : 0.98574
 Detection Rate : 0.57422
 Detection Prevalence : 0.57824
 Balanced Accuracy : 0.65020

'Positive' Class : 0

4.1.2 Random Forest

4.1.2.1 At-The-Spread

Variable importance of at-the-spread violations:

	0	1	MeanDecreaseAccuracy	MeanDecreaseGini
DollarValue	59.007187	100.40460	131.27640	2617.498
AskVol_before	146.211349	287.26167	393.89538	4729.450
BidVol_before	142.931942	286.48835	364.34268	4790.141
Volume	49.769757	103.75083	134.10499	2248.948
spread	230.996712	431.11889	589.67343	8098.680
Date	12.170909	65.69846	59.37895	2057.638
Hour	40.580342	51.03897	66.12206	1264.557
Dayofweek	8.310214	49.13468	42.56112	1139.813

Confusion Matrix and Statistics of at-the-spread violations on the test dataset:

Confusion Matrix and Statistics

	Reference	
Prediction	0	1
0	825008	2571
1	215239	11665

Accuracy : 0.7934
95% CI : (0.7927, 0.7942)
No Information Rate : 0.9865
P-Value [Acc > NIR] : 1

Kappa : 0.0732

McNemar's Test P-Value : <2e-16

Sensitivity : 0.79309
Specificity : 0.81940
Pos Pred Value : 0.99689
Neg Pred Value : 0.05141
Prevalence : 0.98650
Detection Rate : 0.78238
Detection Prevalence : 0.78482
Balanced Accuracy : 0.80625

'Positive' Class : 0

4.1.2.2 Outside the Spread

Variable importance of outside-the-spread violation:

	0	1	MeanDecreaseAccuracy	MeanDecreaseGini
DollarValue	125.50860	157.4889	217.4215	6946.841
AskVol_before	204.88930	413.4406	504.1273	15512.206
BidVol_before	242.37856	432.8081	517.8487	15926.278
Volume	133.80397	150.5007	204.1081	6561.616
spread	171.97334	601.5576	720.5479	16535.967
Date	51.70494	261.0853	258.5334	7005.261
Hour	85.76693	130.0931	144.6198	3594.039
Dayofweek	32.07256	241.1619	236.0054	3561.868

Confusion Matrix and Statistics of outside-spread violations on the test dataset:

Confusion Matrix and Statistics

	Reference	
Prediction	0	1
0	851631	6737
1	162469	33646

Accuracy : 0.8395
95% CI : (0.8388, 0.8402)
No Information Rate : 0.9617
P-Value [Acc > NIR] : 1

Kappa : 0.236

McNemar's Test P-Value : <2e-16

Sensitivity : 0.8398
Specificity : 0.8332
Pos Pred Value : 0.9922
Neg Pred Value : 0.1716
Prevalence : 0.9617
Detection Rate : 0.8076
Detection Prevalence : 0.8140
Balanced Accuracy : 0.8365

'Positive' Class : 0

4.1.2.3 Apply model to twpi data outside broker 210 and 361

Confusion Matrix and Statistics of at-the-spread violations on the new dataset:

Confusion Matrix and Statistics

	Reference	
Prediction	0	1
0	791298	1906
1	244031	6615

Accuracy : 0.7644

95% CI : (0.7636, 0.7652)
No Information Rate : 0.9918
P-Value [Acc > NIR] : 1

Kappa : 0.0358

McNemar's Test P-Value : <2e-16

Sensitivity : 0.76430
Specificity : 0.77632
Pos Pred Value : 0.99760
Neg Pred Value : 0.02639
Prevalence : 0.99184
Detection Rate : 0.75806
Detection Prevalence : 0.75988
Balanced Accuracy : 0.77031

'Positive' Class : 0

Confusion Matrix and Statistics of outside-spread violations on the new dataset:

Confusion Matrix and Statistics

	Reference	
Prediction	0	1
0	863004	4861
1	165959	10026

Accuracy : 0.8364
95% CI : (0.8356, 0.8371)
No Information Rate : 0.9857
P-Value [Acc > NIR] : 1

Kappa : 0.0809

McNemar's Test P-Value : <2e-16

Sensitivity : 0.83871
Specificity : 0.67347
Pos Pred Value : 0.99440
Neg Pred Value : 0.05697

Prevalence : 0.98574
Detection Rate : 0.82675
Detection Prevalence : 0.83141
Balanced Accuracy : 0.75609

'Positive' Class : 0

4.1.3 Summary

Violation	GLM_top2	GLM_others	RF_top2	RF_others
at-spread	0.6927471	0.6701720	0.8062450	0.7703068
outside-spread	0.6722889	0.6502005	0.8364812	0.7560929

4.1.4 Limitation

5 Conclusion 500

5.1 Potential Future Work

6 References

ASIC Market Integrity Rules (Competition in Exchange Markets) 2011.

Australian Securities and Investments Commission. (20 May 2004). *Market demutualisation and privatisation: The Australian experience* [Speech]. Retrieved 24 October 2024, from <https://asic.gov.au/about-asic/news-centre/speeches/market-demutualisation-and-privatisation-the-australian-experience/>

Australian Securities and Investments Commission. (May 2014). *Report 394: Review of recent rule changes affecting dark liquidity* (PDF). Retrieved 24 October 2024, from <https://download.asic.gov.au/media/1344596/rep394-published-19-May-2014.pdf>

Australian Securities and Investments Commission. (May 2022). *Market integrity update: Issue 137*. Retrieved 24 October 2024, from <https://asic.gov.au/about-asic/corporate-publications/newsletters/market-integrity-update/miu-issue-137-may-2022/>

Australian Securities and Investments Commission. (3 February 2023). *Wilson's Advisory and Stockbroking Ltd ACN 010 529 665 pays \$548,328 infringement notice* [Media release].

Retrieved 24 October 2024, from <https://asic.gov.au/about-asic/news-centre/find-a-media-release/2023-releases/23-016mr-wilsons-advisory-and-stockbroking-ltd-acn-010-529-665-pays-548-328-infringement-notice/>

Australian Securities Exchange. (n.d.). ASX regulatory framework. Retrieved 24 October 2024, from <https://www.asx.com.au/about/regulation>

Australian Securities Exchange. (n.d.). ASX story. Retrieved 24 October 2024, from <https://www.asx.com.au/about/asx-story>

Australian Securities Exchange. (n.d.). About Us. Retrieved 24 October 2024, from [https://www.asx.com.au/about#:~:text=As%20an%20integrated%20exchange%2C%20ASX's,equities%20and%](https://www.asx.com.au/about#:~:text=As%20an%20integrated%20exchange%2C%20ASX's,equities%20and%20)

Australian Securities Exchange. (19 February 2024). *ASX Trade: Markets Participant and Trading Schedule of Fees* (PDF). Retrieved 24 October 2024, from <https://asxonline.com/content/dam/asxonline/of-fees/asx-trade-markets-participant-and-trading-schedule-of-fees.pdf>