

# Measuring misconduct in financial markets

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# Statement of originality

This is to certify that to the best of my knowledge, the content of this thesis is my own work. This thesis has not been submitted previously for a higher degree or qualification at any other university or institute of higher learning. I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis, and sources used have been acknowledged. This research is supported by the Australian Government Research Training Program.

Production Note:  
Signature removed prior to publication.

Jonathan R. Karlsen

Date: July 20, 2021

To my family

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# Preface

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# Table of contents

	Page
Statement of originality	ii
Acknowledgments	iv
Preface	v
Table of contents	vi
List of tables	x
List of figures	xi
Abstract	xii
<b>Chapter 1: Introduction</b>	<b>14</b>
1.1 Background and motivation	14
1.1.1 What is market integrity?	16
1.1.2 Why market integrity matters	21
1.2 Purpose and contribution	21
1.3 Structure of this thesis	22
<b>Chapter 2: How much illegal activity uses bitcoin?</b>	<b>23</b>
2.1 Introduction	23
2.2 Institutional details	26
2.2.1 The structure of the bitcoin blockchain	26
2.2.2 Darknet marketplaces and their microstructure	27
2.2.3 Surveillance and cryptocurrency seizures from darknet marketplaces	30
2.3 Data and descriptive statistics	31
2.3.1 Identifying users in transaction-level bitcoin data	31
2.3.2 Filters and data transformations	32
2.3.3 Descriptive statistics of user-level variables	34
2.4 Identifying a sample of illegal users	38
2.4.1 First approach: Bitcoin seizures by law enforcement agencies	38
2.4.2 Second approach: Illegal darknet marketplaces and their users	39

2.4.3 Third approach: Users identified in darknet forums	39
2.4.4 The sample of illegal users	40
2.5 Quantifying and characterizing all illegal activity	44
2.5.1 Method 1: Network cluster analysis	44
2.5.2 Method 2: Detection-controlled estimation (DCE)	46
2.5.3 Variables used in the DCE model and their descriptive statistics	48
2.5.4 How much illegal activity involves bitcoin?	50
2.5.5 How does the illegal activity vary over time?	52
2.5.6 Robustness tests	58
2.6 Discussion	61
2.7 Conclusion	62
<b>Chapter 3: Characteristics of illegal activity in bitcoin</b>	<b>64</b>
3.1 Introduction	64
3.2 Hypotheses	65
3.2.1 Characteristics of illegal activity in cryptocurrencies	65
3.2.2 Determinants of illegal user detection	69
3.2.3 The illegal user network	70
3.3 Illegal user characteristics	70
3.3.1 What are the characteristics of the illegal users	71
3.3.2 What are the characteristics of the illegal user network	77
3.4 Discussion	79
3.4.1 Implications	79
3.4.2 Relation to other literature	82
3.5 Conclusion	84
<b>Chapter 4: Measuring market integrity</b>	<b>85</b>
4.1 Introduction	85
4.2 Data	89
4.2.1 Prosecuted insider trading and market manipulation cases	89

4.2.2 M&A event and trading data	90
4.2.3 Closing price data	91
4.2.4 The characteristics of the prosecuted and nonprosecuted samples	92
4.3 How do we measure market integrity?	93
4.3.1 Development and validation of insider trading measures	93
4.3.2 Development and validation of market manipulation measures	98
4.3.3 Creating a measure of aggregate market integrity	101
4.4 Market integrity in US stock markets	102
4.5 Conclusion	105
<b>Chapter 5: Market integrity around the world</b>	<b>106</b>
5.1 Introduction	106
5.2 Hypotheses	108
5.2.1 Stocks vulnerable to misconduct	108
5.2.2 Country development and market integrity	109
5.2.3 Stock market design and market integrity	111
5.2.4 Regulation and market integrity	112
5.3 Data	114
5.3.1 M&A event and closing price data	114
5.3.2 Stock and country characteristics data	114
5.4 Market integrity around the world and over time	116
5.5 Drivers of market integrity	121
5.5.1 Stock characteristics	121
5.5.2 Country-level drivers	124
5.5.3 Market structure	128
5.5.4 Regulation and enforcement	132
5.6 Conclusion	135
<b>Chapter 6: Conclusion</b>	<b>137</b>
6.1 How pervasive is illegal activity in bitcoin?	137



6.2 How has illegal activity in bitcoin changed over time?	137
6.3 What characterizes illegal bitcoin users and their network?	137
6.4 How do countries compare in market integrity?	138
6.5 How has market integrity changed over time?	138
6.6 What determines market integrity?	139
6.7 How does equity market structure and regulation affect market integrity?	139
6.8 Implications for misconduct legislation and enforcement	140
6.9 Avenues of future research	141
<b>Appendix A: Darknet sites and bitcoin seizures</b>	<b>143</b>
<b>Appendix B: Derivations for the DCE models</b>	<b>145</b>
<b>Appendix C: Estimated illegal activity in bitcoin from DCE and SLM models</b>	<b>146</b>
<b>Appendix D: Impact of AlphaBay's adoption of Monero on illegal activity in bitcoin</b>	<b>154</b>
<b>Appendix E: Detection-controlled estimation robustness tests</b>	<b>156</b>
<b>Appendix F: Differences in characteristics of illegal users after the Silk Road seizure</b>	<b>157</b>
<b>Appendix G: HFT trading, colocation, and whistleblower dates</b>	<b>158</b>
<b>References</b>	<b>161</b>

# List of tables

		Page
Table 2.1	Variable definitions	35
Table 2.2	Descriptive statistics for all users	38
Table 2.3	Size and activity of observed user groups	41
Table 2.4	Estimated size and activity of legal and illegal user groups	52
Table 2.5	Robustness tests	60
Table 3.1	Differences in characteristics between illegal and legal users	73
Table 3.2	DCE model estimates	76
Table 3.3	Network characteristics of legal and illegal bitcoin user networks	78
Table 4.1	Prosecuted and nonprosecuted sample univariate statistics	92
Table 4.2	Insider trading and market manipulation metrics in prosecuted and nonprosecuted samples	98
Table 5.1	Definitions of explanatory variables	115
Table 5.2	Market integrity across countries	117
Table 5.3	How market integrity varies with stock characteristics	124
Table 5.4	How market integrity varies with country characteristics	126
Table 5.5	The impact of stock market fragmentation on market integrity	130
Table 5.6	The impact of dark trading on market integrity	131
Table 5.7	The impact of high-frequency trading on market integrity	132
Table 5.8	Effect of regulatory strategies on market integrity	135
Table A1	Darknet sites accepting bitcoin, current and past	143
Table A2	Bitcoin seizures	144
Table B1	Two-stage DCE model probability matrix	145
Table D1	Impact of AlphaBay's adoption of Monero on illegal activity in bitcoin	154
Table E1	Detection-controlled estimation model (DCE) robustness tests	156
Table F1	Differences in characteristics of illegal users after the Silk Road seizure	157
Table G1	HFT and colocation start dates	158
Table G2	Whistleblower laws	160

# List of figures

		Page
Figure 1.1	An example of insider trading	17
Figure 1.2	An example of market manipulation	18
Figure 1.3	An example of illegal activity in bitcoin	20
Figure 2.1	Screenshots from one of the first illegal darknet marketplaces, Silk Road 1	29
Figure 2.2	Size and activity of the sample of “observed” illegal bitcoin users	43
Figure 2.3	Two-stage detection-controlled estimation (DCE) model	47
Figure 2.4	Estimated number and percentage of bitcoin users involved in illegal activity	53
Figure 2.5	Estimated number and percentage of illegal bitcoin users transactions	54
Figure 2.6	Estimated dollar volume and percentage dollar volume of illegal bitcoin user transactions	55
Figure 2.7	Estimated dollar value and percentage of illegal user bitcoin holdings	56
Figure 4.1	Classification accuracy for market integrity metrics and indices	97
Figure 4.2	Index construction	102
Figure 4.3	US market integrity over time	103
Figure 5.1	Market integrity over time by location	118
Figure 5.2	Market integrity over time by country development	120
Figure 5.3	Market integrity across stock characteristics	122
Figure C1	SLM estimated number and percentage of bitcoin users involved in illegal activity	146
Figure C2	SLM estimated number and percentage of illegal bitcoin user transactions	147
Figure C3	SLM estimated volume and percentage dollar volume of illegal bitcoin user transactions	148
Figure C4	SLM estimated dollar value and percentage of illegal user bitcoin holdings	149
Figure C5	DCE estimated number and percentage of bitcoin users involved in illegal activity	150
Figure C6	DCE estimated number and percentage of illegal bitcoin user transactions	151
Figure C7	DCE estimated volume and percentage dollar volume of illegal bitcoin user transactions	152
Figure C8	DCE estimated dollar value and percentage of illegal user bitcoin holdings	153
Figure D1	Legal and illegal user transaction activity in bitcoin around AlphaBay’s adoption of Monero for payments	155

# Abstract

Fair and efficient financial markets facilitate economic growth by providing funding for firms, investments for individuals, and risk allocation mechanisms. New technologies such as blockchains have the potential to improve these markets by providing more efficient settlements and a range of applications implemented in smart contracts. However, for financial markets and financial technologies to deliver their full potential, they must not only be efficient but also operate with a high level of integrity. Although much research has been devoted to examining financial market efficiency, market integrity—or how fair and free of misconduct markets are—has received far less attention. This thesis helps bridge this gap in knowledge by providing empirical evidence on the prevalence, characteristics, and determinants of illegal activity in both traditional financial markets and cryptocurrencies.

This thesis begins by examining the illegal activity in bitcoin—a cryptocurrency that presents significant challenges for law enforcement given its anonymity, decentralization, and popularity among darknet market criminals. The thesis uses the transaction data from the bitcoin blockchain and a hand-collected sample of individuals who use bitcoin for transactions in illegal goods and services, including in darknet markets and darknet forums. The thesis then estimates the total amount of illegal activity involving bitcoin payments by using two empirical models that rely on different assumptions. The key finding is that approximately one-quarter of all bitcoin users are involved in illegal activity and are responsible for one-half of all transactions in the bitcoin network, equivalent to a total value of \$76 billion per year.

The second issue examined is the characteristics of illegal bitcoin users, the determinants of illegal activity, and the topology of their network. Illegal users have characteristics that suggest they use bitcoin as a payment system rather than for speculation or investment; they conduct transactions with many other users, often with the same user repeatedly, hold fewer bitcoins than legal users, and make small and frequent transactions. They also commonly use services that obscure their activity. The proportion of illegal bitcoin usage decreases with its mainstream popularity and the number of alternative (or shadow) coins, which provide technological innovation in improved user and transaction anonymity.<sup>1</sup> The users in the illegal network are very heterogeneous in the number of counterparties they transact with. For example, darknet markets have many more transactional counterparties than darknet market participants.

Third, this thesis examines criminal activity in traditional financial markets. The thesis develops measures of market integrity based on the estimated frequency of insider trading and market manipulation, validating the measures using a hand-collected sample of prosecuted insider trading and closing price manipulation cases. The measures of insider trading are based on abnormal returns,

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<sup>1</sup> This thesis refers to anonymity in bitcoin as a continuum (i.e. not binary). Bitcoin does not offer “perfect anonymity” but is more anonymous than, for example, Visa and less anonymous than some other cryptocurrencies, for example, Monero or Z-cash.

abnormal volumes, and abnormal order imbalances in the target companies ahead of announced merger and acquisition (M&A) events. The measures of closing price manipulation are based on abnormal day-end order imbalances, day-end stock price volatility, and overnight return reversals. This thesis combines the insider trading and market manipulation proxies to form a market integrity index that can be used to track market integrity over time and make comparisons between countries. The results for the US suggest that higher regulatory resourcing and whistleblower programs tend to increase market integrity.

Finally, the thesis uses the market integrity index to compare the integrity of financial markets around the world and test the determinants of market integrity. Developed countries exhibit high levels of integrity because of their resourceful regulatory bodies, low corruption levels, and rule-abiding societies. Large, liquid stocks are vulnerable to insider trading because insiders can hide their trades in large order flows, while small, illiquid stocks attract manipulation because their closing prices are easier to move. However, regulatory interventions such as whistleblower schemes, enforcement, increased penalties, and cooperation across jurisdictions can effectively deter misconduct. Market designs such as fragmentation of trading across competing trading venues, dark trading restrictions, and colocation services for algorithmic and high-frequency traders tend to improve market integrity. These market design features are especially useful in jurisdictions with lower regulatory resources.

This thesis has implications for law enforcement, regulators, and legislators around the world. Financial markets commonly face integrity issues when there are lucrative opportunities for criminal activity. Government institutions around the world can use the tools developed in this thesis to conduct market surveillance, detect and discourage criminal activity, and improve market integrity in traditional financial markets and cryptocurrencies.