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The Impact of Board Gender Diversity on the Profitability of Insider Trading

Evidence from the Swedish Stock Market

Master Thesis in Accounting and Finance

Lund University School of Economics and Management

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Abstract

Title: The Impact of Board Gender Diversity on the Profitability of Insider Trading

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Keywords: Insider Trading, Board Gender Diversity, Corporate Governance, Asymmetric Information, Abnormal Returns

Purpose: This study examines if gender diversity among the board of directors affects information disclosure and the profitability of insider trading. Furthermore, to fulfill the purpose aforementioned, we initially investigate whether or not insiders generate abnormal returns.

Methodology: By means of a classic event study approach, we calculate abnormal returns for insider trades. Subsequently, we use various regression models to evaluate the relationship between board gender diversity and abnormal returns from insider trades.

Theoretical Perspectives: We discuss insider trading and asymmetric information in the context of the market efficiency hypothesis and the signaling hypothesis. The agency theory, the social identity theory, and the theory of critical mass, among others, underpin the understanding of board gender diversity.

Empirical Foundation: The empirical analysis is based on a sample of 5,671 buy and sell transactions covering 292 unique firms listed on the Nasdaq Stockholm between January 2017 and December 2019.

Conclusion: Our empirical results suggest that insiders earn abnormal returns from their insider transactions. Moreover, we estimate the insignificant effects of board gender diversity on the profitability of insider trading.

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List of Abbreviations

APT	Arbitrage Pricing Model
AR	Abnormal Returns
BLUE	Best Linear Unbiased Estimators
CAAR	Cumulative Average Abnormal Returns
CAR	Cumulative Abnormal Returns
CAPM	Capital Asset Pricing Model
EU	European Union
FI	Finansinspektionen
FE	Fixed Effects
OLS	Ordinary Least Squares
OMXSPI	Open Mobile Exchange (OMX) Stockholm Price Index
MAR	Market Abuse Regulation
RE	Random Effects
RDT	Resource Dependence Theory
R&D	Research and Development

1 Introduction

This introductory chapter provides an overview of the thesis. Section 1.1 presents a background of the topic. Section 1.2 states the research question. The main findings and contributions to the literature are discussed in section 1.3. A schematic outline of the thesis is provided in section 1.4.

1.1 Background

Corporate insiders[1] who, by virtue of their position, use their access to non-public, material information to earn excess returns, is a topic that has received much attention over the past decade. The importance of an operating and efficient stock market is substantial, as it acts as an intermediary for firms to raise capital. In general, insider trading is suggested to dissuade outside investment and diminish the efficiency of corporate behavior due to costs stemming from information asymmetry (Manove, 1989; Fishman, 1993; Seyhun, 1986). It is essential to distinguish between accepted market practice regarding insider transactions, and what is classified as illegitimate market abuse. The former refers to the board of directors of public listed companies being allowed to own stock in their firms. This contrasts with the latter; the illegal proceedings which bring to mind the state of affairs in *The Wolf of Wall Street*[2], encompassing unlawful disclosure of confidential inside information and market manipulation. The European Parliament and the EU Council enacted in 2016 regulation *596/2014* under the name of *Market Abuse Regulation* (MAR). The new requirements of MAR were aimed at bolster market integrity, protect investors, advocate transparency, and improve equal treatment of all market participants. Member states of the European Union (EU) are required to incorporate EU directives into national law.

Several researchers aim to explain behaviors and circumstances surrounding insider trading (e.g., Jaffe, 1974; Finnerty, 1976; Seyhun, 1986; Wahlström, 2003). The starting point for this thesis is the overarching theory of efficient markets initially developed by Eugene F. Fama in the 1970s, who suggest that it was not possible to outperform the market since all information is already incorporated in the current stock price. Since then, plenty of evidence has been presented, which indicates that the strong-form efficient market hypothesis does not hold due to the existence of information asymmetry in the market, facilitating the creation of abnormal returns. It is the firm's task to provide the market with all relevant information, and ultimately, the board of directors are responsible for supervising its fulfilling. Thus, how successful the board is in its monitoring role of information disclosure is a relevant topic within corporate governance. There exists one strand of

[1] Insider refers to an individual within a company with access to information unavailable to the public.
[2] The Wolf of Wall Street was a screenplay from 2013 based on a memoir which portrayed how a Wall street stockbroker and his firm engaged in rampant corruption and fraud.

research that emphasizes the effect of board gender diversity on monitoring. It seems that no consensus is reached on what potential benefits female board presence induce. Yet, evidence is presented that higher board gender diversity, in particular, more female directors, have a positive influence on corporate governance functions, especially transparency and information disclosure (Adams & Ferreira, 2009), stock informativeness (Gul, Srinidhi, & Ng, 2011), the relationship between disclosure quality and information asymmetry (Brown & Hillegiest, 2007), and how board gender diversity influences transparency and accuracy of financial reports (Gul, Hutchinson, & Lai, 2013).

1.2 Purpose and Research Question

Although previous studies offer preliminary insights into insider profits and market efficiency, a considerable number of years have passed since many of the most significant studies were conducted, while market conditions and legal frameworks have progressed. Additionally, the availability of studies on the Swedish market is limited. Accordingly, both literature on board composition from a gender diversity perspective, and insider trading and information asymmetry require additional research to enhance market integrity and investor protection. Potentially, the findings of this study represent an evolution of the thoroughly explored link between board gender diversity and firm financial performance. In the discussion regarding efficient markets combined with gender-equal corporate boards, this thesis provides evidence to the following research question constituting the foundation of this study:

RQ: Does gender diversity among the board of directors affect information disclosure and the profitability of insider trading?

1.3 Findings and Contributions

The study is based on a sample of 5,671 buy and sell transactions covering 292 unique firms listed on the Nasdaq Stockholm between 2017 and 2019. Initially, we examine whether or not insiders are able to earn excess profits on their insider trades. By the use of an event study, we calculate cumulative average abnormal returns (CAAR) for each firm by year measured over 5, 30, and 90 days. We find that insiders create excess profits from both their buy and sell transactions, which is consistent with previous research showing that the stock market is not efficient due to the existence of asymmetric information. Moreover, our findings indicate that Swedish firms, to some extent,

fail to disclose information to the market. Hence, the board of directors does not entirely fulfill their monitoring purpose.

Subsequently, we explore if the degree of diversity among the board of directors affects the profitability of insider trades. The motivations for board gender diversity is that it is advocated to have a positive effect on firm information disclosure, which in turn might mitigate the opportunity to earn abnormal returns. Our regression models with CAAR as the dependent variable and board gender diversity as the independent variable reveal insignificant results. The lack of support for the gender-related effects is suggested to be due to prevailing circumstances that hamper the proposed positive effects such as increased corporate governance, transparency, and information disclosure. Additionally, while higher board gender diversity is found to enhance the quality of information sources such as financial statements, we propose that it does not automatically apply to the firm's continuous ability to disseminate ongoing information.

The contributions of this study are suggested to be twofold. The first contribution is to the emerging, hitherto rather unexplored literature on the relationship between board gender diversity and profitability of insider trading. It appears that merely one previous study exhibits similarities to our research question.[3] To expand the understanding of the potential effects of gender-balanced corporate boards on corporate governance functions such as monitoring, information disclosure, and transparency, assist in the strive for a well-functioning security market. Furthermore, our inquiry of the possible benefits of increased board gender diversity, in particular, higher female presence, facilitates the well-debated topic of introducing gender quota legislation in Sweden.

The second contribution is to research on the practice of insider trading in Sweden. While the topic of insider trading appears to be heavily investigated, the availability of studies conducted on the Swedish stock market is rather scarce. Especially, few studies explore abnormal returns from insider trades after the regulation on insider trading was updated in 2016. Since the revamped framework shortened the insider reporting period from five days to three days, it is of interest to study the market following the regulation change. This study covers the years between 2017 to 2019, hence it reveals insights based on a previously unexamined sample.

[3] Zhong, Faff, and Hodgson (2013) conduct a study with the Australian Stock Exchange as focal point and examine if female directors have a monitoring effect by influencing cumulative abnormal returns on director trades.

1.4 Outline

The remainder of the work is structured as follows. Section 2 provides a review of the literature on insider trading and board gender diversity. The hypotheses of the thesis are derived based on the existing literature. Section 3 discusses the precedent empirical findings. Section 4 provides an overview of the institutional background, including legal frameworks regarding insider transactions and guidelines facilitating good corporate governance. Section 5 introduces the methodological approach of the study, the empirical design of the regression model, and efforts to ensure the internal validity and robustness of the empirical findings. Section 6 describes the data, sample construction, and variable definitions. Section 7 presents the empirical results. Section 8 discusses the findings with regard to the theoretical framework and previous research. Section 9 concludes.

2 Theoretical Framework

The following section presents the main theoretical concepts that will constitute the frame of reference for the study. We commence by introducing relevant theories related to insider trading in section 2.1. Frequently applied theories in studies on board gender diversity are presented in section 2.2. In the final section 2.3, we merge the two separate topics.

2.1 Insider Trading

2.1.1 The Efficient Market Hypothesis

Among the most prominent economic theories explaining how markets determine the price of securities is the efficient market hypothesis developed by Eugene F. Fama (1970). The concept of market efficiency and security pricing constitutes a foundation for the discussion regarding insiders' opportunities to earn abnormal returns on their insider trades. The main purpose of the capital market is suggested to be the allocation of ownership in the economy's capital stock. It is described to be ideal and efficient when the complete information is available to all market participants, the prices of the securities at any time fully reflect the available information, and everyone agrees on what implications the information has for the value of the underlying asset. A market can be efficient to varying degrees based on different criteria, and Fama (1970) proposed a categorization into three subgroups: strong-form efficiency, semi-strong form efficiency, and weak-form efficiency. Firstly, in the state of strong-form efficiency, accurate signals in the market are already acknowledged by the participants. This implies that there exists no information asymmetry between insiders and external investors. Consequently, it would be impossible for insiders to earn abnormal returns. Secondly, during the semi-strong-form efficiency, the price of assets is described to mirror all "obviously publicly available information" as expressed in official financial statements or public reports. Evidence presented in previous studies indicates that insiders can take advantage of their superior information and generate excess profits. Thirdly, abnormal returns are also earned under the weak-form efficiency in which it is suggested that the security prices merely reflect the information contained in the historical prices and historical development of the securities. It is suggested that as the availability of information increases, correspondingly, the opportunity to generate abnormal returns increases. It is possible to determine what level of information efficiency prevails in the market by measure changes in stock prices ahead of and after an announcement of an observed event can be measured and evaluate how rapidly the stock price adjusts in the wake of the announcement.

2.1.2 Information Asymmetry

Asymmetric information is proposed to be a regular feature of market interactions and is a crucial concept in the study of insider trading. The original work of Akerlof, Spence, and Stiglitz[4] constitutes the foundation for the theory of markets with asymmetric information. If markets are efficient, all market participants share the same information. In practice, it seems that this is not the case. Presumably, insiders have superior insight and understanding of their firm compared to outside investors, hence, better positioned to evaluate current and future scenarios. This described information asymmetry is considered to be a market anomaly, and its presence an essential tool to understand how insiders can earn abnormal returns. Commonly, information asymmetry is divided into two categories. The first one, moral hazard, emerges when a contract is entered, and the party not bearing the financial risk has incentives to change their behavior. Insider trading has been described to be a harmful practice, as allowing insiders to capitalize on negative news might give rise to moral hazard (Carlton & Fischel, 1983). The second one, adverse selection, refers to a situation where two parties in a contract have access to different information which is withheld before an agreement is reached. Advocates of insider trading argue that insiders buying or selling stock in their firms might be useful to signal the value of the firm to the uninformed investors, hence reducing information asymmetry. Various studies have been conducted that investigate the correlation between information asymmetry and insider trading, as well as the behavior and outcomes of informed trading.

2.1.3 The Signaling Hypothesis

The signaling hypothesis is commonly applied when attempting to describe how insider trading may convey information to uninformed market participants. In the literature, there exist various examples aimed at explaining how the signaling hypothesis can be applied to illustrate how one party may undertake actions to signal its underlying quality to other parties (Damodaran & Liu, 1993; Connelly, Certo, Ireland, & Reutzel, 2011). For instance, it is found by Goranova, Alessandri, Brandes, and Dharwadkar (2007) that when top executives increase their ownership stakes in their firms, it sends out a positive signal to the market that the insider is positive about the firm's future prospects. Likewise, Levy and Lazarovich-Porat (1995) proposed that the market participants will determine the signals to be either positive or negative, depending on the behavior of the insiders. Positive signals encompass purchase transactions of the firm's stock, whereas negative signals cover

[4] In 2001, George Akerlof, Michael Spence, and Joseph Stiglitz received the Bank of Sweden Prize in Economic Science in Memory of Alfred Nobel for their pioneering contributions on markets with asymmetric information.

selling transactions of stocks, reduced dividends, or decisions regarding the issuance of new stock. The mechanism of how the signaling hypothesis might reduce information asymmetry is further explained by Leland and Pyle (1977). They clarify that when an insider invested their private capital in their firm, it sent a signal to outside investors that the insider believed in the firm; thus, there would be a greater reason for investors to believe in it as well. Furthermore, they suggested that the signaling hypothesis could explain how insiders were able to generate abnormal returns over seven days, given that no additional firm-specific information eventuated during this period. On the contrary, the signal hypothesis might not be able to explain returns 30 days after the transaction date, since new information undoubtedly has reached the market during the days that have passed.

2.2 Board Gender Diversity

Numerous management theories are cited in preceding studies within board gender diversity. To create a framework to understand the role of the board of directors, the firm can be viewed from the resource dependence theory (RDT) as being an open system, dependent on contingencies in the external environment. The diverse directors provide diverse beneficial resources to the firm and provide counsel, legitimacy, and communication channels. A prevalent theory is the agency theory, concerned with the issues of information asymmetry and misalignment of objectives between managers (agents) and shareholders (principals), and the hypothesis that managers often act in self-interest. Based on the organization structure aimed at obtaining and utilizing resources under contracts, the resource dependence theory, and agency theory are the most commonly cited management theories in the literature on board gender diversity (Berle & Means, 1932). Furthermore, related to the investigation of the role, characteristics, and incentives of the board of directors, the human capital theory, social identity theory, and critical mass theory are considered to provide additional perspective.

2.2.1 Resource Dependence Theory

The resource dependence perspectives on organizations originated in 1978, presented by Jeffrey Pfeffer and Gerald R. Salancik, who studied how external resources affected the behavior of the organization. The concentration and availability of resources include a factor of control and, by extension, the influence of managers, interdependence between firms, the environment, and organizational structure (Pfeffer & Salancik, 1978). Underpinning the RDT is the view that resources are key to firm success; hence, the provision and exploitation of resources constitutes a

basis of power. Power is considered to be relational, situational, and potentially mutual since legally independent organizations depend on each other and exercise influence of each other's resources. Based on scarcity in resources, its procurement involves a component of strategic and tactical management. By ensuring access and creating a redundancy, the firm's environmental interdependence and uncertainty are reduced, which proposedly can be achieved through five options, board of directors composing one option (Pfeffer & Salancik, 2003). According to Pfeffer and Salancik (1978), the board of directors generates several benefits to the firm: information in the form of advice and counsel, access to channels of information and environmental contingencies, preferential access to resources, and legitimacy.

Advice and Counsel

Directors are appointed to the board based on the business experience they bring to the boardroom, and due to their understanding of the firm's setting, the directors may offer critical advice and counsel to be used in the formulation of strategy and establishing of long-term priorities (Pfeffer & Salancik, 1978). Additionally, with diverse managerial expertise and point of view, the board discussions and analyses may be improved with greater gender diversity (Burke, 1997). Both the setting, implementation, and monitoring of the corporate strategy is suggested to be enhanced with a more gender-diverse board (Burke, 1997).

Channels of Information

Dunn (2012) implies that corporate boards act as a two-way communication channel. On the one hand, a firm can transmit information about itself to external stakeholders through the appointment of board directorships, and on the other hand, it can be used to obtain information about the firm's external environment (Dunn, 2012). Hillman, Shropshire, and Cannella (2007) propose that the directors act as a linkage between the firm and different constituents. The addition of a female to an all-male board is suggested to bring a divergent set of linkages and perspectives since they possess different skills, styles, and ideas.

Legitimacy

According to Pfeffer and Salancik (1978), the directors act as the face of the firm, and can, therefore, influence what perception of the firm is conveyed to the public. Prestigious or legitimate

individuals can both act as confirmation and signal the value and worth of the firm (Pfeffer & Salancik, 1978). Prestige and legitimacy of the board can be enhanced by the appointments of female directors to the board, which in turn is proposed to influence the investors' perceptions of the firm. Both female promotions to a senior position and boardroom appointments send a positive message to current and potential female recruits. Contrarily, it might result in a downside since its absence might penalize the firm from acquiring and retaining the best female talent (Daily, Certo, & Dalton, 1999). Furthermore, the presence of women on corporate boards might improve the attitude and experience of female employees (Burke, 1997). Dunn (2012) arrives at the conclusion that women add legitimacy to the board, and by extension, to the firm. When the first female has been appointed, subsequent nominations may be based on other needs of resources of the firm besides legitimacy.

An extension of the RDT view is presented by Hillman, Cannella, and Paetzold (2000). They conclude that the board acts as an essential link to the firm's external environment and that changes to the board composition are made as a response to considerable evolution in the environment. Hillman et al., (2000) suggest that directors do more than reduce uncertainty by providing resources such as information, skills, access to key stakeholders, and generating enhanced reputation and credibility to the firm. Thus, each board of directors brings unique attributes to the firm, whose individual capabilities differ based on, for example, experience or occupational attributes. Directors can be categorized as insiders, business experts, support specialists, or community influentials, associated with the resources they contribute to the board (Hillman et al., 2000). Therefore, it can be argued that a more diverse board of directors will provide more valuable resources to the firm through their skills, competences, and knowledge, which may enhance firm performance (Carter, D'Souza, Simkins, & Simpson, 2010).

2.2.2 Agency Theory

The agency theory stems from the principle of information asymmetry between the managers and shareholders of a firm. Supposedly, managers have an information advantage compared to the shareholders, which they take advantage of since they act in self-interest. Since ownership is separate from control, it might engender conflict between the shareholders and the decision-makers. This conflict is primarily present when the managers do not bear the financial risk of the firm, which is the case of listed companies. To align the interests of the two parties, efforts are made to the structure, frame, and monitor contracts between the managers and shareholders, which

give rise to agency costs. The contracts are described to be the rules of the game and specifies what managers are allowed to do, performance criteria, and their pay off function. Contracts that direct decisions toward the interests of residual claimants also add to the survival value of organizations. The board of directors is an essential corporate governance mechanism, responsible for the important task of controlling and monitoring the managers, to mitigate opportunistic behavior of the managers and provide the shareholders with information. (Fama & Jensen, 1983).

One of the main tasks of the board is to address the agency problem between the owners and the principals, achieved through effective strategic decision-making. For instance, the board of directors can take measures such as replacing a manager acting in self-interest while not creating shareholder value and setting compensation (Baysinger & Butler, 1985; Carter, Simkins, & Simpson, 2003; Shrader, Blackburn, & Iles, 1997). Fama and Jensen (1983) describe a firm's decision-making process to be divided into four steps: initiation, ratification, implementation, and monitoring. Initiation and execution can be counted as belonging to decision-management, whereas ratification and monitoring are described to be components of decision control as part of the firm's decision process and decision system. It may be advantageous to do a differentiation between decision-management and decision control considering decision-making in large corporations commonly are a complex process that requires extensive knowledge and specialization. Since it can be challenging to find an equivalent set of expertise across all agents of a firm, it is rational to centralize the decision-making to a small-sized group of agents. With different backgrounds and expertise, the probability of optimal decisions will potentially increase. For instance, Adams and Ferreira (2009) conclude that the greater presence of women on corporate boards increases the board's monitoring, which strengthens weak corporate governance and the owner's rights. The improved board performance and oversight are suggested to be the outcome of greater board attendance, higher diligence and responsibility among women compared to men, and that female directors more frequently participate in committees with supervisory tasks (Adams & Ferreira, 2009). Although greater diversity might increase board effectiveness of monitoring and controlling the activities of managers, Carter et al., (2003) acknowledge that diversity not necessarily generates enhanced effectiveness since the diverse directors might be marginalized.

2.2.3 Human Capital Theory

Closely related to the resource dependence theory (Pfeffer & Salancik, 1978), is the human capital theory (Becker, 1964). Becker (1964) defines human capital as the experience, expertise, and

reputation of the individual. Moreover, human capital theory concerns how an individual's investments in education, knowledge, skills, and experiences enhance cognitive and productive capabilities that benefit both the individual and the firm (Becker, 1964). Hillman et al., (2000) find that human capital brings explanatory power to the analysis of boardroom appointments, and suggest that alterations of the board composition occur to acquire different human capital as a response to changes in the external environment. As a result, it can be anticipated that firms elect their board members based on the unique skills of the individuals, combined with the resource need of the firm, why a discussion on gender diversity and board appointments might be of interest. As mentioned above, Hillman et al., (2000) classify directors into four categories (insiders, business experts, support specialists, and community influentials), who are suggested to provide a unique set of attributes to the firm, of which the board appointment decision is to be based upon. Gender diversity may result in increased uniqueness of human capital and have a positive effect on board performance (Carter et al., 2010).

2.2.4 Social Identity Theory and Critical Mass Theory

Tajfel (1979) proposes that group affiliation generates a sense of social identity, a sense of belonging, as well as being a source of pride and self-esteem. The social identity theory explains how people undergo a process of social categorization when dividing the world into "them" and "us" based on gender, race, religion, class, and occupation (Tajfel & Turner, 1986). The creation of social identity and dividing others into in-groups and out-groups, give rise to group boundaries, which might favor in-group members, further bolster higher entry barriers for out-group individuals. As a result, a board dominated by males, may intensify group boundaries and eliminate women from board appointment. Furthermore, the members of the in-group are expected to possess the values that the group represents. Social affiliations are commonly associated with particular values and attitudes, yet, social identification with a group does not necessarily signify that the group members possess these characteristics (Mintzberg, 1983).

The drawback of shared values, attitudes, and beliefs within a group is the development of tokenism and conform thinking. According to Oliver, Marwell, and Teixeira (1985), the decision to participate in collective action is interdependent, implying that individuals made decisions based on what others had contributed. This may indicate that a "critical mass" is required within a group to engender collective action. Within a group, a distinction can be made between a greater mass, often a majority, and a smaller group or individual called token (Kanter, 1977). Based on the

assumption that the in-group individuals are partially conforming since they share similar characteristics, presumably, a significant majority is the dominant sub-group. Kanter (1977) makes the following grouping. Firstly, around an 85:15 distribution conformity emerges and the underrepresented accommodate to the dominant party. Secondly, at a 65:35 distribution, a so-called tilted group develops, where the minority sub-group has the opportunity to ally with the purpose to benefit from the shared influence to persuade the group. Thirdly, equitable distribution or balanced group is achieved around 60:40 or 50:50 when there is an enhanced balance between the sub-groups. Consequently, it seems as a specific number of women on the board is required to reach a gender balance with the possibility to generate the advantageous resulting from greater board gender diversity.

2.3 The Impact of Gender Diversity on Insider Trading

Overwhelming evidence is presented that indicates that the market is not efficient as it contains market frictions that inhibit security prices from reflecting all information available fully. The existence of information asymmetry creates an opportunity for insiders to take advantage of their information advantage and earn abnormal profits on their insider trades. Thus, the firm's ability to disclose private information to the public is the essence of insider trading since, in the absence of information asymmetry, it would not be possible for insiders to generate excess profits.

According to the signaling hypothesis, the insiders can, through increasing or decreasing their stock ownership, indicate the true value of the firm to the stakeholders. Nevertheless, the firm and its management are in charge of disseminating information to the market. Based on the aim of mitigating principal-agent problems and information asymmetry, the board of directors has a vital role in monitoring that the information disclosure requirement is satisfactorily fulfilled. The importance of ensuring the information disclosure highlights the corporate governance task of the board, and by extension, both the characteristics and appointment of the directors. As it appears from an agency theory perspective, the directors have a significant influence on strategic decision-making, as well as board effectiveness of monitoring and controlling the activities of managers. Both resource dependence theory and human capital theory may be applied to explain and understand the tasks of the directors, and how they are expected to contribute to the board's output based on their unique set of attributes. Evidence is presented suggesting that board member characteristics such as gender impacts the effectiveness of board monitoring since female directors

reportedly have a better attendance rate and more frequently participates in committees associated with corporate governance functions.

3 Literature Review

The purpose of this chapter is to review, and cluster previously conducted research on the topics of insider trading and board gender diversity. The overview of the subject sheds light on identified gaps in previous research. Section 3.1 presents evidence from insider trading and abnormal returns. Section 3.2 summarizes the evidence of the effects of higher board gender diversity. Section 3.3 presents the limited availability of previous research on the relationship between board gender diversity and abnormal insider returns. Based on the theory discussed and previous empirical findings, the hypotheses are developed and introduced in section 3.4.

3.1 Insider Trading

One of the most well-known studies exploring abnormal insider returns was conducted by Jaffe (1974), who studied 200 large firms on the U.S. equity market under the period from 1962 to 1968. Jaffe (1974) examined insider transactions and cumulative average residuals for the one, two, and eight-month holding periods succeeding the trading events. The results showed that insiders earned profits premised on their possession of particular information. Furthermore, it was most common in the eight-month time interval, which gave rise to criticism of the effective market hypothesis.

Similarly, Finnerty (1976) based his study on the market efficiency theory, in contrast to previous studies, he incorporated an adjustment for market risk. Finnerty (1976) circumvented emphasis on the insider transactions that generated higher returns than the average insider trade, thereby he mitigated the bias that prior studies are criticized for. The results of the study were in line with the findings of Jaffe (1974). In the study, evidence is presented to reject the hypothesis of strong market efficiency. Insiders were capable of outperforming the market and earn above-average returns based on their superior ability to identify profitable or unprofitable situations within their firms.

Seyhun (1986) sought to answer a hypothesis regarding insider trades and abnormal returns and examined insider trades between the years of 1975 to 1981. Similar to the study conducted by Jaffe (1974), the results showed that insiders earned abnormal returns, also, that this phenomenon was especially palpable in larger firms compared to smaller firms. As an extension of this finding, in 1998, Seyhun published a report in which he investigated the potential relationship between transaction size and firm size and market capitalization. Seyhun (1998) found a positive relationship

between transaction size and risk-adjusted returns; meanwhile, he discovered a negative relationship between market capitalization and risk-adjusted returns.

Lakonishok and Lee (2001) partially founded their expectations on the findings by Seyhun (1986, 1998) when they observed insider trading activity over time. The difference against previous studies was the substantially longer time horizon since their study covered 1975-1995. In accordance with related studies, their findings suggested that the usefulness of insider activities was not uniform across sizes of market capitalization. They found that insider transactions provided a more significant indicator for a small-cap stock since this market segment generally was comprehended to be less information effective. This implies that insider trading is considered to have an informative purpose, transmitting a signal of firm value to outsiders. Additionally, they found that the informativeness of insiders' transactions derived from purchases, whereas insider sales transactions appeared to have no predictive ability. The argument is that insiders have many reasons to sell shares, whereas the primary reason to buy shares is to earn a profit. (Lakonishok & Lee, 2001).

In contrast to the studies above, which focused on the U.S. market, Eckbo and Smith (1998) studied the performance of insider trades on the Oslo Stock Exchange during the years 1985-1992. By shifting from the commonly applied event study approach, Eckbo and Smith (1998) constructed portfolios that monitored all movements of insiders in and out of the firms in the sample. In the next step, the portfolios were evaluated across three performance estimators and compared to mutual funds on the Oslo Stock Exchange. The authors concluded that it was unfeasible to earn abnormal returns by imitating the insider transactions, and found no statistically significant evidence indicating that insider trades were associated with abnormal returns. Their conclusion appeared contradictory to findings presented in previous studies, for instance, Seyhun (1986). Moreover, it is argued that the studies which found excess returns might be contingent on the selection of research method and the use of more basic approaches.

One study with Sweden as a focal point was conducted by Wahlström (2003), who aimed to answer both if insiders had the opportunity to earn abnormal returns and if it was a feasible investment strategy for outside investors to mimic insiders' buy and sell transactions. The study followed the event study approach and market model, as described by MacKinlay (1997). The sample consisted of firms listed on the Swedish Stock Exchange and included all insider transactions reported to FI between 2000 to 2002. A categorizing was made based on revenue, and the results indicated that abnormal returns barely existed in small firms, whereas large firms produced abnormal returns up

until one percent. Consequently, Wahlström (2003) arrives at the conclusion that outside investors could reproduce insiders' transactions and accordingly collect a profit.

Cohen, Malloy, and Pomorski (2012) aim at decoding information conveyed by the trading activity of corporate insiders between 1989 to 2007. Their study is based on the assumption that insiders have preferential access to information and trade for a number of reasons. The trades are classified as being either uninformative 'routine' trades or 'opportunistic' trades signaling expectations of the firm's future. Their results indicate that 'routine' trades are not associated with abnormal returns, whereas 'opportunistic' trades yield value-weighted abnormal returns of 82 basis points per month.

3.2 Board Gender Diversity

The number of studies concerning the effect of board composition and characteristics of the board of directors on firm performance is countless. Adams and Ferreira (2009) examine whether the female presence in boardrooms is associated with more robust corporate governance or not. Their sample consists of 8,253 firm-years of data on 1,939 firms listed on S&P in the U.S. They find that female directors have superior attendance compared to their male counterparts and are more prone to join monitoring committees. Based on their findings that women enhance monitoring functions such as audit quality and corporate governance committees, Adams and Ferreira (2009) propose that female presence on corporate boards increase transparency and disclosure.

Similar findings are obtained by Nguyen and Faff (2006-2007), who believe that board gender diversity contributes to several benefits to the firm. For instance, enhanced understanding of the marketplace, creativity and innovation, more effective problem-solving, and increased effectiveness of corporate leadership and global relationships. Nguyen and Faff (2006-2007) support the view that board diversity ought to be encouraged as a common corporate governance practice. Likewise, Hillman and Dalziel (2003) advocate that to achieve effective monitoring, the board was required to contain diverse board members with different skills, experience, expertise, and knowledge. Subsequently, gender diversity enhances both demographic and professional diversity within the boards, a requirement for effective monitoring of the management.

The effects of board gender diversity on transparency, information disclosure, and corporate governance are examined by Gul, Srinidhi, and Ng (2011). The authors find a positive relationship between women in boardrooms and stock price informativeness, which are suggested to be the result of an increase in voluntary public disclosure in large firms and enhanced incentives for private information collection in small firms. Hence, the various levels of firm information environment

are suggested to be influenced by the distribution between the male and female board of directors (Gul et al., 2011). According to Bøhren and Strøm (2010), the value of the board's monitoring and advice functions is a function of the quality of the information sources. Another study that focuses on the effect of the presence of female directors on the firm's information environment is carried out by Gul, Hutchinson, and Lai (2013). They propose that board gender diversity increases the transparency and accuracy of financial reports. Based on a sample of U.S. firms in the period 2001 to 2007, Gul et al., (2013) find that corporations with more gender-diverse boards are more inclined to oblige higher-quality disclosure and hence be associated with superior accuracy of the analysts' forecasts.

Abad, Lucas-Pérez, Mínguez-Vera, and Yagüe (2017) investigate the relationship between board gender diversity and the level of information asymmetry in the stock market. Based on 531 firm-year observations of firms listed on the Spanish Stock Exchange in 2004-2009, they present evidence that supports the view that more gender-diverse corporate boards enhance the information environment by mitigating the adverse selection problems present in the equity market. Additional evidence indicating a negative relationship between disclosure quality and information asymmetry are presented by Brown and Hillegeist (2007) and Heflin, Kenneth, and John (2005). Board gender diversity is proposed to ameliorate firm information disclosure, and the increased transparency and disclosure might diminish information risk for the market participants.

3.3 Insider Trading & Board Gender Diversity

After a review of studies related to our issue at hand, it is evident that it barely exists any prior studies that seek to answer our formulated question. Within the literature, there are two apparent strands: occurrence of abnormal returns of insiders, and board gender diversity and its suggested effects. Contrarily, there is a lack of evidence on the connection between the profitability of insider trading and board gender diversity.

Zhong, Faff, and Hodgson (2013) conduct a study similar to ours. They investigate the effect of female board members on the profitability of insider purchases with the Australian Stock Exchange as the focal point. Their final sample consists of 7,232 director purchase transactions during the period 2004-2009, and an event study approach was applied. Their findings suggest that the presence of female directors on the corporate board improved the corporate governance of male directors. Also, those female directors are equally inclined to exploit the asymmetric information advantage available through the board membership. Generally, Zhong et al., (2013) find that the profitability of insider trading does not differ considerably between female and male directors.

Hence, conclude that the market seemed to react differently to insider trading related to gender. The authors suggested two opposing arguments for the obtained mixed results. On the one hand, the so-called "queen bee" syndrome that would indicate that the insider trading profitability of women should be lower than men's, due to the intra-competitive relation among female directors. One the other hand, they propose the board busyness argument implying that female directors (usually being less busy) had increased likelihood of possessing private or price-sensitive information about their firm, indicating that female abnormal returns should be higher than those of male directors. (Zhong et al., 2013).

3.4 Development of Hypotheses

So far, we have been discussing theories of market efficiency, information asymmetry, and signaling. Based on the evidence presented in previous studies reporting market frictions and abnormal returns, it seems likely that either semi-strong efficiency or weak-form efficiency characterizes the Swedish market. Information asymmetry between insiders and outsiders appears to prevail on the previously observed markets (e.g., Jaffe, 1974; Finnerty, 1976), and Sweden is no exception (Wahlström, 2003). In the presence of asymmetric information, the insiders with superior information have an opportunity to outperform the market and earn excess profits on their transactions (e.g., Seyhun, 1986; Lakonishok & Lee, 2001). Accordingly, we expect a similar outcome from our empirical study, which is expressed in our first hypothesis:

H1: Insiders generate abnormal returns, which indicates that the strong-form of market efficiency does not hold.

According to resource dependence theory and human capital theory, directors are appointed to the board with an expectation that they will contribute with various expertise and skills (Becker, 1964; Pfeffer & Salancik, 1978). It is proposed that the board has the ultimate responsibility to ensure information disclosure of the firm to the public, hence a monitoring task. Previous research on the topic suggests that greater board gender diversity, in particular, higher female presence, have a positive effect on corporate governance functions such as transparency and disclosure (Adams & Ferreria, 2009), accuracy and quality of financial reports (Gul et al., 2013), and firm information disclosure (Heflin et al., 2005). A common conclusion seems to be that a more gender-balanced board supports the alleviation of information asymmetry. Consequently, we believe that an increase

of board gender diversity reduces the possibility for insiders to earn abnormal returns on their insider transactions. These expectations are reflected in the second hypothesis:

H2: Board gender diversity has an effect on the profitability of insider trading.

4 Institutional Background

This chapter provides a description of the regulatory setting that serves as the foundation for this study. Section 4.1 introduces the Market Abuse Regulation, and its implications for insider trading, and section 4.2 outlines the guidelines for board gender diversity.

4.1 Insider Regulation in Sweden

In 2016, the European Parliament and the Council enacted regulation *596/2014 - Market Abuse Regulation* (MAR). Primarily, MAR was an updated version of the Market Abuse Directive, adopted in 2003, which was an extensive framework to combat insider dealing and market manipulation. MAR replaced precedent regulations as *Directive 2003/6/EC* of the European Parliament and the Council, and Commission Directives *2003/124/EC, 2003/125/EC*, and *2004/72/EC* (European Securities and Markets Authority, n.d.). As described by the European Commission (2013), the revised framework is presented as a response to the need to mitigate market abuse more effectively by reinforcing regulators' investigative and sanctioning powers, make sure that regulation kept abreast of market developments, and explicitly ban the manipulation of benchmarks[5]. Member states of the European Union (EU) are required to incorporate EU directives into national law. Moreover, regulations and decisions become automatically mandatory across the EU on the date they become effective (European Commission, 2016). Accordingly, in 2016, Sweden implemented *Market Abuse Penalties Act (2016:1307)*.

Relevant reporting requirements, as described in the *Market Abuse Regulation* and *Market Abuse Penalties Act*:

- Issuers' managers and persons closely associated with them are obliged to notify the issuer and FI of their transactions relating to said issuer's shares, debt instruments, derivatives, or other financial instruments.

[5] Refers to the LIBOR scandal, which in 2011-2012 brought into light manipulation of EURIBOR and LIBOR by a number of banks.

- The transactions must be notified promptly and no later than three business days after the date of the transaction, and FI will disclose these transactions on its website and keep a public register of the reported information.
- The obligation to notify transactions applies to all transactions once a total amount of EUR 5,000 is reached within a calendar year. The threshold is calculated by adding, without netting, all transactions referred to in paragraph 1 of Article 19 of MAR within a calendar year.
- Trading Window; the period of time within which directors, officers, and certain employees of the company and its subsidiaries are permitted to trade in the company's securities The trading window opens one trading day after the public announcement of earnings (quarterly, half-yearly and yearly). It remains open until 30 days prior to a reporting date. In between the trading windows, there is a black-out period. During the black-out period, there is an absolute prohibition for insiders to trade in the issuer's share. The black-out period starts 30 days before a reporting date and includes a prohibition to trade on the date of the publication of the report.

4.2 Board Gender Diversity

In Sweden, there are no legal requirements for diversity on corporate boards. Corporate governance for Swedish companies includes a composition of legislation, corporate documents, self-regulation, statements, and generally accepted practices. The main components of the framework are the Swedish Companies Act, the Swedish Corporate Governance Code ("the code"), and the listing requirements.

The code is to be applied by all firms traded on a regulated stock market in Sweden, and the Swedish Corporate Governance Board monitors its application. The application of the code is based on the 'comply or explain' principle. Companies should comply with the code but can deviate from applying some rules if they replace them with alternative solutions. In the code, it is stated that a company is required to strive for gender balance. Along with gender recommendations, the code provides guidelines on audit, remuneration, and nomination committees. (Swedish Corporate Governance Board, 2020).

5 Methodology

This section introduces the central methodological pillars of the study. Section 5.1 describes the event study approach used to measure if insiders are able to generate abnormal returns. Section 5.2 specifies and explains the regression models as well as discusses performed validity and robustness checks.

5.1 Theoretical Framework

In accordance with previous studies (Lakonishok & Lee, 2001; Jeng, Metric, & Zeckhauser, 2003; Huddart & Ke, 2007), we chose to distinguish between buy and sell transactions. Lakonishok and Lee (2001) argue that there are many reasons for insiders to sell, such as for diversification purposes, but the main reason for an insider to buy shares is to make money.

Cumulative average abnormal returns (CAAR) is computed based on a dataset and is obtained through the use of an event study. After receiving values of abnormal returns on insider trades, we define the independent variable that we believe could explain the variations in the values of CAAR. Moreover, we distinguish control variables to enhance the understanding of the relationship between the independent variables. Throughout the empirical work, we perform various robustness checks to ensure the internal validity and correctness of the empirical findings from the regression model. The different steps of the regression model are explained in-depth in the remainder of the chapter.

We conduct an event study to examine the economic impact of insider trades to be used as a dependent variable in the regression model. An event study is a statistical method using financial market data to measure the impact of an event on the value of the firm (MacKinlay, 1997). The dependent variable in the regression model is the cumulative average abnormal return (CAAR), which is computed with an event study of insider trades on the Swedish stock market between 2017 to 2019. Based on the efficient market hypothesis suggesting that in its strong-form, all information about a firm is reflected in the firm's stock price. Hence the effect of an event will be instantaneously observable in the security prices (MacKinlay, 1997).

5.1.1 Event Definition and Event Window

We begin with defining the event and the event date. The selection process for the events that constitute the sample encompass restrictions related to data availability and particular criteria, as described in depth in section 6.2. We set the event date to be the day of occurrence of the insider

transaction, denoted as $t = 0$. The event window is defined as the period following the date of the measured event. We use three event windows: [0,5], [0,30], and [0,90].

The shortest time span, which extended over five days, is expected to be of interest to observe potential immediate market reactions to insider trade. Based on a similar argumentation, Lakonishok and Lee (2001) study how the market reacted to insider trades by accumulating daily abnormal returns across a five-day period initiated from the event date. As described in section 4.1, all insiders are required by Swedish law to report their insider transactions to Finansinspektionen within three days. Hence, we anticipate that the event window of five days is of sufficient length to capture the market's response to the transaction.

The two remaining event windows are set to be moderately longer to estimate market responses on an extended time-span to capture long-term firm development. Lakonishok and Lee (2001) suggest that a shorter event window (five days) is a too limited amount of time for outside investors to evaluate the reliability of the signal communicated by the transaction. Possibly, to merely consider the short-term market response to a complex and rather intermittent transaction, poses a risk of not capturing the entire economic impact of the event (Oler, Harrison, & Allen, 2008), whereas longer time horizons enable us to evaluate the effects over an extended period. To use a fairly short time event window and compare it to an extended one might be advantageous to expand the comprehension of the extent of the information asymmetry across time. Numerous researchers investigate abnormal returns on insider trades and apply several event windows (e.g., Rozeff & Zaman, 1988; Lakonishok & Lee, 2001; Fidrmuc et al., 2006). Based on the recommendation of MacKinlay (1997), we avoid any overlap between the estimation window and the event window to circumvent any parameter estimation bias in the event effect.

5.1.2 Calculating Normal and Abnormal Returns

To estimate the impact of an event, it is necessary to measure the normal and abnormal returns. Computing normal returns are essential to establish a benchmark for specifying what returns to expect without the occurrence of the measured event. In other words, the normal return is the return expected to be generated in the absence of an insider trade. MacKinlay (1997) proposes that normal returns for a stock could be computed using different approaches, categorized as either statistical models or economic models. Following a discussion of the execution and benefits of each model. Statistical models are derived from statistical assumptions about the behavior of the returns and mentioned as two of the most frequently applied are the market model and the constant

mean of return (MacKinlay, 1997). Economic models do not rely upon statistical assumptions of a stock's movement, but economic interpretations of investor behavior.

Economic Models

Among the most common economic models are the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT) model. CAPM is a framework developed to explain the relationship between an investment's risk and expected return, commonly used in asset pricing, investment decisions, and portfolio decisions. Until the 1970s CAPM was widely used in event studies, and its decrease in application is due to the argumentation of invalidity and deviation (Fama & French, 1996; Fama & French, 2004). Other criticisms against the model involve unrealistic assumptions (Seyhun, 1986; Dempsey, 2013) and problems of endogeneity and circularity (Lai & Stohs, 2015).

The APT model is suggested to be an alternative to the CAPM model as a tool to explain phenomena observed in the capital markets for risky assets (Ross, 1976). The expected return of the observed asset can be modeled as a linear function of different macroeconomic factors and indices. The model is also subject to a fair amount of criticism. MacKinlay (1997) proposes that the benefit of employing the APT model instead of the market model is limited since the primary factor in APT serves as a market factor, which leads to other factors was given no or minimal explanatory power in the model. There exists a myriad of models to calculate expected normal returns, both statistical and economical. Regardless, we do not deem it necessary to outline other than the ones we consider to be most relevant.

Statistical Models

Commonly, statistical models are argued to be preferable to economic models (MacKinlay, 1997). Statistical models are derived from statistical assumptions about the behavior of the returns. The assumption underpinning the constant mean return model states that the mean return of the stock is time-constant. In contrast, the market model presumes a consistent linear relationship between the market return and the security's return. We decide to calculate expected returns using a statistical, one-factor model, the market model, based on several reasons. Firstly, it provided a benefit since it was suggested to capture market-driven variation in abnormal returns. Secondly, the abnormal returns are claimed to have a reduced variance (MacKinlay, 1997). In the general discussion about the choice between economic and statistical models, MacKinlay (1997) argues

that in practice, it is essential to include a statistical assumption to an economic model, why the advantage of economic models is reduced. Concurrently, the proposed benefit is the opportunity to compute a more accurate measure of expected returns with the implementation of economic restrictions. Additionally, the market model is commonly applied in previous studies that examine abnormal returns. For instance, MacKinlay (1997), Jaffe (1974), Jeng, Metric, and Zeckhauser (2003), and Gregory, Matako, and Tonks (1994) apply the market model to compute stock returns.

Predicated on the outline above, we decide to use a statistical model to compute normal returns. Specifically, the market model, since it is rather frequently applied by researchers who have conducted studies similar to ours.

Abnormal Returns

When the decision to use the market model to compute normal returns is established, the method for calculating abnormal returns is selected. The abnormal returns are defined as the difference between expected returns and real returns. The calculation of abnormal returns could be expressed as follows:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}|X_t)$$

Equation I - Abnormal Returns

Where:

$AR_{i,t}$ = Abnormal return for time period t

$E(R_{i,t}|X_t)$ = Normal return for time period t

$R_{i,t}$ = Actual return for time period t

X_t = Conditioning information for the normal return model

5.1.3 Estimation Window

Once the appropriate model for computing normal and abnormal returns is decided on, we set an estimation window. The estimation window considered is the time period preceding the event. One major consideration when defining the estimation window is that the selected time period provides a relevant estimation of the stock's volatility while simultaneously maintains its relevance at the time of the event. Repeatedly, the estimation window is suggested to range between 100 to 300 days for studies using daily data, and from 24 to 60 months for studies using monthly data (Peterson, 1989). Campbell, Lo, and MacKinlay (1997) propose 120 days as a suitable estimation

window in their example of an event study. Similarly, MacKinlay (1997) suggests 180 to 250 days to be an appropriate length of the estimation window. Based on these recommendations, we choose an estimation window of 200 days. As mentioned previously, we avoid any overlap of the estimation window and the event window to prevent an estimation bias.

5.1.4 Testing Framework

In the testing framework for the measuring of real returns, the return data is in logarithmic form. Supposedly, calculating the return in its logarithmic form offers two benefits: increase the probability of normally distributed results compared to using arithmetic returns, and since accumulated returns allow simple summing, it facilitates the computation of accumulated returns (Henderson, 1990). The logarithmic return is calculated as follows

$$R_{i,t} = \ln\left(\frac{P_{i,t}}{P_{i,t-1}}\right)$$

Equation II - Logarithmic Returns

Where:

$P_{i,t}$ = The price of the stock at time t

$P_{i,t-1}$ = The closing price of the stock at time $t-1$

The Market Model

The market model allows for a stock's expected return to be priced in a linear regression and states that the stock return depends on the return on the set market portfolio, as well as the extent if the stock's responsiveness, which is measured by beta. The application of the market model follows the approach of Sharpe (1992), who developed a model for the risk and return of an actively managed portfolio. The market portfolio is referred to is set to be a security market index; in our case, OMXSPI. In the equation, the alpha return is the constant, and beta is the stock's return coefficient on the independent variable of the OMXSPI return. The market model is computed as follows

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}$$

Equation III - The Market Model

Where:

$R_{i,t}$ = Return on stock i at time t

$R_{m,t}$ = Return on the market portfolio *m* at time *t*

α_i = Intercept, the estimate of the value of $R_{i,t}$ when $R_{m,t}$ equals to zero

β_i = Slope, the estimate of the systematic risk of the stock *i*

$\varepsilon_{i,t}$ = Error term for stock *i* at time *t*

By the use of a regression model, an alpha and a beta value are estimated. The purpose of the beta value is to consider the systematic risk of the security, while the alpha describes the security's deviation from the expected return, with consideration to the beta (Berk & DeMarzo, 2014).

$$\hat{\alpha} = \frac{\sum R_{i.t}}{n} = \beta \times \frac{\sum R_{i.t}}{n}$$

Equation IV - Computation of Alpha

$$\hat{\beta} = \frac{n \times \sum(R_{m.t} \times R_{i,t}) - \sum R_{m.t} \times \sum R_{i.t}}{n \times \sum R_{m,t}^2 - \sum R_{m.t}}$$

Equation V - Computation of Beta

Where:

$R_{i,t}$ = Return on stock *i* at time *t*

$R_{m,t}$ = Return on the market portfolio *m* at time *t*

$\hat{\alpha}$ = Intercept, the average value of the unsystematic returns over time

$\hat{\beta}$ = Slope, the average impact of systematic risk on the stock over time

Abnormal Returns (AR)

When the real returns are calculated, the abnormal return is computed, which is defined as the difference between expected return and the real returns Abnormal return is calculated as follows

$$AR_{i,t} = R_{i,t} - \hat{R}_{i,t}$$

Equation VI - Calculations of Abnormal Return

Where:

$AR_{i,t}$ = Abnormal return for time period *t*

$R_{i,t}$ = Actual return for time period *t*

$\hat{R}_{i,t}$ = Expected return for time period *t*

Cumulative Abnormal Returns (CAR)

When the abnormal returns are obtained, the accumulated abnormal returns (CAR) are computed. CAR is calculated by summing the total abnormal return per transaction for each of the three event windows. CAR is calculated as follows

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{i,t}$$

Equation VII - Cumulative Abnormal Returns

Where:

$CAR_{i,t}$ = Cumulative abnormal return for stock *i* for time *t*

$AR_{i,t}$ = Abnormal return for stock *i* for time *t*

Cumulative Average Abnormal Returns (CAAR)

The subsequent step is to compute the cumulative average abnormal return (CAAR) based on the selection criteria and event window. It is necessary to aggregate the cumulative abnormal returns for the focal event, both across time and stocks and firms to be able to draw an inference from the observations. CAAR is the value that will be tested when performing a t-test at a later stage

$$CAAR(t_1, t_2) = \frac{1}{N} \sum_{i=1}^{N} CAR_i(t_1, t_2)$$

Equation VIII - Cumulative Average Abnormal Returns

Where:

$CAAR_{i,t}$ = Cumulative average abnormal return for stock *i* for time *t*

$CAR_{i,t}$ = Cumulative abnormal return for stock *i* for time *t*

Statistical Testing

To determine if the computed abnormal returns are statistically significant and the results obtained are valid, a two-sided t-test is performed. Based on the event study methodology proposed by MacKinlay (1997), statistical hypotheses are formulated and thereafter to be checked by the use of t-tests. The application of t-tests is common in studies of abnormal returns (e.g., Jaffe 1974; Seyhun, 1986). The equation for the t-test is stated as follows

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\bar{\mu}_1 - \bar{\mu}_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Equation IX - Two-sided t-test

Where:

$\bar{x}$ = Represents the cumulative abnormal return

$\bar{\mu}$ = Represents the expected cumulative abnormal returns

σ_1^2 = Represents the variance of the cumulative abnormal returns

n = The number of observations

The obtained test statistics are compared to critical values with different significance levels, α, which is defined as the sensitivity of the performed test. α is set to the values of 0.01, 0.005, and 0.001. In the case that the absolute value of the test statistics exceeds the critical value and is located in the rejection region, the null hypothesis is rejected. The decision to use a two-sided test suggests that we test for positive and negative abnormal returns for insider transactions.

5.2 Regression Models

As described in the preceding sections, CAR is calculated for each transaction to enable the computation of the dependent variable CAAR to be used in the regression model. Subsequently, the following step is to develop a regression model to be able to answer our research question. The dataset that serves as the foundation for this study has a panel data structure since a sample of firms is observed across three years. Consequently, it is a longitudinal study. In order to determine if the data is normally distributed, prior to executing the regressions, we test for normality by the use of histograms. Histograms are carried out for all transactions across the three event windows, and from a visual interpretation, we observe a few observations that deviate substantially from the other values in the sample, whose influence on the remaining sample ought to be minimized. According to Dixon (1960) winsorized means are considered more stable than trimmed means, assuming a normal sample. Winsorizing does not drop the extreme observation, rather replace its original value by that of the closest observation, which brings the outlier into a more reasonable range (Kennedy, Lakonishok, & Shaw, 1992). We decide to winsorize merely the top one percent and the bottom one percent of data points, which corresponds to 98 % unaffected data. After the

winsorizing, the histograms are performed once more, and it was unambiguous that the dataset is normally distributed.

5.2.1 Model Specifications

Model I

Based on the anticipation that board gender diversity potentially could explain differences in how insiders earn abnormal returns on trades in their firms, the following regression model is formulated

$$CAAR_{i,t} = \beta_0 + \beta_1 Board\ Gender\ Diversity_{i,t} + \delta_1 Independent\ Directors_{i,t} + \delta_2 Insider\ Ownership_{i,t} + \delta_3 Busy\ Directors_{i,t} + \delta_4 Board\ Size_{i,t} + \delta_5 Firm\ Size_{i,t} + \delta_6 Leverage_{i,t} + \delta_7 R\&D_{i,t} + \delta_8 Board\ Age_{i,t} + u_{i,t}$$

Equation X - Regression Model (I)

In the equation above, Equation X, $CAAR_{i,t}$ is the cumulative average abnormal return of firm i at time t. The model shows the effect Board Gender Diversity, measured as the percentage of women on the board of directors, has on CAAR. The interpretation of the model follows; on average, a one-point increase in Board Gender Diversity corresponds to a β_1 increase in CAAR, ceteris paribus. Controls, δ, refer to the control variables which are defined and motivated in section 6.4. Finally, $u_{i,t}$ refer to the error term u of firm i at time t.

Model II

It could be argued that there can exist a non-linear relationship between board gender diversity and CAAR, as different levels of men and women in a group can contribute to different group dynamics (Kanter, 1977). Hence, we investigate if there existed a non-linear relationship, a peak or turning point indicating an inverse u-shape effect of board gender composition on the profitability of insider trades, we used the following model

$$CAAR_{i,t} = \beta_0 + \beta_1 Board\ Gender\ Diversity_{i,t} + \delta_1 Independent\ Directors_{i,t} + \delta_2 Insider\ Ownership_{i,t} + \delta_3 Busy\ Directors_{i,t} + \delta_4 Board\ Size_{i,t} + \delta_5 Firm\ Size_{i,t} + \delta_6 Leverage_{i,t} + \delta_7 R\&D_{i,t} + \delta_8 Board\ Age_{i,t} + \beta_1 Board\ Gender\ Diversity_{i,t}^2 + u_{i,t}$$

Equation XI - Regression Model (II)

The difference of equation X compared to IX is that the additional variable, Board Gender Diversity^2, represents the main variable, Board Gender Diversity, measured in percentage, squared. The remaining variables are unaltered from IX.

5.2.2 Model Validity & Robustness

We use ordinary least squares (OLS) estimation for our linear regression model, correspondingly we perform several tests to ensure that the model satisfies the OLS assumptions[6]. The issue of non-normality is examined in a section above, and additional issues of heteroscedasticity, endogeneity, and multicollinearity are discussed in the following paragraphs. The aforementioned topics are suggested to be frequent issues of OLS (Brooks, 2008).

Heteroscedasticity

When the OLS assumptions are met, the error term is homoscedastic and has constant variance. Violating the assumption of homoscedasticity might result in bias in the standard errors and inhibit the coefficient estimation from being the best linear unbiased estimators (BLUE)[7]. In order to test if the variance of the error term is different for some of our variables, heteroscedasticity (Bailey, 2019), we conduct a pooled ordinary least squares (POLS) regression followed by a White test for each of our models. Based on the outcome of the White test, we decide if robust standard errors or ordinary standard errors are appropriate to use for our regression models. The null hypothesis for the White test is homoscedasticity (White, 1980), suggesting the variance of the error term to be constant for all variables. (Bailey, 2019). When the results of the White test indicate that the assumption of homoscedasticity is not satisfied, there is heteroscedasticity present in a model, then clustered (company) robust standard errors are used for the regression model. If the assumption of homoscedasticity hold, ordinary standard errors apply. As summarized in Table 6, also shown in Table 7 to 12, the White test generates divergent results for the various regressions, consequently, clustered (company) robust standard errors are used for the regressions presented in Table 7, 8 and 12, whereas ordinary standard errors are used for the regressions presented in Table 9, 10 and 11.

[6] Based on the Gauss-Markov theorem stating that if the linear regression model satisfied the first six classical assumptions, the OLS regression produces unbiased estimates that have the smallest variance of all possible linear estimators.

[7] As stated in the Gauss-Markov theorem, when satisfying a certain set of assumptions, the OLS estimate for regression coefficients provides the best linear unbiased estimate (BLUE) possible.

Endogeneity

The problem of endogeneity is present when there exists a correlation between the explanatory variables and the error term in a regression model (Wooldridge, 2015). The problem of having endogenous variables present in a regression model is not uncommon. However, there are methods in order to reduce the impact of it, such as using a fixed effects (FE) or random effects model (RE). Hence, we conduct the Hausman test, which allows us to choose between FE and RE models[8]. When using the fixed effects model, we are controlling for effects that are fixed over time. These fixed effects help us to capture the differences in our dependent variable (CAAR) associated with each unit as well as period. In a random effects model, unit-specific errors are treated as random, uncorrelated with the independent variables. Further, as the RE model estimate coefficients on the variables that do not vary within a unit, this could be seen as an advantage, as fixed variables are dropped using the FE model. Failing to detect described correlation and proceed with random effects (RE) will result in a missed opportunity to benefit from the superiority of panel data, and ultimately it may cause spurious inferences regarding the independent variable (Bailey, 2019). As summarized in Table 6, also shown in Table 7 to 12, the Hausman test generates divergent results for the various regressions. Consequently, FE is used for the regressions presented in Table 8 and 12, whereas RE is used for the regressions introduced in Table 7, 9, 10, 11.

Multicollinearity

For each of our regression models testing our second hypothesis, a correlation matrix is presented to inspect the extent of correlation among the independent variables. If the appearance of perfect correlation or even moderately high correlation, this endogeneity might create difficulties for the model since it diminished the accuracy of the estimates generated. This potential issue is addressed by utilizing correlation matrices (Table 1, Table 2). According to Brooks (2008), the critical limit for correlation is 0.8. Based on Table 1 and Table 2 we establish that no variables are at risk of near collinearity. The only variables that are somewhat protruding are *Board Size* and *Firm Size* (correlation of 0.550), which is unremarkable since it is reasonable to assume that the number of directors increases with the size of the company. Either way, since the variables do not surpass the threshold of near collinearity, we conclude that the non-linearity assumption is satisfied.

[8] We applied two decision rules, as described by (Bailey, 2019): If fixed effects and random effects generated approximately the same $\hat{\beta}$, we failed to reject the null hypothesis and hence used random effects. If both approaches provided different answers, we rejected the null hypothesis and used fixed effects.

6 Data Description

This chapter provides information about the data sample. Section 6.1 outlines the process of data collection and data sources. Section 6.2 describes the selection criteria. The benchmark index is motivated in section 6.3, and a description of the variables used in the regression model and the summary statistics are provided in section 6.4.

6.1 Data Collection

This study is based on data on insider trades carried out on the Swedish stock market during the period 2017-01-01 to 2019-12-31. To fulfill the purpose of the study, it requires information on insider transactions and various data on the variables related to board characteristics. Accordingly, multiple databases and sources are utilized to gather a comprehensive set of information.

Our sample includes companies listed on Large Cap, Mid Cap, and Small Cap Stockholm. The data for the independent variable, and several control variables are obtained from Holdings Modular Finance, which is the largest ownership database for listed companies in the Nordics. Modular Finance provided us with data covering for the variables Board Gender Diversity, Independent Directors, Insider Ownership, Busy Director, Board Size, and Board Age. Data for the remaining control variables, Firm Size, Leverage, Industry, and R&D are obtained from Bloomberg. The data concerning insider transactions encompassed information on the date of the trade, the reporting date, what company the transaction applied to, the name of the buyer or seller, the number of shares and price per share, and whether it is a purchase or sale transaction. The insider transaction information is gathered from FI and amounts to a total of 40,482 observations. Subsequently, historical share prices for the firms in the sample are collected from the financial database Datastream provided by Thomson Reuter. Additionally, supplementary information regarding stock splits, reverse stock splits, and voting rights are obtained from Nasdaq and Skatteverket (The Swedish Tax Agency).

6.2 Sample Construction

We use data for firms listed on Nasdaq Stockholm during 2017-2019, and the initial sample consists of 40,482 observations. To obtain our final set of data, we compile the primary insider trade data and accounting data with reference to the following conditions:

1. The firm is listed on Nasdaq Stockholm. We decide to exclude companies listed on alternative financial marketplaces such as Spotlight and First North since those firms tend to be characterized by rapid growth, being smaller in size, and their stocks are less liquid. Especially appertaining to the latter, we suggest that the illiquidity of the stocks will perchance engender imprecise normal returns, by extension generate a bias in the calculation of the abnormal returns.
2. The transaction has occurred during the period 2017-01-01 to 2019-12-31. This period was chosen, first, because of the provider of the data in regard to the board, Modular Finance, was limited to provide data from their database Holdings for this period. Second, due to Sweden implementing the *Market Abuse Penalties Act (2016:1307)* in 2016, the data for insider transactions available at FI is only available for transactions after 2016-07-04. Third, since our initial sample generated more than 40,000 transactions, we deemed this amount of data to be sufficient to be able to draw a reliable conclusion.
3. Merely include non-financial firms. We chose to exclude financial firms from the final sample due to the fact that high leverage is common in this industry, and debt is used differently compared to non-financial firms. This is common practice in studies within corporate governance (Fidrmuc, Goergen, & Renneboog, 2006).
4. The transactions had to be purchase or sale of shares classified as A, B, C, or D. This implies that for instance, preferred shares, share-based incentive plans, firm options, bonus programs, and warranties have been excluded.
5. Manually aggregation of several trades. If an insider reports he or she conducted several transactions during one day, we summarize the transactions as being one. In these cases, we compute the volume-weighted average prices.
6. Transactions with adequate and complete data available. In the first instance, if there is a lack of comprehensive data on a firm's historical share prices, it will complicate the calculation of estimated normal returns. Hence the transaction is removed likewise if it does not exist sufficient price data in the period following the event. Lastly, if accounting data of a firm is unavailable, it is excluded.

Following the categorization of the data premised on the criteria above, we obtain a final sample of 5,671 observations, which consists of 4,112 buy transactions and 1,559 sell transactions and covers 292 unique firms.

6.3 Choice of Index

To be able to determine whether a transaction generated abnormal return or not, it requires an estimation of what return is considered normal, i.e., an index to use as a benchmark. Since our sample includes firms from various industries of different sizes, an index that embodies the wide-ranging stock market is preferable. Consequently, we choose the index OMX Stockholm PI (OMXSPI), which is considered to be comprehensive in its scope, encompassing firms listed on the Nasdaq Stockholm Large Cap, Mid Cap, and Small Cap. We chose OMXSPI in place of the OMX Stockholm Gross Index (OMXSGI), given that OMXSGI incorporates the stock's development and dividend payouts while we consider a price index which merely takes stock development into account.

6.4 Description of Variables

Presented below are the variables used in the regression model. Furthermore, summary statistics for each variable, based on Table 3, are presented. The sub-section concludes with a compilation of the information presented in Table 4.

6.4.1 Dependent Variable

The dependent variable in the regression model is a measure of the excess profits generated from insider transactions, cumulative average abnormal returns (CAAR). Firstly, we compute the cumulative abnormal returns (CAR) for the 4,112 buy transactions, and 1,559 sell transaction observations in our sample. Secondly, the buy transactions for each company and each year were added. Subsequently, the sum is divided by the total number of buy transactions for each company and each year. The same procedure is conducted for the sell transactions. This results in a total of 1,054 CAAR observations, out of which 651 buy transactions and 403 sell transactions (Table 3). Table 3 shows, as expected, an increase in the standard deviation, maximum and minimum values in regard to CAAR as the period increases, both for the buy and sell transaction. Interestingly, this also seems to be the case for the mean as well as the median for both the buy and sell transactions.

6.4.2 Independent Variable

The main explanatory variable that is used to explain variation in the abnormal return is a measure for board gender diversity. More precisely, a measure of the proportion of females on the corporate board expressed as a percentage of women on the board of directors. In Sweden, there is legislation

stating that certain public limited companies have employee directors on their board. The employee representatives are not elected by the general meeting, as in the case of the regular board of directors. We do not count employee directors as being part of the board to avoid a biased sample. Table 3 shows that the mean (Buy, 34.3 %; Sell, 35.1 %) and median (Buy, 33.3 %; Sell, 33.3 %) for Board Gender Diversity are close to each other, with a standard deviation of 13 % for buy transactions and 13.1 % for sell transactions. For both buy and sell transactions, the observed minimum is 0 %, and the maximum 80 %, which means there is no board in our sample that only constitutes of women (Table 3). Moreover, an in-depth discussion on the anticipated effect of female board presence on information asymmetry and abnormal returns is provided in sections 2.2 and 3.2.

6.4.3 Control Variables

Independent Directors

We make a distinction between independent or outside director, being a non-executive board member lacking pecuniary relationship with the firm apart from the board remuneration. The other category is dependent directors involved in the day to day operations of the firm. The variable for board independence is defined as the fraction of independent directors on the board to the total number of directors. It suggested by Moursli (2020) that a combination of codes for corporate governance practices share the view that a greater proportion of independent directors is encouraged, if not mandated. Additionally, to include this variable to explain information asymmetry and excess profit on insider trades is considered to be relevant as prior research presents evidence that independent directors enhance the monitoring role of the board (Carter et al., 2010; Zhu, Ye, Tucker, & Chan, 2016). It is proposed that an independent board member will exercise more influence over the management, reducing agency costs. Adams and Ferreira (2009) include independent directors as a variable based on the expectation that outside directors would strengthen corporate governance through enhanced director's attendance behavior. Independent Directors range between 0 % and 100 %, with a mean of 68.9 % for buy transactions and 67.7 % for sell transactions. Further, the standard deviation for buy transactions, 18.4 %, and sell transactions, 17.9 %, compared to the standard deviations for the variable Board Gender Diversity, suggests that the data distribution of Independent Directors has a wider spread (Table 3).

Insider Ownership

Insider ownership, or ownership concentration, is defined as the fraction of equity owned by the firm's directors. The discussion on the effects of ownership concentration is contradictory. On the one hand, Shleifer and Vishny (1986) propose that agency costs could be mitigated by increasing insider ownership since they believe that manager's incentives were better aligned with shareholders when they had an ownership stake in the firm. On the other hand, manager ownership can possibly aggravate agency problems by empowering managers to use their voting rights to pass shareholder resolutions. For the sell transactions, the highest observed level of Insider Ownership amounts 94.1 %, whereas 79.6 % is the highest value for the buy transactions, and 0 % is the lowest value obtained for both transaction types. The mean for this variable is 14.3 % for the buy transactions and 14.4 % for the sell transactions, which implies, that on average, the firm's directors own roughly about 14 % of the company. The standard deviation for the buy transactions is 17.3 % and for the sell transactions, 16.5 %, which is closer to the figures for the Independent Directors variables standard deviation than the Board Gender Diversity variable (Table 3).

Busy Directors

They are defined as the total number of outside directorships held by all the directors on the board, regardless of their independence status. Seemingly, there is no consensus regarding what the number of directorships held by a board member might be a token of. One opinion is that the busyness of a director is an indication of aptitude (Fama & Jensen, 1983), considering that the board appointment is a comprehensive process associated with expertise and responsibility. Conversely, it is claimed that an increasing number of directorships might have a negative effect on the directors who might experience time constraints and excessive busyness. If their ability to perform their duties properly is affected negatively, it might restrain their anticipated advisory and monitoring role (Adams & Ferreira, 2009). For both the buy and sell transactions, the lowest number of outside directorships held by the directors on the board equals 0, whereas the highest observed number for buy transactions is 23, and for sell transactions 20. The mean is close to 6 for both buy and sell transactions, and the median is 5 for buy transactions and 6 for sell transactions. The standard deviation of the sample (Buy, 4.165; Sell, 4.110) suggests that the number of directorships held vary among the directors (Table 3).

Board Size

We use a measure of the number of board of directors. For instance, Bøhren and Strøm (2010) suggest that the size of the board affects its ability to take action. Furthermore, it is plausible to associate board size with resource dependence theory and human capital theory. Both insinuate that board appointments are premised on the director's abilities to contribute with resources and skills to fulfill the needs of the firm. If the board members serve such purpose, it might have an influence on monitoring and information disclosure, hence being of interest when explaining variations in our dependent variable. Both Adams and Ferreira (2009) and Bøhren and Strøm (2010) use the absolute number of board members, not the logarithm, and we choose to follow their approach. For both buy and sell transactions, the largest boards constitute of 11 board members, whereas the smallest constitutes of only 3 board members. The mean is 6.561 and median 6 for the variable for the buy transaction, and for the sell transactions, the mean is 6.675 and median 7. The standard deviations (Buy, 1.447; Sell, 1.466) points to the Board Size being clustered around the mean. Combined with the information about the mean for the main variable (Board Gender Diversity), our statistics suggest that the typical board for the firms in our sample most likely constitutes of two women and four men (Table 3).

Firm Size

Due to the varying sizes of the firms in the sample, both considering their market capitalizations and the book value of assets, we include a variable to control for potential heterogeneity across the sampled firms, similar to several previous studies (Fidrmuc et al., 2006; Rozeff & Zaman, 1988). Moreover, Rozeff and Zaman (1988) demonstrate that purchase transactions by insiders are more common in smaller firms pro rata compared to large firms. The Firm Size variable is measured as the natural logarithm of the book value of total assets. Table 3 illustrates that as the natural logarithm was used, the numbers for the variable doesn't vary too much in regard to mean (Buy, 8.283; Sell, 8.483), median (Buy, 8.213; Sell, 8.472), min (Buy & Sell, 3.321) and max (Buy & Sell; 13.171), which is further supported by the statistics for the variables standard deviation (Buy, 1.950; Sell, 1.971) (Table 3).

Leverage

The variable Leverage is measured as a percentage, computed as the total debt over total assets. A firm's amount of debt in its capital structure has been applied as an indicator of monitoring, premised on the proposition that debt performs a governance function by alleviating information

asymmetry between the firms and its investors (Epure & Guasch, 2019). For a company to be granted credit, they are obliged to be approved in an application process, and subsequent to the transaction, their activities are subject to screening and monitoring. By this means, credit institutions and lenders serve as a governance device, mitigating information asymmetry in the market. Also, creditors are better positioned to take a monitoring role, decide on collateral, and impose contract terms, reinforcing firm accountability. Purportedly, increasing leverage indicates enhanced scrutiny, monitoring, and information disclosure. The means (Buy, 24.669 %; Sell, 25.487 %) and the medians (Buy, 23.532 %; Sell, 24.677 %) are close to each other. However, the standard deviations (Buy, 17.824 %; Sell, 17.666 %) indicates that the data points are more spread out than previous variables. Furthermore, for both the buy and sell transactions, there are at least one firm without any leverage in the sample, and one with as high as 96.567 % (Table 3).

R&D

We chose to use a dummy variable for R&D, assuming a value of 1 if the firm submits R&D expenditures, and 0 otherwise. This approach is primarily based on the findings of Aboody and Lev (2000), who propose that investors' reaction to the public disclosure of insider trades is substantially stronger for R&D companies than for non-R&D companies. This finding implies that it exists a larger information asymmetry in R&D-intensive firms and that the R&D-related private information is not completely disclosed preceding the public announcement of the insider transaction. For the buy transactions, the mean of 0.412 for R&D is 0.412, suggest 41.2% of the 651 firm observations engage in R&D activities, whereas for the sell transaction, as the mean is 0.400 it indicates 40 % of these 403 firm observations conducts R&D. For both buy and sell transactions, this indicate that more than 50 % of the firms do not engage in R&D activities, which is in line with the statistics for the median of 0. Furthermore, the standard deviation is higher than 0.49, which suggests that, on average, the values are considered to be far from the mean (Table 3).

Board Age

Board age is calculated as the sum of the ages of all directors divided by the total number of directors. The average board age might be of interest if age was to be used as a proxy for experience. The variable is widely applied in previous studies on board gender diversity (Carter et al., 2010; Adams & Ferreira, 2009). For both the buy and sell transactions, the median for Board Age is 57 years, and the average amounts to 56.637 years for buy transactions and 56.519 years for sell

transactions. The lowest observed age is 42 years, and the highest is 70 years (Sell, 68 years). Further, the low standard deviations (Buy, 4.312 years; Sell, 4.197 years), indicates that there is a low level of dispersion in regard to the mean (Table 3).

Industry

To account for potential industry effects in the regression, we add the control variable Industry to be able to eliminate this impact, consisting of 10 different industries[9]. However, when controlling for fixed effects, the industry variable will disappear, as the industry for companies is most often fixed, meaning, does not vary over time.

Year

Since we conduct a regression based on panel data, we include a control variable for each year in the dataset to capture the effect of aggregate trends.

[9] The following industries controlled for in our regression models are: Communication Services, Consumer Discretionary, Consumer Staples, Energy, Health Care, Industrials, Information Technology, Materials, Real Estate and Utilities. As mentioned in section 6.2, firms in the Financial industry is excluded.

Table 4: Variable Definitions

CAAR	Cumulative Average Abnormal Returns 5, 30, and 90 days after the transaction date.
Board Gender Diversity	Board gender diversity, the percentage of women on the board of directors, %.
Independent Directors	Number of independent directors on the board divided by board size, %.
Insider Ownership	Fraction of equity owned by the firm's officers and directors to total outstanding shares.
Busy Director	The total number of outside directorships held by all busy directors sitting on the board, regardless of their independence status.
Board Size	Board size, the number of board of directors.
Firm Size	Firm size, logarithm of the book value of total assets.
Leverage	Leverage, total debt over total assets.
R&D	Research and development, binary number if the firm submits R&D expenditures or not.
Board Age	Average age of the board of directors.

7 Empirical Results

In this chapter, the results from the empirical approach are presented. Section 7.1 presents the results of the event study. Section 7.2 discusses the results from the regressions on the cumulative average abnormal returns and board gender diversity.

7.1 Event Study

H1: Insiders generate abnormal returns, which indicates that the strong-form of market efficiency does not hold.

In order to test our first hypothesis, we perform two-sided t-tests to determine whether the computed abnormal returns are statistically significant or not. Panel A in Table 1 presents the results for the cumulative abnormal returns (CAR), and Panel B in the same table illustrates the results for the cumulative average abnormal returns (CAAR).

Table 5: Regressions - CAR & CAAR

PANEL A						
TRANSACTIONS	**BUY**			**SELL**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
VARIABLES	**CAR 5**	**CAR 30**	**CAR 90**	**CAR 5**	**CAR 30**	**CAR 90**
Constant	0.010***	0.009***	0.007***	-0.009***	-0.016***	-0.031***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.004)	(0.004)
T-statistics	14.90	7.51	3.10	-8.60	-7.05	-7.74
Observations	4112	4112	4112	1559	1559	1559
R-squared	0.000	0.000	0.000	0.000	0.000	0.000

PANEL B						
TRANSACTIONS	**BUY**			**SELL**		
VARIABLES	**CAAR 5**	**CAAR 30**	**CAAR 90**	**CAAR 5**	**CAAR 30**	**CAAR 90**
Constant	0.008***	0.011***	0.017***	-0.006***	-0.012***	-0.028***
	(0.001)	(0.002)	(0.005)	(0.001)	(0.004)	(0.007)
T-statistics	7.40	5.10	3.67	-3.7	-3.17	-4.01
Observations	651	651	651	403	403	403
R-squared	0.000	0.000	0.000	0.000	0.000	0.000

Standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Table 5 illustrates the output from the regression on *CAR* (Cumulative Abnormal Returns) in Panel A and *CAAR* (Cumulative Average Abnormal Returns) in Panel B, aimed at testing H1. Panel A illustrates that *CAR* for the buy

transactions consists of 4,112 observations and 1,559 observations for each of the sell transactions. The results show that for the buy transactions in our sample, *CAR* for day *5*, *30,* and *90* has a positive sign and are statistically significant at a 1 % significance level. The results for the sell transactions point to that the *CAR* for day *5*, *30,* and *90* has a negative sign and are statistically significant at a 1 % significance level. Panel B presents *CAAR* for 651 buy transactions and 403 sell transactions. For the buy transactions, the results show that *CAAR* for day *5*, *30,* and *90* has a positive sign, as well as *CAR*. However, *CAAR* increases from day *5* up to *90* when *CAR* decreases. The results for the sell transactions show that *CAAR* for day *5*, *30,* and *90* has a negative sign and increases from day *5* up to *90*, same as for *CAR* sell transactions. Both *CAAR* buy and sell transactions are statistically significant at a 1 % significance level.

The results for Panel A in Table 1 show that CAR measured at day 5 is 1.0 %, which is the highest observed CAR of the buy transactions in our sample, and where CAR day 90 at 0.7 % is the lowest. Based on our sample, this suggests that insiders earn abnormal returns as if they would hold a market portfolio; in our case, OMXSPI, they would yield less in regard to risk. Further, the highest observed CAR sell transactions are CAR at day 90 (-3.1 %), which is to be interpreted as from when an insider conducts a sell transaction; the share of that company has performed 3.1% worse than what is expected in regard to the risk. Hence, a statistically significant constant with a negative sign for sell transactions suggests that insiders generate abnormal returns by performing the sell transactions, as they yield higher returns regarding risk by holding the market portfolio, in our case, OMXSPI. Moreover, CAR day 5 is -0.9 %, which is the lowest observed CAR in the sell transactions.

The results for Panel B in Table 1 illustrates that CAAR measured at day 5 is 0.8 %, which is the lowest observed CAAR of the buy transactions in the sample, and where CAAR day 90 at 1.7 % is the highest. This trend is the opposite trend of the buy transactions for CAR, which decreases measured on day 5 to day 90. For the CAAR sell transactions, the trend for CAAR and CAR are the same, suggesting the lowest abnormal returns at day 5, (-0.6 %), and the highest day 90 (-2.8%). As all the observed CAR and CAAR in our sample are different from zero and statistically significant at a 1 % significance level, we reject the null hypothesis in favor of the alternative hypothesis, meaning that, based on our sample, insiders do generate abnormal returns on their inside buy and sell transactions on 5, 30, and 90 days respectively.

7.2 Impact on Board Gender Diversity on the Profitability of Insider Trading

H2: Board gender diversity does have an effect on the profitability of insider trading.

In order to test our second hypothesis, we perform various regressions with CAAR as our dependent variable. We use six different CAAR, and thereby have six different base models, as we are testing three different event windows, 5, 30, and 90 days, and both buy and sell transactions. At first, a White test is performed for each base model in order to test for heteroscedasticity and decide whether to use robust standard errors or ordinary standard errors. Secondly, as we have panel data, a Hausman test is then performed in order to decide whether to choose between utilizing a fixed effects or a random effects models. At last, by adding the variable Board Gender Diversity^2, board gender diversity squared, in each model (see Regression Model II) we control for a non-linear relationship between CAAR and board gender diversity. Table 6 provides a summarized overview of the decisions made from performing the above tests for each of the six models. Tables 7-12 presents the various results testing the impact on board gender diversity on CAAR, the profitability of insider trading.

Table 6: Regressions - Overview

	(1)	(2)	(3)
REGRESSIONS	**WHITE TEST**	**HAUSMAN TEST**	**NON-LINEARIY TEST**
BUY TRANSACTIONS			
(A) CAAR5	Robust SE	Random Effects	Fail to Reject
(B) CAAR30	Robust SE	Fixed Effects	Fail to Reject
(C) CAAR90	SE	Random Effects	Fail to Reject
SELL TRANSACTIONS			
(D) CAAR5	SE	Random Effects	Fail to Reject
(E) CAAR30	SE	Random Effects	Fail to Reject
(F) CAAR90	Robust SE	Fixed Effects	Fail to Reject

Table 6 provides a summarized overview of the decisions made from performing (1) the White test, (2), the Hausman test, and (3) a Non-linearity test with different *CAAR* as the dependent variable. White test: This test indicates whether the variance of the errors in a regression model is constant, i.e., testing for heteroscedasticity. When Prob>chi2 is 0.05 or smaller, the null hypothesis is rejected, suggesting there is heteroscedasticity present in a model. Hence, model *(A) CAAR5* and *(B) CAAR30* for the buy transactions, and model *(F) CAAR90* for the sell transactions, uses robust standard errors, while the three other models, *(C)*, *(D)*, and *(E)*, use ordinary standard errors. Hausman test: In order to choose between a fixed effects models and a random effects model, a Hausman test is conducted. If the Prob>chi2 is 0.05 or smaller, the null hypothesis is rejected, suggesting there exists a correlation between the independent variables and the error term. Therefore, a fixed effects model is performed for model *(B) CAAR30* and model *(F) CAAR90,* and a random effects model is performed for model *(A)*, *(C)*, *(D),* and *(E)*. Non-linearity test: In order to test whether

there is a non-linear relationship, we added the variable *Board Gender Diversity^2* (Board gender diversity, the percentage of women on the board of directors, %, squared). When the variable is included in a regression model, and the p-value for this variable is less than 0.1, this indicates statistical significance on a 10 % level, indicating there exists a non-linear relationship. However, this is not the case for any of the CAAR regression models above. Hence we fail to reject the hypothesis that there exists a non-linear relationship between board gender diversity and CAAR.

Table 7: Regressions – Buy Transactions – CAAR5

	(1A)	(2A)	(3A)
PANEL A			
		BUY TRANSACTIONS	
VARIABLES	**CAAR5**	**CAAR5**	**CAAR5**
Board Gender Diversity	-0.017	-0.018	-0.088
	(0.013)	(0.013)	(0.056)
Independent Directors	-0.015*	-0.013	-0.012
	(0.008)	(0.008)	(0.008)
Insider Ownership	-0.004	-0.005	-0.003
	(0.007)	(0.007)	(0.007)
Busy Director	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Board Size	0.000	0.001	0.001
	(0.001)	(0.001)	(0.001)
Firm Size	-0.002*	-0.002**	-0.002*
	(0.001)	(0.001)	(0.001)
Leverage	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
R&D	0.001	0.002	0.001
	(0.003)	(0.003)	(0.003)
Board Age	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Board Gender Diversity^2			0.101
			(0.070)
Constant	0.025	0.052*	0.031
	(0.024)	(0.028)	(0.025)
Observations	651	651	651
R-squared	0.056		0.063
Fixed effects	-	-	-
Random effects	-	Yes	-
Industry controls	Yes	Yes	Yes
Year controls	Yes	Yes	Yes
PANEL B: WHITE TEST			
Chi-squared statistic	237.43		
p-value	0.001		
PANEL C: HAUSMAN TEST			
Chi-squared statistic		13.76	
p-value		0.247	
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 7 illustrates the output from the various regressions aimed at testing our second hypothesis. *Model (1A)*, *(2A)*, and *(3A)*, uses *CAAR5* (Cumulative Average Abnormal Returns, measured at day 5) as the dependent variable. All the above models use *Board Gender Diversity* (Percentage of women on the board of directors, %) as the main explanatory variable, and *Independent Directors* (Number of independent directors on the board divided by board size, %), *Insider*

Ownership (Fraction of equity owned by the firm's officers and directors to total outstanding shares, %), *Busy Director* (The total number of outside directorships held by all busy directors sitting on the board, regardless of their independence status), *Board Size* (The number of board of directors), *Firm Size* (Logarithm of the book value of total assets), *Leverage* (Total debt over total assets, %), *R&D* (Binary number if the firm submits Research & Development expenditures or not), *Board Age* (Average age of the board of directors), *Industry* and *Year* as control variables. *Model (1A)* tests the main model with cluster robust standard errors. *Model (2A)* tests the main model with a random effects model and cluster robust standard errors. *Model (3A)* tests the main model but adds the variable *Board Gender Diversity^2* (Percentage of women on the board of directors, %, squared) in order to control for a non-linear relationship.

The results for Panel A in Table 7 shows the results from the three different regression performed for CAAR measured on day 5. The coefficient and magnitude of -0.017 for the main explanatory variable, Board Gender Diversity, in Model (1A) is to be interpreted as, on average, a one-point increase in Board Gender Diversity decreases CAAR on day 5 by 0.017 %, ceteris paribus. Further, this suggests that the higher Board Gender Diversity, the lower CAAR for insiders´ measured on 5 days, however, as the results are not statistically significant at any relevant significance level, this conclusion cannot be drawn. That is, we fail to reject the null hypothesis, that board gender diversity does not have an effect on the profitability of insider trading. Noteworthy from Table 7 is that Firm Size is -0.002 % for all the three models and statistically significant at a 10 % significance level. This suggests that, based on our sample, a one-point increase in Firm Size, decreases the CAAR on day 5, holding everything else constant, i.e., the bigger the firm (measured as the logarithm of the book value of total assets), the lower CAAR at day 5.

Table 8: Regressions – Buy Transactions – CAAR30

	(1B)	(2B)	(3B)
PANEL A			
	BUY TRANSACTIONS		
VARIABLES	**CAAR30**	**CAAR30**	**CAAR30**
Board Gender Diversity	0.019	-0.014	-0.029
	(0.020)	(0.041)	(0.073)
Independent Directors	-0.030**	0.026	-0.028**
	(0.014)	(0.037)	(0.014)
Insider Ownership	-0.035**	-0.029	-0.034**
	(0.014)	(0.053)	(0.014)
Busy Director	0.000	0.002	0.000
	(0.001)	(0.002)	(0.001)
Board Size	-0.001	0.003	-0.001
	(0.002)	(0.005)	(0.002)
Firm Size	-0.002	-0.023	-0.001
	(0.002)	(0.022)	(0.002)
Leverage	0.000	-0.001	0.000
	(0.000)	(0.000)	(0.000)
R&D	0.000	-0.034***	0.000
	(0.005)	(0.010)	(0.005)
Board Age	0.000	-0.001	0.000
	(0.001)	(0.002)	(0.001)
Board Gender Diversity^2			0.069
			(0.093)
Constant	0.034	0.243	0.038
	(0.047)	(0.207)	(0.047)
Observations	651	651	651
R-squared	0.047	0.039	0.048
Fixed effects	-	Yes	-
Random effects	-	-	-
Industry controls	Yes	-	Yes
Year controls	Yes	Yes	Yes
PANEL B: WHITE TEST			
Chi-squared statistic	259.23		
p-value	0.000		
PANEL C: HAUSMAN TEST			
Chi-squared statistic		21.46	
p-value		0.029	
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 8 illustrates the output from the various regressions aimed at testing our second hypothesis. *Model (1B)*, *(2B)*, and *(3B)*, uses *CAAR30* (Cumulative Average Abnormal Returns, measured at day 30) as the dependent variable. All the above models use *Board Gender Diversity* (Percentage of women on the board of directors, %) as the main explanatory variable, and *Independent Directors* (Number of independent directors on the board divided by board size, %), *Insider Ownership* (Fraction of equity owned by the firm's officers and directors to total outstanding shares, %), *Busy Director* (The total number of outside directorships held by all busy directors sitting on the board, regardless of their independence status), *Board Size* (The number of board of directors), *Firm Size* (Logarithm of the book value of total assets), *Leverage* (Total debt over total assets, %), *R&D* (Binary number if the firm submits Research & Development expenditures or not), *Board Age* (Average age of the board of directors), *Industry* and *Year* as control variables. *Model (1B)* tests the main model with cluster robust standard errors. *Model (2B)* tests the main model with a fixed effects

model and cluster robust standard errors. In this model, the *Industry* control variable is dropped, as the industry for companies most often is fixed, meaning, does not change over time. *Model (3B)* tests the main model but adds the variable *Board Gender Diversity^2* (Percentage of women on the board of directors, %, squared) to control for a non-linear relationship.

Table 8 shows the results from the three different regression performed for CAAR measured at day 30. For the main explanatory variable, Board Gender Diversity, there are not any statistically significant results; hence, we fail to reject the null hypothesis that board gender diversity does not have an effect on the profitability of insider trading. Notable for Table 8 is that in Model (1B), the results of -0.030 for Independent Directors and -0.035 for Insider Ownership, which are both statistically significant at a 5 % significance level. The results for Independent Directors are to be interpreted as a one-point increase Independent Directors decreases CAAR measured on day 30 after a buy transaction has been executed by 0.030 %, on average, ceteris paribus. That is the higher level of independent directors in relation to firm size, the lower CAAR on 30 days. The result for Insider Ownership suggests that the higher fraction of equity owned by the firm's officers and directors, the lower the CAAR on 30 days, holding everything else equal.

Table 9: Regressions – Buy Transactions – CAAR90

	(1C)	(2C)	(3C)
PANEL A			
		BUY TRANSACTIONS	
VARIABLES	**CAAR90**	**CAAR90**	**CAAR90**
Board Gender Diversity	0.040	0.055	-0.013
	(0.041)	(0.045)	(0.137)
Independent Directors	-0.053*	-0.059*	-0.050*
	(0.029)	(0.031)	(0.029)
Insider Ownership	-0.050*	-0.056*	-0.049*
	(0.029)	(0.033)	(0.029)
Busy Director	-0.001	-0.001	-0.001
	(0.001)	(0.002)	(0.001)
Board Size	0.002	0.002	0.002
	(0.004)	(0.005)	(0.005)
Firm Size	-0.001	-0.002	-0.001
	(0.004)	(0.004)	(0.004)
Leverage	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
R&D	0.000	0.001	0.000
	(0.011)	(0.013)	(0.011)
Board Age	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
Board Gender Diversity^2			0.076
			(0.186)
Constant	0.063	0.110	0.067
	(0.087)	(0.096)	(0.087)
Observations	651	651	651
R-squared	0.041		0.041
Fixed effects	-	-	-
Random effects	-	Yes	-
Industry controls	Yes	Yes	Yes
Year controls	Yes	Yes	Yes
PANEL B: WHITE TEST			
Chi-squared statistic	190.04		
p-value	0.140		
PANEL C: HAUSMAN TEST			
Chi-squared statistic		8.72	
p-value		0.647	
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 9 illustrates the output from the various regressions aimed at testing our second hypothesis. *Model (1C)*, *(2C)*, and *(3C)*, uses *CAAR90* (Cumulative Average Abnormal Returns, measured at day 90) as the dependent variable All the above models use *Board Gender Diversity* (Percentage of women on the board of directors, %) as the main explanatory variable, and *Independent Directors* (Number of independent directors on the board divided by board size, %), *Insider Ownership* (Fraction of equity owned by the firm's officers and directors to total outstanding shares, %), *Busy Director* (The total number of outside directorships held by all busy directors sitting on the board, regardless of their independence status), *Board Size* (The number of board of directors), *Firm Size* (Logarithm of the book value of total assets), *Leverage* (Total debt over total assets, %), *R&D* (Binary number if the firm submits Research & Development expenditures or not), *Board Age* (Average age of the board of directors), *Industry* and *Year* as control variables. *Model (1C)* tests the main model with ordinary standard errors. *Model (2C)* tests the main model with a random effects model

and ordinary standard errors. *Model (3C)* tests the main model but adds the variable *Board Gender Diversity^2* (Percentage of women on the board of directors, %, squared) in order to control for a non-linear relationship.

Table 9 illustrates the results for the three regressions performed for CAAR buy transactions performed by insiders measured at 90 days. As for the other results for CAAR buy transactions, in regard to the main explanatory variable, Board Gender Diversity, there are not any statistically significant results. Hence, we fail to reject the null hypothesis that board gender diversity does not have an effect on the profitability of insider trading. Interestingly, both Independent Directors and Insider Ownership are statistically significant at a 10 % significance level in all of the three models. The magnitude of Independent Directors varies between -0.050 to -0.059, and the magnitude for Insider Ownership varies between -0.049 and -0.056.

Table 10: Regressions – Sell Transactions – CAAR5

	(1D)	(2D)	(3D)
PANEL A			
	SELL TRANSACTIONS		
VARIABLES	**CAAR5**	**CAAR5**	**CAAR5**
Board Gender Diversity	-0.025*	-0.027*	-0.019
	(0.013)	(0.014)	(0.044)
Independent Directors	-0.005	-0.006	-0.006
	(0.010)	(0.011)	(0.010)
Insider Ownership	0.011	0.014	0.011
	(0.010)	(0.011)	(0.010)
Busy Director	-0.000	-0.000	-0.000
	(0.000)	(0.001)	(0.000)
Board Size	-0.001	-0.000	-0.001
	(0.001)	(0.002)	(0.001)
Firm Size	0.002	0.002	0.002
	(0.001)	(0.001)	(0.001)
Leverage	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
R&D	-0.004	-0.004	-0.004
	(0.004)	(0.004)	(0.004)
Board Age	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Board Gender Diversity^2			-0.008
			(0.058)
Constant	-0.014	-0.025	-0.015
	(0.029)	(0.034)	(0.029)
Observations	403	403	403
R-squared	0.066		0.066
Fixed effects	-	-	-
Random effects	-	Yes	-
Industry controls	Yes	Yes	Yes
Year controls	Yes	Yes	Yes
PANEL B: WHITE TEST			
Chi-squared statistic	181.20		
p-value	0.132		
PANEL C: HAUSMAN TEST			
Chi-squared statistic		12.35	
p-value		0.338	
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 10 illustrates the output from the various regressions aimed at testing our second hypothesis. *Model (1D)*, *(2D)*, and *(3D)*, uses *CAAR5* (Cumulative Average Abnormal Returns, measured at day 5) as the dependent variable. All the above models use *Board Gender Diversity* (Percentage of women on the board of directors, %) as the main explanatory variable, and *Independent Directors* (Number of independent directors on the board divided by board size, %), *Insider Ownership* (Fraction of equity owned by the firm's officers and directors to total outstanding shares, %), *Busy Director* (The total number of outside directorships held by all busy directors sitting on the board, regardless of their independence status), *Board Size* (The number of board of directors), *Firm Size* (Logarithm of the book value of total assets), *Leverage* (Total debt over total assets, %), *R&D* (Binary number if the firm submits Research & Development expenditures or not), *Board Age* (Average age of the board of directors), *Industry* and *Year* as control variables. *Model (1D)* tests the main model with ordinary standard errors. *Model (2D)* tests the main model with a random effects model

and ordinary standard errors. *Model (3D)* tests the main model but adds the variable *Board Gender Diversity^2* (Percentage of women on the board of directors, %, squared) in order to control for a non-linear relationship.

In Table 10, the main explanatory variable, Board Gender Diversity, shows statistically significant results at a 10 % significance level both for Model (1D) and Model (2D). Hence, we reject the null hypothesis, in favor of the alternative hypothesis, that board gender diversity does affect the profitability of insider trading. However, as these models use CAAR5 for sell transactions as the dependent variable, the results are to interpret that an increase in Board Gender Diversity increases CAAR5, suggest that insiders generate higher abnormal returns the more diverse board, ceteris paribus.

Table 11: Regressions – Sell Transactions – CAAR30

	(1E)	(2E)	(3E)
PANEL A			
	SELL TRANSACTIONS		
VARIABLES	**CAAR30**	**CAAR30**	**CAAR30**
Board Gender Diversity	-0.019	-0.022	-0.063
	(0.031)	(0.034)	(0.103)
Independent Directors	-0.010	-0.004	-0.009
	(0.023)	(0.025)	(0.023)
Insider Ownership	0.019	0.026	0.019
	(0.024)	(0.026)	(0.024)
Busy Director	0.001	0.000	0.001
	(0.001)	(0.001)	(0.001)
Board Size	0.002	0.002	0.002
	(0.003)	(0.004)	(0.003)
Firm Size	-0.000	-0.000	-0.000
	(0.003)	(0.003)	(0.003)
Leverage	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
R&D	-0.015*	-0.019*	-0.015*
	(0.008)	(0.010)	(0.008)
Board Age	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Board Gender Diversity^2			0.061
			(0.136)
Constant	-0.120*	-0.110	-0.117*
	(0.069)	(0.081)	(0.069)
Observations	403	403	403
R-squared	0.117		0.118
Fixed effects	-	-	-
Random effects	-	Yes	-
Industry controls	Yes	Yes	Yes
Year controls	Yes	Yes	Yes
PANEL B: WHITE TEST			
Chi-squared statistic	180.78		
p-value	0.136		
PANEL C: HAUSMAN TEST			
Chi-squared statistic		17.60	
p-value		0.092	
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 11 illustrates the output from the various regressions aimed at testing our second hypothesis. *Model (1E)*, *(2E)*, and *(3E)*, uses *CAAR30* (Cumulative Average Abnormal Returns, measured at day 30) as the dependent variable. All the above models use *Board Gender Diversity* (Percentage of women on the board of directors, %) as the main explanatory variable, and *Independent Directors* (Number of independent directors on the board divided by board size, %), *Insider Ownership* (Fraction of equity owned by the firm's officers and directors to total outstanding shares, %), *Busy Director* (The total number of outside directorships held by all busy directors sitting on the board, regardless of their independence status), *Board Size* (The number of board of directors), *Firm Size* (Logarithm of the book value of total assets), *Leverage* (Total debt over total assets, %), *R&D* (Binary number if the firm submits Research & Development expenditures or not), *Board Age* (Average age of the board of directors), *Industry* and *Year* as control variables. *Model (2E)* tests the main model with a random effects model and ordinary standard errors. *Model (3E)* tests the main model

but adds the variable *Board Gender Diversity^2* (Percentage of women on the board of directors, %, squared) to control for a non-linear relationship.

Table 11 illustrates the results for the regression performed for CAAR sell transactions performed by insiders measured at 30 days. The results show there are not any statistically significant results for Board Gender Diversity. Hence, we fail to reject the null hypothesis that board gender diversity does not affect the profitability of insider trading. In this table, R&D is significant at a 10 % significance level in all the three regression models. As the coefficients are negative, this suggests that based on this sample, on average, CAAR for insiders increases when R&D increases as the magnitude range from -0.015 to -0.019.

Table 12: Regressions – Sell Transactions – CAAR90

	(1F)	(2F)	(3F)
PANEL A			
	SELL TRANSACTIONS		
VARIABLES	**CAAR90**	**CAAR90**	**CAAR90**
Board Gender Diversity	0.080	0.399***	0.216
	(0.067)	(0.124)	(0.248)
Independent Directors	-0.036	-0.018	-0.041
	(0.045)	(0.112)	(0.046)
Insider Ownership	-0.013	0.102*	-0.012
	(0.043)	(0.062)	(0.043)
Busy Director	0.002	-0.002	0.002
	(0.002)	(0.005)	(0.002)
Board Size	-0.000	0.016	-0.001
	(0.006)	(0.016)	(0.006)
Firm Size	-0.002	-0.021	-0.002
	(0.005)	(0.063)	(0.005)
Leverage	-0.000	-0.002	-0.000
	(0.001)	(0.002)	(0.001)
R&D	0.011	-0.133**	0.011
	(0.016)	(0.065)	(0.017)
Board Age	0.002	-0.005	0.002
	(0.002)	(0.006)	(0.002)
Board Gender Diversity^2			-0.189
			(0.304)
Constant	-0.210	0.300	-0.220
	(0.146)	(0.689)	(0.152)
Observations	403	403	403
R-squared	0.101	0.128	0.102
Fixed effects	-	Yes	-
Random effects	-	-	-
Industry controls	Yes	-	Yes
Year controls	Yes	Yes	Yes
PANEL B: WHITE TEST			
Chi-squared statistic	212.25		
p-value	0.004		
PANEL C: HAUSMAN TEST			
Chi-squared statistic		23.46	
p-value		0.015	
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 12 illustrates the output from the various regressions aimed at testing our second hypothesis. *Model (1F)*, *(2F)*, and *(3F)*, uses *CAAR90* (Cumulative Average Abnormal Returns, measured at day 90) as the dependent variable. All the above models use *Board Gender Diversity* (Percentage of women on the board of directors, %) as the main explanatory variable, and *Independent Directors* (Number of independent directors on the board divided by board size, %), *Insider Ownership* (Fraction of equity owned by the firm's officers and directors to total outstanding shares, %), *Busy Director* (The total number of outside directorships held by all busy directors sitting on the board, regardless of their independence status), *Board Size* (The number of board of directors), *Firm Size* (Logarithm of the book value of total assets), *Leverage* (Total debt over total assets, %), *R&D* (Binary number if the firm submits Research & Development expenditures or not), *Board Age* (Average age of the board of directors), *Industry* and *Year* as control variables. *Model (1F)* tests the main model with cluster robust standard errors. *Model (2F)* tests the main model with a fixed effects

model and cluster robust standard errors. In this model, the *Industry* control variable is dropped, as the industry for companies most often is fixed, meaning, does not change over time. *Model (3F)* tests the main model but adds the variable *Board Gender Diversity^2* (Percentage of women on the board of directors, %, squared) in order to control for a non-linear relationship.

Finally, Model (2F) in Table 12 shows that when utilizing a FE model with clustered robust standard errors, the results for Board Gender Diversity is 0.399 and statistically significant at a 1 % significance level. The result suggests that an increase in Board Gender Diversity decreases the profitability of insiders when performing sell transactions, measured as CAAR on day 90. Hence, we reject the null hypothesis in favor of the alternative hypothesis, suggesting that the more diverse board, the less CAAR on day 90, on average, ceteris paribus.

8 Analysis

In this chapter, we seek to answer the previously formulated research question and hypotheses by discussing the empirical findings under the auspices of the theoretical framework and previous empirical findings. Section 8.1 addressed the insider's ability to generate abnormal returns on their trades. Section 8.2 provides insights on the impact of board gender diversity on information disclosure and the profitability of insider trading.

8.1 Insider's Abnormal Returns

Based on the empirical results from our regression models as summarized and interpreted in section 7, our findings unequivocally suggest that insiders can generate abnormal returns on their insider transactions. It is evident that insiders appear to be successful in predicting when the price of the stock is going to rise or fall. Their forecasts for the stock price development seem to generate abnormal returns both in the short term and over a longer time horizon. In terms of CAR for buy transactions, it ranges between 0.7 % and 1 %, and for sell transactions between -0.9 % and -3.1 %. Insiders earning excess profits are in line with a vast amount of previous studies (e.g., Jaffe, 1974; Finnerty, 1976; Seyhun, 1986; Fidrmuc et al., 2006; Cohen et al., 2012). One plausible reason explaining this phenomenon is that firms are deficient in their tasks of information disclosure to the market, which gives rise to information asymmetry between insiders and outsiders.

A Market Under Asymmetric Information

The fact that insiders earn abnormal returns from their insider trades insinuates that the market is subject to asymmetric information. It is apparent that insiders, based on their position, possess superior knowledge about their firm compared to outsiders, resultantly they are most often in a better position to assess future prospects and its true value. This indicates that insiders trading and to allow directors to profit from bad news is actually a harmful practice as described by Carlton and Fischer (1983), as it imposes costs of loss of market efficiency. Since this finding corresponds to a vast majority of previous studies, we believe that additional focus should be directed towards requirements on the availability, timeliness, and reliability of the firm's information disclosure. Indeed, insider trading is an issue that is frequently addressed from a legal perspective, considering that legislative authorities continuously introduce frameworks and directives aimed at ensuring a market with equal opportunities, characterized by transparency and integrity to enhancing investor confidence (European Commission, 2013). Together, this indicates that the board of directors, to

some extent, fails to disseminate information to the market. There exist researchers who claim the practice of insider trading to be informative (Lakonishok & Lee, 2001), given that it can be used to signal the true value to outsiders (Damodaran & Liu, 1993). However, we are inclined to agree with Manove (1989) who argues that it would be more appropriate to transmit information to the public directly, as opposed to using the stock market.

The Impact of the Signaling Effect

The results for CAR and CAAR on five days, suggest that insiders earn abnormal returns, which can be explained on the basis of the signaling hypothesis. Assuming that an insider's decision to change their ownership stake in the firm signals an assessment of the firm's quality (Connelly et al., 2011) and a belief in the firm and its future prospects (Goranova et al., 2007), we expect to find this positive effect on the stock price for buy transactions, and negative impact on the price for the sell transactions. As an example, we suggest that the observed trend of declining CAR for buy transactions over time is due to dilution of the value of the signal as new firm-specific information reaches the market (Leland and Pyle, 1977). Consequently, measuring the signaling effect of transactions over a long time period does not appear to be feasible, since the occurrence of other events and new information is reflected in the stock price, distorting the signal. Based on this rationale, the results of the sell transactions imply that the market undervalues the short-term signal of these transactions, as the long-term abnormal returns, measured on 30 days and 90 days, are markedly higher.

Furthermore, the observed trend of declining CAR buy transactions is the opposite of the rising trend of sell transactions. Hence, the same conclusion, that the market would seem to undervalue the signal of sell transactions cannot be drawn for the buy transactions abnormal returns. Moreover, as the abnormal returns for both buy and sell transactions are positive on the longer-term estimates, the rationale presented suggests that the information the decision of the insider transaction was based on has more likely been revealed. Hence, insiders are able to use their information advantage to generate abnormal returns.

The Effect of Insider Trading on Market Efficiency

From the explanations above, it is clear that insiders can generate abnormal returns as a result of information asymmetry, which gives rise to a discussion regarding what category of market efficiency prevails based on our empirical findings. Immediately, the strong-form efficiency is

discharged since our findings of abnormal returns violate the assumption of all information being fully available; this is in line with several previous studies (e.g., Seyhun, 1986). Instead, the attention is directed at semi-strong market efficiency, which Fama (1970) described as a market containing rational investors, insiders with access to non-public information, and stock prices that reflect "obviously publicly available information." Under these circumstances, insiders can earn excess profits on their transactions, and we would suggest that our findings satisfy the criteria of semi-strong market efficiency. Interestingly, this contrasts with the suggestion by Wahlström (2003), who finds that insiders in large firms generated abnormal returns yet, argued that the hypothesis of semi-strong form market efficiency is rejected as outsiders are not supposed to be able to make abnormal returns based on insider trading. This is an event that was claimed to be impossible, as the actions of insiders should be immediately incorporated into the price of stocks as soon as it is published. Regardless, we adhere that semi-strong efficiency prevails since we believe that weak-form is not an adequate alternative, as weak-form in part is characterized by stock prices that exclusively reflect historical information (Fama, 1970). However, it is advisable to stress that the efficient market hypothesis is markedly theoretical in its nature; for instance, it presumes that all investors are rational, which is dubious on the practical level. Hence, though it offers a convenient framework for understanding conditions and extent of information disclosure, it ought to be applied with consideration.

8.2 Board Gender Diversity and the Profitability of Insider Trading

Our empirical findings suggest that there is an absence of sufficient evidence to evaluate the relationship between board gender diversity and the profitability of insider trading. Below are several suggestions aimed at explaining the lack of support for the anticipated gender-related effects.

Expected Gender-Related Effects

Advocates of the resource dependence theory propose that the board of directors are appointed to the board based on the expectations that they bring unique attributes to the firm and act as a linkage to the external environment (Pfeffer & Salancik, 1978). Furthermore, according to human capital theory, the directors contribute with human capital in the form of expertise and experience (Becker, 1964). Adams and Ferreira (2009) suggested that higher board gender diversity, in particular, more females on the board strengthened corporate governance and increased

transparency and disclosure. If the aforementioned is proposed to be benefits that would ultimately mitigate information asymmetry on the markets, thereby impede abnormal returns on insider trade, it may seem surprising that we do not find sufficiently strong evidence that supports this.

Factors that Potentially Inhibit the Monitoring Effect

One of the most plausible reasons why a significant relationship is absent might be that there are circumstances present that inhibit the proposed advantages that a higher degree of board gender diversity would engender. In fact, a certain degree of gender diversity prevails among the directors, presumably possessing various skills, knowledge, and attributes. Under different circumstances, they might have been able to generate desirable effects on information disclosure. Considering the board of directors to be an in-group, in which there are strong norms, and the board members share values and attitudes. There exists a significant risk of the emergence of conform thinking within the group that suppresses new thinking and initiatives. Also, this poses a risk that a newly elected board member will conform to their thinking and acting following the group to create a sense of social belonging, as suggested by Tajfel (1979). Perchance, if separate or in a different setting, the directors would be able to discuss and make decisions that would have enhanced the information disclosure of the firm. In addition to shared values and norms, there might exist social hierarchies with more established board members exercising more influence over processes and decisions compared to newer directors. Additionally, aside from the official appointment process of being elected on the annual general meeting, it might be hard for the new directors even to enter the group since there can be high entry barriers. A social group tends to welcome members who are similar to themselves and share their values (Mintzberg, 1983); why new perspectives within the board might have difficulties arising.

To concretize, there can be additional drawbacks of a board with persistent shared values and conformity as it might give rise to tokenism. Sub-groups likely emerge within the board, where the non-dominant group constitutes a token (Kanter, 1977) and are unable to influence the decisions and actions of the board sufficiently. It is proposed that a balanced group materialize around a 40:60 or 50:50 distribution, the critical point where the benefits of the directors would be realized (Kanter, 1977). Our empirical results indicate that the board gender diversity[10] for the buy transaction and sell transactions amount to 34.3 % and 35.1 %, respectively. This suggests that the threshold for reaching critical mass and fully enable the reaping of the benefits from greater board

[10] Board gender diversity is measured as the proportion of females on the corporate board, expressed as a percentage of women on the board of directors. See section 5.4.2.

gender diversity is not reached. Hence, it could be argued that the positive effects on corporate governance by having a diverse board are not utilized in most firms in our sample. Furthermore, this could explain the lack of unambiguous statistically significant results pointing to that board gender diversity has an impact on the profitability of insider trading.

Disclosure of Continuous Information

The board of directors has an essential task of monitoring the firm's disclosure of information to the market, ultimately, with an aim to minimize agency problems. Even though extensive evidence has been presented indicating that a more diverse board containing more females mitigate information asymmetry and adverse selection problems (Abad et al., 2017), quality of information disclosure and transparency (Heflin et al., 2005), quality of financial reports (Gul et al., 2013), and audit quality (Adams & Ferreira, 2009), greater board gender diversity does not seem to have an impact on how insiders generate abnormal returns. In this study, we hypothesize that abnormal returns on insider trades only can arise when there is an information asymmetry between outsiders and insiders, and the level of firm information disclosure is the key. From our findings, we propose that it might be of interest to raise the question on what can explain insider trading behavior, and also from the board's point of view if the boards have internal policies in place regulating insider trading.

Despite gender has been found to ameliorate the quality of financial statements and audit quality (Gul et al., 2013; Adams & Ferreira, 2009), yet it appears that it is insufficient to reduce information asymmetry between the market participants, at least when measured with the profitability of insider trades. This gives rise to the question of what indeed affects firm information disclosure. Since financial statements and earnings announcements are publicly available, and insiders are prohibited to trade in the firm's stock 30 days prior to the report release, it indicates that insiders act based on ongoing information, not merely on the figures and information disclosed in the financial statements. What can be inferred from this statement is that although board gender diversity enhances financial reporting and audit quality, this behavior does not necessarily spill over on continuous information disclosure.

9 Conclusion

In the strive to achieve an equal and transparent stock market with sufficient investor protection, we provide insights to a hitherto disregarded link between board gender diversity and information disclosure. The motivation behind board gender diversity is the body of literature and previous empirical evidence indicating that higher diversity has a positive effect on firm information disclosure, which in turn might mitigate the opportunity to earn abnormal returns. Before we attempt to answer this question, we investigate if insiders have an opportunity to capitalize on an information advantage and gain an excess profit. The hypotheses are approached by initially conducting an event study to obtain cumulative average abnormal returns (CAAR), to be employed as the dependent variable in a regression model where board gender diversity (BGD) represents the independent variable. The study is predicated on a set of insider transaction data and corresponding director data of 292 firms listed on Nasdaq Stockholm between January 2017 and December 2019, which results in 5,671 observations.

The first conclusion presented is that insiders can earn abnormal returns on their transactions in their firms both in the cases of buy and sell transactions, which indicates that the Swedish stock market is inefficient since it is subject to asymmetric information. Ultimately, our findings suggest that Swedish firms, to some extent, fail to disseminate information to the market, which indicates that the board of directors does not entirely fulfill their monitoring purpose. The evidence of abnormal returns converges to a vast majority of previous studies that present similar results. Interestingly, we find that insiders generate higher abnormal returns on their sell transactions compared to their buy transactions. This contrasts with our initial expectation underpinned by the idea that abnormal returns commonly are higher for buy transactions since stock purchases are made based on a belief in the firm, unlike sell transactions that can be explained by more reasons than a lack of faith in the company.

From our empirical regression models, we estimate an insignificant effects of board gender diversity on the profitability of insider trading. We consider two possible explanations for the absence of sufficient evidence. First, that circumstances prevail that inhibit the proposed positive effect of increased gender diversity on firm transparency and information disclosure. The presence of shared values and attitudes, norms, and hierarchies might prevent effective monitoring. Second, more diversity is found to enhance the quality of information sources, such as financial statements, which perhaps holds. Yet, it does not necessarily apply to the quantity and quality of continuous information dissemination to the market. The question of whether or not a gender-balanced board

influences the firm's continuous information disclosure and profitability of insider trading remains open.

9.1 Limitations

We have identified several potential limitations of this study. The main restriction is suggested to be due to insufficient sample size. Since our obtained empirical findings do not provide supporting evidence to make a significant inference regarding the second hypothesis, there might exist an issue of a too-small sample. An expanded sample can, perhaps generate more precise results. However, at the time of the performance of the study, the availability of data on insider trades are limited as a result of the updated regulation on insider trading in 2016. In the case of future research that seeks to answer a similar research question to ours, the question of sample size is an essential factor to consider.

The second limitation to be introduced is related to selection bias. Our sample of insider transactions includes all buy and sell transactions that fulfill the selection criteria described in section 6.2. We choose not to impose a minimum transaction amount as a requirement. Consequently, even small trades of a few hundred Swedish crowns are represented in the sample. This decision can be discussed, but we suggest that it is a double-edged sword. Arguably, diminutive insider transactions send a less reliable and valuable signal to outsiders compared to more substantial amounts, which indicates that imposition of an amount threshold is appropriate. However, such action can give rise to a selection bias too since it can be both difficult and arbitrary to determine an adequate critical amount.

Lastly, as stated in previous sections, our research explores a topic in its infancy stage. The limited availability of prior studies and empirical findings complicated the development of relevant hypotheses. For the feasibility of the study, we include a combination of theories and previous findings within insider trading and board gender diversity. Yet, we develop an entirely new research typology divided into two stages. First, we use the event study approach to answer hypothesis one. Second, we develop a basic regression model to address our second hypothesis. The intention to contribute to the literature with a rather pioneering study is undoubtedly considered to be a limitation.

9.2 Future Research

The lack of support for the expected gender-related effects on insider trading profitability does not imply that it is an insignificant or unimportant topic. On the contrary, we encourage further investigation and make several suggestions for future studies. Our first suggestion stems from the absence of sufficient evidence; the Swedish stock market generates a relatively small sample size. Hence we suggest that a similar study might yield different results if it is conducted on a larger market. Also, trading behavior and institutional settings can vary between countries, which provide another argument on why another market is of interest.

In this study, we present different previous empirical findings that indicate that female directors have an overall monitoring effect. In the literature, there exist many studies on risk-taking behavior in relation to gender, and the results seem to be indecisive. However, plenty of evidence has been presented that argue that men are less risk-averse compared to women, and engage more frequently in insider trading. As a result, we suggest that it would be of interest to examine the influence of board gender diversity on the profitability of male director purchases.

Since 2006, companies listed on the Oslo Stock Exchange are required to have at least 40 % of females on their boards to avoid severe penalties. Potentially, it would be interesting to conduct a study and use the implementation of the gender quota as the exogenous shock to board gender diversity to measure and compare the period prior to the enactment to the period afterward. Utilizing the exogenous shock, possible changes in the behavior surrounding insider trading, as well as the abnormal returns from insider trades, can be observed and analyzed. A sample of firms with a guaranteed 40 % of female directors is an intriguing sample.

References

Abad, D., Lucas-Pérez, M. E., Mínguez-Vera, A., & Yagüe, J. (2017). Does gender diversity on corporate boards reduce information asymmetry in equity markets? *Business Research Quarterly*, vol. 20, no. 3, pp. 192-205.

Aboody, D., & Lev, B. (2000). Information Asymmetry, R&D, and Insider Gains, *The Journal of Finance*, vol. 55, no. 6, pp. 2747-2766.

Adams, R., & Ferreira, D. (2009). Women in the Boardroom and Their Impact on Governance and Performance, *Journal of Financial Economics*, vol. 94, no. 2, pp. 291-309.

Akerlof, G. (1970). The market for lemons, *Quarterly Journal of Economics*, vol. 84, no. 3, pp. 488-500.

Bailey, M. A. (2019). Real Econometrics: the right tools to answer important questions, 2nd edn., New York: Oxford University Press.

Baysinger, B. D., & Butler, H. N. (1985). Corporate Governance and the Board of Directors: Performance Effects of Changes in Board Composition, *Journal of Law, Economics, & Organization*, vol. 1, no. 1, pp. 101-124.

Becker, G. S. (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education. Chicago: University of Chicago Press.

Berk, J., & DeMarzo, P. (2014). Corporate Finance. Boston: Pearson.

Berle, A. & Means, G. (1932). The Modern Corporation and Private Property. New York: Commerce Clearing House.

Bøhren, Ø., & Strøm, R. Ø. (2010). Governance and Politics: Regulating Independence and Diversity in the Boardroom, *Journal of Business Finance & Accounting*, vol. 37, no. 9/10, pp. 1281-1308.

Brooks, C. (2008). Introductory Econometrics for Finance, 2nd edn., New York: Cambridge University Press.

Brown, S., & Hillegeist, S. A. (2007). How disclosure quality affects the level of information asymmetry, *Review of Accounting Studies*, vol. 12, no. 2-3, pp. 443-477.

Burke, R. (1997). Women Directors: Selection, Acceptance and Benefits of Board Membership, *Corporate Governance*, vol. 5, no. 3, pp. 118-125.

Campbell, J. Y., Lo, A. W., & MacKinlay, C. A. (1997). The Econometrics of Financial Markets. New York: Princeton University Press.

Carlton, D. W., & Fischel, D. R. (1983). The regulation of insider trading, *Stanford Law Review*, vol. 35, no. S, pp. 857-895.

Carter, D. A., D'Souza, F., Simkins, B. J., & Simpson, W. G. (2010). The Gender and Ethnic Diversity of US Boards and Board Committees and Firm Financial Performance, *Corporate Governance: An International Review*, vol. 18, no. 5, pp. 396-414.

Carter, D. A., Simkins, B. J., & Simpson, W. G. (2003). Corporate Governance, Board Diversity, and Firm Value, *The Financial Review*, vol. 38, no. 1, pp. 33-53.

Connelly, B. L., Certo, S. T., Ireland, D. R., & Reutzel, C. R. (2011). Signaling Theory: A Review and Assessment, *Journal of Management*, vol. 37, no. 1, pp. 39-67.

Daily, C. M., Certo, S. T., & Dalton, D. R. (1999). A decade of corporate women: Some progress in the boardroom, none in the executive suite, *Strategic Management Journal*, vol. 20, no 1, pp. 93-100.

Damodaran, A., & Liu, C. H. (1993). Insider trading as a signal of private information, *Review of Financial Studies*, vol. 6, no. 1, pp. 79-119.

Dempsey, M. (2013). The Capital Asset Pricing Model (CAPM): The History of a Failed Revolutionary Idea in Finance?, *ABACUS*, vol. 49, no. S1, pp. 7-23.

Dixon, W. J. (1960). Simplified Estimation from Censored Normal Samples, *Annals of Mathematical Statistics,* vol. 31, no. 2, pp. 385–391.

Epure, M., & Guasch, M. (2019). Debt signaling and outside investors in early stage firms, *Journal of Business Venturing*, vol. 35, no. 2, pp. 1-21.

European Commission (2016). Applying EU law, Available Online:

https://ec.europa.eu/info/law/law-making-process/applying-eu-law_en?2nd-language=fr

[Accessed 02 April 2020]

European Commission (2013). European Parliament's endorsement of the political agreement on the Market Abuse Regulation. Available Online:

https://ec.europa.eu/commission/presscorner/detail/en/MEMO_13_774

[Accessed 03 April 2020]

European Securities and Markets Authority (n.d.). Market abuse and accepted market practice, Available Online:

https://www.esma.europa.eu/regulation/trading/market-abuse

[Accessed 02 April 2020]

Fama, E. F., (1970). Efficient Capital Markets: A Review of Theory and Empirical Work, *The Journal of Finance*, vol. 25, no. 2, pp. 383-417.

Fama, E. F., & French, K. R. (1996). Multifactor Explanations of Asset Pricing Anomalies, *The Journal of Finance*, vol. 51, no. 1, pp. 55-84.

Fama, E. F., & French, K. R. (2004). The Capital Asset Pricing Model: Theory and Evidence, *Journal of Economic Perspectives*, vol. 18, no. 3, pp. 25-46.

Fama, E. F., & Jensen, M. C. (1983). Separation of Ownership and Control, *Journal of Law and Economics*, vol. 26, no. 2, pp. 301-325.

Fidrmuc, J. P., Goergen, M., & Renneboog, L. (2006). Insider Trading, News Releases and Ownership Concentration, *Journal of Finance*, vol. 61, no. 6, pp. 2931-2973.

Finansinspektionen (2020). Market abuse. Available Online:

https://www.fi.se/en/published/statistics/market-abuse/

[Accessed 20 May 2020]

Finnerty, J. E. (1976). Insiders and market efficiency, *The Journal of Finance*, vol. 31, no. 4, pp. 1141-1148.

Fishman, J. J. (1993). A Comparison of Enforcement of Securities Law Violations in the UK and US, *Company Lawyer*, vol 14, no. 9, pp. 163-172.

Goranova, M. L., Alessandri, T., Brandes, P. M., & Dharwadkar, R. (2014). Managerial Ownership and Corporate Diversification: A Longitudinal Examination, *Strategic Management Journal*, vol. 28, no. 3, pp. 211-225.

Gregory, A., Matatko, J. & Tonks, I. (1994). UK Directors Trading: The impact of Dealings in Smaller Firms, *Economic Journal*, vol. 104, no. 442, pp. 37-53.

Gul, F. A., Srinidhi, B., & Ng, A. (2011). Does board gender diversity improve the informativeness of stock prices?, *Journal of Accounting and Economics*, vol. 51, no. 3, pp. 314-338.

Gul, F. A., Hutchinson, M. R., & Lai, K. M. Y. (2013). Gender-diverse boards and properties of analyst earnings forecasts, *Accounting Horizons*, vol. 27, no. 3, pp. 511-538.

Heflin, F., Kenneth, W., & John. (2005). Disclosure Policy and Market Liquidity: Impact of Depth Quotes and Order Sizes, *Contemporary Accounting Research*, vol. 22, no. 4, pp. 829-866.

Henderson Jr, G. V. (1990). Problems and solutions in conducting event studies, *Journal of Risk and Insurance*, vol. 57, no. 2, pp. 282-306.

Hillman, A. J., Cannella, A. A., & Paetzold, R. L. (2000). The Resource Dependence Role of Corporate Directors: Strategic Adaptation of Board Composition in Response to Environmental Change, *Journal of Management Studies*, vol. 37, no. 2, pp. 235-255.

Hillman, A. J., & Dalziel, T. (2003). Firm Performance: Integrating Agency and Resource Dependence Perspectives, *The Academy of Management Review*, vol. 28, no. 3, pp. 383-396.

Hillman, A. J., Shropshire, C., & Cannella, A. A. (2007). Organizational predictors of women on corporate boards, *Academy of Management Journal*, vol. 50, no. 4, pp. 941-952.

Huddart, S. J., & Ke, B. (2007). Information asymmetry and cross-sectional variation in insider trading, *Contemporary Accounting Research*, vol. 24, no. 1, pp. 195-232.

Jaffe, J. F. (1974). Special information and insider trading, *Journal of Business*, vol. 47, no. 3, pp. 410-428.

Jeng, L. A., Metrick, A. & Zeckhauser, R. (2003). Estimating the Returns to Insider Trading, *Review of Economics & Statistics*, vol. 85, no. 2, pp. 453-471.

Kanter, M. R. (1977). Some Effects of Proportions on Group Life: Skewed Sex Ratios and Responses to Token Women, *American Journal of Sociology*, vol. 82, no. 5, pp. 965-990.

Kennedy, D., Lakonishok, J., & Shaw, W. H. (1992). Accommodating Outliers and Nonlinearity in Decision Models, *Journal of Accounting, Auditing & Finance*, vol. 7, no. 2, pp. 161-190.

Kim, O., & Verrecchia, R. E. (1994). Market liquidity and volume around earnings announcements, *Journal of Accounting and Finance*, vol. 17, no. 1-2, pp. 41-67.

Lakonishok, J. & Lee, I. (2001). Are insider trades informative? *The Review of Financial Studies*, vol. 14, no. 1, pp. 79-111.

Lai, T., & Stohs, M. H. (2015) Yes, CAPM is Dead, *International Journal of Business*, vol. 20, no. 2, pp. 144-158.

Leland, H., & Pyle, D. H. (1977). Informational Asymmetries, Financial Structure, and Financial Intermediation, *Journal of Finance*, vol. 32, no. 2, pp. 371-387.

Levi, H., & Lazarovich-Porat, E. (1995). Signaling Theory and Risk Perception: An Experimental Study, *Journal of Economics and Business*, vol. 47, no. 1, pp. 39-56.

MacKinlay, A. C. (1997). Event Studies in Economics and Finance, *Journal of Economic Literature*, vol. 35, no. 1, pp. 13-39.

Manove, M. (1989). The Harm from Insider Trading and Informed Speculation, *The Quarterly Journal of Economics*, vol. 104, no. 4, pp. 823-845.

Marquardt, B. B., Myers, B. W., & Niu, X. (2018). Strategic voting and insider ownership, *Journal of Corporate Finance*, vol. 51, pp. 50-71.

Mintzberg, H. (1983). Power in and around Organizations. Englewood Cliffs, N.J: Prentice-Hall.

Mougoué, M., & Rao, R. P. (2003). The Information Signaling Hypothesis of Dividends: Evidence from Cointegration and Causality Tests, *Journal of Business Finance & Accounting*, vol. 30, no. 3/4, pp. 441-478.

Moursli, R. M. (2020). The effects of board independence on busy directors and firm value: Evidence from regulatory changes in Sweden, *Corporate Governance*, vol. 28, no. 1, pp. 23-46.

Nguyen, H., & Faff, R. (2006-2007). Impact of Board Size and Board Diversity on Firm Value: Australian Evidence, *Corporate Ownership and Control*, vol. 4, no. 2, pp. 24-32.

Opler, D. K., Harrison, J. S., & Allen M. R. (2008) The danger of misinterpreting short-window event study findings in strategic management research: an empirical illustration using horizontal acquisitions, *Strategic Organization*, vol. 62, no. 2, pp. 151-184.

Oliver, P., Marwell, G., & Teixeira, R. (1985). A theory of critical mass: I. Interdependence, group heterogeneity, and the production of collective action, *American Journal of Sociology*, vol. 91, no. 3, pp. 522-556.

Peterson, P. P. (1989). Event Studies: A Review of Issues of Methodology, *Quarterly Journal of Business and Economics*, vol. 28, no. 3, pp. 36-66.

Pfeffer, J., & Salancik, G. R. (1978). The External Control of Organizations: A Resource Dependence Perspective. New York: Harper & Row.

Ross, S. A. (1976). The Arbitrage Theory of Capital Asset Pricing, *Journal of Economic Theory*, vol. 13, no. 3, pp. 341-360.

Rozeff, M. S., & Zaman, M. A. (1988). Market Efficiency and Insider Trading: New Evidence, *Journal of Business*, vol. 61, no. 1, pp. 25-44.

Seyhun, H. N. (1986). Insiders' profits, cost of trading, and market efficiency, *Journal of Financial Economics*, vol. 16, no. 2, pp. 141-283.

Seyhun, H. N. (1998). Investment Intelligence from Insider Trading. Cambridge: MIT Press.

Sharpe, W. F. (1992). Asset Allocation: Management style and performance measurement, *The Journal of Portfolio Management*, vol. 18, no. 2, pp. 7-19.

Shrader, C. B., Blackburn, V., & Iles, P. (1997). Women in Management and Firm Financial Performance: An Exploratory Study, *Journal of Managerial Issues*, vol. 9, no. 3, pp. 355-372.

Swedish Corporate Governance Board. The Swedish Corporate Governance Code, Available Online:

http://www.bolagsstyrning.se/UserFiles/Koden/2020/The_Swedish_Corporate_Governance_Code_1_January_2020_00000002.pdf

[Accessed 27 May 2020]

Tajfel, H. (1979). Individuals and Groups in Social Psychology, *British Journal of Social and Clinical Psychology*, vol. 19, no. 2, pp. 183-190.

Tajfel, H., & Turner, J. C. (1986). The Social Identity Theory of Intergroup Behavior. Psychology of Intergroup Relations. Chicago: Hall Publishers.

Wahlström, G. (2003). Legal insider trading and abnormal returns: Some empirical evidence from Sweden, *Belgian Journal of Banking and Finance*, vol. 6, no. 4, pp. 348-355.

White, H. (1980). A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity, *Econometrica*, vol. 48, no. 4, pp. 817-838.

Wooldridge, J. M. (2015). Introductory Econometrics: A Modern Approach, 5th edn., Boston: Cengage Learning.

Zhong, T., Faff, R., Hodgson, A., & Yao, L. J. (2014). The role of board gender on the profitability of insider trading, *International Journal of Accounting & Information Management*, vol. 22, no. 3, pp. 180-193.

Zhu, J., Ye, K., Tucker, J. W., & Chan. J. C. (2016). Board hierarchy, independent directors, and firm value: Evidence from China, *Journal of Corporate Finance*, vol. 41, no. C, pp. 262-279.

Figures

Figure 1: Histogram of Buy Transactions before Winsorizing

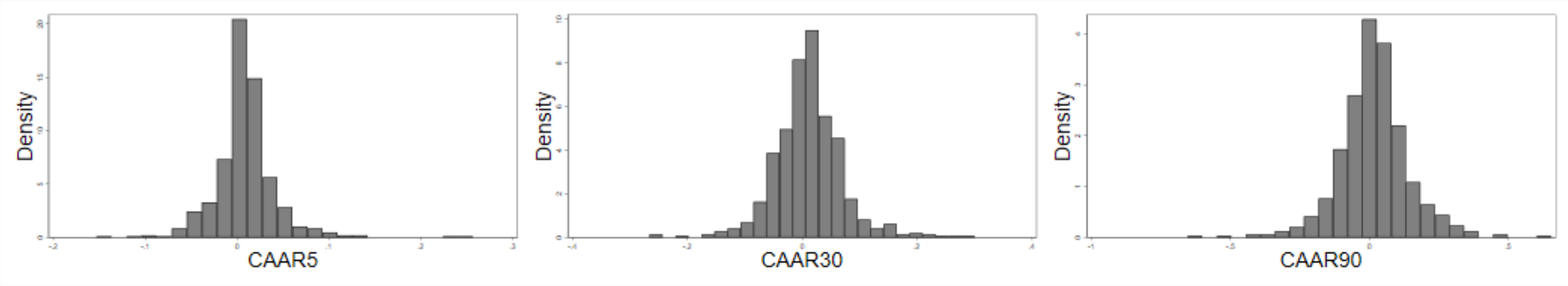

Figure 1 illustrates histograms for *CAAR* buy transactions measured on day *5*, *30*, and *90,* respectively, in levels. From a visual interpretation, the three histograms seem to be fairly normally distributed, however, some heavy outliers are observed. Hence, in order to damper the effects of these outliers, we decided to winsorize the 1 % most extreme values in each tale for our samples.

Figure 2: Histogram of Buy Transactions after Winsorizing

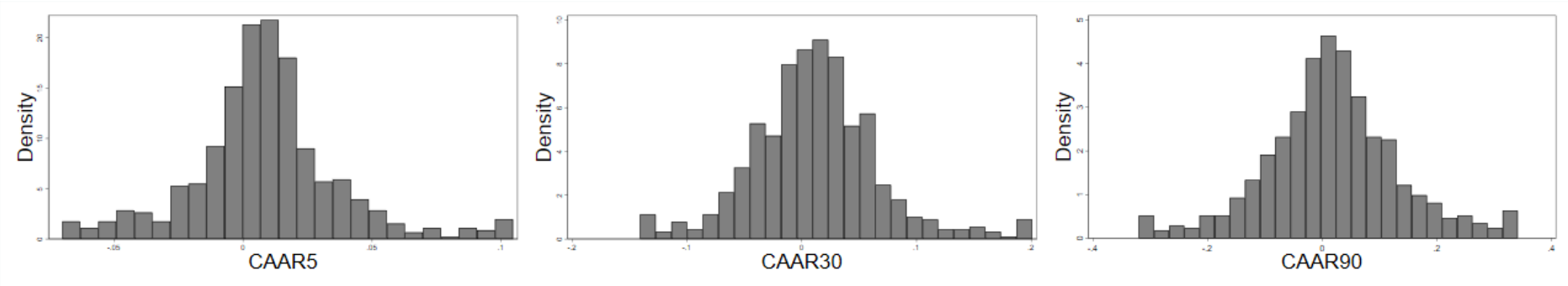

Figure 2 presents a view over the distribution for *CAAR* buy transactions measured on day *5*, *30*, and *90* respectively in levels after winsorizing the top 1 % and bottom 1 % most extreme values for each of the three *CAAR* buy transaction variables. From visual analyzes, all three histograms seem to be fairly normally distributed and free of heavy outliers.

Figure 3: Histogram of Sell Transactions before Winsorizing

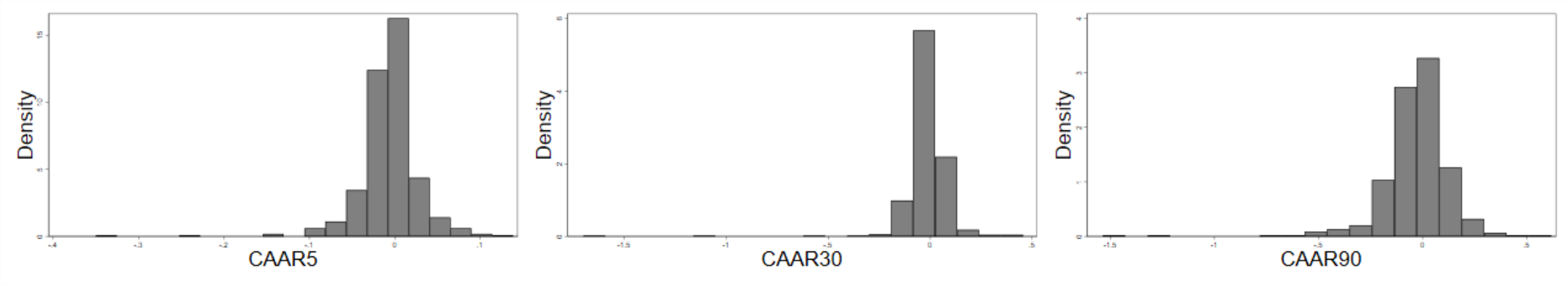

Figure 3 illustrates histograms for *CAAR* sell transactions measured on day *5*, *30*, and *90* respectively in levels. From a visual interpretation, it is difficult to determine whether the three histograms are normally distributed due to the observed extreme outliers present in each of the three histograms. In order to deal with these outliers, we decided to winsorize the 1 % most extreme values in each tale for our samples.

Figure 4: Histogram of Sell Transactions after Winsorizing

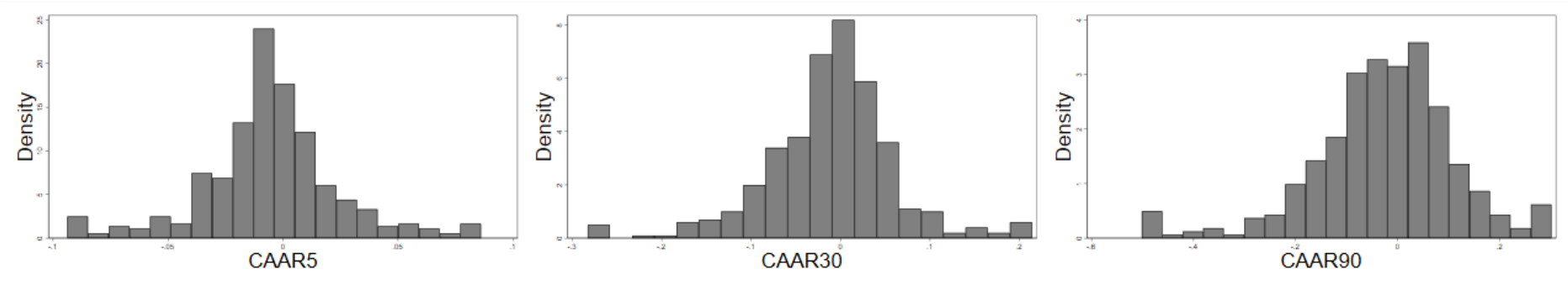

Figure 4 displays the distribution for *CAAR* sell transactions measured on day *5*, *30*, and *90*, respectively, in levels after winsorizing the top 1 % and bottom 1 % most extreme values for each of the three variables. From a visual analysis, the histogram for *CAAR5* conveys the impression to be normally distributed, however, for the variables *CAAR30* and *CAAR90*, these could be argued to be slightly skewed to the left instead of normally distributed.

Tables

Table 1: Correlation Matrix – Buy Transactions

VARIABLES	CAAR5	CAAR30	CAAR90	BGD	INDEP	OWNER	BUSYD	BSIZE	FSIZE	LEVER	RD	AGE
CAAR5	1.000											
CAAR30	.	1.000										
CAAR90	.	.	1.000									
Board Gender Diversity	-0.105***	0.026	0.033	1.000								
Independent Directors	-0.091**	-0.054	-0.058	0.238***	1.000							
Insider Ownership	0.018	-0.058	-0.031	-0.106***	-0.265***	1.000						
Busy Director	-0.007	0.007	-0.016	0.246***	-0.061	-0.115***	1.000					
Board Size	-0.025	-0.050	-0.014	0.160***	-0.138***	-0.171***	0.489***	1.000				
Firm Size	-0.090**	-0.022	0.011	0.339***	-0.054	-0.074*	0.361***	0.550***	1.000			
Leverage	-0.039	0.062	0.044	0.057	-0.077*	0.121***	0.003	0.030	0.385***	1.000		
R&D	0.004	-0.017	-0.013	-0.041	0.146***	-0.188***	0.153***	0.114***	-0.037	-0.275***	1.000	
Board Age	-0.011	0.029	-0.012	0.025	0.157***	-0.071*	0.151***	0.067*	0.042	-0.056	0.162***	1.000
**** Significant at 0.01 level*												
*** Significant at 0.05 level*												
** Significant at 0.1 level*												

Table 1 illustrate the correlations between two variables, including each combination of variables. The table shows that *Board Gender Diversity* has a statistically significant negative correlation to *CAAR* at day *5* at a 1 % significance level. However, for *CAAR* measured at day *30* and *90*, the matrix indicates a positive correlation between these and *Board Gender Diversity*, though not statistically significant. The tables show that no extreme multicollinearity occurs. As can be identified, the variables *Board Size* and *Firm Size* possess the highest correlation, which amounts to 0.550. However, as 0.550<0.8 this suggests there are no issues in regard to multicollinearity.

Table 2: Correlation Matrix – Sell Transactions

VARIABLES	CAAR5	CAAR30	CAAR90	BGD	INDEP	OWNER	BUSYD	BSIZE	FSIZE	LEVER	RD	AGE
CAAR5	1.000											
CAAR30	.	1.000										
CAAR90	.	.	1.000									
Board Gender Diversity	-0.063	0.041	0.141***	1.000								
Independent Directors	-0.061	-0.0185	-0.003	0.177***	1.000							
Insider Ownership	0.090*	0.070	-0.001	-0.099**	-0.261***	1.000						
Busy Director	-0.022	0.034	0.080	0.264***	-0.064	-0.217***	1.000					
Board Size	-0.020	0.005	0.038	0.147***	-0.181***	-0.229**	0.485***	1.000				
Firm Size	0.071	0.069	0.115**	0.272***	-0.104**	-0.114**	0.413***	0.550***	1.000			
Leverage	0.076	0.068	0.054	-0.014	-0.144***	0.101**	-0.016	0.028	0.394***	1.000		
R&D	-0.054	-0.073	0.019	0.005	0.068	-0.174***	0.178***	0.195***	0.041	-0.317***	1.000	
Board Age	-0.009	0.089*	0.076	0.051	0.201***	-0.095*	0.168***	0.118**	0.136***	-0.015	0.138***	1.000

**** Significant at 0.01 level*
*** Significant at 0.05 level*
** Significant at 0.1 level*

Table 2 illustrates the correlations between two variables, including each combination of variables The table further shows that the correlation between *Board Gender Diversity* and *CAAR5* is negative, however not statistically significant. Furthermore, the correlation between *Board Gender Diversity* and *CAAR30* is positive, yet also not statistically significant. However, the matrix indicates a statistically significant positive correlation between *CAAR* at day *90* and *Board Gender Diversity*, measured at a 1 % significance level. The highest correlation between two variables in Table 2 is for the variables *Board Size* and *Firm Size*, which amounts to 0.550. Therefore, no extreme multicollinearity occurs, as 0.550<0.8, hence, no issues in regard to multicollinearity are present.

Table 3: Summary Statistics – Buy & Sell Transactions

PANEL A						
	BUY TRANSACTIONS					
VARIABLES	**N**	**Mean**	**Median**	**Std. Dev.**	**Min**	**Max**
CAAR5	651	0.008	0.008	0.029	-0.070	0.105
CAAR30	651	0.011	0.011	0.056	-0.141	0.201
CAAR90	651	0.017	0.016	0.117	-0.320	0.341
Board Gender Diversity	651	0.343	0.333	0.130	0	0.800
Independent Directors	651	0.689	0.714	0.184	0	1
Insider Ownership	651	0.143	0.073	0.173	0	0.796
Busy Director	651	6.060	5	4.165	0	23
Board Size	651	6.561	6	1.447	3	11
Firm Size	651	8.283	8.213	1.950	3.321	13.171
Leverage	651	24.669	23.532	17.824	0	96.597
R&D	651	0.412	0	0.493	0	1
Board Age	651	56.637	57	4.312	42	70

PANEL B						
	SELL TRANSACTIONS					
VARIABLES	**N**	**Mean**	**Median**	**Std. Dev.**	**Min**	**Max**
CAAR5	403	-0.006	-0.005	0.030	-0.094	0.086
CAAR30	403	-0.012	-.007	0.073	-0.283	0.214
CAAR90	403	-0.028	-0.020	0.140	-0.502	0.301
Board Gender Diversity	403	0.351	0.333	0.131	0	0.800
Independent Directors	403	0.677	0.667	0.179	0	1
Insider Ownership	403	0.144	0.083	0.165	0	0.941
Busy Director	403	6.293	6	4.110	0	20
Board Size	403	6.675	7	1.466	3	11
Firm Size	403	8.483	8.472	1.971	3.321	13.171
Leverage	403	25.487	24.677	17.666	0	96.597
R&D	403	0.400	0	0.490	0	1
Board Age	403	56.519	57	4.197	42	68

Table 3 presents the summary statistics of the variables used (except for *Year* and *Industry* controls). *N* refers to number of observations for each variable, *Mean* displays the average value for each variable, *Median* refers to the "middle" value for each variable in a list of numbers in numerical order, *Std. Dev.* illustrate the spread around the mean values for each variable, and lastly, the *Min* and *Max* refers to the minimum and maximum values for each variable. Variables: *CAAR* (Cumulative Average Abnormal Returns 5, 30 and 90 days after the transaction date), *Board Gender Diversity* (Percentage of women on the board of directors, %), *Independent Directors* (Number of independent directors on the board divided by board size, %), *Insider Ownership* (Fraction of equity owned by the firm's officers and directors to total shares outstanding, %), *Busy Directors* (The total number of outside directorships held by all busy directors sitting on the board, regardless of their independence status), *Board Size* (The number of board of directors), *Firm Size* (Logarithm of the book value of total assets), *Leverage* (Total debt over total assets, %), *R&D* (Binary number if the firm submit R&D expenditures or not), *Board Age* (Average age of the board of directors).