UNIVERSITÀ DEGLI STUDI DI PADOVA

DIPARTIMENTO DI SCIENZE ECONOMICHE ED AZIENDALI
"M. FANNO"

CORSO DI LAUREA MAGISTRALE IN
ECONOMICS AND FINANCE

TESI DI LAUREA

"Are European Banks Opaque? Evidence from Trades by Corporate Insiders"

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MATRICOLA N. 1237809

ANNO ACCADEMICO 2021 - 2022

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INTRODUCTION

A high degree of asymmetric information between a bank's management and outside investors is a widespread belief. Such idea mounts on the particular nature of banks' operations and in the banking literature it is ascribed to three main reasons (Morgan, 2002). In the first place, loans lead the core activities of a bank, but even though they are the typical bank asset, usually limited information is available for an accurate valuation. Diamond (1984) explains the asset side of banks and why financial intermediaries might grant credit to asymmetrically advantaged borrowers who often lack quantifiable information on their likelihood of repayment, or produce loans that are hardly marketable. Secondly, as part of banks' assets are highly liquid and consent rapid change of holding positions, any disclosure made by banks might quickly become obsolete. Myers and Rajan (1998) though show how relatively liquid assets help the intermediary function. Third, the typically high level of leverage in banks invites agency problems: while Jensen and Meckling (1976) claim that conflicts between shareholders and debtholders might end up in asset substitution and risk shifting, Wagner (2007) predicts that bank managers have incentives to circumvent shareholders' leverage constraints by shifting towards opaquer, less profitable, financial instruments. All these assertions hint at banks as intrinsically opaque type of firms, since asymmetric information is inherently tied to their core operations and capital structure. As a consequence, concerns on the ability of outsiders to monitor bank managers risk taking behavior raises questions on whether market participants can ensure financial stability and effectively discipline banks alone: this provides one rationale to enhance regulation in the banking sector more than in others.

Finding empirical evidence endorsing the above arguments is a hard task, since opacity is, by definition, an hardly quantifiable object. The existing literature has thus relied on theoretical standards proxying for the degree of asymmetric information between a company and its outside investors. For instance, Morgan (2002) links split ratings assigned by different rating agencies to the same bond as a signal of difficulty in valuing the issuer's condition from the outside. Flannery, Kwan and Nimalendran (2004, 2013) instead proxy opacity through stock-level measures associated to asymmetric information. These works compare banks and firms in the selected proxy, but by using the firms as benchmarks of transparency, they overlook the fact that also some type of firms might be inherently opaque, perhaps for their highly uncertain R&D investments or for their hardly estimable commodity reserves. Therefore, while the literature performs a joint test on whether banks are opaque both in absolute terms and relative to other firms, banks and nonbanks should ideally be compared to a transparency benchmark.

To investigate opacity of banks in absolute and relative terms, following Spargoli and Upper (2018), this work uses returns on trades by EU corporate insiders of financial and nonfinancial firms. Under the Market Abuse Regulation of 2016, EU firms' insiders in the group of Persons Discharging Managerial Responsibilities are obliged to disclose their trades within three days after the transactions. Their notifications contain information such as execution price, volume and date of transaction, which this work intends to link to the respective future stock returns on the insiders' trades. The reason to do so is that due to their privileged position in the firm, insiders enjoy an informational advantage when the company is hard to value from the outside. Therefore, because insiders can act as informed traders and extract rent from uninformed outside traders (Grossman and Stiglitz, 1980; Kyle, 1985), stocks traded by insiders should exhibit abnormal returns after their purchases and abnormal stock return reduction after their sales. If banks are harder to value than firms, such variation in stock returns should be greater for financial intermediaries than other firms.

On the empirical level, these assumptions are addressed through a performance-evaluation methodology, which aims at establishing whether insiders earn abnormal returns on their trades through a calendar-time approach. By constructing portfolios that like a shadow mutual fund replicate all the trades made by insiders and earn the same returns, performance of insider trading can be regarded for both positive information driving purchases and negative information driving sales. To this end, the portfolios are constructed by type of trade, i.e. buy or sell, and type of company, i.e. bank or nonbank. The returns of these portfolios are then regressed on a number of asset pricing models which constitute the benchmark for detecting abnormal returns: the estimated intercepts of these equations measure the abnormal performance of any portfolio taken in analysis. If banks are opaque, the portfolios should be abnormally profitable; if they are opaquer than firms the profitability should be higher for bank insiders than for firm insiders.

Baseline findings document no statistically different than zero abnormal returns on bank insiders' purchases or sales. Also, bank insiders fail to obtain higher profits than their peers, when compared to nonbank insiders' profits. Such results remain unchanged when investigating time and within banking sector variation in opacity, and mostly resemble the results obtained by Spargoli and Upper (2018) for US banks. These outcomes are in contrast with conventional wisdom maintaining banks as opaquer than firms, and challenge the theory assigning to banks a natural degree of non-transparency.

The contribution to the banking literature is twofold. Firstly, this work adds up to the works trying to establish whether banks are more opaque than other firms. Morgan (2002) claims that banks are opaquer than nonbanks because they are more likely to carry split ratings on their debt issuances. Such result is contrasted by Flannery, Kwan and Nimalendran who first (2004) show that stocks of banks indicate alike levels of opacity to firm stocks, in terms of bid-ask spreads and price impact of trades, and then (2013), confirm such results also pointing out greater uncertainty during the 2007 financial crisis. These authors' results are mirrored also by the use of earning forecasts as a metric of opacity, as they themselves find (2004) that accuracy of banks' earnings forecasts resembles the one of nonbanks' earnings forecasts. Hirtle (2006) points out that bank stocks show positive and significant abnormal returns after the Sarbannes-Oxley requirement for CEOs to attest the validity of financial statements, supporting relative opaqueness of banks. Morgan (2010) investigates the presence of abnormal returns jointly to the 2009 SCAP stress test provision, concluding that the law was in part able to produce information about banks. By measuring bank opacity as the correlation between bank stock prices and the market index, Dewally and Shao (2013) establish a positive relation between the use of financial derivatives and information asymmetry between banks and outside market participants. Secondly, a strain of literature documenting abnormal returns on insider trading is joined. Niederhoffer (1968), Jaffe (1974), Seyhun (1986, 1998), Rozeff and Zaman (1988), Lin and Howe (1990), and Lakonishok and Lee (2001), are all articles studying the cross-sectional variation of future stock returns as a function of past insider-trading activity by relying on intensive-trading criteria and find that intensively-bought shares outperform relevant benchmarks and intensively-sold shares underperform, presenting increasing levels of insider trading yielding abnormal returns. Jeng, Metrick, and Zeckhuser (2003), turn to performance-evaluation methods to evaluate insider trading profitability; they find that insiders' purchases earn abnormal returns, but sales do not. Finally, Spargoli and Upper (2018)'s work picks up Jeng, Metrick, and Zeckhuser (2003)'s methodology to address bank opacity through insider trading activity, by which this thesis is inspired.

By adopting an approach that compares abnormal returns on trades by firm and bank insiders, the present empirical analysis has two advantages with respect to past research. (1) Using a theory-based test for opacity not relying on proxies of asymmetric information; (2) The possibility to distinct purchases from sales together with the use of a transparency benchmark to compare across firms. These features enable insights on bank opacity that are unique for EU banks. In fact, with except for Iannotta (2006), who finds EU banks more likely to carry split ratings on their

bonds, the vast majority of the bank opacity literature focuses on the US. At the same time, the articles investigating returns on insider trading are limited, and anyway largely adopt basic event-study approaches and overlook to separate banks from nonbanks: statistically significant price effects attesting informational importance of insiders' trades are found for Austria in Fidrmuc et al., (2013), for Italy in Dardas and Guttler (2011), for Germany by Dardas and Guttler (2011), for Belgium in Fidrmuc et al. (2013), for the Netherlands in Cziraki et al. (2014), for Switzerland in Zingg et al. (2007), while Brio et al. (2002) document the opposite for Spain. The only comprehensive study is Aussenegg et al. (2017) who track insider trading to be followed by abnormal price reactions on a EU-level. This thesis is hence motivated also by the lack of inclusive results on bank opacity or the use of profitability criteria in the old continent.

The study is structured as follows. Chapter 1 reflects on the theory behind what are considered the three main determinants of bank opacity: loans, trading assets and a high leverage; it then moves to the implications a relatively high level of bank opacity can have for overall financial stability, which resulted in regulatory efforts for improving the ability of market participants to discipline financial institutions; the chapter ends with a deep description of the methodological approaches taken in the literature to assess bank absolute and relative opacity. Chapter 2 builds on the reason for looking at insiders' trades when appraising the transparency of a company; informed trading theory is revised in perspective of the main object of the empirical analysis: disclosures of trades by corporate insiders, the regulatory steps of which are also illustrated. Chapter 3 opens with a detailed description of the dataset collected and its limitations, remarking the sample selection strategy employed; consequently, the methodology known as performance-evaluation is examined in depth, together with the advantages it brings to the bank opacity query; the results are then stated and compared to the ones obtained for the US by Spargoli and Upper (2018) and are displayed in the Tables at the end of the chapter. Appendix A and B complement the analysis with insights on the portfolios and the estimation code.

Chapter I

BANK OPACITY: THEORETICAL BACKGROUND

Preface

"…the vault, in other words, matters more than the cash it contains, presumably because cash can disappear but the vault is hard to move." - Donald P. Morgan (2002)

With this quote, Morgan (2002) alludes at why banks are particularly protected and regulated: if it were left to savers and investors who put their money in banks, an impenetrable vault would be enough to prevent them from monitoring where their money goes. But is the vault in realty so immovable to justify more rigorous rules for banks than for other firms? Surely, banks are the only firms with a vault: loans and trading assets are very hard to value from the outside of a bank and reduce the degree of transparency an institution is able to guarantee. Constituting the base of the traditional activity of intermediation, they are the reason why a bank might be inherently opaque.

This chapter is structured as follows. Section 1.1 explores the main sources and determinants of bank opacity and why it might be intrinsic to the banking business. Section 1.2 continues by examining the implications a high degree of bank opacity has for the regulator and for the financial system. Finally, Section 1.3 concludes with a review of the literature investigating absolute and relative opacity of banks, focusing on the measures advanced so far.

1.1.1 Sources of Bank Opacity

The risk exposure of banks is notoriously hard to judge for outsiders, and prior research argues that the process of intermediation renders banks intrinsically opaque types of firms (Spargoli and Upper, 2018). The information uncertainty about the riskiness of banks comes primarily from their financial assets and represents the key argument for regulating banking more than other sectors (Iannotta, 2006): it is the unique financial nature of bank assets that distinguishes them from other firms (Morgan, 2002). Since they hold much fewer physically fixed assets than non-banks, the potential for easier asset substitution - that is, willingly replacing higher quality assets, or projects, with lower quality ones thereafter a credit analysis - makes asset composition a determinant of fundamental uncertainty for bank investors in the first place.

As a practical matter, opacity results from the degree of asymmetric information between a firm's management and outside investors (Flannery et al., 2013). The veil between a firm's insiders and the market can arise when incomplete disclosure by the firms takes place, when the quality and credibility of the disclosed information is interpreted in contradictory ways or, more interestingly, when the investor knowledge remains imprecise even with full and credible information disclosure because of the built-in complexity of the business (Jones et al., 2012). In regard to the latter case, the following theory suggests why the opacity over banks is to some extent inherent, i.e. it reflects the mix of assets and capital structure that define banking. The theoretical literature of intermediation and agency theory in fact claims that greater uncertainty over banks may be inevitable and suggests two channels that could make commercial banks opaque (Hirtle, 2006): one information-related and one liquidity-related, both aggravated by the corporate governance issues bank leverage can bring.

1.1.1 Information Channel: Bank Loans

The reasons to ascribe to bank opaqueness an intrinsic quality stems from the main feature of credit relationship, asymmetric information between borrowers and lenders, and the banks' role in solving its issues (Hirtle, 2006). As the main intermediation activity of banks beholds loans, borrowers' informational advantage on one hand justifies prompted bank regulation, while on the other it justifies bank existence itself (Iannotta, 2006).

Agency theory identifies three types of potential asymmetric information between borrowers and lenders and respectively the ways to bridge them to improve efficiency. First, ex-ante uncertainty, related to assessing who is a good borrower, is solved by creditworthiness testing a priori to reduce adverse selection problems (Broecker, 1990); Second, ex-interim uncertainty, which concerns the moral hazard of the borrower not investing in good projects by spending sufficient effort to be successful, can be offset through monitoring during the realization of a project (Holmstrom and Tirole, 1997); Finally, ex-post uncertainty, involving a costly state verification of whether the project was actually successful, provides one of the primary motives for banks to exist since, delegated by investors, they can cheaply punish or audit a borrower who fails to meet contractual obligations (Diamond, 1984). Exploring frictions to liquidity and the role for banks in mitigating them, Diamond (1984) answers to the questions "why do investors first lend to banks who then lend to borrowers, instead of lending directly?". In this work's interest, Diamond's influential paper (1) shows how, by acting as delegated monitors, banks can achieve an optimal allocation of funds that markets cannot, improving efficiency, (2) models the risk transformation function of banks from providing risk-free investments to depositors to investing in risky assets like loans, this way (3) explaining the asset side of banks' balance sheet and why it is the main source of bank opaqueness, key argument for banking regulation. In a simplified version of the model (Kubitza, 2021), the following illustrates in depth and builds on such considerations.

Risk neutral investors are endowed with $1/m$ money units and have no direct access to investment projects: they can invest in a risk-free asset and receive r or lend to poor (no cash) risk neutral entrepreneurs who in turn pursue their investment projects. Entrepreneurs need 1 money unit investment from m investors for the project, which yields the stochastic project return $0 \leq \tilde{y} < \infty$ with $E[\tilde{y}] > r$ and thus is efficient to be undertaken. With direct lending, realization of the project can only be observed by the entrepreneur, who consumes actual return $\tilde{y}$ minus the repayment and thus has incentive to understate returns and embezzle the difference. As the entrepreneur cannot promise credible commitment, investors anticipate such behavior and are not willing to provide funding. This is socially inefficient as a positive NPV project is not taken and privately inefficient for entrepreneurs: there is incentive to reach an agreement.

One possible solution involves an incentive compatible contract with non-monetary punishments as a self-commitment device. The contract would specify: the desired face value repayment $h > 0$; the actual repayment z with $E[z(y)] \geq r$ chosen by entrepreneur after privately observing return y; the non-monetary penalty $\varphi(z)$, for instance the time spent in bankruptcy

proceeding or loss of reputation etc., which is $\varphi(z) = 0$ if entrepreneur repays $z(y) = h$ or $\varphi(z) > 0$ if entrepreneur repays $z < h$. In this way, the entrepreneur is penalized if actual repayment is less than the desired repayment. The optimal penalty φ^* to be enforced equals the desired repayment that is in excess of the actual repayment: $\varphi^*(z) = \varphi^*\big(z(y)\big) = max[h - z(y), 0]$. Consequently, the entrepreneur chooses to pay back z^* by maximizing her expected utility conditional on suffering penalty φ^* after repayment: $z^* = \max_{z\in[0,y]} y - z - \varphi^*(z(y))$. If the entrepreneur chooses to understate such that $z < min\{y, h\}$, her utility would be $y - z - (h - z) = y - h$ and thus has no incentive to understate the actual return. The optimal penalty however must be paid also if the actual return is low ($y = z < h$) otherwise the contract is not credible, while the expected repayment has to be greater $E[z(y)] \geq r$ than the outside option to respect the participation constraint of investors, or they will not be willing to invest. This implies that in the optimal incentive compatible repayment contract the entrepreneur either pays h or the actual project return, if it is below h: $z^*(y) = min[h, y]$, meaning that punishment inconveniently happens even when telling the truth and causes investors to not benefit from punishing the entrepreneur, who also bears a cost, resulting in a welfare loss compared to first-best equal to $\mathrm{E}\big[\varphi^*\big(z(y)\big)\big]$.

A better solution is represented by monitoring to verify returns, which however is costly and costs k. When it is possible to verify states of the project, informed investors will have incentive to collude with entrepreneurs and share excess returns with them. Thus, each single investor has to monitor, resulting in an aggregate monitoring cost of mk which represents a welfare loss as it does not benefit the entrepreneurs. Is monitoring better than penalty $mk \leq E\big[\varphi^*\big(z(y)\big)\big]$? From such inequality, monitoring is superior the less investors are needed to fund a project with probably low returns. A bank can do better than the market solution.

With financial intermediation, investors delegate monitoring to a bank, that invests in entrepreneurs on behalf of depositors, receiving deposit contracts that specify expected repayment R per project. As investors cannot freely observe the monitoring activity of bank, a new principal agent problem arises, the one directly related to bank opacity: who monitors the monitor? If investors have to monitor the bank at k per depositor, there is no efficiency improvement as the total monitoring cost per project becomes $(m + 1)k$. The same if bank writes incentive compatible contract with penalties for all entrepreneurs resulting still in unchanged mk total cost. Then, Diamond's intuition instead sees investors sign a contract that delegates monitoring but has

penalties for the bank: thanks to diversification of loans as measure of risk reduction the "monitoring the monitor" issue is addressed, and efficiency improved. The bank in fact can invest in many N entrepreneurs, paying Nk total monitoring cost. It collects $m \cdot n$ funds from depositors promising repayment R and will be subject to penalty if not respected. In such environment, the welfare loss is only increasing in the likelihood of low returns, i.e. the larger $P(bank\ returns < R \cdot N \cdot m)$. Through a diversification effect, with many uncorrelated investments, the return of the bank approaches $E[\tilde{y}]$ due to the law of big numbers. If $R < E[\tilde{y}]$, the bank is able to repay deposits, with certainty when there are infinitely many entrepreneurs, implying no needed penalties for the bank. In the market direct investment case, the welfare cost with N entrepreneurs would be $min\{Nmk, NE[\varphi^*(z(y))]\}$. Defining D the required penalty for the bank as a function of its solvency probability, financial intermediation improves welfare if $Nk + D < min\{Nmk, NE[\varphi^*(z(y))]\}$, but, the bigger the bank the more the diversification and as $N \to \infty$ the probability of solvency tends to 1 and $D \to 0$. In such case, it follows that a perfectly diversified financial intermediary with $N \to \infty$ increases welfare if $k < min\{mk, E[\varphi^*(z(y))]\}$ or, since $m > 1$, if $k < E[\varphi^*(z(y))]$ which is satisfied either with low costs of control k (LHS) or a high probability of low project repayment before diversification $E[\varphi^*(z(y))]$ (RHS).

Diamond's study explains the role of banks as they optimally allocate funds: turning household endowment into loans through risk and lot size transformation. A large, diversified, financial intermediary may enhance social welfare, as it is less risky than a single loan. However, in reality banks are far from perfectly diversified (Craig et al. 2019), giving depositors reason to question their behavior and fear systemic risk or excessive risk taking. In addition, cost k of monitoring can be lower for banks as they benefit from economies of scale in the loan portfolio, but it ultimately depends on the borrower's conduct, observability and transparency. Indeed, at least part of their core lending activity involves intermediation to potentially more opaque borrowers, like smaller firms or entities unable to access the debt market (Hirtle, 2006). Delegating to banks the extra monitoring such information-intensive debtors require is of course efficient, but lending to opaque borrowers might cause opaque banks. In general, the monitors themselves, banks, can become less than fully transparent, as their role in solving asymmetric information issues might mean that they hold informationally opaque assets that are difficult for outsiders to assess. To this extent, opacity is embedded in the banking industry. In fact, loans are transactions that are privately negotiated between a bank and a borrower, customized or even granted on soft

data: limited public information on loans is available as banks possess exclusive data about the features of the loan contracts and the creditworthiness of the respective borrowers that investors do not have (Flannery et al., 2004). As Table 1 shows, bank asset composition is dominated by loans which thus represent the primary source of opacity for most banks. Understanding the value of loans is vital to any assessment of the resilience of the banking system (Knott et al., 2014).

	Total	Loans to euro area residents				Holdings of debt securities issued by euro area residents				Money market fund (MMF) shares [1]	Equity and non-MMF investment fund shares [1]	External assets	Fixed assets	Remaining assets
		Total	General government	Other euro area residents	MFIs	Total	General government	Other euro area residents	MFIs					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Eurosystem (total)	12,028.6	5,194.5	10.2	5.4	5,178.8	4,691.9	3,766.3	399.8	525.7	0.3	56.6	1,387.1	8.2	690.1
BE	352.1	90.2	0.0	0.2	90.0	209.2	120.2	81.2	7.8	0.0	0.3	36.2	0.4	15.8
DE	2,816.2	1,530.2	4.4	1.7	1,524.0	1,015.5	739.4	79.5	196.6	0.0	2.3	250.4	1.0	16.9
EE	16.7	3.4	0.0	0.1	3.2	1.5	0.7	0.7	0.2	0.0	0.1	10.6	0.0	1.1
IE	195.6	101.9	0.0	0.0	101.9	73.9	69.8	0.0	4.0	0.0	0.2	16.9	0.5	2.2
GR	227.5	53.9	5.4	0.4	48.2	84.8	81.7	0.0	3.1	0.0	0.5	71.0	0.6	16.7
ES	1,156.1	298.5	0.0	0.2	298.3	506.7	438.1	43.6	25.0	0.0	1.2	185.5	0.3	163.9
FR	2,002.5	576.2	0.0	0.2	576.0	971.5	780.0	110.8	80.7	0.3	20.1	338.8	1.3	94.3
IT	1,557.4	458.8	0.0	1.2	457.6	816.9	748.7	31.8	36.5	0.0	18.7	198.0	1.9	63.1
CY	30.5	17.8	0.0	0.0	17.8	6.4	6.3	0.0	0.1	0.0	0.0	4.2	0.0	2.0
LV	25.3	1.5	0.0	0.0	1.5	5.7	5.1	0.4	0.1	0.0	0.5	12.0	0.0	5.6
LT	32.9	13.0	0.0	0.4	12.6	12.7	12.7	0.0	0.0	0.0	0.4	5.2	0.0	1.5
LU	360.9	332.7	0.0	0.0	332.7	11.6	7.4	0.1	4.2	0.0	0.2	15.9	0.1	0.4
MT	11.1	6.9	0.0	0.0	6.9	2.0	1.8	0.0	0.2	0.0	0.1	1.8	0.0	0.3
NL	510.5	175.2	0.0	0.0	175.2	194.0	149.6	0.1	44.4	0.0	0.9	57.8	0.2	82.5
AT	273.7	86.9	0.4	0.0	86.5	111.5	99.2	0.5	11.9	0.0	10.3	29.7	0.1	35.1
PT	220.2	42.4	.	0.2	42.3	94.0	90.6	0.0	3.4	.	0.2	30.0	0.1	53.4
SI	33.6	11.8	0.0	0.0	11.8	16.3	14.8	0.3	1.3	0.0	0.1	5.0	0.1	0.4
SK	67.6	17.0	0.0	0.0	17.0	21.6	18.6	0.1	2.9	0.0	0.1	28.4	0.1	0.4
FI	216.1	104.5	0.0	0.0	104.5	88.1	53.9	20.0	14.1	0.0	0.3	14.4	0.1	8.8
ECB	1,922.0	1,271.6	0.0	0.8	1,270.9	448.0	327.8	30.9	89.2	0.0	0.0	75.6	1.2	125.6

Table 1: Breakdown of Eurosystem aggregated balance sheet; EUR billions; not seasonally adjusted; outstanding amounts at end of period, October 2021. Source: ECB.

1.1.2 Liquidity Channel: Trading Assets

Even financial assets more liquid than loans, like trading assets, might be a cause of opacity and uncertainty for bank outsiders. Unlike loans, trading assets such as cash, securities, saleable loans, off-balance sheet contracts and derivatives are fundamentally transparent, as for their ready valuation, which makes them highly liquid (Hirtle, 2006). But, the rapidity with which they can be traded and changed makes it relatively easy for banks to modify the composition of the balance sheet and to shift risk exposures over short time horizons, i.e. risk transformation. Liquidity enables trading but makes positions “slippery” and hard to monitor from the outside (Morgan, 2002). Although in non-financial corporations holdings of very liquid assets are generally perceived positively and easier to finance, offering greater value in short-notice sales, they can instead be seen as unfavorable for financial institutions in what Myers and Rajan (1998) call the "paradox of

liquidity": in banks, increased liquidity helps raising short-term cash promptly, but it also reduces the management's ability to commit credibly to a given asset portfolio and investment strategy that matches investors' risk profile over time.

As investing in a wide range of liquid assets and derivative positions, together with proprietary trading and market-making, represents for banks part of the core activities, the resulting elevated potential for asset and risk structure shifting at high frequencies implies that any periodic financial report and disclosure might reflect obsolete information for investors trying to keep track of the bank's condition (Flannery et al., 2013). Given that liquid positions are hard to effectively monitor, managers have opportunities to depart value-maximizing plans. However, Myers and Rajan (1998) explain that particularly liquid holdings allow banks to be what they are: they show that a firm (bank) which has liquid core assets to begin with should look to obtain external finance (deposits) for less liquid projects (loans) and thus banks, having a relatively liquid core business are best suited to assume the role of intermediaries. Through their linear programming model[1], they show that the debt capacity of a firm with a specific asset structure (more or less liquid) when undertaking a new illiquid project is as in Figure 1. If undertaken separately, such project has high cash flow but low liquidation value: it is subject to little transformation risk but has limited and illiquid collateral in case of liquidation need, i.e., it is assumable to a loan.

The asset transformation risk potential of the firm makes debt capacity to be non-monotonic in the intrinsic liquidity of firm's assets: α. The index of liquidity α, with $0 < \alpha < 1$ and the liquidity of cash $= 1$, stands for the different asset structure of firms and differentiates debt capacity among $illiquid$, $liquid$ and $overly\ liquid$ firm, being the slope of the participation and incentive constraints of such three types of firms in undertaking the project (Figure 1). The focus is on $overly\ liquid$ firms, as excessive liquidity threatens risk shifting and transformation, with α negatively affecting debt capacity. In the situation when a $overly\ liquid$ firm undertakes the project, (1) the project can offer cash flows but little liquidation value to promise repayment while (2) the firm instead has excess liquidation to offer but too little stable cash flow to commit not to transform the assets. If such firm goes ahead with the project, then, its cash flows insure the investors of the firm against transformation risk while the firm's potential liquidation value enables the investors to credibly hope for repayment. The combination of a $overly\ liquid$ firm with an illiquid project increases and moves debt capacity back up the constraint in Figure 1. Therefore, being inherently $overly\ liquid$, banks can ensure themselves higher debt capacity by taking on

[1] Due to space reason, it is reported here only Section II (E); p. 744.

illiquid loans that are cash flow-rich but asset-poor. In fact, a financial institution can arrange long-term financing more easily if it invests in illiquid businesses, as its creditors (depositors) are given more time to assess its risks. Illiquidity on one hand reduces the seize value but on the other it increases the likelihood the assets will "be there". Firms with relatively liquid core business are therefore suited to channel financing to other firms in the economy.

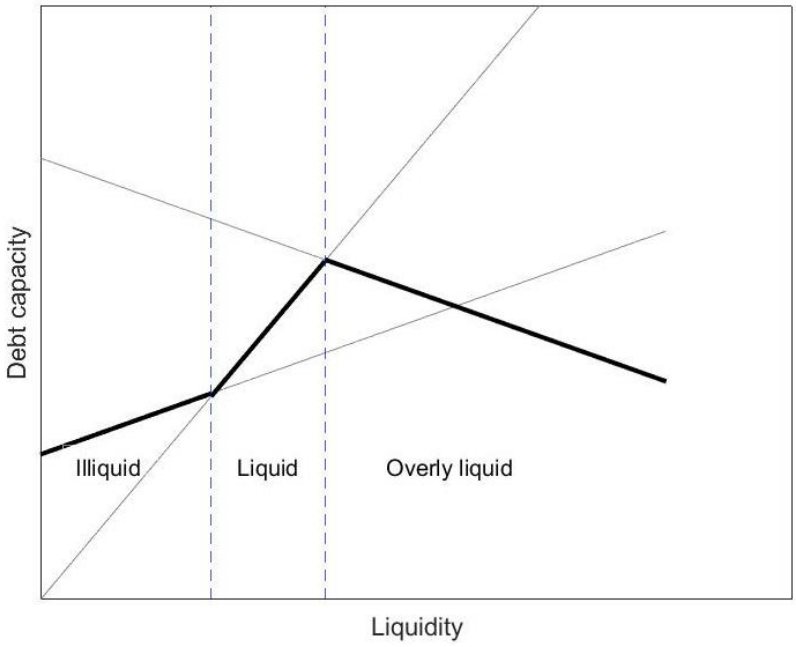

Figure 1: Debt Capacity with Transformation Risk. Source: author's elaboration from Myers and Rajan (1998).

Myers and Rajan (1995), argue that such incentive structure is consistent with the origins of the rise of banks and them historically holding a mix of illiquid loans and liquid securities. Banks started as payment services providers and were thus forced to hold liquid assets to meet cash demands as depositors required both safe storage and the ability to withdraw. With liquid assets only however, their debt capacity - and thus customers - was limited by transformation risk, which later made them move to illiquid, opaque, lending. Figure 2 shows the latest loan-to-deposit ratio of banks in European countries, which measures the funding strategy of a bank and the pace at which it moves from liquid holdings to illiquid claims.

The opacity associated to the potential transformation of liquid assets is thus an intrinsic characteristic that qualifies banks to conveniently be intermediaries. The interaction

between liquid and illiquid assets explored by Myers and Rajan (1995) prompts an interesting aspect on the type of opacity carried by loans analyzed in the previous section.

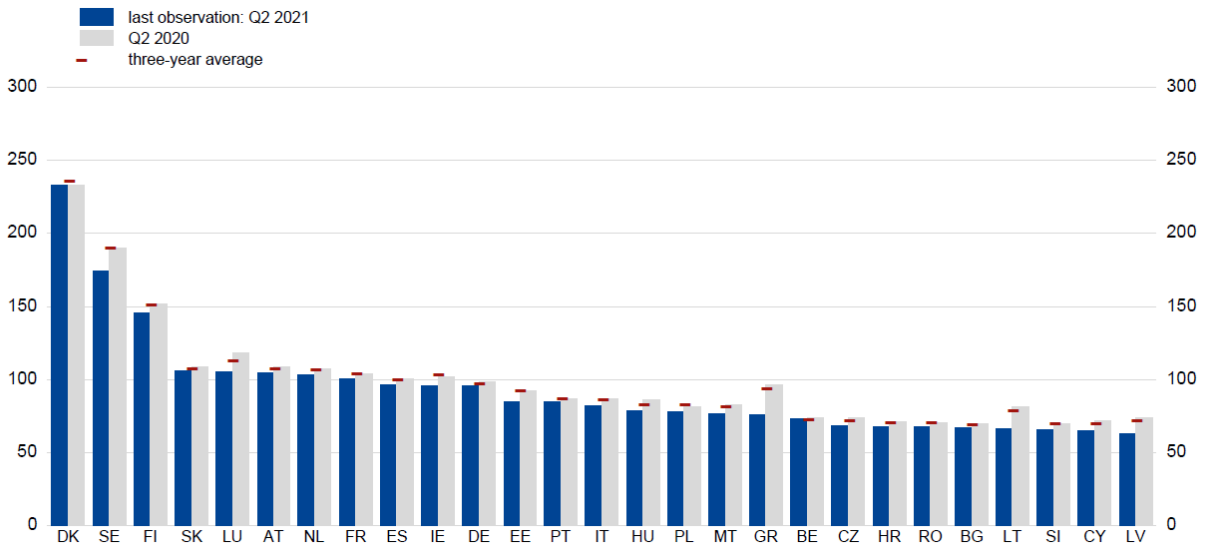

Figure 2: Loan-to-deposit ratio for EU countries; percentages; Q2 2021. Source: ECB.

As Wagner (2007) points out, the opacity associated to the illiquidity of loans can be seen as beneficial for banks, since it reduces the managers' ability to trade liquid assets against the interest of shareholders providing insurance against transformation risk.

1.1.3 Corporate Governance: Bank Leverage

The uncertainty that surrounds bank assets is exacerbated by the high leverage characterizing financial institutions (Morgan, 2002). Apart from the typical operational risks that leverage gives rise to, it also implies significant agency problems. The choice of capital structure, and thus of the level of leverage, in fact affects two types of agency costs: one associated to outside debt, involving shareholders and creditors, and one regarding outside equity, thus between shareholders and managers.

Corporate governance theory (Jensen and Meckling, 1976), predicts that higher leverage incentivizes shareholders towards activities that accommodate the residual nature of their stake strategies, undertaking more risk than creditors subscribed for. Jensen and Meckling (1976) consider a simple example. In a firm with a financial structure presenting creditors for an amount

of €100,000,000 and an entrepreneur's investment of €10,000, the owner-manager has visible reasons to pursue strategies implying very high payoffs even with very low probability of success: in positive outcomes he will obtain most of the profit, otherwise the creditors will bear most of the costs. Shareholders can lead to conflict with the debtholders' expected return through asset substitution and risk shifting, for instance deploying riskier trading strategies and loan underwritings. With an increasing level of leverage, potential for risk shifting and reduced effort in risk-management will cause higher expected costs of financial distress and liquidation to fall on creditors as bankruptcy becomes more likely (Berger and di Patti, 2002). Uncertainty around shareholders' behavior inevitably influences the institution's degree of transparency. In this regard, capital has a role for risk mitigation, and its level represents a signal for where on the risk-return spectrum the owners locate their firm. Generally, high capital levels might hint at more conservative plans and better asset quality (Morgan, 2002). This is why bank regulators aim at offsetting banks' agency problems and opaqueness through interventions on the capital structure in terms of minimum equity capital requirements and regulatory capital, together with measures minimizing the social welfare and creditors' expenses surrounding firm failure (Iannotta, 2006).

Agency risks can though not only concern the owners-creditor axis, but also stem conflicts between the ones in charge of operations and their principals, respectively, managers and shareholders. The separation of ownership and control with outside equity might cause misalignments in managerial behavior like inadequate work effort, privileged benefits, personally preferred decisions on supplies and products or, in general, failing to maximize the firm's resources. Hentschel and Smith (1996), suggest that such risks of managers transforming assets to expropriate wealth from outside investors are due to the managers facing asymmetric incentives with respect to their owners: the upside is the same, through bonuses and promotions, but the downside liability is limited for the managers only. Interestingly, although agency costs between owners and creditors are augmented by increased leverage, outside equity costs might instead be mitigated by it (Berger and di Patti, 2002). Bank owners can in fact use a leveraged capital structure, or a low equity/asset ratio, to discipline managers: pressure to generate enough cash flow to meet interest expenses, together with liquidation threatening losses of salaries, reputation and benefits, are useful in constraining them to follow the shareholders' interests. However, Wagner (2007) argues that in such situation of a sharply leveraged bank, managers have grounds to tilt portfolios towards less profitable opaque assets to make debt more expensive for owners and force them to adopt a softer capital structure. In Wagner's opinion, the issue is worsened by an

unwelcome effect of financial development, which on one hand has reduced opacity associated to bank loans but on the other it has pushed managers into opaque and inefficient assets in order to escape discipline. In fact, loans' valuation has improved along more information availability, credit risk has become less inaccurate thanks to instruments such as credit derivatives, and structured products like collateralized loan obligations have made it possible to trade portions of the loan portfolio while also increasing the frequency with which external entities and investors need to evaluate and supervise banks. Even so, banks have simultaneously shifted to more opaque, illiquid, positions: engagement in off-balance-sheet activities, derivatives and long-term loans showed rapid growth (Rajan, 2005). The increase in opaque activities is due to bank managers valuing and considering opaque type of assets as a tool to oppose capital structure discipline enforced by shareholders through leverage. The fact that financial development has rendered some of the traditional assets more transparent and liquid has given bank managers incentives to practice asset substitution in favor of anyway still opaque holdings once ignored because unprofitable. Wagner's (2007) model sees a banker (bank manager), her investors ad three dates. At date 1 the banker raises funds. She then can choose to undertake projects that are either transparent or opaque. Both types have a fine number of projects that require same amount upfront and singularly have probability $q(0 < q < 1)$ to deliver a high return at date 3. Project i has q probability of success, for instance $q_i^t < q_{i+1}^t < q_{i+2}^t$, where $t = T, O$ stands for transparent or opaque project: when a project is transparent the investors can perfectly forecast its payoff at date 3 (in other words, they know probability of success q_i^t). At date 3 the manager can obtain X^H from the matured project with probability q_i^t and X^L with probability $(1 - q_i^t)$, where $(s = H, L)$ indicate respectively high and low state. However, since only the manager owns the expertise to extract value from the project, the investors only get βX^S, where $0 < \beta < 1$ represents how much of the full value of the project the manager decides to extract: this is how Wagner (2007) captures the agency costs between owners and managers for potential asset substitution or inappropriate effort. It follows that the banker can threaten not to use her know-how at date 3.

If the bank is fully financed by capital, the banker can exploit her exclusive ability and exert bargain to promise only βX^S to shareholders. This way, as investors need to break even they will only fund what they can expect, $\beta E[X]$ (where $E[X] = q_i^t \cdot X^H + (1 - q_i^t) \cdot X^L$), which is smaller than the present value of the project itself $E[X]$. With only equity, the banker thus would rise less funds. Such problem is solved by issuing deposits: the banker is forced to fully repay depositors when the project allows it, as any action to disappoint depositors would result in a bank run.

The investors thus constraint managers by choosing the level of depositors D (= leverage) after they observe at date 2 whether the banker has implemented the transparent or the opaque project. When the project chosen in transparent, the investors are certain about its outcome at date 3, which they can fully extract by placing deposits equal to it, $D = \{X^H, X^L\}$ depending on the signaled state, leaving nothing to the banker.

When, however, the project is opaque, investors only know q_i^t and thus face two possibilities. (1) They enforce a safe capital structure where $D = X^L$. In the low state the project return is completely extracted, while in the high state the banker obtains $(1-\beta)X^H$ and the investors obtain βX^H: the expected payoff is $q_i^t \cdot \beta X^H + (1-q_i^t) \cdot X^L$ for the investors and $q_i^t \cdot (1-\beta)X^H$ for the manager. (2) They enforce a risky capital structure where $D = X^H$. In the high state the return is fully extracted, but in the low state the depositors cannot get fully repaid and force the banker to liquidate the project for βX^L and obtain no rent: the expected payoff for the investors is $q_i^t \cdot X^H + (1-q_i^t) \cdot \beta X^L$ and nothing for the manager. By comparing their expected payoffs then investors will choose a safe capital structure if: $q_i^t \cdot X^H < (1-q_i^t) \cdot X^L$.

A safe capital structure is what the manager wants when choosing either transparent or opaque projects, as she would get nothing with transparent projects or a risky capital structure: She chooses opaque projects with q_i^O that cause a safe capital structure. By inserting q_i^{tO} in the above inequality, it results that a safe capital structure implies an upper limit on the probability of the opaque project to be successful $q_i^O < X^L/(X^H - X^L)$. In turn, among such projects, the banker prefers the most profitable ones approaching such limit, as they allow her to extract at least some rent, choosing thus a project $i^* = \max_i q_i^{tO} \ \ s.t.$ the safe capital structure constraint.

Finally, whenever financial development makes i^* transparent, the banker faces zero rent as the outcome of the project is anticipated by the investors and she will thus gradually shift towards a marginally opaquer i^*, choosing in the remaining interval of opaque, and decreasingly likely profitable, assets. Wagner (2007) thus shows how bank managers can circumvent shareholders' leverage constraints by shifting towards more opaque holdings.

In reality, high leverage is a crucial feature of banks, to the point that *"put simply, banking is all about leverage"*[2]. Figure 3 displays the EU banking sector's leverage as of equity-to-assets ratio, a metric useful to assess the institution's exposure to the risk of excessive leverage, capturing

[2] Keynote address by Mr. S. Ingves, Chairman of the Basel Committee on Banking Supervision. BCBS speech, 2014.

the current diversified situation across states[3]. Leverage though carries disciplining mechanisms with consequences that bolster outsiders' doubts on the actions of the managers being in line with the interest of shareholders. According to what observed by Myers and Rajan (1995) and seen in Section 1.1.2, Wagner therefore suggests the existence of a potential cost, this time in form of agency cost, of a reduced opacity, hinting at a relentlessly inherent opaqueness in financial intermediaries.

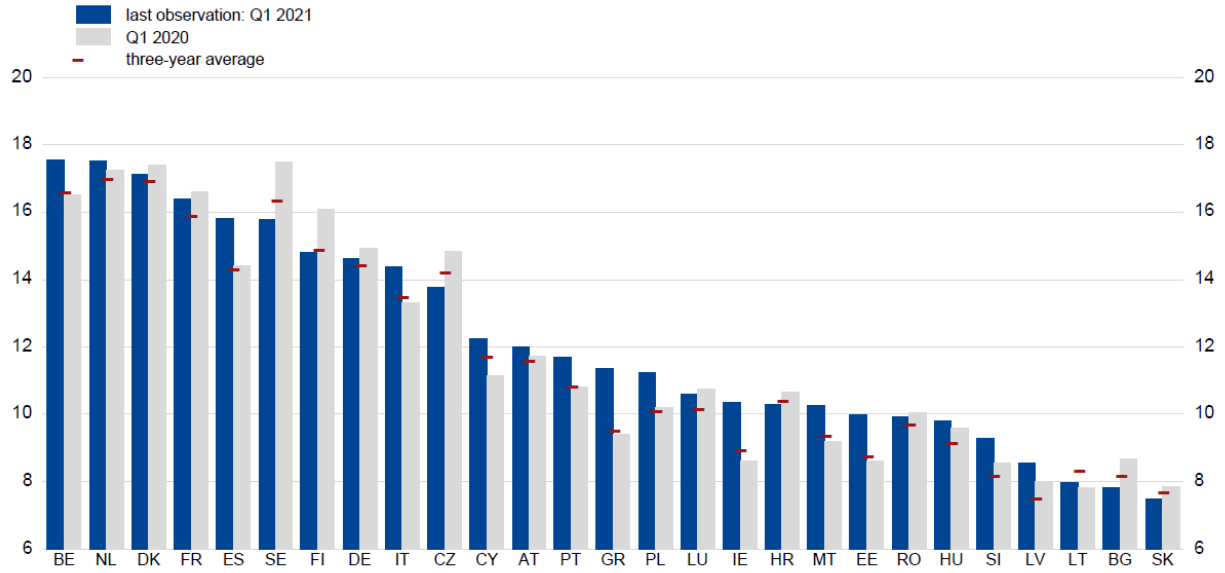

Figure 3: Banking sector leverage, EU; share of total assets in capital; Q1 2021. Source: ECB

1.1.2 Implications of Bank Opacity

The nature of bank assets and corporate governance structure suggests opacity is an intrinsic feature of financial intermediaries, as banks' business model is inherently affected by information asymmetries and agency costs central to their existence. Opacity though makes it difficult for market participants not only to assess but also to discipline banks' risk behavior, bringing negative consequences for overall financial market stability (Morgan, 2002) that draw regulatory intervention. In fact, opacity makes banks' balance sheet structure fundamentally instable, threatening systemic risk: as banks finance relatively illiquid and rather opaque loans by issuing

[3] Certain central bank exposures are excluded from the leverage ratio, as exceptional macroeconomic circumstances due to the coronavirus (COVID-19) pandemic continue. The move extends until March 2022 the leverage ratio relief granted in September 2020, which was set to expire on 27 June 2021. ECB press release, 18 June 2021.

liquid demand deposits, depositors' lack of information about bank assets can bring delegated monitoring to be unsuccessful, triggering bank runs that can culminate in systemic failure (Iannotta, 2006). Government's deposit insurance addresses such issue, avoiding bank runs, but at the same time it induces banks into additional risk taking. As their incentives and ability to "monitor the monitor" decrease due to the presence of informationally opaque and shiftable assets, depositors require protection. Therefore, investors need a representative acting as monitor of banks: the regulator (Iannotta, 2006), who also looks to avert accumulation of systemic risk.

In the following, it is illustrated how opacity on the risks taken in the intermediation process represent motive for regulatory intervention and how regulators have acted so far.

1.1.3 Informativeness: Efficiency of Bank Stock Prices

Theory of efficient markets predicts that asset prices reflect all available information (Fama, 1970). It is thus reasonable to hypothesize that relatively opaque information about the risks of an asset will result in less efficient stock prices. As bank opacity alters the ability of outsiders to value them accurately, stock prices will be affected by informational inefficiencies. If opacity produces informational uncertainty, then bank stocks probably have an hard time incorporating market-wide information.

Blau et al. (2016) test such hypothesis, investigating whether opacity surrounding banks' operations brings to inefficient information production through price delay. Price delay is considered to be a measure of informational inefficiency as it can spot stocks that have difficulty in interpreting and integrating information into their prices: it calculates the lag between a stock weekly return with respect to the market's. The study by Blau et al. (2016) looks for evidence that, since investors are precluded a precise assessment of their true value, bank stocks are less efficient than non-bank stocks. They therefore compare the price delay of bank stocks to the price delay of the matched (with similar market capitalization and share price) non-bank stock, finding indeed notably, in the range of 5.6% to 8.2%, higher price delay for bank stocks. The result is particularly sound, as it is further tested for actually being driven by opacity. In fact, after controlling for other factors that might influence inefficiency, bank stocks showing higher price delay are the ones with higher bid-ask spreads and lower trading volumes, which are measures typically correlated to the degree of asymmetric information and thus opaqueness. Price delay is therefore accentuated for supposedly more opaque banks, among a sample from 1996 to 2008: a period preceding the great

financial crisis and the banking regulation milestones in attempting to reduce bank opacity (see Section 1.2.3). Further evidence relates opacity to possible stock mispricing as the authors find a significant increase in banks' stock price delay associated to higher loan-to-asset ratio, consistent with the idea that loans represent one of the main sources of informational uncertainty for investors.

Blau et al. (2016) thus find bank stocks to be less informationally efficient, with inefficiencies to some extent related to the level of opacity: opaqueness steps into the flow of value-related information towards stock prices. Outsiders' uncertainty on the riskiness of a bank translating into inefficient market prices has an important implication: a proper functioning of market discipline forces is consequently inhibited. In fact, effective market discipline requires investors to punctually absorb in stock (and bond) prices all the complete information they possess about a bank's risk profile (Lane, 1993), but opaqueness hampers market participants' ability to prevent and punish excessive risk taking (Blau et al., 2016). As markets are not effective in constraining the actions of bank managers, increased opacity creates conditions that potentially lead to systemic risk, exposing the entire banking system to financial instability (Jones et. Al, 2012).

1.1.3 Systemic Risk

With no government's deposit insurance, or lender of last resort, the banking industry would be vulnerable to banks runs because its opaque nature prevents depositors from evaluating which banks are healthy and which are not (Jones et al., 2012). A credible deposit insurance can deflect bank runs, but favors moral hazard and unnecessary risk taking, which justifies further regulatory interventions on bank's capital to preserve banks' essential role of credit suppliers and avoid bank failures disrupting credit flows to the economy (Flannery, 1998). However, Jones et al. (2012) argue that since opaqueness impairs investors' evaluations, opacity has to be expressly supervised despite deposit insurance and capital requirements as it threatens financial stability. By weakening the effectiveness of market discipline on banks, opacity contributes to systemic risk for a variety of reasons (Jones et al., 2013).

First, it fosters bubbles. Even the most sophisticated investors deal with the uncertainty produced by opacity, when estimating the fundamental value of firm. The presence of only limited informed trading allows for more noise traders, whose heterogeneous perceptions of risk enhance price uncertainty. This requires sophisticated investors to bear greater risk while price deviates

from fundamentals and, assuming they are risk-averse, the possibility of short-term losses discourages them from betting against noise traders, leaving space for speculative bubbles to grow. When bubbles eventually deflate, financial instability looms large since a sudden sharp decline in equity price is a special issue for banks as it constraints their capital-raising potential discouraging the provision of new capital and consequently reduces their ability to lend. This mechanism can thus translate financial distress into an economic crisis if the supply of credit is hit. Increased likelihood of crisis is a reason for policies aiming at explicitly reducing the level of bank opacity such as improved disclosure and objective limits on asset complexity.

Second, opacity creates feedback effects, through intra-industry price contagion. Opacity in fact pushes even informed investors to rely on bank-specific information to affect valuations of other banks: price contagion takes place when investors cannot discern bank-specific events from systematic ones, propagating information from one stock to the other without valid reason. Markets use idiosyncratic data about one bank to update the valuation of other opaque but apparently alike banks. Jones et al. (2012) study in depth how opaqueness can originate price contagion in the banking industry by examining the price reactions associated to US bank merger announcements in the 2000-2007 span, which carry bank-specific information on bank value, as the bidder specifies a premium for a determined target. They find that banks not involved in the merger having larger investments in opaque assets show higher, positive, cumulative abnormal returns after the announcement. In other words, among the banks not connected to the merger operations, the banks that benefitted the most of a price revaluation are the opaquer ones (in terms of asset composition): price contagion is a characteristic of the price discovery process in the opaque banking industry. The response to such revaluations resulted into a feedback effect: as the relatively opaquer banks experienced stronger price increases, their untransparent strategies were imitated by managers of the less opaque banks by means of greater investments in opaque assets, causing an increasing intra-industry level of opaqueness. In a successive study, Jones et al. (2013) find an alternative explanation for opacity stirring a feedback effect. They argue that since opaque assets require investors to apply a higher valuation discount due to their risk-return trade off, when in successful outcomes such discount is insufficient to offset a higher marginal risk banks are recompensated with higher stock prices for having invested in opaque assets and are thus incentivized to expand their opaque holdings. The lack of transparency limits the ability of the market to assess the true, bank-specific, risks of bank's opaque investments and correctly price them (see previous Section 1.1.2) thus can result in darkened overinvestment. Therefore, as opacity invites more opacity, the

fact that investors cannot distinguish and discriminate across banks and confuse bank-specific information with economic-wide events is translated into price synchronicity and accumulation of systemic risk. Like Figure 4 and Figure5 show, the two are fundamentally related and follow each other.

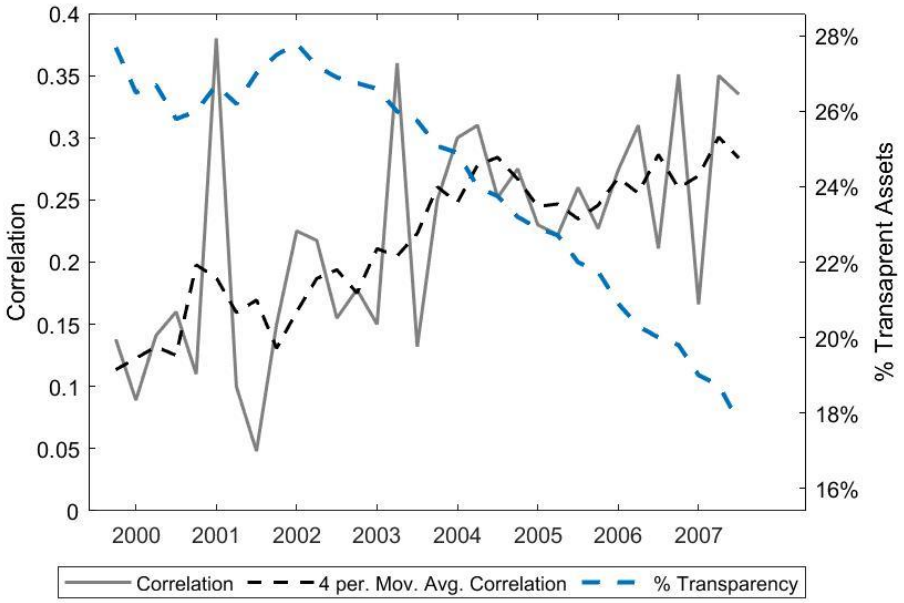

Figure 4: Correlation of bank equity returns - price synchronicity - and transparency. Source: author's elaboration from Jones et. al (2013).

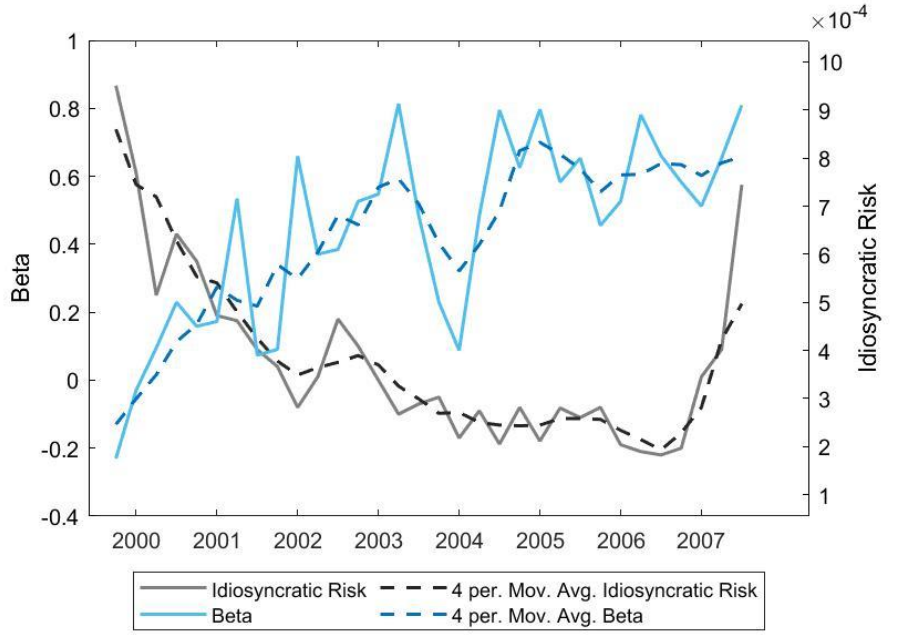

Figure 5: Systemic and idiosyncratic risk. Source: author's elaboration from Jones et. al (2013).

Progressive sequential larger investments in opaque assets in the industry as a whole remove reliable bank-specific information, boosting price contagion that culminates in price synchronicity and drags with it a concentration of systemic risk in the financial system. In time of crisis, opacity and its consequences are exacerbated. For example, Flannery et al. (2010) document higher adverse selection trading costs of bank stocks, like wider bid-ask spreads reflecting uncertainty, relative to those of nonbank firms during the rise of 2007 financial crisis, while many other observers have linked the financial panic of 2008 to bank opacity[4]. When markets cease to function properly, the doubts around the primary sources of bank opacity are aggravated. The unknown credit risk linked to loans can tilt as bank investors and counterparties cannot judge bank solvency, and the concerns on the interchangeability of trading assets can mutate into illiquidity fear. In fact, mark-to-market accounting practices are made impossible with dried-up markets and determining the intrinsic value of securities cannot rely on observed market prices (Jones et al., 2012). In this environment, conservative estimates of market value might be inevitable, threatening erosion of bank capital through forced accounting losses. Furthermore, because the industry tends to converge towards a higher density of opaque assets, the repercussions are systemically magnified as the crisis eventually materializes, as noted by Jones et al. (2012): the relatively opaquer banks that received higher price revaluations in the years preceding the 2007 crisis also suffered the largest stock price decline at inception of bad news, with the negative side effects on capital distress and lending capacity.

Opacity thus both creates the conditions inciting financial instability and exacerbates the cycle of the resulting downturn. The intensified likelihood of systemic market failures and crisis as banks are exposed to systematic shocks provides support for complementing individual-bank regulatory efforts with system-wide supervision.

1.1.4 Banking Regulation

Some degree of uncertainty appears to be inherent to the banking business and market participants alone cannot ensure financial stability, providing a rationale for regulating banks more than firms in any other sector. Given that the risk behavior of banks is hard to assess for capital markets

[44] Gorton (2008, p.1): "The ongoing Panic is due to a loss of information". Dudley (2009, p. 6): "The difficulty in valuing opaque and heterogeneous securities has led to greater illiquidity, price volatility and market risk, bigger haircuts, and more forced deleveraging". Lewis (2008, p.344): "Their (Wall Street firms) complexity renders them in inherently opaque. Investors…will demand to be paid for opacity".

participants, especially in times of crisis, supervisory authorities have attempted to generate more transparency on banking activity and avoid the growth of systemic risk, defined according to the EU regulation 1093/2010 of the European Parliament as "a risk of disruption in the financial system with the potential to have serious negative consequences for the internal market and the real economy". Although the work of the Basel Committee on Bank Supervision (BCBS) in Basel Accords I, II and III has mainly concerned capital requirements and thus aimed at preventing banks from excessive risk taking rather than enhance transparency, some specific provisions are particularly relevant to monitor bank behavior or expressly built to contrast opacity, respectively, stress-tests and extended disclosure requirements of Basel Pillar 3. In fact, as Iannotta (2006) explains, traditional supervisory methods like minimum capital requirements in percentage of risk weighted assets need to be supplemented with informative measures to ensure an effective banking prudential supervision.

Supervisory Capital Assessment Programs (SCAP), known as stress tests, are a supervisory tool consisting in analysis of hypothetical forward-looking scenarios to determine if a bank has enough capital to resist unexpected shocks. They are designed primarily to ensure adequate capital levels and prevent defaults but can potentially have an informative power and usefully produce information for outsiders (Morgan et al., 2010). In fact, the results of the stress tests are released to the public. Morgan et al. (2010) examine the stock price reactions to the announcements of stress test results on the nineteen largest U.S. bank holding companies in 2008, concluding that the attempt to produce information about banks was in part successful as investors already knew which banks had sufficient capital, but ignored the scale of capital inadequacy of the turned-to-be undercapitalized banks. Such findings suggest an intermediate degree of opacity for the analyzed banks at that time, at least in terms of capital requirements. Anyway, stress-tests are instruments seemingly able to reduce opacity and may help suppress the panic, as the banking sector stabilized pretty soon after the results and even experienced successful voluntary, not required, equity issues. In the EU, the Capital Requirements Directive (2013/36, Article 100) requires yearly stress tests on 113 supervised banks led by the European Banking Authority (EBA) together with the ECB's Supervisory Review and Evaluation Process (SREP). In addition to these, other type of stress tests can be carried out ad hoc: EU-wide, individual, thematic for a specific kind of shock, and for macroprudential purposes, which focus on system-wide effects rather than on individual banks.

When banks are unusually opaque, as market participants' ability to understand banks' risk-taking behavior is undermined, market-based discipline might fail (see Section 1.2.1). Although

bank risk is inherently hard to judge, there is room to increase bank transparency and improve the effectiveness of market discipline: bank supervisors tackled the problem through public disclosure requirements regulating how much information banks need to reveal about their investment behavior. The BCBS has recognized the important role of market discipline for banking prudential supervision in support of traditional supervisory methods withing Pillar 3 of the Basel Framework (BCBS 2004, 2009a, 2009b, 2015): while the first two pillars are centered on capital regulation and nation-wide supervision, the third pillar "encourages market discipline by way of meaningful disclosure of the key risks borne by internationally active banks" (Financial Stability Institute Executive Summary, 2019). In the attempt to generate transparency further than on capital adequacy about the risks taken by managers in the intermediation process, the comprehensive set of disclosure requirements seeks to provide sufficient information following five guiding principles. Clarity: understandable form and accessible medium; comprehensiveness: sufficient qualitative and quantitative information on all significant activities, management procedures and risk exposures; meaningfulness/usefulness: risks and how they are managed must be linked to the respective balance sheet or income statement items that allow to interpret them; consistency over time: changes in disclosures must be highlighted and explained; comparability: it is critical for stakeholders to compare prudential metrics, risk and its management across banks and jurisdictions. The release frequencies vary between quarterly, semi-annual and annual depending on the nature of the requirements, which can concern 3 main areas: credit and operational risk, credit valuation adjustment (CVA) risk and leverage ratio; risk-weighted assets (RWAs) calculated through both bank's internal and standardized models; key prudential metrics and risk management's overview (Financial Stability Institute Executive Summary, 2019).

Finally, also International Accounting Standards contribute to enhance the reporting of bank risk, especially through the IFRS 7 published by the International Accounting Standards Boards (IASB). Applied for the first time in 2007's fiscal year, IFRS7 requires entities to provide disclosures together with their financial statements that allow outsiders' evaluation of the significance of financial instruments and their influence on performance, together with the risk arising from such instruments and how the entity manages it (IFRS Foundation, 2021). IFRS7 applies to all entities but intuitively concerns financial institutions in particular, as of their relevant financial instruments' holdings.

As financial stability is threatened, regulation cannot leave it to the savers and investors who put their money in banks but needs to supervise intermediaries and protect depositors

(Morgan, 2010). The regulatory front has pushed, especially since the 2007-2008 crisis, advanced restrictions and specific disclosure requirements for banks, in a concrete effort by the BCBS to improve transparency in banking. However, crucial attention has to be paid to the fact that supposing banks' opacity is intrinsic to the business, they cannot become fully transparent (Iannotta, 2006). Thus, even if banks were inherently opaque and regulation helps make them clearer, an empirical question focuses on whether rigorously supervised banks are more or less opaque than nonbanks (Flannery et. al 2004), which brings to the next section's literature review and present research question.

1.3 Measuring Bank Opacity

Concerns about the accuracy with which outside investors are able to evaluate a bank's risk behavior and the possible consequences for financial market stability thus motivate many government interventions to keep banks under special surveillance (Spargoli and Upper, 2018). However, finding empirical evidence to support why banks should be regulated more than firms in other industries to back up the theoretical questions discussed in the previous sections is an arduous task: by definition, opacity refers to a state of affairs that is hard to quantify. Since no observable statistic can indisputably refer to a bank's degree of transparency, a proxy is needed to empirically handle opacity.

Part of the works in the existing literature focuses on proxies looking within the banking industry that can be helpful to measure banks' informational failures in absolute terms but miss to offer a holistic view of opacity and disclosure regulation across sectors. Such measures are not appropriate to address the question of whether banks are more opaque than nonfinancial firms. In fact, since all firms are affected by some degree of opaqueness, many of the theoretical arguments supporting bank opacity also apply to nonbanks. For instance, the reserves of oil companies are not publicly traded, and outsiders might be prevented from correctly estimating their real volume together with the costs to extract them (Spargoli and Upper, 2018). The same uncertainty lays on firms presenting large investments in R&D (Aboody and Lev, 2001). Though with mixed results, a parallel strand of research therefore joint tests whether banks are opaque both in absolute terms and relative to other firms, to which this work contributes by investigating relative bank opacity in the Euro area. With few exceptions, e.g. Iannotta (2006), the majority of research studies centers on the US markets. Since European banking firms exhibit peculiar characteristics, testing for bank

opaqueness in Europe is of particular interest: bailout policy limiting bank protection has yet to be proven fully credible and a comparison with the US in terms of bank opaqueness can relate to different banking system functions and remark the singular nature of the industry (Iannotta, 2006). This thesis thus aims at transposing the work of Spargoli and Upper (2018) to the Euro area, in order to measure relative bank opacity and consider the implications it might have for a bank-centric financial system.

The unavailability of an ideal universal transparency benchmark has forced researchers to rely on measures associable to the level of asymmetric information between firms and outside investors that are obtainable for both banks and other firms. In what follows, a short list of absolute measures of bank opacity is firstly illustrated: delayed expected loan loss recognition, loan loss provision, loan portfolio and use of derivatives. Secondly, ways for relative measurement are described: split ratings, stock-level microstructures, earnings' forecasts and event-studies. This section reviews the analytical instruments adoptable to examine bank opacity and their potential results from a methodological point of view. This intends to outline the formal boundaries and the empirical environment that are strategic for the tractability of the further relative measure of bank opacity object of this work: returns on trades by corporate insiders.

1.3.1 DELR, LLP and Loan Portfolio

Bank opacity is proxied by Bushman and Williams (2013) with delayed expected loan loss recognition (DELR). Being a loan loss accounting entry, DELR is the overhang unrecognized expected losses carried forward to future periods. It is seen as a driver of balance sheet recession and capital inadequacy concerns as it can jeopardize the availability of loan loss reserves. Since it signals unrecognized expected losses that will eventually threaten common equity Tier 1 if other unexpected losses rise, it is suitable for measuring the level of bank transparency as its growth raises uncertainty on ongoing managerial discretion and the ability to absorb losses.

Loan loss provision (LLP) is instead used by Jiang et al. (2015) and Viet Tran et al. (2019). They argue that LLP, being a key accounting mechanism for banks linking earnings to regulatory capital, reflects information asymmetry since the reported amounts depend on manager's discretion, thus signaling the bank's health to stakeholders, creditors and regulators. It also carries informative power about the loan portfolio's risk. Both authors follow the modeling by Beatty and Liao (2014) to isolate the abnormal accruals of LLP, which are possibly due to managerial

discretion, from the "normal" systemic component of LLP determined by bank and state fundamentals and captured by the estimation of:

$$llp_{it} = \alpha + dnpl_{it+1} + dnpl_{it} + dnpl_{it-1} + alw_{it-1} + cho_{it} + size_{it} + dloan_{it} + csret_{it} + dgdp_{it} + dunemp_{it} + \varepsilon_{it} \quad (1.1)$$

where $dnpl_{it}$ is the change in NPL over the selected horizon with respect to total loans, alw_{it} is the loan loss allowance with respect to total loans, cho_{it} is charge-off with respect to total loans, $size_{it}$ is gross total assets, $dloan_{it}$ is variation in total loans, $csret_{it}$ is the return on a relative real estate index, $dgdp_{it}$ is the variation in gross state product and $dunemp_{it}$ the change in unemployment. The departure from the LLP predicted through (1.1) is the abnormal LLP, which becomes this way a proxy for discretionary manipulation of bank earnings and indirectly, of a bank's disclosure quality and opacity's severity.

A rather simplified way to approximate bank opacity is considering diverse aggregates of loans with respect to total assets. Jones et al. (2012) use ratios strictly associated to the intrinsic uncertainty carried by loans as real estate loans to total assets and all other loans to total assets. To these they add a ratio of potentially opaque assets to total assets, where potentially opaque assets are all assets that are not: "cash, federal funds sold, securities purchased under agreement to resell, guaranteed AFS and HTM securities".

The above measures however prioritize an absolute assessment of bank opacity. By construction, they refer to variables strictly linked to banks only. This makes them appropriate to focus on evidence of opacity in banks, link it to specific bank characteristics and thus to study its determinants and its consequences, but prevents them from a sector-transversal study on whether the financial sector is less transparent than the non-financial sector.

1.3.2 Use of Financial Derivatives

Financial engineering and the availability of advanced off-balance sheet financial instruments such as interest rate and foreign exchange derivatives helped banks manage and hedge risk exposure, avoiding inconvenient frequent portfolio rebalancing. The study by Dewally and Shao (2013) explores if the use of financial derivatives in US banks for the period from 1995 to 2010 has informational implications for outside investors, affecting the degree of transparency perceived by

the market. The practice of derivatives thus turns to be a proxy for opacity, which is compared to a variable measuring the revelation of bank-specific information in the markets: the R^2 derived from the market-index model regression (Roll, 1988; Morck et al., 2000):

$$r_{i,t} = \alpha_i + \beta_1 r_{m,t-2} + \beta_2 r_{m,t-1} + \beta_3 r_{m,t} + \beta_4 r_{m,t+1} + \beta_5 r_{m,t+2} + \varepsilon_{i,t} \quad (1.2)$$

where $r_{i,t}$ is the stock i's return at t and $r_{m,t}$ is the value-weighted market index return. A higher R^2 reflects a greater level of synchronicity of a stock with the market index. When fewer investors can find firm-specific information and trade on the basis of it, the stock returns will tend to co-move with the respective market index. The specific information and idiosyncratic risk is then captured by $1 - {R^2}_{i,t}$. The logic is that if using derivatives intensifies opacity, then the stocks of the banks with higher use of derivatives will exhibit sharper synchronicity with the market index. The first to theoretically hypothesize that a more intensive use of derivatives would imply greater opacity was Wagner (2007), as seen in Section 1.1.3, and Dewally and Shao (2013) provide empirical support for it: they find that an higher adoption of derivatives causes informational shortfall for bank stocks as they synchronize more with the market index, implying a diminished transparency of the banks' balance sheets. Even though it could seem obvious that, being harder to value for outsiders, complex instruments would decrease outsiders' ability to understand a bank's activity, Wagner (2007) argues that opaqueness in this case is driven by the potential incentives managers have to substitute transparent traditional assets with less transparent ones in order to avoid discipline. The existence of such possibility motivates this methodology as it gives the opportunity to associate the amount and extensiveness of derivatives usage that banks report as a direct measure of opacity.

Since derivatives represent a crucial tool in interest rate risk management for basically all banks, this strategy represents a straightforward focus on the intermediaries' transparency dynamics. However, the fact that banks are by large the predominant users of derivatives casts doubt on a potential comparative study with nonbanks trying to endorse a relatively unusual opacity of banks. In fact, the US banks in the Dewally and Shao (2013) study's sample are required to furnish detailed information on their positions in derivatives contracts, while nonfinancial firms are subject to less rigorous disclosure requirements.

1.3.3 Split Bond Ratings

In order to examine the relative opacity of banks, Morgan (2002) uses disagreement between bond-rating agencies (in particular, Moody's and Standard and Poor's) as a proxy for uncertainty. Split bond ratings, that is, when the two agencies assign a different rate to the same bond, are interpreted as a signal of opacity. Such analysis relies on the intuition that if a firm, or a bank, is harder to value and its risk harder to evaluate, then rating agencies are more likely to dissent.

The author uses the information of new bonds issued in the US in a 10-year period (between January 1983 and July 1993), and the sample contains only initial ratings at the date of issue, so that disagreements resulting from asynchronous changes in ratings over time are not considered: this way, the ratings stand only for creditworthiness and bond features. Having a rating dataset allows to check for various measures of discord between the raters across sectors: all of them allude to greater uncertainty over banks. First, the difference between the average of the ratings assigned by Moody's and S&P was four times larger for bank issues than for nonbank issues. Second, issues by banks show the lowest correlation coefficient among ratings. Third, the kappa[5] statistic, which places raters in a range between complete disagreement (kappa = 0) and complete agreement (kappa = 1), pinpoints banks at the uncertain end of the spectrum, towards zero. A relatively higher kappa is instead associated to the non-banking sector, where structural exogenous cash flows help reducing agency problems. This finding is consistent with the idea that banks drag behind an intrinsic form of opacity, since most of the nonbank issues are asset-backed bonds capable of reducing the uncertainty around the risk of asset substitution mentioned. For a more formal test, Morgan estimates the probit regression:

$$\Pr(disagree_{itk}) = F(issuer\ type_k, average\ rating_{it}, face\ value_{it}, maturity_{it}, year_{it}) + e_{itk} \qquad (1.3)$$

where the dependent variable measuring the probability of a split rating is either a dummy variable (0 if Moody's equals to S&P; 1 if their rating differs) or the absolute difference between the ratings given by the two agencies. The resulting estimates of the control regressors capture the change in probability of a split rating linked to a variation of the continuous variables around their respective

[5] $Kappa = [p_0 - p_e]/[100 - p_e]$, where p_0 is the percentage of same-rated bonds observed and p_e is the percentage expected by chance, given the actual distribution of ratings across sectors.

means. Some general results highlight how conflict among agencies, such to generate a split rating, constitutes a good surrogate of uncertainty and allows a tractable quantitative assessment on firms' opacity. A positive effect on chances of disagreement for the average rating points out that uncertainty may follow risk itself: as the rating deteriorates splits increase. Also, disagreement grows with maturity, as longer-term issues may carry greater uncertainty, while it decreases with face value, since bigger firms may be able to minimize agency problems and diversify away idiosyncratic risk. The most important and significant finding is finally that banks are 18% more likely to produce disagreement between raters than nonfinancial firms.

Morgan goes further. To make sure to disentangle the possibility that the above results come from the late 80's laissez-faire regulation, he shows how the probability of split rating is significantly affected by the banks' asset composition, by an additional probit model relating the different shares and components of bank assets to the absolute difference between ratings, the dependent variable appointed to capture the likelihood of splits. The results are meaningful and ascribable to the theory in section 1. Holding more loans and leases with respect to securities augments the disagreement among raters. The same effect is associated to trading assets and holdings of cash and deposits: being highly liquid, they invite agency risk since creditors and analysts cannot be sure of how managers will dispose of the cash. On the other hand, fixed assets like premises or real estate clean up uncertainty with a negative effect on disagreement. Even though rare or not so relevant for the banking industry, their significative negative sign allows to locate them at the opposite end of the agency risk spectrum, symmetrically with respect to trading and loans.

Extending the balance sheet perspective of the analysis, Morgan also finds that raters' disagreement decreases in the level of bank capital. As one would expect, equity binds owners to the firm, mitigating agency problems for outsiders and creditors. In the sample, capital indeed has a risk-reducing role that eases uncertainty: only in undercapitalized banks (below the median capital/asset ratio) loans and trading assets do increase the probability of split ratings.

The split rating methodology thus seems to find in agencies' disagreement a reasonable proxy for uncertainty that is appropriate to highlight how lack of transparency is a built-in characteristic of financial intermediaries that makes them more opaque than other firms. In a more recent study, Iannotta (2006) picks up this research method to take on a similar analysis for bonds issued by European firms from 1993 to 2003. His findings for relative opaqueness are consistent with Morgan: when the issuer is a bank, the probability of a split rating increases by more than

20%. He also proves that uncertainty is a function of risk itself, as worse ratings extend the odds of disagreement, and that opacity is a product of financial rather than fixed assets. However, the outcome regarding capital structure is, surprisingly, the opposite to the previous findings: a higher capital ratio increases the likelihood of split ratings, statistically significantly. The source of the contradictory issue is to be found in the time difference between the two samples. In fact, Morgan's study refers to the 1983 to 1993 span, for most of which the US regulation demanded just a simple[6] capital ratio unrelated to risk-adjusted assets, a benchmark introduced with the 1990 Basel Accord; such period thus misses the hike of US banks' equity ratio and capital per unit risk occurred in the 1990s (Flannery and Rangan, 2002) due to the new regulatory provision, bank involvement in derivatives together with other complex business lines, and a reduction in implicit government guarantees. This way, the negative effect of capital on disagreements in Morgan (2002) reflects an actual mitigation role of capital towards agency problems. Iannotta's (2006) inverse result instead captures how a higher level of capital implies a lower asset quality caused by a broader bank intricacy, making capital an indicator of omitted sources of opacity – and therefore split rates.

1.3.4 Market Microstructures

Flannery et al. (2004) address the opacity query by comparing banks and nonbanks' equity market microstructure characteristics during the 1990-1997 period. Their study is based on the idea that if banks were relatively harder for outsiders to comprehend, their stocks should present dissimilar bid-ask spreads and other variables closely related: the adverse selection (AS) components of the same spreads, trading volume and return volatility. They build on an established literature demonstrating the existence of a systematic relation between a stock's spread and the information availability that surrounds its trading. The possibility of nonidentically informed traders was popularly noted by Bagehot (1971), who paved the way for identification of interdealer competition, order flow, stock price, stock price volatility and insider trading as important forces contributing to bid-ask spreads' width. The model of the market maker's information problem built by Kyle (1985) then allowed a logical decomposition of a stock's bid-ask spread into rationally separate components. Part of the spread is associated to the market makers' typical operating costs of providing liquidity while facing non diversifiable risk, in particular, the order-processing

[6] At that time, capital adequacy was calculated through two indicators: primary capital (equity and loan loss reserves) had to be more than 5.5% of assets; primary capital together with secondary capital had to be at least 6% of assets.

component and the inventory holding cost. The component of most interest for opacity is however the AS component. Since informed traders would pick up options to buy and sell only if they consider the bid to be too high or the ask to be too low, market makers can occur in a AS cost that is proportional to the supply of private information. The information content of a stock spread's is named AS component. In practice, such spread portion should compress as more information about the stock is mined and the weight of private information reduced. On the other hand, if a stock is opaque and traders cannot price it accurately, maybe insiders, or specialists, can: any possibility that some trader can hold private information about the stock's value would force the market maker to raise the spread, reducing the liquidity of the traded share.

Opacity can also both lower or raise the trading volume of a stock. In the former case, as a result of a wider spread, uninformed traders would be discouraged from trading because they face the possibility to be renting the informed traders with their potential information-based loss (Gorton and Pennacchi, 1990). However, if trading diminishes but does not halt, the informed traders could still trade with one another if opacity is such to make them disagree, ending up narrowing the spread again.

An opaque stock should also be characterized by limited periods of time with flattened equity return's volatility. If the true intrinsic value of an opaque asset changes unnoticed, the price will react only at occasional information arrival dates. The periods in-between signal opacity to the extent that true changes of the asset's value go unmatched by adequate return volatility.

The above stock-level features thus are candidates for measuring relative opacity between different stocks. In doing so, the authors contrast banks to a control group of unregulated nonfinancial firms through comparative statistics of the matched sample built by pairing the stocks of the two categories by capitalization, market price and trading venue. They draw two main results basing on the size of the firms. First, all the microstructure properties of the larger banks closely mirror those of their control group. Second, the same happens for the bid-ask spreads of the smaller banks, but their trading volume and return volatility are much lower. Since such outcome can simply be explained by a less concentrated ownership of outstanding float and fewer institutional holdings, the study concludes that no indication is found that market investors consider banking firms particularly opaque.

The market microstructure inspection thus finds results contrary to those of the split rating method, upholding that investors are able to evaluate banking firms with the same effort as nonfinancial firms. According to Morgan (2002) and Iannotta (2006), the validity of the strategy

can be tested further by investigating whether asset composition affects the microstructure variables, meaning that balance sheet and financial characteristics explain some variation in the opacity proxy chosen. In fact, if spreads, trading volume and returns' volatility are actually able to incorporate and reflect opacity, they should change among banks with different balance sheet structure. For instance, a greater concentration of loans should imply larger bid-ask spreads than an abundance of securities. The regressions use accounting variables such as total loans, loan loss allowance, held for trading assets, real estate owned, the book value of premises and fixed assets, cash and other marketable securities. The estimates welcome the hypothesis that the cost of trading is affected by the asset portfolio diversity, in a statistically significant way. However, the various sets of accounting variables as regressors do not improve the explanatory power, in terms of R^2, achieved when considering as regressors the lagged microstructure variables themselves. This reflects the main limitation of working with stock-level data: the variables are interrelated by nature and need to be included in the specifications to capture such effect. In fact, a wider spread contributes to depress trading volume, aggravating the market maker's inventory costs. Higher volatility also weights on inventory costs, in turn widening the spread. The other way around is realistic too, since slim volumes can in the first place cause higher operating costs and hence spreads. It is thus almost impossible to structurally specify a set of instruments that simultaneously captures such intrigued causation, forcing to use a lagged factor.

The stock-level data methodology obtains indication that market microstructures do reflect the diverse degrees of information asymmetry carried by bank assets. Although it does not supply a robust empirical structure, due to the simultaneity property of the measures, it confidently backs the theory that different asset classes are associated to diverse degrees of opacity. A cue for the existence of absolute opacity in financial intermediaries is laid down, but the main result is that on average large banking firms are not relatively more opaque than nonbanks. Likewise, neither are smaller banks, which result perhaps just "boring", trading less frequently and showing less return volatility. Market microstructure characteristic suggest therefore that if banks are intrinsically opaque, it could well be that banking regulation and supervision have done a good job in reducing it for investors.

In a follow-up study Flannery et al. (2013) confirm their previous results: in normal times, banks are not opaquer than nonbanks. But, in the light of the recent financial crisis events that clearly enhanced concerns about the composition of banks' portfolios and their true transparency, they extend the stock-level analysis to crisis situations. Considering also the Long-Term Capital

Management turmoil of 1998 and the global financial crisis of 2007-2009, they point out wider spreads and higher price volatility for both groups of small and large banks: relative opacity does change over time. Uncertainty on the actual economic value of banks' assets and solvency status raised the adverse selection costs of trading bank stocks more than nonbank stocks. Such findings reinforce the validity of market microstructures measures in investigating relative opacity, even along the temporal dimension.

1.3.5 Earnings Forecasts

In their study, Flannery et al. (2004) advance an additional opacity metric: earnings forecasts. Since it should be more complicated for equity analysts to forecast the earnings of relatively opaque firms, they look for greater forecast errors or disagreement among analysts' forecasts, as, ceteris paribus, (i) less accurate and (ii) more dispersed earnings forecasts would hint that the firm is harder to understand.

$$Forecast\ Error_{it} = \left|\frac{FEPS_{it} - AEPS_{it}}{Price_{it}}\right| \text{ (i)} \qquad Forecast\ Dispersion\ _{it} = \frac{\sigma FEPS_{it}}{Price_{it}} \text{ (ii)} \qquad (1.4)$$

$FEPS_{it}$ stands for the 12-Month analysts' forecast error, σ its standard deviation, while $AEPS_{it}$ means actual earnings per share and price is at year-end closing. Coming from outside analysts, this is an independent measure of firm opacity, analogously to the split-rating method. The authors use fiscal year forecasts and compare them to actual earnings to get errors while dispersion is collected from multiple forecast firms. Overall, bigger banks forecasts' dispersion and accuracy resemble those of the nonbanks control group, supporting no unusual opacity of banks and mirroring the stock-level measure's result. The findings about the smaller firms subgroup help explaining the infrequent trading and low return volatility for the smaller banks' case emerged with the microstructure variable method. First, banks' earnings forecasts are reviewed much less frequently, consistent with a stability in assets' value and firm condition that provides less reasons to trade. Second, since forecasts are always more accurate for banks than for nonfinancial firms, the absence of return volatility is not due to infrequent information arrival of hidden value changes: from this point of view banks are just easier to understand and monotonous.

The authors then extend the regression used for the stock-level data identifying earnings forecasts as the new variable dependent on balance sheet characteristics. A small but significant

portion of the variation in earnings forecasts among analysts is ascribable to asset composition: further evidence that certain bank assets are more difficult for outsiders to value.

The forecast method thus constitutes a suitable instrument for empirical inquiry on transparency and definitely conceives a tractable idea of a firm's degree of opacity. An objection to this method, however, is that forecasts for banks are not so relevant because it is easier for them to artificially manage their earnings in order to meet market expectations. The authors argue that such possibility is not enough to explain why their forecasts tend to be more accurate since earnings management or window dressing practices are only significant for end-of-year short-term adjustments. Nevertheless, the sample's empirics show, if anything, a worsening in analysts' accuracy towards banks approaching the end of the year.

Bannier et al. (2010) propose an alternative way to exploit earnings' forecasts to proxy bank opacity: simply, considering the number of analysts following banks relative to nonbanks in producing such outlooks. They look for the case in which the number of analysts covering a firm is below the group's median and find statistically significant support to the intuitive hypothesis that opacity should be negatively correlated with analyst coverage, as the least covered banks showed higher likelihood of split ratings.

1.3.6 Event Study

Hirtle (2006) enriches the bank opacity literature with a measure that is the product of an event study around the release of a regulatory act later known as Sarbannes-Oxley requirement. In June 2002, the Security and Exchange Commission mandated the CEOs of large, publicly traded firms to "certify the accuracy of their financial statements". The aim of the order was to counteract recent accounting scandals' negative effects on investors' confidence in the liability of financial reports, but Hirtle exploits it as a natural experiment to check for opacity in banks, as 44 out of the 950 companies subject to the act were commercial bank holding companies.

His intuition is to study the stock price reaction of the banks affected by the act in terms of abnormal returns, the presence of which would imply that the regulation improved the reliability of the financial statements thus reducing opacity for investors. Previous research (Bhattacharya et al., 2002, Griffin and Lont, 2005) on the whole group of firms subject to the certification order yielded an absence of statistically significant abnormal returns. Hirtle instead finds that if isolated, banks stocks alone do exhibit positive and significant abnormal return from the introduction of the

certification requirement. Such results support a relative opaqueness of banks, as the SEC's act reduced uncertainty around the intermediaries' transparency on their activity. In other words, the greater degree of opacity held banks hard to monitor and their risk difficult to assess, but the CEOs' certification was able to convey information to the market that resulted in a positive stock price reaction. The positive effects of the certification are identifiable through an increased confidence on banks' numbers that eased discount of future earnings by value investors as the likelihood of negative outcomes shrank and a reduction of potential for earnings management as banks realigned their internal control procedures to guarantee validation; also, incentives for banks to rapid shift their portfolio composition or risk profile diminished with commitment to validation processes.

The instrument to evaluate the extent of bank opacity is in this case the stock price reaction, specifically, abnormal returns, tied to a pertinent regulatory event. Defined as deviation of the actual return on the stock from the expected return implied by the stock's historical association to market returns, abnormal returns express the portion of return excessing normal price movement that is firm-specific and attains to the event in question. Such measure is therefore useful to extract quantitative statistics able to interpret qualitative raw material facts, and it will be central to the methodology explained in the next chapters.

The event-study methodology also offers to Hirtle the opportunity to analyze the data cross-sectionally to check if the pattern of the obtained abnormal returns is associated to other variables measuring bank opacity. Not only the ones described in this section, as split ratings and market microstructures or earnings forecasts, but also less formal proxies like asset components (more or less liquid) or balance sheet elements of interest. In this way, which opacity determinants and bank-specific characteristics are systematically important for market participants can be detected. Finally, it is easy to follow abnormal returns over time to judge whether this kind of regulation on opaqueness tends to have a one-time impact or can be of long-lasting help for investors.

As seen in section 1.2.3, Morgan (2010) uses abnormal returns jointly to the 2009 SCAP stress test provision, concluding that it was in part able to produce information about banks. Clearly, the specific recipient of the act only permits an absolute assessment of bank opacity, while a relative comparison to other firms is not possible as with the Sarbannes-Oxley requirement. This highlights the importance of the nature of the phenomenon chosen to evaluate relative bank opacity with an event-study: disclosure of trades by corporate insiders used in this work are transversal among sectors. Other than regulatory acts, abnormal returns can indeed be combined to the analysis

of a variety of circumstances of relevance for opacity and thus represent a highly versatile instrument of analysis.

Chapter II

RETURNS ON TRADES BY CORPORATE INSIDERS

Preface

While theory holds banks intrinsically opaque, in trying to establish whether banks are more opaque than other firms the existing literature has primarily adopted measures that proxy for the level of asymmetric information between the firm and outsiders somewhat failing to obtain uniform results. Such divergence points out how conclusions on bank opacity can depend on the measure chosen.

In trying to shed brighter light on the query, this thesis introduces an additional measure of bank opacity following Spargoli and Upper (2018), returns on trades by corporate insiders, and in doing so it reproduces their study for the Eurozone. Considering the disclosures on trades by EU banks and firms' insiders, the aim is to test if bank insiders earn higher profits than their nonbank peers when trading the stocks of their own company, which would imply that the degree to which insiders know values better than outside investors, i.e. opacity, is accentuated for banks.

This chapter is organized as follows. Section 2.1 explores the informed trading theory that is foundation of this work's empirical analysis. Section 2.2 firstly discusses in detail the regulation regarding insider trading, with a focus on the EU, and the data it produces: disclosures of insiders' trades; it continues with prior evidence on information carried by EU insider trades and ends with a reflection on the validity of the interlinkage between insiders' advantage and their trades for measuring bank opacity in a way that goes beyond the standard proxies. Throughout the chapter, lessons from the insider trading literature and the strategical use of its theoretical instruments are considered in view of the next chapter's analysis.

2.1 Corporate Insiders' Informed Trading

When a firm is opaque, its insiders should arguably know more than outside market participants thanks to their exclusive role in the business. As a result, they might exploit their condition for higher trading profits by buying or selling the shares of their own company. The reason for measuring absolute and relative bank opacity through return on trades by corporate insiders therefore spurs from the assumption that if a bank is particularly hard to value for outsiders, because opaquer than other firms, bank insiders should have a greater informational advantage.

The upcoming theory provides support to this argument, exploring in depth its logic and laying down the basis for its empirical test by: defining informational advantage, describing its relationship with returns on insider trading and validating that insiders trade to exploit it.

2.1.1 Insiders' Informational Advantage

The typical advantage, in terms of information, attributed to a firm's insiders refers to the possibility that they get to know about forthcoming news before anybody else. Such informational advantage is the product of specific knowledge on corporate events like express company's announcements, share repurchases, equity issues, seasoned equity offerings, mergers and acquisitions, dividend changes and deals or earnings announcements. There is wide consensus on these events carrying significant new value-relevant information for investors, testified by contiguous market reactions following their announcement. As insiders are likely to possess superior details relative to other market participants in the months prior the information going public, corporate events have a high potential to be complemented by insider trading. There is indeed substantial evidence of insider trading happening before these events, confirming that they do give insiders an advantage to exploit.

For example, Agrawal and Nasser (2014) study the stock trades by registered insiders of target firms before take-over announcement. Since being acquired signals value creation and is a revealing event for the target, the resulting substantial (and often instantaneous) increase in stock price represents an attractive occasion for those insiders who have knowledge on the negotiations well before their release. They investigate the level and pattern of insider trades executed by US corporate insiders considering the 1988-2006 period and as a primary result they find that, unexpectedly, insiders do not unusually increase their buys before takeover announcements.

However, while reducing their purchases below average, insiders altogether decrease their sales even more: as a result, their net purchases ($net\ purchases = purchases - sales$) grow, by a magnitude of about 50% relative to normal levels. Such strategy is named passive insider trading: increasing net share purchases aims at postponing planned sales to after the announcement rather than increasing actual purchases ahead of it, which allows to circumvent a precise US law[7] prohibiting insider trading specifically before take-overs. As the authors find evidence that insiders practice passive insider trading to profit from internal news of potentially valuable acquisitions, they support the idea that internal personnel can benefit of an informational advantage coincidently to such corporate event.

Cziraki, Lyandres and Michaely (2015) examine other corporate events, stock repurchases and seasoned equity offers (SEOs). They study the interaction between such strategic choices and the consequent activity of insiders to assess the nature of information contained in insider trades around corporate-level decisions, trying to retrieve what kind of informational advantage, if they have one, insiders possess. They find that insiders' net buying rises before stock repurchases and declines ahead of SEOs, as one would rationally expect since repurchases signal a reduction in the number of outstanding shares and SEOs avert share dilution. The authors though try to answer to the question "what do insiders know better before these events?". Apart from the upcoming event itself, the possess of what kind of data constitutes their informational advantage: (i) operating performance, (ii) risk, or (iii) perceived misvaluation? Their investigation on similarities and differences among pre-event insiders' transactions shows that trades by insiders predict: (i) a better future operating performance (ROA) for both repurchasing and SEOs firms; (ii) a future decline in the cost of capital for firms with buyback programs; (iii) a change in investor sentiment after repurchases (SEOs) in terms of a reduction in market measures of general undervaluation (overvaluation) as insiders take advantage of downward (upward) biased investors before the market corrects once the announcements are public. The personal investment decision that guides insider trades thus carries valuable information on future changes for the company in fundamentals and investor sentiment, which constitutes the type of advantage insiders hold with respect to outside traders when approaching a corporate event.

[7] SEC's rule 14e-3 prohibits anyone from trading based on material, non-public information about an upcoming take-over after the bidder has taken substantial steps toward an offer to the target. The rule also prohibits insiders of the bidder and of the target from passing such private information anyone who might trade on it. Insider trading regulation is more thoroughly assessed in section 2.2.1.

The above proof of profitable insider trading preceding corporate events, in spite of possible legal accusation, highlights how insiders might trade from a better standing. The type of advantage associated to corporate events however is not necessarily linked to the degree of opacity of a firm, since it is more about the potential to anticipate the effect of singular, episodic, information that would eventually be disclosed to everyone. Greater interest for this thesis is rather the case in which the advantage concerns a persistent condition in which the firm is informationally and operationally set with respect to the outside. Insiders might also benefit of a more or less persistent place in the sun, tied to the power to directly observe activities of the firm that outsiders cannot trace. Therefore, Spargoli and Upper (2018) suggest an interpretation of informational advantage that goes beyond the control of specific information on singular occurrences and refers more broadly to the inability of outsiders to assess the value of a firm. In this view, the informational advantage insiders have is somewhat proportional to the opacity of the company, connected to the level of transparency inherently related to a certain business widely explored for banks in chapter 1: when the incapacity of outsiders to properly appraise a firm's condition is considerable, affected for instance by the amount of loans held or by the innovative nature of projects undertaken, insiders know more compared to outsiders.

Overall, not only insiders are informationally advantaged because they can have access to knowledge on specific corporate events, but also when in general there is lack of precise information to understand the firm from the outside. If banks are actually opaque from the outside as theory predicts, their insiders should know more than other market participants. This viewpoint on opacity enables to empirically test for it because an informational advantage would be reflected by higher returns, as the next section explains: even though an insider's private information is not observable by a researcher, whether trading takes place, the direction of the trade, its value and, thus, profits can be observed.

2.1.2 Insiders' Profits: Informed Trading Theory

When the market is little uncertain about a firm's value, the chances of profit for insiders narrow, even if they perfectly know the fundamental value of the firm. Instead, if the uncertainty in evaluating the firm's value is high, then the perfect information insiders hold has potential to be more profitable. This does not necessarily imply that the insiders' informational advantage is high just because outsiders' opinions on the firm are dispersed or contrasting, since it is possible that an

insider does not possess better information than outsiders: what matters is the magnitude of the deviation in information between the inside and the outside, the higher the precision of the insiders' information and the lower the precision of outsiders' knowledge on the firm, the more the insiders can profit from their trades (Huddart and Ke, 2007).

It follows that a fundamental prediction about information asymmetry and insiders' trades is that greater insiders' informational advantage implies higher trading profits. A positive relationship between informational advantage and trading profits is indeed well established in the literature (Spargoli and Upper, 2018): informed trading theory has modeled frameworks that characterize the insider-trading environment and capture its interaction with returns. In fact, insider trading is a real-world analog of information economics models where the informed insiders take into account the expected value and quality of their information and the costs of trading before trading on the basis of their special information (Seyhun, 1986). Theoretically, in capital markets' buy-side traders are essentially differentiated by the degree of information possessed; being informationally advantaged by the private news they can exploit, insiders who trade upon such information constitute informed traders, while outsiders who ignore such information are uninformed traders.

- Informed traders act on fundamental information that is not available to the others (Da Silva Rosa, Saverimittu and Walter, 2005). They can form reliable opinions about whether financial instruments are reflecting their fundamental value, that is, the intrinsic value upon which all traders would agree if they knew all available information about the instrument and could properly analyze it – in other words the expected present value of all benefits and costs associated with the instrument. They trade when they believe that prices differ from fundamental values and will thus profit if prices adjust towards their fundamental values. The category includes several types of informed traders. *Value traders*, who estimate fundamental values by collecting and analyzing all available information related to the instrument: they use such information to forecast and discount future cash flows, to value the option associated with the assets underlying the instruments or with the ownership of the instrument itself. *Information-oriented technical traders*, who attempt to predict future course of prices by identifying systematic recurring patterns which indicate that prices differ from their fundamental values, thus trading on others' mistakes. *Arbitrageurs*, who compare fundamental values across similar instruments to simultaneously buy and sell them when they are inconsistently priced relative to each other to profit from later appreciation

or depreciation. Finally, *news traders*, to which informed corporate insiders belong. They are the first to trade on new information: trying to predict how instruments values will change upon new information they collected, they will buy (sell) the instruments if they think that value will significantly increase (decrease). By assuming that current prices accurately reflect all information except for their knowledge, their intent is not to estimate the intrinsic value of an instrument but to estimate how values will change in response to their new material information. Their success depends upon rapid action, to anticipate other traders: to this extent, insiders who trade because they possess information obtained from their privileged position in the company are news traders that will profit if they trade before the news or the information they possess is rendered public and can exhibit impact on the price.

- Uninformed traders are agents trading for liquidity purposes considering only public information and personal convictions (Martins and Paulo, 2014). They do not know whether instruments are fundamentally undervalued or overvalued since they cannot form reliable opinions about values or they are not to motivated to. The difference between fundamental value and market value is called noise: they are also known as noise traders. Uninformed traders include: *utilitarian traders* (investors and borrowers, asset exchangers, hedgers gamblers, fledglings, cross-subsidizers, tax avoiders) who trade because they expect some benefit from trading besides profit such as maturity transformation or liquidity, *parasitic traders* who try to gain off the anticipation of trades that other traders will make and *futile traders* who lose on average as they are either inefficient, pseudo-informed, victimized or independently reckless rogue traders.

The typical informed trading models (i.e. Grossman and Stiglitz, 1980; Kyle, 1985) identify the former, informed traders, extracting rent from the latter, liquidity (noise) uninformed traders. As informed news traders more broadly attain to the class of speculators, they are profit-oriented and will trade only because they rationally expect to profit: being all trades a zero-sum game, the gain made by one side corresponds to the loss of the other side; therefore, insiders owning private precise and valuable information will make profit at the expense of those with a lower level of information. These models assume that insiders trade to maximize profits due to their informational advantage and describe information asymmetry's effect on (1) trade size and (2) trading profits. Regarding the size of the trade, depending on the type of model, the equilibrium-level of informed trading is the result of different fundamentals. In price-taking models like Grossman and Stiglitz (1980),

individuals are not worried about their trade amounts altering the price, so the quantity traded by an informed insider only is influenced by features such as risk aversion and wealth or rule constraints. Instead, in imperfect competition models like Kyle (1985), informed traders anticipate that their trades would impact the trade price, and limit size accordingly. For what concerns profitability of insiders' trades, viewed as a purchase's gain or a sale's avoided loss, and more relevantly for this work's test, both models predict that insiders' profits grow with increasing insiders' informational advantage. In particular, Kyle's (1985) model shows how insider trading's profits are a function of the information environment. In his single auction model, an informed insider trader has the opportunity at a one-shot trading of a risky asset, normally distributed with mean p_0, variance Σ_0 and ex post liquidation value of $\tilde{v}$; the quantity traded by noise traders is $\tilde{u}$, normally distributed with mean zero and variance σ_u^2. In equilibrium, the expected profits of the insider are equal to:

$$E(\tilde{\pi}) = \frac{1}{2}(\Sigma_0 \sigma_u^2)^{1/2}. \tag{2.1}$$

This means that the insider's profits are proportional, and a product of, the standard deviations of both $\tilde{v}$ and $\tilde{u}$. Insider trading profit is thus steered by two elements of an insider's informational advantage: the prior variance of share price and the precision of the private information possessed, because both elements increase the information asymmetry in place, now defined as the advantage of an insider itself. As an insider knows better the past evolution of the stock and can count on an higher level of supply by noise traders, he/she will expect greater trading profits.

As the trades by insiders who have an informational advantage with respect to outsiders are supposed to yield higher trading profits, empirical investigation on the extent of the advantage owned by corporates is done by examining whether their transactions are followed by *abnormal returns*, defined as the unusually large profits or losses in divergence from expected rates of return. Doffou (2003) defines insider trading as "the sale or purchase of securities by corporate insiders, using monopolistic information to their advantage to generate abnormal returns*"*. With absence of information asymmetry between insiders and other market participants, meaning perfect transparency of a firm, insiders cannot exploit any private information, and their trades would not produce abnormal returns (Huddart and Ke, 2007). The theory above instead suggests that for a higher informational advantage due to lack of company's transparency, the abnormal return after a purchase should be greater and the abnormal return after a sale smaller (that is, more negative). Abnormal returns not only support the study of opacity across sectors to compare banks and

nonbanks. In addition, whether a presumed opacity key determinant (loan portfolio, trading portfolio and leverage, see chapter 1) is actually positively related to information asymmetry between insiders and outsiders can be tested by examining if abnormal returns following buys are larger and abnormal returns after sales are smaller, when the considered determinant is higher. Abnormal returns' analysis thus represents empirically an instrument suitable to investigate the inquiries on bank absolute and relative opacity presented until now.

In an attempt to relate abnormal returns of corporate insiders' trades to opacity, Huddart and Ke (2007) investigate if abnormal returns on insider trading are associated to classic proxies seen in Section 1.3, which try to measure the level of distance between managers' knowledge on the firm and the market's. Their empirical strategy to test if insiders earn more on their trades when their firm is possibly more opaque builds on the same theoretical steps described in this chapter. The results for US stocks in the period 1994 to 1997 find substantial abnormal returns on insider trading and a mostly statistically significant relationship with the proxies, which are (1) institutional ownership, (2) analyst following, (3) book-to-market ratio, (4) the frequency with which the firm reports losses, (5) whether the firm reports research and development (R&D) expenditures, and (6) the median absolute abnormal return over past earnings announcements. However, for proxies (1) to (4) there is no association with insider trading's profitability and the face value of individual trades are inconsistent with both price-taking and imperfect competition models mentioned earlier. As the paper casts doubts on measuring cross-sectional variation in information asymmetries through proxies (while also considering all insider trading without discerning bank insiders from other firms' insiders), it makes the argument of this thesis more compelling. In fact, Huddart and Ke's (2007) results suggest that either the models of informed trading previously mentioned do not describe advantaged insiders' behavior, and thus returns on insiders' trades cannot reflect information asymmetry, or the proxies (1) to (4) are not able to capture and measure opacity.

2.1.3 Insiders' Trading Motif

After acknowledging that insiders own an advantage from which they can profit, the logic of the abnormal returns test requires that insiders trade to exploit it and not for other reasons (Spargoli and Upper, 2018). Even though the reason for trading is obviously not observable, finding evidence of significant abnormal stock returns following insider trades is itself proof of the desire to profit from their superior knowledge on the firm's business circumstances (Huddart and Ke, 2007).

Among the first to do so, representative articles are Lorie and Niederhoffer (1968), Jaffe (1974), Seyhun (1986, 1998), Rozeff and Zaman (1988), Lin and Howe (1990), and Lakonishok and Lee (2001), who study the cross-sectional variation of future stock returns as a function of past insider-trading activity by relying on *intensive-trading criteria*: they look to link abnormal returns to the intensity of insiders' buys and sells, which is defined as net number of stocks bought and sold during a determined closed period. These articles find that intensively-bought shares outperform relevant benchmarks and intensively-sold shares underperform, presenting convincing indication of insider trading happening at increasing pace and yielding abnormal returns: insiders do try to exploit their advantage.

Intensive-trading criteria are then improved by Jeng, Metrick, and Zeckhuser (2003), who shift the analysis to *performance-evaluation methods* placing all trades in a respective buy or sell value-weighted portfolio from execution and held for 6 months. As they document significant abnormal returns on insider purchases but not on sales, a helpful insight is supplied: if on one hand insiders buy stocks of their own company to exploit their advantage, on the other they might have other reasons to sell them. They might be driven by diversification or liquidity purposes, to diversify their holdings into other assets and avoid concentration of exposure on company risk (their wage already depends on such risk and holding too much company stock would add upon it) or manage liquidity needs and shocks. This result implies downward bias estimates of abnormal returns, for instance because stock returns might increase after a sale transaction: the profit an insider would have made if he/she did not have to sell for liquidity needs or other reason is in this case missed. Also, there is a possibility that purchases are driven by discounts coincident to stock splits and repurchases or a pursuit of corporate control and non-monetary benefits rather than special information on the firm.

To address this potential problem, and disentangle abnormal returns from not advantage-driven trades, Cohen, Malloy and Pomorski (2012), suggest that personal motives to trade would be reflected by either predictable "*routine*" trades following calendar patterns over time, or "*Opportunistic*" transactions that, instead, are not repeated in the same month over the years should be the ones driven by determination to benefit from an informational advantage. Accordingly, in a portfolio of either solely routine or only opportunistic trades for a sample for US firms over the 1986-2007 period, routine trades are found to not carry informative power for the future of the firm, with essentially zero abnormal returns associated to them; opportunistic transactions instead

yielded value-weighted abnormal returns of 82 basis points per month, thus proving to be moved by an informational advantage.

While the vast majority of academic research looking for proof of abnormal returns on insiders' trades has focused on the US, limited and less conclusive evidence of profitable insider trading is found for continental Europe. In addition, unlike *intensive-trading criteria* and *performance-evaluation methods*, rather than directly trying to examine abnormal returns in terms of effective profits of insiders' transactions, the literature regarding insider trading in Europe takes an *event-study* approach, concentrating on abnormal returns in terms of price impact as an indirect reaction of the market around the disclosure date of the trades: abnormal returns on the stocks after insiders have reported their trades correspond to insider trades made on superior information the market had not available. For instance, statistically significant price effects attesting informational importance of insiders' trades are found for Austria (Fidrmuc et al., 2013), Italy (Dardas and Guttler, 2011), Germany (Dardas and Guttler, 2011), Belgium (Fidrmuc et al., 2013) and Netherlands (Cziraki et al., 2014). A rare study finds the same for Switzerland (Zingg et al., 2007), while on the contrary Brio et al. (2002) document that in Spain outsiders cannot benefit from mimicking disclosed insider trades. The only post-crisis study for the EU, comprehensively, is Aussenegg et al. (2017). Their work, finding insider trading to be followed by abnormal price reactions, offers evidence that insiders in the Union look to exploit their advantage. The implications of such evidence on insiders' informed trading in the old continent are useful to this work and will thus be covered and analyzed in detail in Section 2.2.2.

The above literature shows how insider trading is pervaded with details that constitute potential research material, due to the implications that the features of informed financial agents have for the information environment around asset pricing. The methodologies just mentioned will be deeply explained in Chapter 3: Spargoli and Upper (2019) pick up *intensive-trading criteria* and *performance-evaluation methods*, together with the *opportunistic-routine* distinction, to renew investigation of whether insiders earn abnormal returns and to extend it to the bank opacity debate. The absence of coverage with this approach for the EU, considering that the existing results are contrasting, methodologically limited and anyway overlook to separate banks from other firms, motivates this thesis to do the same for the old continent.

Finally, Gregory et al. (1997) argue, in accordance with microstructure theory, that trading volume is another signal of an attempt from insiders to take advantage of their privileged information. In fact, since large trades likely cause a larger price effect than small trades, in the

interval between the effective insider trade and its disclosure the price undergoes a large (small) adjustment if the trade size is large (small). Thus, once the trade is disclosed, there will be an additional effect on the price of the security that is relatively more evident for larger trades, as outsiders find out about the trade and try to conform. Likewise, the information conveyed to the market by disclosures is positively related to the number of insiders disclose purchases or sales dating the same day. When, instead of singular transaction, more than one insider indicates trades that are relatively uniformed in direction, outsiders should be able to incorporate the new information with more confidence.

2.2 Disclosure of Trades by Corporate Insiders

The introduction of an opacity measure based on the transactions insiders make with their own company's shares is enabled by the existence of laws capable to provide information on these insiders' activity. In fact, given their informational advantage and preferential access to their firm's doings, when it comes to their trading action insiders are subject not only to greater restrictions and scrutiny, but also to requirements that involve the disclosure of their trades' details.

With the aim to reduce unfairness among traders and generate informative data for the financial markets, disclosure requirements for insiders constitute one of the foundations of a rather complex set of regulations, and a precious source of information for market participants and empirical work. While in the US insider trading regulation firstly appeared in the 1934 Securities Exchange Act, in Europe it developed only in the last two decades, until the Market Abuse Regulation (MAR) of 2016 currently in force: the still-present differences between the two jurisdictions highlight diverse approaches in trying to shape definitions and applicable enforcement structures without running into non-systematic or contradictory notions.

This section first illustrates the conceptual and historical origins of insider trading regulation and the divergent perspective between the two sides of the Atlantic; it then focuses on how insiders can legally trade their shares as a result of the laws in place and the implications for this work's empirical approach to their disclosure; finally, it draws some conclusions from the enforcement of the MAR in Europe and reflects on how insiders can keep their informational advantage despite the regulation in place.

2.2.1 Insider Trading Regulation

In light of the informational advantage of corporate insiders, there is a case for the regulators to prevent and rule insider trading activity. Whether fully unrestricted insider trading is good for financial markets has been long-windedly debated, and the considerations on its benefits and harms have concerned two aspects (Leland, 1992). First, is it fair to have trading when participants are diversely informed? Second, is it economically efficient to pursue no prosecution of insider trading whatsoever? If the regulation is justified by the aim to impact activity regarded as "unfair", then critics note that trading is always unfair as there will always be investors better informed or more sophisticated than others. It is hard to draw a line between what information is unfair and what is not from a legal, regulatory, point of view and since a commonly accepted definition of "unfair" cannot be produced, this aspect of insider trading is not directly tackled. The second aspect of insider trading is instead more liable of economic analysis. In fact, in addressing the effect of insider trading on economic efficiency and welfare, the study of gains and losses borne by differently informed traders can yield an assessment of the net benefits, or costs, associated with a prohibition of insider trading. In order to comprehend the nature of such debate, it is helpful to examine the usual arguments in defense and against unrestricted insider trading.

Among the pros of unlimited insider trading mentioned by researchers, there are price efficiency, costs of enforcement and incentives for entrepreneurial behavior by managers.

- Informative prices. As insiders belong to the group of informed traders, the price impact of their orders would push prices towards their fundamental values. Because they potentially incorporate new and useful information into asset prices, allowing them to trade freely would make prices more informative while effective restrictions on insider trading would remove insiders and their information from the market, making prices less informative. Informative prices are essential for efficient allocation decisions in market-based economies: when prices properly reflect information, portfolio managers and firms making real investment decisions are able to efficiently reduce risk through diversification and improve performance. To this extent, insider trading would make production more efficient, as reduced risk increases asset prices to allow in turn greater real investment (Leland, 1992).
- Costs of enforcement. Insider trading is ultimately a transaction like others, just ordered by an insider of the traded stock's company, and only supposedly based on material, non-public information about the same company. Clearly, detecting insider trading is extremely

difficult, and anyway must cope with the chance that the insiders do not personally trade under their name but though acquaintances and third parties. The generally low likelihood of detections implies extremely difficult enforcement of insider trading laws, as no reasonable punishment will deter unethical or unlawful insiders from illegal insider trading. The resulting high costs of effective enforcement could not only be unsustainable in absolute terms, but also exceed the economic benefit of the enforcement itself. Moreover, when laws are continuously broken with no punishment or consequence the ability to enforce decreases, as respect for the authority and worries deteriorate, making the laws unproductive.

- Entrepreneurial incentives. Insider trading represents an incentive for managers to engage in entrepreneurial behavior (Manne, 1996). Managers can exploit their good ideas and profit from them by buying stock in their firm before their ideas' implication for the value of the firm is released to the public and selling the stock after markets have incorporated it in higher prices. The reward they could gain through insider trading represents a more effective incentive to entrepreneurial behavior than formal compensation schemes, which must be negotiated with managers and shareholders, because insiders can enter it whenever they want. In addition, allowing insiders to profit from their insider trading represents a form of compensation alternative to the traditional ones, and can be favorable also to shareholders. Since the choice to engage in insider trading carries a risk of loss for the insider linked to the effective market stock price, only the employees who firmly believe in the firm outperforming the market will pursue insider trades. This way, shareholders do not have to evaluate employees requests one-by-one, as those who are willing to take a position in the firm will self-select insider trading as their preferred compensation scheme, or do not have to rely on the offer of stock options to extract entrepreneurial initiative from employees.

Defense of effective restrictions to insider trading prompts from three arguments, investors' confidence, lower transaction costs and solving corporate control problems.

- Investors' confidence. Advocates of insider trading restricting rules support the idea that since such regulation would promote insightful research for fundamental information from market participants rather than reliance on exclusive personal connections, markets would

benefit of a greater confidence from investors: increased funds available would in turn raise liquidity, prices and lower corporate costs of capital.

- Transaction costs. As seen in Section 2.1.2, insiders trade at the expense of noise traders who supply liquidity and force the market maker to widen the spread, reducing the liquidity of the traded share, increasing the transaction costs for uninformed or limit order traders. Effective restrictions against insider trading would remove informed traders from trading in the markets, making them more liquid for uninformed traders.
- Corporate control problems can arise when insiders trade on inside information. If insider trading is unrestricted in fact, insiders would be reluctant in sharing their information, and in trying to avoid losing their advantage they would make it more difficult for directors and shareholders to control them and evaluate their work. Furthermore, when insiders can freely trade on inside information, they could look to take managerial decisions that maximize their unique advantage as informed traders, instead of pursuing the maximization of the firm's value. Also, they might front-run trades that their firms make contingently to corporate events like stock repurchase, issues, acquisitions etc., diluting shareholders' value.

Yet, no regulation provisions unconditionally that all insider trading must be restricted. In the United States, the history of regulation trying to prevent misconduct of insiders at expenses of other traders traces back to the 1934 Securities Exchange Act, pushed by cases of insider trading that highlighted immoral activity in the securities industry (Jardak et al., 2020). The law defined illegal insider trading as when an individual serves of exploitation of non-public information to profit from trading in the capital markets. Four main pieces of regulation govern insider trading. First, Section 10(b) of the 1934 Act, together with the SEC rule 10b-5 forbid "trades based on material, non-public information". This is the primary and broadest insider trading rule, which applies to anyone owning such information that potentially affects instruments' value and is entitled of a fiduciary duty towards the firm involved. Second, Section 16a of the Act requires registered corporate insiders (i.e., corporate officers, directors, and 10% or larger block-holders) to report their trades to the SEC, which renders them of public record. Third, Section 16b of the Act, also known as the short-swing rule, obliges registered corporate insiders to surrender to their company any profits on round-trip trades (i.e., a purchase followed by a sale or vice-versa) made within a six-month period. This trading rule mechanically involves all such trades made by the class of

registered insiders, regardless of whether they involve non-public information, and is thus less effective for insider trading as insiders can elude it simply by holding the stock for six months and one day. Finally, fourth, SEC rule 14e-3 prohibits anyone from trading based on material, non-public information concerning in particular an upcoming take-over after the bidder has taken substantial steps toward an offer to the target[8]. The rule also prohibits insiders of the bidder and of the target from passing such private information anyone who might trade on it. The 1934 Act was subject to amendments in 2002, following the Enron scandal that set off the release and adoption of the Sarbanes-Oxley (SOX) Act. Regulatory authorities focused on making transparent and timely public the information on such trades, as, if disclosed, it would positively impact the ability of outsiders to assess the condition of the firm. In particular, Section 403 of the SOX Act, amending Section 16(b) of the 1934 Act, requires insiders specified as directors, corporate officers and stockholders of more than 10% of equity to report their trades to the Securities and Exchange Commission (SEC). Information such as type of transaction, size and execution price have to be filed within two trading days after the transaction (before, it used to be within the 10th day after the month in which the trade took place), bringing punctual relevant information to other investors. Therefore, legal insider trading in the US is constituted of trades by insiders that (i) are not based on specific non-public information and (ii) are disclosed to the competent authority.

While the US has looked after insider trading regulation since 1934, in continental Europe analogous regulatory requirements were promulgated much more recently. With the objective to reinforce the integrity of the member states' financial markets and improve market efficiency, the European Community (EC) emitted the Insider Dealing and Money Laundering Directive (89/592/EEC) in 1989. It presented the first legal definition of insiders and insider information, which were briefly after accepted and put into national law by most of the member states. As the birth of the European Union (EU) demanded more uniform legislation in financial matters, the Market Abuse Directive (MAD) (2003/6/EC) replaced the 1989 directive in 2003, aiming at the introduction of a common standard for insider dealing and market manipulation to enhance market integrity and encourage confidence in investors in the financial markets. The MAD imposed member states to determine a singular regulatory and supervisory authority in charge to cope with

[8] Due to the particularly positive market reaction associate to takeovers, acquisitions have been a major focus of regulatory efforts against insider trading. For example, among the most notorious insider trading cases ever prosecuted in the U.S. like the Levine–Boesky–Milken case in the late 1980s and the Galleon hedge fund case in 2009, almost all of the charges relate to insider trading in takeover targets (Agrawal and Nasser, 2014).

insider dealing and market manipulation, and established a deadline of five trading days, referred as "immediately", for insiders to disclose the details of their trades. Such disposition was required to be implemented locally by member states by October 12th 2004, limit respected by Germany only, with the other countries following through by 2005. A complementary provision, namely, the Transparency Directive (TD), specifically focused on the harmonization across the Union in the strengthening the enforcement of the existing disclosure requirements; approved in 2004 (2004/109/EC), it was implemented starting from March 2007 (2007/14/EC). The law in the area was further developed and updated by the Market Abuse Regulation (MAR), entered into application on July 3rd, 2016. Partly replacing the previous 2003 MAD, the new rules aimed at ensuring for regulation to keep pace with market developments (for instance, high-frequency trading), reinforce the investigative and administrative sanctioning powers of regulators and facilitate cooperation between the relevant authorities, harmonizing the regulatory tools available across states. Currently, under the MAR, three main general rules constitute the core of European insider trading law (Taleska, 2020): the insider trading ban, the tipping ban and the selective disclosure ban, which jointly serve the legal purpose of leveling the playing field in security markets. The insider trading ban entails that securities' trading on the basis of material, non-public information is "generally prohibited"; unlike in the US, an insider is qualified by the virtue to possess an inside information, and not as a result of fiduciary relationship of trust and confidence with the information's source; the focus is the possession of inside information rather than the manner in which it was achieved. The tipping ban restricts the transfer of inside information; a tipper is potentially anybody in possession of inside information who passes it to others (tippee), even without specific relationship between the subjects, and can be prosecuted even if she /he does not personally profit from it; The selective disclosure ban remarks the affirmative obligation to "promptly and continuously" make available to the public any inside information that "directly" concerns them, which certifies a formal attempt to foster market efficiency. Overall, the MAR added three dimensions to the definition of insider trading: i) insider dealing not only covers the active execution of trades, but also the amendment and cancellation of orders based on inside information; for instance, cancelling or amending an already placed order after receiving material information that would alter the profitability of the trade; ii) insider dealing implies also the collusion between third parties; the MAR aims to prevent persons with access to inside information from bridging it towards third parties in order to place, amend or cancel advantageous deals; iii) a distinction between information of direct and indirect concern to the issuer, as only the former is

reached by the continuous disclosure obligation; for example, information produced outside need not to be disclosed to the public.

For what concerns the reporting requirements of insiders' transactions, the MAR introduced a more robust, wide-raging regime. Article 19 obliges Persons Discharging Manager Responsibilities (PDMRs) and persons closely associated to them to notify both the issuer and the relevant competent authority of every transaction relating to the shares or debt instruments of that issuer (including also derivatives and financial instruments linked thereto). A PDMR is defined as:

1. a member of the administrative management or supervisory body of the issuer;
2. a senior executive with regular access to inside information and the power to take managerial decisions affecting the future developments and business prospects of the issuer.

While, a closely associated person is:

i) a spouse, or a partner considered to be equivalent under national law;
ii) a dependent child;
iii) a relative who has shared the same household for at least one year at the date of transaction;
iv) a legal person, trust or partnership, the managerial responsibilities of which are discharged by a PDMR or by a person referred to at i) – iii) and which is either controlled by that person, set up for the benefit of that person or the economic interest of which are substantially equivalent to those of that person.

Such notification requirements must be complied with within three trading days after the transaction. In addition, the notification is not required under a predefined calendar year threshold between €5,000 and €20,000, depending on the member state. Finally, a PDMR must not carry out any transaction on its own, or of a closely associated person, account during a closed period of thirty days before the announcement of interim or year-end results.

Clearly, perhaps due to the impossibility to create universal (not too case-customized) laws that are reasonably enforceable, lawmakers have integrated hardly appliable prohibitions with disclosure requirements for insiders who intend to trade the share of their own company, anchoring their rationale on enhanced transparency for the markets. Such data constitutes the raw material for the analysis carried out by this thesis. However, from a regulatory point of view, the distinction between illegal and legal insider trading, defined as the disclosed insider trades that do not come

from material private information, makes the analytical use of the data contained in the disclosures possible conditionally on 3 caveats.

1) In order for the analysis of the disclosures by insiders to be meaningful, it is important that disclosures might anyway carry new information about the firm value, thus representing a hint for the evaluation of the degree of asymmetric information between the firm and the outside, despite the prohibition to trade on material information. In fact, with the prohibition into force, the regulator expects that the trades that are reported are supposedly based only on public, available to everybody information only. Meulbroek (1992) claims that the trades disclosed are legal insider trades and thus "are by definition not based on material, non-public information", meaning that when insiders trade basing on material information, they will not report it. However, the validity of this assumption is questionable[9] (Agrawal and Nasser, 2014). First of all, even when based on material information, if insiders fail to report a trade, they are subject to violation of disclosure requirement. Secondly, the intense appeal generated by the trades reported from insiders and the focused attention with which other investors trace and focus follow them proofs that markets believe such trades to be informed. In addition, the use of the existence of reported insider trades to measure the merit of a securities lawsuit in the settings od private securities litigation efficacy is increasingly cited in the recent law and economics literature. Furthermore, evidence of profitable insider trades is self-explanatory of, on average, informed insiders, as seen in Section 1.1.3: it is difficult to believe that top executives and directors acquire precious information on their company from news reports or media. Finally, as an example, there have been cases of charges with violation of rule 10b-5, even though they were reported to the SEC (see Emshiller, 2006). Lastly, as Cohen et al. (2012) find, there is an association between reported trades and formal SEC enforcement action for violation of the 10b-5 rule. The above instances suggest that while the percentage of disclosed insider trades that are actually based on material, non-public information is less the 100%, as insiders remain free to trade driven by other motifs, this percentage is likely to be significantly positive. The next Section, 2.2.3, tries to assess the importance of such percentage for the EU.

[9] Meulbroek (1992) is indeed an exception in the insider trading literature, which studies insider trades uncovered by, rather than reported to, the SEC after enforcement.

2) Insiders reporting their trades to the responsible authority as required by law has to be assumed (insiders may well try to trade without being detected or actively investigated).
3) Insiders might decide to trade via closely associated persons; even though in Europe the disclosure requirement for PDMR includes their closely related persons for the notification obligation, these trades might stretch the feasibility of the legal reach.

The regulatory approaches to insider trading adopted on the two different sides of the Atlantic are different, Ventoruzzo (2014) points out. In the United States the structure of insider trading rules is overly complex as it is the result of case law and administrative regulations enacted by the SEC. Its nature is defined unalterably by the Supreme Court in relation to the famous Chiarella decision[10] and revolves around the violation of a fiduciary duty, which has hindered enforcement and complicated the specific regulatory branch with twisted regulations to cover and resolve conflicts around the prohibition of insider trading. Being the first country to grasp on insider trading, US regulation is subject to pros and cons of the "first comer": the legal framework can be complex, contradictory and can be fully understood only under examination of its historical evolution in case law. A more simple, elegant, and effective regulation would be to appoint that anyone who obtains material non-public information concerning an issuer or a security due to their professional activity, or misappropriates it, should either disclose it or avoid trading, and that tippees aware of the kind of information received should also behave accordingly.

Such easier regulatory approach is the one providing the foundation of insider trading forbiddance in the European Union and is referred to as "parity of information" theory. The parity of information approach was briefly introduced also in the US in the 1960, but was later on abrogated in favor of continuation of the fiduciary-duty based approach. Practically, the parity of information theory turns into a disclose or abstain" rule and is established on a fairness-based doctrine maintaining that informational disparity threatens confidence and integrity of financial markets and thus contextually their development and liquidity. Being a "late comer", the EU appointed insider trading regulation in a more explicit and direct way, through systematic union-level directives for substantial harmonization that resulted clearer than their U.S. statutory counterparts. Ventoruzzo (2014) also notes that even though the EU approach follows an almost

[10] Chiarella v. U.S., 445 U.S. 222 (1980). Vincent Chiarella used to work for a financial printer treating corporate takeovers. Without making public his knowledge, He bought the targets' shares before the announcements and sold them afterwards. As he only was an employee at the printer, the court established that he had no "fiduciary duty" with either of the companies, lifting him from any obligation of disclosure.

opposite judicial philosophy and might be theoretically considered preferable to foster liquidity and efficient markets, from a practical point of view there is not a dramatic divergence concerning the scope of application of the prohibition.

2.2.2 Enforcement of Insider Trading Regulation in The European Union

The regulation in place regarding insider trading thus aims at instilling confidence in investors. By requiring insiders to disclose their operations, they furnish signals to financial markets about what might be going on in the company insiders work for. Therefore, they are relevant for firm opacity to the extent that they potentially mitigate the information asymmetry between the inside and the outside of a firm, as the details contained in a transaction made by whom is supposedly an informed trader with specific, and precise, knowledge carry informative value. However, in order for market participants to benefit from insider trades' informativeness, insiders do have to disclose their transactions since, even with the laws in place, they could still unlawfully avoid to. It follows that the more the laws are enforced, and legal disclosure encouraged through active monitoring and sanctioning, the less the incentives for insiders to hide their trades with no notification to the competent authority. Bhattacharya and Daouk (2002) highlight that the matter with insider trading regulation is not the installation of formal power, but their exercise in sanctioning offenders.

Like their derivations, US and EU insider trading law's enforcement diverges. In the Us, the SEC is entitled of enforcement, which places special interest on the trades of the insiders. The Insider Trading Sanctions Act of 1984 (ITSA) imposed monetary penalties as high as three times the illegal gain made or loss avoided by insiders. Sanctions were then strengthened by the Insider Trading and Securities Fraud Enforcement Act of 1988 (ITSFEA). Civil provisions can be turned by the Justice department into criminal penalties entailing fines and incarceration. Beside legal measures, also the reputational loss of insiders facing firing or corporate-level disciplinary action represents a penalty, and highlights the existence of a private enforcement mechanisms: in particular, while more primary laws like the SEC rule 10b-5 are usually enforced publicly, peculiar rules like Section 16b (short-swing rule) are enforced by private attorney, as it concerns the handover of round-trip trades and thus involves more closely the company-insider bond. More recently, infamous scandals like Enron, Worldcom and HealthSouth have projected media, investors and regulators' attention on insiders' activities, and their trading behavior in response and encompass of greater scrutiny of their activity. Ventoruzzo (2014) claims that insider trading

enforcement, at least traditionally, has been more aggressively and successfully enforced in the United States than in the European Union, the determinants of which are identifiable in diversity of resources available for regulators and in diverging cultural attitudes towards insiders. The trend has however evolved, and the active prohibition of insider trading has gained traction also in Europe, where administrative and criminal sanctions have been required a minimum harmonization across EU jurisdictions, nonetheless leaving to the individual member states the ability to adopt their more or less severe penalty schemes. Therefore, concerning the implementation of the MAD directive in the EU and its effects, the fragile and divided nature of the Union's financial markets questions the integrity of enforcement across the member states, motivating investigation on how the regulation has settled among different countries and responsible authorities, and whether it has honored the expectations of higher price informativeness. For instance, Fernandes and Ferreira (2009) document that insider dealing enforcement's effect on price informativeness could depend on a country's infrastructure, in terms of the state of development and efficacy of the judicial system, investor protection and financial reporting. Another difference with the US is the emphasis on public rather than private enforcement, as, notoriously, countries ruled by civil law rely less on private litigation than common law countries.

In light of enforcement being important to avoid misconduct of insiders trading at expense of other traders, and to ensure greater transparency and fairness, Aussenegg et al. (2017) produce a thorough assessment of (1) the degree of MAD and TD enforcement across member states and (2) the effectiveness of such enforcement in EU in terms of price impact of the resulting required disclosure of insiders' transactions. Since both the MAD and the TD were not introduced as a response to particular cases of insider dealing in any of the EU countries, but were exogenously mandated by the European Committee for the member states to be accommodated, the authors exploit them as a natural experiment that allows to evaluate the importance of the consequent enforcement such directives had among member countries for market participants.

They begin by analyzing the information content of insider trading disclosures in seven European countries: Austria, Belgium, France, Germany, Italy, the Netherlands and Switzerland. These countries are supposed to operate under the same regulations, MAD and TD included, but the effectiveness of their enforcement depends to some extent on their legal origins[11]. In order to evaluate the state of the true active enforcement in place after the MAD and the supplementary TD,

[11] La Porta et al. (1998) define legal origins as the genesis of a country's commercial law through the transplantation of either common law, English in origin, and civil law, deriving from Roman law. Civil law legal tradition gave rise to French, German and Scandinavian legal families.

the authors develop an index for the sample countries encapsulating the level of public enforcement of the MAD in the context of insider trading. Such public enforcement Insider Trading Index (ITE) incorporates a variety of inputs relevant for the directive's application: the regulators' formal legal powers (in terms of sanctioning style, penalties, and disclosure of the sentences), the resource-based measures of public enforcement (the grade of ability to carry out supervision), and data on actual enforcement activity (amount of sanctions and discharges). These are implemented into the following criteria:

i) The enforcement record: a score of 1 if the ratio between the number of natural or legal persons sanctioned or discharged for insider dealing and the stock market trading volume[12] is equal to or above the median, for the same period.

ii) Sanctioning method: a score of 0 if either one among an administrative or a criminal sanction approach was used; 1 if both were.

iii) Disclosure of sanctioning jurisprudential decisions: 1 if systematically disclosed, 0 otherwise.

iv) Maximum penalty for MAD-related insider trading abuses: 1 if equal to or above the median penalty in the sample countries, 0 otherwise.

v) Maximum penalty for TD-related insider trading abuses: 1 if equal to or above the median penalty in the sample countries, 0 otherwise.

vi) Supervisory capacity: a score of 1 if the average number of personnel employed in the national banking and insurance regulating institutions – normalized with respect to a country's stock market trading volume – is above the median, 0 otherwise.

The sum of the i) to vi) entries produces the ITE Index, as a scale of 0 to 6, the higher the score, the more enforcement is deployed. Table 2 is the summary of the information regarding the application of MAD and TD in the sample's countries, abstracted according to the above criteria. Austria, Switzerland and Germany rate low on sanctioning (columns 6, 7 and 8), with Switzerland being the lowest ranked in supervisory capacity among the three (column 9). In terms of the two different legal origins and respective groups, French civil law countries show worse performance in supervisory capacity but better in penalties and number of sanctions. The ITE index generated country by country is reported in column 10: the highest is yielded by Italy (overall score of 6),

[12] To examine the importance of public enforcement for insider dealing, rather than its importance for the development of financial markets, the size of stock markets is a better normalizer than GDP.

Country	Responsible authority	MAD (TD) Entry-Into-Force Dates	Sanction for insider dealing (MAD)			Sanction related to TD	Number of sanctions or discharges (MAD)	Supervisory capacity	ITE
			Sanctioning approach	Publication of decisions	Minimum/Maximum penalties (€)	Max penalties (€000)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
German legal origin									
Austria	Financial market authority (FMA)	Jan-05 (Apr-07)	Either	No	No penalties [5]	30 [6]	0 [6]	0.06173 [1]	1 [5]
Germany	Federal financial services supervisory authority (BaFin)	Oct-04(Jan-07)	Either	No	(1-999)/(199,000-999,999) [4]	200 [4]	2 [5]	0.01689 [3]	1 [5]
Switzerland	Swiss Financial Market Authority (FINMA)	Jan-08 (Jun-07)	Either	No	No penalties [4]	0 [7]	n.a	0.00002 [7]	0 [6]
French legal origin									
Belgium	Commission for banking and insurance (CFBA)	Sep-05 (Sep-08)	Both	Yes	(1,000-9,999)/ pending on profit obtained [3]	2,500 [2]	22 [3]	0.01661 [4]	4 [3]
France	Autorité des Marchés Financier (AMF)	Jul-05 (Dec-07)	Both	Yes	No min./5 mil. or more [1]	10,000 [1]	158 [1]	0.00873 [6]	5 [2]
Italy	Commissione Nazionale per la Società e la Borsa (Consob)	May-05 (Apr-09)	Both	Yes	100,000/5 mil. or more [1]	620 [3]	38 [2]	0.04444 [2]	6 [1]
Netherlands	Authority for the financial markets (AFM)	Oct-05 (Jan-09)	Either	Yes	No min./1 mil. – 4,999,999 [2]	120 [5]	3 [4]	0.01218 [5]	2 [4]
Mean (median) for German legal origin					4.67	76.60 (30)	1 (1)	0.02621(0.01689)	0.61 (1)
Mean (median) for French legal origin					1.75 (1.5)	3,310 (1,560)	55.25 (30)	0.02049 (0.0144)	4.25 (5)
German versus French; P-values for differences in means and medians					0.000 (0.102)	0.067 (0.109)	0.042 (0.180)	0.067 (0.593)	0.019 (0.109)

Table 1: Public enforcement of insider trading rules. Ranking for sample countries is reported in [parentheses]. Source: author's elaboration from Aussenegg et al. (2017)

followed by France (5), Belgium (4), the Netherlands (2), Austria and Germany (1), and Switzerland (0). Comprehensively, countries inheriting French legal origins score better than countries coming from German legal origins, with a statistically significant (to the 5% level) difference between average (mean) rankings.

The obtained differences in the level public enforcement of the MAD between countries cause to believe that the price effects following the disclosure of insider transactions would vary among member states. Thus, after identifying for each country the intensity of enforcement, the study tests the effectiveness associated to a different level of it. In fact, the effort deployed by one country to require lawful disclosure of insider trades or punishing unlawful hidden ones (i.e. enforcement) does not imply that such policies are actually successful (i.e. effectiveness), in terms of producing helpful information for other market participants and reducing the advantage insiders have. This means that the differences in the level of public enforcement of the MAD across countries, as measured by the ITE, could cause different price reactions to the disclosure of insiders' transactions: when market participants are provided with a fairer environment they should be able to mine information more easily and fear less the possibility to be exploited by more informed traders; as a consequence, they should not over react to the disclosure of trades by insiders; while, when soft enforcement does not guarantee transparent markets, the information coming with the insiders' disclosures might be something they did not expect or not yet incorporated in prices.

Accordingly, the authors predict a negative association between public enforcement and the price impact of the disclosure of insider trades: when weak enforcement is in place, more positive abnormal returns after purchases and more negative abnormal returns after sales should be registered, as lack of transparency gives insiders incentives to not disclose their operations, depriving the market of reliable information and causing investors' mistrust; on the contrary, stronger public enforcement should enhance standards and produce precise and transparent information for investors; therefore, insider trades in countries with a stricter public enforcement should result in a smaller price impact compared to the price impact in countries with a weaker enforcement;

In other words, if enforcement is effective, then trades by insiders should not come with surprise for the rest of the market. In turn, one would expect countries with a higher ITE Index to experience less price response around insider's notifications. Data collected from insiders' transaction for the period 1st January 2006 to 31st December 2013, thus temporally including the

potential effect of MAR and TD regulation, is used for comparison with the respective stock prices' time series. Figure 6 shows the pattern of disclosed insider trades, as total of the sample of the seven countries.

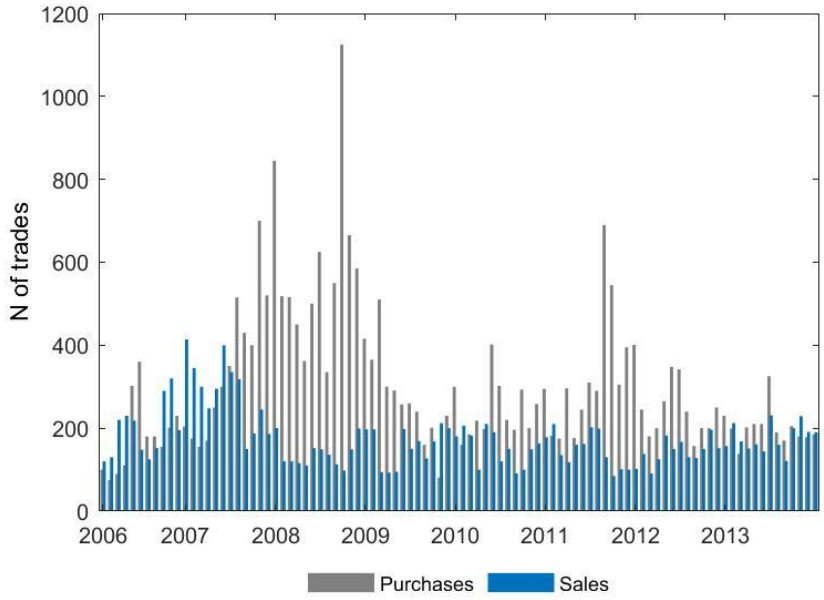

Figure 6: Monthly insider purchases and sales for the entire sample of countries over the entire January 2006 to December 2013 sample period. Source: author's elaboration from Aussenegg et al. (2017).

The graph gives an idea of the relative development over time of filed trades, with purchases starting to dominate sales as the 2008 crisis hit: the number of buy orders reached its apex right amid the financial crisis. The tendency continued in the post-crisis period, when purchases overtook sales in all sample countries.

The price reactions around the trades' announcements, in terms of abnormal returns, are examined through an event study approach focusing on the disclosure of legal corporate insider transactions. The evolution of stock prices is analyzed from twenty days preceding the disclosure date up to twenty days after it. The resulting 41 trading days window (20 before disclosure, disclosure and 20 after disclosure) evolution of the mean cumulative abnormal returns (CARs) is displayed in Figure 7 and highlights two tendencies, for buys and sales: (1) insiders tend to buy the stocks of their own company after periods of negative abnormal returns, while are (2) inclined to sell them after particularly profitable periods.

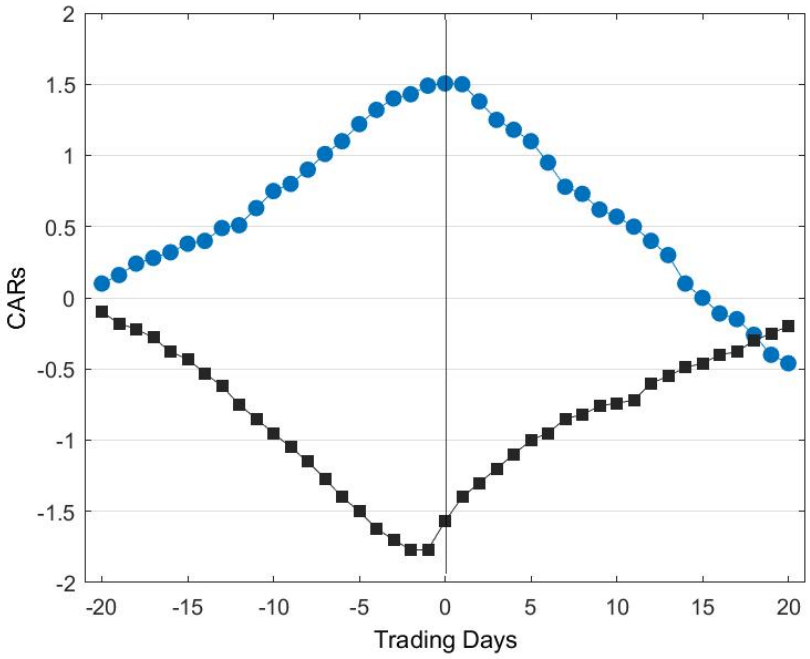

Figure 7: mean Cumulative Abnormal Returns (CARs) for the total sample of insiders' transactions, for the 20 trading days prior to the disclosure date and the 20 days after. Source: author's elaboration from Aussenegg et al. (2017).

First, purchases happen after a period of negative average CARs, which means that they act as contrarian investors, consistently with the intensification of purchases during the crisis described previously, when drops in prices bringing negative returns are more likely; the purchases are then followed by significantly positive mean CARs, and the price impact is notably remarked during time of crisis, if isolated from the rest of the series; this is consistent with outsiders knowing less about the firms during periods of distress (see Section 1.2.2), looking to acquire valuable information from the trades made by insiders. Second, sales happen after a hike of average CARs, and precede negative CARs. Therefore, on average, both insiders' purchases and sales are profitable as they anticipate, respectively, abnormally positive and abnormally negative CARs that are statistically significant: the connection tracing of insiders' movements with stock returns points out significant informativeness of European firms' insiders' trades.

When relating CARs with ITE scores, to find determinants of abnormal performance around disclosures, the results are that countries with a higher level of public enforcement are associated with a weaker effect of insiders' disclosures on prices than countries with lower ITE scores, for purchases: where public enforcement is stronger, standards are improved and lead to better transparency and better precision of information available to investors, who react less to the

information encapsulated into the insiders' disclosures. For sales instead, public enforcement is less important in magnitude and not statistically significant, in line with the idea that insiders' sales might in general convey less information as they could derive from liquidity or diversification needs (see Section 2.1.3): if market participants anticipate that insiders could sell their shares for other purposes than profits, they will rely less on, and react less to information coming from disclosures of sales, making enforcement of insider trading laws for sales less helpful.

Aussenegg et al. (2017)'s precious assessment of the informativeness of insider trading's disclosure requirements in Europe delivers some general considerations to bring into this thesis' empirical analysis. (i) Insider trading in Europe is informative: insiders reveal significant information to the public through the disclosure of their purchases and sales, because the markets react to them. (ii) The degree of information conveyed to the market seems to be characterized differently among member states: as Europe is the result of a relatively recent integration of diverse legal origins and financial infrastructures, how much laws are actively enforced results in a varying effect of regulation aiming to improve transparency. (iii) Evidence of successful contrarian strategies by insiders, who buy more of their company's stock in time of crisis, indicates that insiders' informational advantage – and how much information they convey to the market by disclosing their trades - is a function of time: insiders might know more than outsiders when what is going on in the business is especially hard to monitor. (iv) Insiders' purchases might carry a different type of information than sales, making the two operations differently valuable for outsiders.

In line with predictions of information theory elaborated in the previous sections, disclosures by European insiders seem to reflect a greater level of information content (i) and exhibit variation in member states (ii), time (iii) and type of transaction (iv). The case for abstracting insiders' advantage to the level of asymmetric information between firms and the outside to capture its variation also across sectors, i.e. comparing banks vs nonbanks, is therefore strengthened.

2.2.3 Insiders' Trading Strategies: Maintaining an Informational Advantage

The disclosures of trades by insiders thus contain useful information for other market participants, and contribute to make prices more informative as outsiders can react to informed corporates' trades and adjust their valuations. In theory however, the informational advantage insiders have

should consequently be eliminated, since the trading based on private information is rendered public and markets can accordingly incorporate it into prices. This raises the question whether insiders still want to trade, even if they risk losing their informational advantage by giving it away to the public due to the disclosure requirements. Addressing such concern is crucial for an empirical analysis relying on (i) theory predicting that insiders do trade to exploit their advantage and (ii) on insider trading data carrying privileged information that potentially signals asymmetric information with the outside. Spargoli and Upper (2018) argue that insiders trade to profit from their position notwithstanding the disclosure obligation they face, because they can engage in trading strategies that allow them to keep a certain degree of informational advantage, in accordance to the following reasoning.

Informed traders must carefully consider how they trade, for mainly one reason: price impact. When traders must move prices for their orders to be filled (i.e. raising it when intentioned to buy, lowering it when intentioned to sell), due to difficulty in execution or impatience of the trader, they are said to have market impact. Market impact depends on market size, increasing with larger trades that struggle to find traders willing to take the other side, and on the liquidity available in the market, increasing in markets with few participants. The price impacts of informed traders' orders thus constitute transaction costs to them. In fact, if their prices impacts are large, they would profit less from their trades than when impacts are small, as the price shift would make them pay more than half the bid-ask spread for liquidity. To be profitable, informed traders will look to trade in liquid markets where prices significantly depart from their estimates of fundamental value and avoid illiquid markets where their trades might quickly eliminate their potential profit opportunity. Informed traders thus want prices to adjust towards their estimate of fundamental value only after their have traded, not while their transaction is being matched and executed. To do so, they must minimize the price impact of their trades and a basic trading decision is represented by the decision to either trade aggressively or slowly (Cao, 1995).

Informed traders should trade aggressively when they believe that their private information will soon be common knowledge, with relative implications for price change. If information becomes widely acknowledged and reflected in prices, informed traders would not be willing to accept any price to spend their advantage, because to profit the must trade only when they know prices diverge from what they value. Moreover, an aggressive strategy is preferable when they think that other informed traders will engage in trading thanks to the same piece of information. In such case being the first to trade is key, since each informed trader will push prices closer to the

expected fundamental value. The rapidity of the demand schedule is likely to cause higher price impact and concessions[13], which become secondary for a trader who wants to compete the trades as fast as possible. As informed traders compete with each other aggressively, uninformed traders might exit the market after interpreting the flood of orders as a signal that current prices do not coincide with values, resulting in even greater price impact.

On the other hand, when they have confidence that they can keep their informational advantage over time, informed traders should trade slowly. Stealth trading, that is breaking up their orders and avoiding placing ones that might make it easy for other traders to infer that they are informed, is a tactic that aims at hiding among the liquidity traders. By trading slowly and dividing trades, the trader will be able to save some price impact. Being insiders a particular type of informed traders, this is the ideal strategy to follow for corporates who are trying to exploit their ongoing special knowledge resulting from an enduring lack of transparency from the outside rather than from flash corporate news (as argued in Section 2.1.1), because it lets them complete their trades without anyone noticing them and thus to repeatedly profit whenever they establish that price differs from value. In fact, it is rare that other traders will act on the same information owned by a corporate insider of a particularly opaque firm, and thus it is a type of advantage insiders will want to keep and cover when trading to profit from it.

For insider traders however, the aggressive-slow problem is compounded by the disclosure requirement, which complicates the trading decisions of informed, rent-seeking insiders even more: whatever strategy they choose will be made inevitably observable to other traders when they report the information regarding their trades. Because they must render public that they have engaged in trading – indirectly including details on the strategy chosen - they might lose the ability to slowly profit "undercover" over time as the market learns from their transactions. Even the most careful trades, because disclosed, can indicate that they are acting on reliable material information: the trade itself is a signal of a higher degree of information that resulted in a certain direction of trade and size at a specific time. Informed insiders required to disclose their trades afterwards would surrender their entire informational advantage the first time they would do so (Huddart, Hughes and Levine, 2001). Long-lived insiders therefore have an incentive to try to find a way to minimize the signal coming out from their inevitably public trades.

[13] As large buyers (sellers) bid up (ask down) prices to encourage sells (buys), the premium (discount) they leave on the table are named price concessions. A permanent component reflects the actual information that caused the trade while a temporary component compensates the liquidity dimensions entailed in the trade.

Huddart, Hughes and Levine (2001) show that insiders can keep part of their informational advantage even after disclosure through *dissimulation* of their trades, which allows them to release only part of their information. According to their discrete time analog of Kyle's (1985) rational expectations trading model[14], insiders can dissipate their long-lived private information gradually by including a random noise component (i.e. a buy or a sell) to their intended order schedule: the resulting overall trading would be the sum of such noise component and an information-based component. For example, when considering a stock overvalued (undervalued) they could place a relatively sized buy (sell) for being able to sell (buy) more heavily than they would if their trades were not subject to disclosure requirement. The authors call this phenomenon *dissimulation*, which is costly because forces insiders to trade in an inconsistent way with the private information they own but is optimal to reduce the other market participants' ability to deduct inferences from the details of the disclosures. The extent of the noise component acts as balance between immediate profits and the corresponding reduction in future profits following the disclosure that will reveal part of the insider's private information. By giving up some immediate profits, insider trading will remain profitable for insiders even after disclosure, because their trade does not fully reveal their information.

The above suggests that disclosure requirements cannot prevent insider trading, only make it less profitable. This is consistent with the idea that policies promoting publication of fundamental information can aim at increasing both market liquidity and price efficiency: by making informed trading by insiders at expenses of uninformed traders less profitable, insider trading disclosure requirements lower adverse effects on price, raising incentives for uninformed traders to trade thus raising liquidity; at the same time, they are successful in producing prices that reflect more information, as other market participants can interpret them and incorporate the deducted information into prices accordingly.

As they are likely to carry specific information regarding the firm and conceivably be driven by informational advantage over time, insiders' disclosures reflect informed trading and make up a sound instrument upon which build an alternative to standard adverse selection proxies studying opacity. The motivation is stressed by Collin-Dufrense and Vos's (2015) findings, which detect that proxies seen in Section 1.3.3, like bid-ask spread or microstructures, do not capture informed trading. The authors argue that when informed traders can select when and how to trade, standard

[14] In Kyle's model, a single trader with long-lived private information optimally takes advantage from his monopolistic information over time; while trading in continuous time, his private information is leaked out at a constant rate.

measures of adverse selection might fail to capture the presence of informed trading, because they will choose times of higher liquidity (with more noise traders from whom extract rent) and use limit orders to avoid execution price uncertainty or price concessions and maximize the liquidity available: it is in this view optimal for informed insiders to shift trading to specific periods with high liquidity and low adverse selection costs. Accordingly, Collin-Dufrense and Vos's (2015) track down activist investors (assumed to be informed traders) accumulating shares on days when measures of adverse selection and stock illiquidity are lower, while still having positive price impact. Even though these proxies can be juxtaposed across firms to test whether banks are absolutely and relatively opaque, ideally banks and nonbanks should be compared to a transparency benchmark: for insiders' trade returns this is made possible by factors predicting market returns.

Besides not relying on artificial proxies, the approach involving returns on trades might be preferable also because it is a theory-based test for opacity, as backed by the capital markets' principles expressed in this chapter. In its contribution, such theoretical features allow to provide insights on the absolute and relative levels of bank and firm opacity, as well as the type of information that drives opacity and thus infer the role of leverage, the size of the trading and loan book: the three main determinants of bank opacity unveiled by Chapter 1.

Chapter III

PROFITABILITY OF BANK CORPORATE INSIDERS

Preface

The data on insider trading have inspired a wide literature studying the cross-sectional variation of future stock returns as a function of past insider-trading activity. Various methods have helped researchers assessing whether insiders trading their company's stocks carry informative power or obtain abnormal profits. This work employs extensively the so-called performance-evaluation method, based on a calendar-time approach designed to estimate the extent of bank insiders' abnormal returns. Such methodology comes with a number of advantages in updating the query on bank opacity, both in absolute terms and relative to other firms.

The chapter starts with an appraisal of the database used, sample selection strategy and summary statistics in Section 3.1; it continues with stating the research hypothesis and precise description of the methodology deployed to detect insiders' abnormal returns and its empirical validity in Section 3.2, ending with the presentation of the results obtained in Section 3.3.

3.1 Data and Summary Statistics

As of the introduction of the Market Abuse Regulation of 2016, board of directors and PDMRs must report their trades to the national responsible authority for market supervision. The regulation in fact prohibits trading when in possession of material inside information, considered as the private information potentially important for agents deciding to buy or to sell a company's security. The enforcement of insider trading rules is supported by the national market authorities of the member states, requiring insiders to promptly disclose their trades. However, while the aim of these mechanisms is to publish information helpful to market participants, the segmented nature of the European Union regulatory structures complicates the ability of researchers to make use of such information for steady results. Directors' disclosures in fact belong to databases that lack consistency over time and across firms. In what follows, these issues are assessed, and the strategy adopted to overcome them is explained, together with the computation of key sample statistics.

3.1.1 Data

The trade-level data comes from the notifications of transactions surrendered by insiders and made publicly available by the competent authority of the relative member state on their websites. Insiders are required to file the respective member state's authority's notification form within three days from each transaction altering the ownership of any of their company's security classes. The notification provides disclosure of the name of the insider and their role in the company, the security object of the transaction, the transaction's price, date and volume, the market in which the security was traded and, in some cases, also the reason for trading (i.e. when the transactions are ascribable to specific compensative, remunerative or tributary programs or particular corporate events like the subscriptions of new shares). For most of the countries, the same notification form applies to all kind of financial instruments: derivative and non-derivative instruments, debt securities, grants and awards together with the exercise and conversion of derivative positions.

Among all transactions, the attention is on purchases and sales of corporate common stocks only, following most of the insider trading literature. Thus, debt instruments and all hybrid securities are not considered. Purchases (sales) are trades resulting in the acquisition (disposition) of stocks through the open market, while privately dealt transactions are excluded as they could reflect trading conditions that would potentially bias the calculation of the abnormal returns earned. With the same rationale, transactions that happen outside of the respective trading day's range are

excluded. Other type of transactions concerning companies' shares like grants, free awards of stocks and the exercise of options are also directly excluded. However, they might still appear in the dataset indirectly: stocks acquired from the exercise of options or deriving from executive compensation cannot be considered as purchases or sales, due to the focus on common stocks, but they show up in the data when, for instance, insiders decide to sell the newly acquired stocks. Such trades carry an informative intention to sell. Deals attain to insiders that are full time executive directors and board members, former executives and former board members, embers of supervisory boards, PDMRs and non-executive directors. Trades made by third parties or closely associated persons are considered as they were trades made by the insider tipper, since the MAR (2016) intended to make public the information conveyed by such trades too.

Notifications falling in the period from 1st January 2007 to 31st December 2019 are inspected, and the resulting database contains 1090 transactions of which 515 are purchases and 575. For a sample of six countries (Belgium, France, Germany, Italy, Netherlands and Spain), transaction data is retrieved for both banks and nonbanks. The typical buy is substantially larger than the average sale: the mean euro value for purchases is 4,666,363.80, while for sales it is 2,002111.77.

Figure 8 displays the development of disclosed insider dealings for the total sample of countries month by month. Although slightly visible, a significant increase in the number of reported trades is present in the period from 2016 onwards, consistently with the MAR regulation entering into application on July 3rd 2016 and its aim to promote enhanced disclosure and strengthen enforcement. The number of purchases clearly peaks during the 2008 financial crisis and 2010-11 sovereign debt crisis, pointing at insiders recognizing contrarian buy opportunities. For the rest of the series instead, sales seem to steadily outnumber purchases, in consistency with the overall higher number of sales than purchases in the sample. This is also the case in half of the sample countries, which thus split evenly as of percentage of sales relative to purchases: in Belgium sales represent 29% of all trades, in France 66%, in Germany sales are at 21%, in Italy 52%, in the Netherlands 93% and in Spain 33%. The particular type of trade-level data coming from a likewise peculiar notification form produces a time series of disclosure of trades by corporate insiders that from a preliminary analysis is somewhat not so uniform across member states and through time: of crucial importance for the empirical analysis is the adopted sample selection strategy, which is described in the next section.

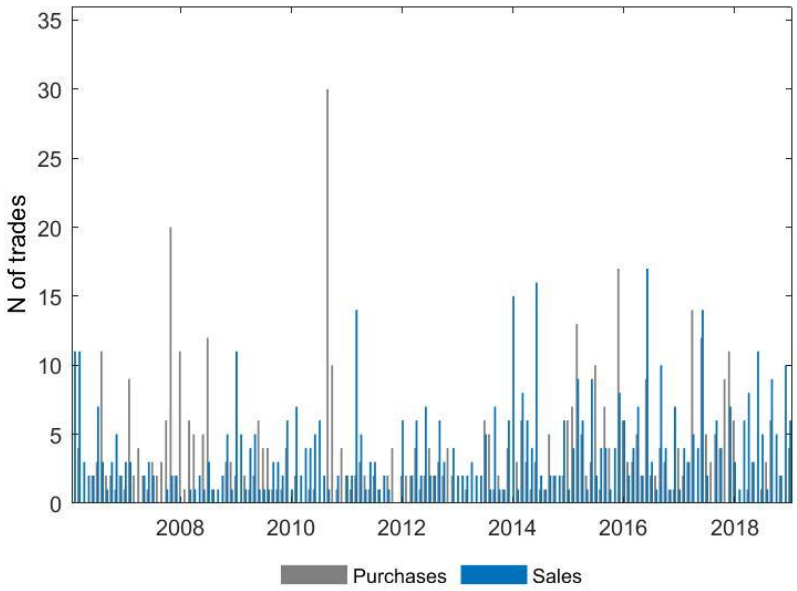

Figure 8: monthly number of trades in all countries. Source: author's elaboration.

Data on returns is collected from Thomson Reuters Eikon (Datastream stock price series), and from Yahoo Finance for specific companies' trading days missing from the 1st January 2007 to 31st December 2019 period. Thomson Reuters is also the source for company-level balance sheet information on sample banks' historical key metrics.

3.1.2 Sample Selection

While in the United States the notifications made available by insiders through their "Form 4" are managed by the SEC centrally, in Europe a primary market authority in charge of specifically receiving and publishing directors' disclosures in a supranational systematic manner is absent. As a result, every transaction made by insiders must be disclosed to the respective national financial market authority. For example, the insider of a company with Italian legal residence who is intentioned to trade his/her shares will have to fill the nationally designated specific form with the details of the transaction and surrender it to the Commissione Nazionale per la Società e la Borsa (Consob), which will take care of a prompt disclosure to the public. Such modus operandi is applied also in the other member states, resulting in a lack of insider that aggregated at European, or even Eurozone, level. This work therefore relies on the notifications made available by the single national market authorities. The segmentation of disclosure enforcement in turn fosters different

national authorities to follow different rules, languages and diverse practical methods to gather director dealings information while aiming at disclosing it to the European investors. Such fragmentation is exacerbated by the coexistence of data provided by public entities like the market authorities and data made available by exchanges and thus service providers themselves. For instance, while the insider of a company with Italian legal base will report his/her trades to the Consob, such information will eventually made public on the site of Borsa Italiana, thus referring to Euronext. In France instead the same authority, Authoritè des Marchès Financier (AMF), has a defined section both gathering the information and directly publishing it on its own behalf.

As each member state has been reporting insider dealings in its own way, the resulting accessible data entails several problematic features. (1) The absence of a complete centralized database impedes to easily retrieve data aggregated for a whole sector, for a group of companies, or for the entirety of insider trades happening in Europe or in a state. As notifications are forced to be classified on a company level, they are singularly uploaded one-by-one for each company: they consequently have to be downloaded in the same way. (2) Not many companies exhibit a significant number of insider trades; perhaps due to the shattered level of enforcement discussed in Section 2.2.2, only a limited number of companies shows an insider transactions record that is seemingly plausible, or, empirically significant. (3) The consistency with which trades are made public over time varies across national market authorities; while the MAR is in force since 2016, there are noticeable empty periods of time in some countries' notification history, possibly as a result of the sequence of European Directives and Regulations that occurred prior to 2016 (this tendency is indeed visible in Figure 8). Such issues have yielded the following sample selection strategy.

A group of banks and a group of nonbanks are formed in a way that the selected companies respect the criteria of: i) a high market capitalization, ensuring their representativeness; ii) a consistent notification history for the period 1st January 2007 to 31st December 2019. The group of highly capitalized[15] and with an established insider transactions history banks is: Banco Santander S.A., Banco Bilbao Vizcaya Argentaria S.A., BNP Paribas S.A., Credit Agricole S.A., Deutsche Bank A.G., ING Groep N.V., Intesa San Paolo S.p.A., KBC Group N.V. and UniCredit S.p.A. Consequently, to each of these banks a nonbank firm is associated respecting i) - ii) and maintaining the same legal base as the bank in object. The resulting group of nonbank company is: Allianz A.G., Anheuser-Busch InBev N.V., ASML Holding N.V., Eni S.p.A., Enel S.p.A., Iberdrola S.A., L'Oreal S.A., LVHM S.E. and Telefonica S.A. Thus, for instance, Italy is represented by Intesa

[15] The capitalization classification of S&P Global Market Intelligence (2022) is followed.

San Paolo S.p.A. and UniCredit S.p.A. for banks, which are paired to the companies Eni S.p.A., Enel S.p.A. to form the nonbank sample. Table 3 displays the two samples (the relative responsible market authorities are already named in Table 2).

Country	Banks	Firms
Belgium	KBC Group	AB InBev
France	BNP, Credit Agricole	LVMH, L'Oreal
Germany	Deutsche Bank	Allianz
Italy	Intesa San Paolo, Unicredit	Enel, Eni
Netherlands	ING	ASML
Spain	Banco Santander, BBVA	Iberdrola, Telefonica

Table 3: Bank and Firm sample.

Bank stocks represent 174/515 (34%) of purchases and 219/575 (38%) of sales. Despite the total sample is equilibrated and sees one bank for one firm, this evidence is consistent with the different compensation structure of bank insiders, who typically are attributed less stocks and options than firm insiders (Spargoli and Upper, 2018). Thus, owning on average more stocks, firm insiders' sale transactions tend to be more numerous than those by bank insiders. For banks, the mean purchase has a euro value of 3,581,250.52 and the average sale has euro value of 420,567.87. For firms, the typical purchases averages 5,146,242.189 euro and the sales 3,027,271.13 euro.

Since all the transactions reported are made by insiders as potentially informed traders at the expense of other traders (see Section 2.1.2), it is of particular interest to investigate what percentage of all trades are made by insiders. Such fraction can be calculated as the volume of insider purchases and sales in a determined period divided by the volume of all trades happening for the same stock and window of time: I calculate these percentages separately on a monthly basis for both purchases and sales and for both banks and nonbanks. Figure 9 plots the time series of the monthly means of these percentages and compares banks and firms. Over the whole sample period, the average monthly ratio of bank insider purchases to all trades is 0.002624%. Thus, an outsider selling one of the sample bank stocks would expect to have an insider as counterparty with such probability. The average monthly ratio of bank insider sales to all trades is 0.002175%. Thus, an outsider buying one of the sample bank stocks would expect to have an insider as counterparty with such probability. On the other hand, the average monthly ratio of firm insider purchases to all trades is 0.030419%.

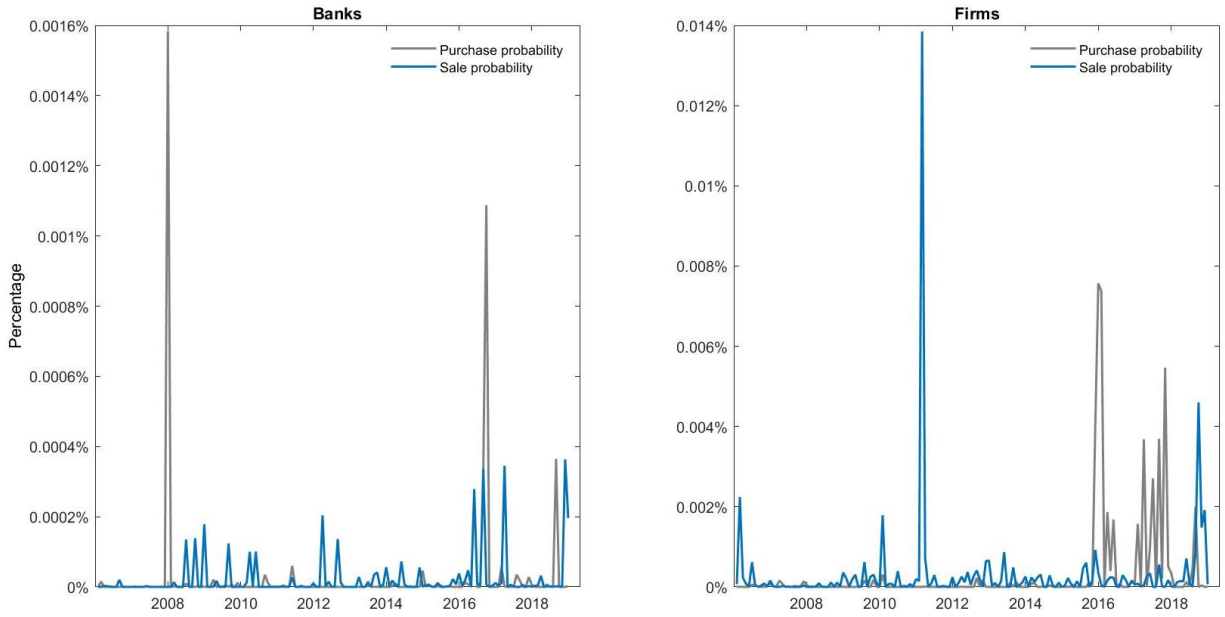

Figure 9: banks and firms' stocks' monthly average probability of insider trading, for purchases and sales. Source: author's elaboration.

Thus, an outsider selling one of the sample firm stocks would expect to have an insider as counterparty with such probability. Finally, the average monthly ratio of firm insider sales to all trades is 0.029936%. Thus, an outsider buying one of the sample firm stocks would expect to have an insider as counterparty with such probability. Overall, these percentages indicate that an outsider has more probability to trade with a potentially better-informed insider when trading a nonbank stock. The plot also confirms the tendency of insiders to trade more on the heels of the great financial crisis and the higher amount of disclosures available starting from post 2016 MAR intervention previously highlighted by Figure 8.

The peculiar nature, and the issues of the dataset allow some preliminary considerations. The absence of a well-established and well-organized database on an aggregate level is inconsistent with the efforts of the regulator to "reinforce the integrity of the member states' financial markets and improve market efficiency" (Section 2.2.1). Furthermore, it is proof of an unsophisticated harmonization across the union of enforcement mechanisms on insiders' disclosure requirements, at which the 2003 MAD and the 2007 Transparency Directive allegedly aimed. An unchanged condition six years into the 2016 MAR enforcement. If on one hand the legal structures of the European directives are designed to supply a prompt "parity of information", on the other their underdeveloped practical application hinders the effectiveness of such laws. The unconsolidated

information on insider movements might hamper empirical investigation on the importance of insider transactions data as an additional tool for the regulator aiming at improved transparency, such as this work, but at the same time it enhances the uniqueness of the database used here and the results it might obtain.

3.2 Research Hypothesis and Methodology

This work investigates the link between insider trading data - information disclosed by corporate insiders on their trades – and the respective stock returns. The rationale is that when a firm is opaque, its insiders should know more than outsiders thanks to their exclusive role in the business and, as a result of such informational advantage, they should have larger profits when they trade the shares of their own company. In fact, because insiders can exploit their privileged information to extract rents from relatively less informed outside investors (Grossman and Stiglitz, 1980; Kyle, 1985), trades by insiders should produce an abnormal increase in stock returns to be observed after they buy their company's stock and an abnormal reduction subsequent to sales; if banks are actually more opaque and harder to value than nonbanks, this variation in stock returns should be more marked for banks than nonfinancial firms.

In order to measure absolute and relative bank opacity through return on trades by corporate insiders, a greater informational advantage of bank insiders of a particularly hard to value bank is assumed. Under such hypothesis, which is consistent with the view of conventional wisdom on the intrinsic nature of bank opacity, Spargoli and Upper (2018) claim that trades by bank insiders: (1) should produce higher profits than their equivalents in nonfinancial firms; (2) bank insiders' trades should convey a more intense predictive power. The aim of the empirical analysis is to check whether insider trades' returns do reflect a significant informational weight denied to outsiders. In absolute terms, if banks are opaque, trades by bank insiders should be profitable and anticipate future bank stock returns; in relative terms, if banks are opaquer than nonbanks, the profitability and predictive power of insider trading should be stronger for banks than other firms.

3.2.1 Evaluating Insider Trading's Profits

What are the returns to insider trading? Section 2.1.3 reviewed the results earned by past literature in the matter. Such question is set to deepen the study of market efficiency and uncover policy

implications for the regulation of insider trading. Unfortunately, a complete thorough answer is prevented by one main data limitation: unknown holding periods. Several data features make such an analysis impossible for insider trading data. Even though the change in insiders' holdings is made available through the notifications and disclosures of the transactions, it is not possible to determine the starting date of such holdings, as much of them might have come from stock grants, option exercises, acquired before the achievement of insider status or, simply and illegally, acquired without disclosure. Being insiders net sellers of stocks, the unknown date of acquisition of the exact same shares getting sold impedes a calculation of the true holding period, which can only be imperfectly inferred from the notification disclosures. Actual returns to insider trading are then not directly computable.

These issues have initially forced researchers to shift the focus on studies investigating the profitability of "intensive" insider trading. This literature associates future stock's abnormal returns to the intensity of insiders' transactions over a determined period of time. The rules chosen to define intensity are referred to as *intensive-trading* criteria: for instance a stock can be labeled as a buy or a sell for a month when it is purchased or sold by at least five insiders, or when it is purchased or sold in net by insiders during the same period. This method however prevents from obtaining an approximation for what insiders earn on their trades. To overcome the challenge, Jeng, Metrick and Zeckhauser (2003) suggest employing *performance-evaluation methods* on value-weighted portfolios composed by insider trades, to compare their returns to expected returns benchmarks.

The following sections explain the two categories of methodologies grouped by Jeng, Metrick and Zeckhauser (2003), namely, *intensive-trading* and *performance-evaluation methods*, describe their advantages and disadvantages and state the approach chosen in this work to evaluate absolute and relative bank opacity: the *performance-evaluation method*. As Chapter 1 pointed out, the existing bank opacity literature jointly tests whether banks are absolutely and relatively opaque while heavily relying on opacity proxies and missing to compare companies to an ideal transparency benchmark.

To this extent, the approach used in this work has two main advantages: it is a theory-based test, established on Chapter 2's principles; it allows to separate purchases and sales while also relying on a transparency benchmark. Such characteristics ensure the provision of new results on the absolute and relative level of bank and nonbank opacity.

3.2.2 Intensive-Trading Method

The intensive-trading method examines the predictive power of insider trading for future stock returns. They depend upon the designation of a measure of trading intensity on the company-time level. Such measure is then regressed on future stock returns and, if insider trading is informative, an intensively bought (sold) stock should be associated to higher (lower) future stock returns. The following equation represents an example for testing this hypothesis.

$$R_{i,t}^{f} = \beta_0 + \beta_1 IT_{i,t} + \beta_2 Bank_i + \beta_3 IT_{i,t} Bank_i + \beta_4 X_{i,t} + \beta_5 X_{i,t} Bank_i + \varepsilon_{i,t} \qquad (3.1)$$

Observing stock-months exhibiting trading activity, the dependent variable $R_{i,t}^{f}$ is the return of a stock traded in month t and calculated from moth $t+1$ until the desired month after the transaction. $X_{i,t}$ is a set of variables typically influencing stock returns associable to inputs used to compute asset pricing factors like size, book-to-market ratio, lagged returns and cumulative returns prior to month t. As such regression works through a panel dataset, time and other control fixed effects of interest can be included, such as market leverage or ROE. In such specification, the different effects of the determinants of stock returns on banks and firms can be accounted for through interaction terms between controls and a bank dummy, $X_{i,t} Bank_i$ as in the above. As a result, the variable of interest of this specification is the insider trading indicator, $IT_{i,t}$, and its interaction with the bank dummy $IT_{i,t} Bank_i$, to distinguish the estimated effect on returns between banks and nonbanks.

Concerning $IT_{i,t}$, the intensive-trading criteria vary, but they all have in common a couple of characteristics: (i) abnormal returns averages are analyzed across firms and not across trades, by classifying each firm as purchase or sale for the period of reference, and (ii) such classification requires a filter rule to apply over the pre-determined period at the end of which firms are reclassified. An example of insider trading indicator of intensity can be a Net Purchase Dummy variable, which equals one whenever the difference between the number of stocks purchased and sold by insiders of company i at time t is positive. Another solution would be continuous indicators, as the total net purchase by insiders of company i at time t normalized by the sum of purchases and sales in the same company and at the same time (i.e. a Net Purchase Ratio), or as the number of insiders buying and selling (i.e. Net Buyer Ratio).

The coefficient on the interaction $IT_{i,t} Bank_i$ instead allows to discern the different magnitude of the relation between the intensity of insider trading and future stock returns among

banks and other firms. If banks were opaquer than nonbanks, the returns of their stocks should be higher with greater buying intensity ($\beta_1 + \beta_3 > 0$), while the same relationship stays stronger for banks ($\beta_3 > 0$).

3.2.3 Performance-Evaluation Method

The objective of performance-evaluation methods is to test if insiders earn abnormal returns on their trades through a calendar-time portfolio approach. Spargoli and Upper follow Jeng, Metrick and Zeckhauser (2003), who employed this methodology to overcome the limitations surrounding the intensive-trading methods. The basic idea is to imagine that all insider transactions are placed into a portfolio starting on the day of their execution: the portfolio is tracked over time and is like a shadow mutual fund "managed" by the combination of all insiders. In chronological order for the sample window from 1st January 2007 to 31st December 2019, the portfolio is gradually fed with all the trades made by insiders and thus replicates over time all the trading decisions and strategy of the insiders themselves and earns their same returns. Since the holdings in the portfolio are weighted in accordance with the euro value of the underlying transactions, the returns earned by such portfolio proxy for the value-weighted returns earned by all the insider transactions and thus can be compared to a series of expected return models. This is the fundamental intuition upon which the calendar time portfolio methodology builds: forming a portfolio in each calendar month with companies that had an event of interest – here, a purchase or a sale by an insider – within a certain time period prior to the month, in order to test the null hypothesis that the intercept is zero in a regression of monthly calendar-time portfolio returns against the factors in an asset pricing model. The calendar time portfolio methodology, also known as Jensen-alpha methodology, was originally introduced by Jaffe (1974). In more formal detail, the first step consists in building for each investor group of interest a time series of the group's mean excess return by averaging the month t excess return y_{ht} of all N_{jt} investors h belonging to group j:

$$y_{jt} = \frac{1}{N_{jt}} \sum_{h=1}^{N_t} z_{ht}^{(j)} y_{ht}, \tag{3.2}$$

where $z_{ht}^{(j)}$ is a dummy equal to one if investor h belongs to group j and or zero otherwise. The second step aims at measuring the performance of the groups of investors through a linear k-factor regression model entailing the obtained y_{jt} as the dependent variable:

$$y_{jt} = \beta_{j0} + \beta_{j1}x_{1t} + \cdots + \beta_{jk}x_{kt} + \varepsilon_{jt} \quad (3.3)$$

This equation are usually specified following Fama and French (1993) or Carhart (1997) type regressions. In this structure the coefficient of the intercept seizes the focus of the researcher, to establish how well the investor group j performs. This procedure is not only suited to analyze one investor group's performance but it is also handy to compare the performance of two different groups (i.e. banks and nonbanks). For example, investigating if $j = bank\ insiders$ are able to earn better returns with respect to $j = firm\ insiders$ is possible by building a portfolio that is long on the portfolio made with bank insiders transactions and short on the portfolio made of firm insiders transactions: the new dependent variable in the above mentioned second step regression will be:

$$\Delta y_t = y_{t,bank\ insiders} - y_{t,firm\ insiders}. \quad (3.4)$$

If bank insiders outperform (underperform) firm insiders, the estimate of the intercept $\beta_{\Delta 0}$ of the k-factor regression model

$$\Delta y_t = \beta_{\Delta 0} + \beta_{\Delta 1}x_{1t} + \cdots + \beta_{\Delta k}x_{kt} + \varepsilon_{\Delta t} \quad (3.5)$$

should be positive (negative) while staying significantly different from zero.

In the above framework, Jeng, Metrick and Zeckhauser (2003) suggest building two portfolios, a "purchase portfolio" and a "sale portfolio", that respectively include all the stocks bought and sold by insiders during the sample period. After being placed in the portfolio on the month corresponding to the execution date, the stocks are held for exactly six months. The six months holding period is the result of Jeng, Metrick and Zeckhauser (2003) exploiting the "short-swing" rule 16b of the Securities Exchange Act of 1934 (see section 2.2.1) to overcome the problem of the unknown holding period: since six months is the minimum time that an insider must hold a stock to avoid surrendering profits coming from opposite trades back to the company, the returns of the constructed portfolios represent the returns insiders can expect to legally, and profitably, make. While such rule is in force in the US, in Europe it is not envisaged by the 2016 MAR. However, a couple of reasons justifies the adoption of the same six months holding period also in the present work. Although arbitrary, replicating the analysis with the same operating window

allows a straight US-EU comparison with Spargoli and Upper (2018); also, holding every stock for at least six months obviates the limitations in terms of temporal continuity of the data sample of EU insider transaction history, which would otherwise produce empty portfolios in the months where two insider transactions are chronologically separated by more than one month. After being held for six months, the stocks are dropped and the portfolios rebalanced using new trades; therefore, at each point in time, the purchase (sale) portfolio includes all the shares bought (sold) by insiders in the previous six months: month by month the portfolios progress by including the newly executed trades and dropping the stocks that reach the six months holding period. The value-weighted monthly returns on the portfolios are computed and regressed on various factors predicting stock returns. Under the efficient market hypothesis, the intercept of such regressions would be zero as competing arbitrageurs deplete any return excessing risk, but that is not the case if insiders trade on non-public information: a standard t-test on the intercept estimates of a regression associating portfolio returns to risk factors thus gauges the hypothesis of insider trades earning abnormal returns.

Because the aim here is to compare banks and firms, the application of the calendar-time approach breaks down purchases and sales along another dimension: whether the insider making a trade belongs to a bank or a firm. This yields four portfolios: buy-bank, buy-firm, sell-bank and sell-firm. For instance, the buy-bank portfolio follows all the trades by bank insiders in the bank sample and at any point in time it contains all the stocks that had been purchased by any bank insider in the previous six months. Such four portfolios assess the existence of statistically significant abnormal returns on: (i) the purchases made by bank insiders, (ii) on their sales, (iii) on the stocks bought by firm insiders and (iv) on their decisions to sell.

After evaluating the magnitude of abnormal returns for banks and nonbanks separately, it must be established whether the abnormal returns of one group are greater than the ones earned by the other group, in order to juxtapose banks and firms (i.e. relative bank opacity): two additional portfolios are built, following the Jensen-alpha methodology's indication previously described, to obtain Δy_t. To retrieve Δy_t while keeping the division between purchases and sales, the two additional portfolios are long on bank transactions (both purchases and sales) and short on firm transactions (both purchases and sales): one is long on bank purchases while short on firm purchases (namely the long-short buy portfolio); the other is long on bank sales and short on firm sales (namely, the long-short sell portfolio). Each of the six $i = \{1,2,3,4,5,6\}$ portfolios are weighted by the euro value of the transactions they carry. This allows to compute monthly value

weighted returns on all the calendar months of all portfolios: after a transaction is inserted in the respective bank/firm buy/sell portfolio, its returns are followed for six months using market data on the stock in analysis. Aggregating the returns on all singular stocks present in portfolio i at month t yields the value weighted portfolio return of month t. The resulting value-weighted monthly returns are therefore the returns on the actual price paid or received by insiders, and constitute the raw material of the estimation process (see Appendix A for a detail of portfolio construction).

To empirically estimate the magnitude of the abnormal returns on transactions made by insiders the following base line regression is run:

$$R_{i,t} - R_{f,t} = \alpha_i + \sum_{j \in M} \beta_j X_{j,t} + \varepsilon_{i,t}. \tag{3.6}$$

On the left-hand side, the dependent variable is constituted by the return on portfolio i in month t, $R_{i,t}$, minus the risk-free rate of corresponding month t, $R_{f,t}$. M is a set of variables capturing stock returns' variation in an efficient market. As no certain consensus defines one "right" expected returns model, three different specifications are implemented, according to the expected return models of a well-established empirical asset pricing literature: firstly, the Fama and French (1993)'s three-factor model; secondly, the Carhart (1997)'s four factor-model; thirdly, the Fama and French (2014)'s five-factor model. In the Fama and French (1993)'s three-factor model the set M includes the value-weighted market return net of the risk-free rate in month $t, MKTRF_t$, together with the size factor SMB_t, which is the month t return yielded by a long position on small firms and a short position on large firms, and the value factor HML_t, accounting for the month t return yielded by a long position on value firms (low book to market ratio) and a short position on growth firms (high book to market ratio). In the Carhart (1997)'s four factor-model a momentum factor, MOM_t, is apposed to the Fama and French (2014)'s three factors, accounting for the month t return yielded by a long position on high prior return stocks and a short position on low prior return stocks; these measures help adjusting for the difference between the market and the portfolios in terms of size, momentum and value. Finally, the Fama and French (2014)'s five-factor model specification adds an investment factor term, CMA_t, which accounts for the month t return yielded by a long position on conservative investment firms and a short position of aggressive investment firms, and

a profitability factor RMW_t, bringing the month t return of going long on companies with robust profitability while short on companies with weak profitability[16].

These three specifications are equally run for all of the six time-series of monthly returns produced by the six portfolios. The variable of interest is, once again, the intercept α_i as it represents the average return of portfolio i exceeding the compensation produced by the risk factors of the set of variables M: since α_i would be zero in an efficient market, it can be interpreted as the abnormal return to portfolio i. The assessment of relative bank opacity involves the retrieval of two type of empirical results. First, the magnitude of abnormal returns earned by bank insiders and nonbank insiders is computed separately, using portfolios $i = \{1,2,3,4\}$. If bank (firm) insiders obtain returns in excess of the compensation for risk, the α_i of the buy-bank (buy-firm) portfolio should be positive and the α_i of the sell-bank (sell-firm) portfolio should be negative: such results would suggest the presence of a degree of market inefficiency as insiders earn positive abnormal returns on purchases and positive (that is, more negative) abnormal returns on sales. Second, using portfolios $i = \{5,6\}$ whether the abnormal returns of bank insider are greater than nonbank insiders is established: a positive (negative) α_i on the long-short buy portfolio (long-short sell portfolio) indicates a higher degree of market inefficiency for bank stocks and implies that a strategy replicating all the transactions made by bank insiders earns greater returns than one following all firm insiders' trades.

3.2.4 Performance-Evaluation vs Intensive-Trading Methods

Both the performance-evaluation and the intensive-trading methods establish a relationship between insider trading and stock returns. The principal dissimilarity between the two is the benchmark applied to evaluate the returns on insiders' transactions, while both of them have their pros and cons.

In the performance-evaluation method, the returns earned by the portfolio mimicking the trades of insiders is compared to a series of expected return models. These models are constituted by an array of risk factors computed as the returns on portfolios arranged with respect of variables such as size, momentum or book-to-market ratio, which theoretically are able to explain all the variation in asset prices in an efficient market environment. Such postulation can be examined

[16] All of these asset pricing factors for the EU market are downloaded and extracted from K.French's online data library on developed markets.

through a test of statistical significance of the constant intercept (α_i) in the equation of asset returns against risk factors. Following the rationale that efficient markets would produce a $\alpha_i = 0$ because any excessive positive ($\alpha_i > 0$) or negative ($\alpha_i < 0$) return is arbitraged away by traders who can trade both the specific individual asset in analysis and the respective benchmark portfolio, the degree of market inefficiency can be inferred through the estimated α_i. Relying on this statistical inference however is subject to the so called "joint-hypothesis" test problem: because there does not exist an ultimately true asset pricing model, assuming that the specification of the model explains well the variation in stock returns casts the possibility that α_i results different than zero due to model misspecification. To this extent, using three different specifications attempts to produce more robust results.

The intensive-trading approach links future stock returns to insider trading using panel data regressions. It establishes if higher returns are associated to stocks that are bough in net by insiders rather than sold in net, unlike the performance-evaluation approach which instead studies the abnormal returns earned by insiders relative to a certain benchmark. While in the performance-evaluation approach the variables commonly affecting stock returns are inserted as asset-pricing factors composing the return benchmark, in the intensive-trading approach they are introduced as stock-level controls. Since the performance-evaluation method relies on a correct specification of the benchmark to build on a $\alpha_i = 0$ hypothesis but the intensive-trading method is not affected by restrictions on the regression coefficients (it does not suppose the group of regressors captures in full the variation in stock returns), the intensive-trading method is not vitiated by the "joint-hypothesis" issue. It however has some major limitations. The criteria used through filter rules to classify firms as purchases or sales, averaging returns across firms and not across trades, are more useful in a framework looking to evaluate the informativeness of insider trading with respect to future return. Therefore, it yields "buy" or "sell" signals to investors rather than proxying for insiders' earnings. Furthermore, the adoption of individual stocks as metric of analysis prevents from an appraisal of value-weighted returns of all trades: intensively bought or sold stocks miss to capture the relative size of trading activity, which can be either a small or large portion of overall insider trading. Also, as intensity is linked to a specified interval forces the stock to fall into a category at the end of such interval: this way, the returns immediately building on the transaction price in the days following the execution are lost. Finally, data-snooping biases[17] loom large on the

[17] Also known as data-dredging, it is the increasing probability of false-positive results with higher artificial combinations tested.

selection of a certain intensity rule (Jeng, Metrick and Zeckhauser (2003). Until the development of performance-evaluation techniques, these issues were tried to be overthrown by event-study methodologies for daily returns around trades; these attempts however are threatened by cross-sectional correlation across trades and might yield biased long-run abnormal returns (Jeng, Metrick and Zeckhauser (2003).

Another shortcoming of the performance-evaluation approach is, as Loughran and Ritter (2000) argue, a lack of statistical power in determining market inefficiency. In fact, it uses the variation in time of the portfolio returns on a calendar basis: since stocks are followed for six months with transaction date as inception date, the resulting estimates are tied to the calendar month returns rather than the amount of effective insider trading. For instance, a stock traded in March 2014 will contribute to the portfolio returns one calendar month after the other until September of the same year. Since it is like insiders artificially earn returns for six months after their execution, the possibility that there is no other transaction in that stock during, and afterwards, the same period is not accounted for. The intensive-trading approach carries a higher statistical power because it uses stock trading months instead of calendar months, as it assigns returns to the month in which the stock was traded.

On the contrary, multiple grounds support the use of the performance-evaluation approach. First, it enables the researcher to compute stock returns from the trading date and from the exact execution price. As mentioned above, the intensive-trading approach instead misses the return obtained by the stock in the month of the transactions used to attribute the rule of trading intensity, neglecting the time, for example, between a purchase and a subsequent sale when looking at net buyers of a stock. Second, in the performance-evaluation approach it is possible to weight stock returns by the size of the underlying transactions, which is an unavailable feature in the intensive-trading approach tackling company-stock-level variation instead of trade-level variation. Third, the performance-evaluation approach is exempt from intensity measure rules determination. For these reasons, Jeng, Metrick and Zeckhauser (2003) argue that this portfolio-based approach has an important advantage in examining the profits from insider trading: value-weighted stock returns computed from inception date produce an accurate measure of the dynamic yielding returns for insiders. From an economic research point of view, the inspection of the performance of buy and sell portfolios furnishes new insights on the strong form of market efficiency advanced by Fama (1971): whenever one of $i = \{1,2,3,4,5,6\}$ portfolios proofs to be generator of abnormal returns, evidence against strong-form efficiency for the corresponding asset-pricing model is found. Even

though that is not the main aim of the present work, performance evaluation methods including all returns starting from the transaction date, and not depending on pre-determined intensity rules, are better suited at testing such hypothesis. Intensive trading rules are in fact designed to answer more appropriately different queries, for example the predictive power of insider trading, matter of interest for outsiders looking to profit from the informative advantage insiders might reveal to the market. Intensive-trading rules are thus ideal in the assessment of insider trading's informativeness rather than profitability.

Ultimately, both methods fit for the investigation of bank opacity, as both profitability and predictive power lye on the supposition that insiders have an informational advantage. However, in light of Jeng, Metrick and Zeckhauser (2003)'s claims on the shortcomings of intensive-trading methods and the particularly straightforward Jensen-alpha assist for the relative comparison of banks and firms, this work will focus on the performance-evaluation test. Empirically, the performance-evaluation method seeks statistical significance of the α_i estimated on the customized portfolios, while the intensive-trading method relies on testing the significance of $IT_{i,t} + IT_{i,t}Bank_i$ and of $IT_{i,t}Bank_i$. One crucial importance leans in favor of the performance-evaluation test: the intensive-trading approach impedes the discernment of purchases from sales, since they are both used to define the trading intensity measure. As the performance-evaluation test allows the separation of purchases from sales, its results more thoroughly mirror the informed trading theory laid down in the previous chapters. In addition, portfolios can be decomposed by any time horizon and company features: the construction of sub-portfolios along the time or firm dimension allows to find results conditionally on these elements; therefore, time-variation in opacity and absolute opacity among the sample of banks can be easily investigated. Finally, the insider trading literature regarding Europe has employed mainly event-study methodologies which, as previously claimed, can bypass the intensity-trading criteria drawbacks but undermine the achievement of statistically unbiased results. Hence, as EU studies have focused primarily on the informativeness of insider trading, a case for examining profitability is made.

3.3 Empirical Results

Spargoli and Upper (2018) employ both the performance-evaluation and the intensive-trading methods. When they employ the former to compare banks and firms, their estimates of equation (3.6) preliminarily show positive αs for both type companies' purchase transactions but not on

sales. However, the difference between bank insiders' and firm insiders' abnormal earnings is not statistically different than zero and instead points at firm insiders' greater profitability under some asset pricing model specifications. They conclude that banks are opaque in absolute terms, but not more than firms, and that insiders' profitability implying absolute opacity only refers to positive information driving buy orders.

They later separate routine and opportunistic trades à la Cohen, Malloy and Pomorsky (2012), to isolate only the trades with higher potential to carry private information, failing to obtain results different than the previous. As different trading motifs do not explain the absence of abnormal profitability for bank insiders, highlighting no informational advantage in their trading behavior, they turn the attention to bank opacity time variation. When studying the abnormal returns of bank and firm transactions during the 2007-2009 crisis and in the immediate pre-crisis months however, they find no evidence of bank insiders' greater ability to predict the winding of stock prices or to exploit different news on financial distress than the markets, both relative to normal times and nonbanks.

Finally, they analyze whether certain bank balance sheet characteristics can affect the absolute degree of opacity of banks, through the intensive-trading method, though failing to link loan and trading books or leverage level to bank insiders' abnormal returns. These results challenge the concept of inherent opacity in banks widely assessed in Chapter 1. To the extent of this type of test, the following results of Section 3.3.4 constitute a novel, as I employ the performance-evaluation instead of the intensive-trading method also to examine the impact the three main determinants of bank opacity might have on insider trades, since the restricted sample allows to do so by altering the stock portfolios. In the following, all the results of the performance-evaluation analysis are reported, discussed, and compared to the ones obtained by Spargoli and Upper (2018) in a EU vs US fashion.

3.3.1 Baseline results

This section discusses the baseline results obtained through the performance-evaluation approach following Spargoli and Upper (2018). Table 4 reports the OLS estimates of equation (3.6) of all three specifications from Fama and French (1993)'s three-factor model, Carhart (1997)'s four factor-model and Fama and French (2014)'s five-factor model, for the whole sample of trades in the period from 1st January 2007 to 31st December 2019 (See Appendix B for estimation code).

The dependent variables are the value-weighted monthly returns on the portfolios, which track all the stocks purchased and sold by bank insiders, all the stocks purchased and sold by firm insiders in the six months prior the transactions are executed. Results are displayed for all the $i = \{1,2,3,4,5,6\}$ portfolios. Once again, the focus is on the α: positive αs on the buy portfolios indicate abnormal returns; negative αs on the sell portfolios imply negative abnormal returns (that is, avoided abnormal losses); the same logic applies to the long-bank-short-firm buy and sell portfolio, assessing the discrepancy between banks and firms.

The αs on the purchase portfolios are positive for banks, regardless of the expected return model and range between 10 to 30 basis points. They would indicate bank insiders earning abnormal returns on their buys, but the estimates are however not statistically significant. Although for firms the intercepts are negative in all specifications, ranging between 50 and 60 basis points, which would indicate negative abnormal return on purchases of nonbank insiders, the estimates are also not significantly different than zero. The opposite signs and magnitude of abnormal returns on bank and firm purchases is somewhat confirmed by the positive αs on the long-bank-short-firm buy portfolio, although such results are not statistically significant. For the sell portfolio, a similar scenario is casted: the αs reveal negative, but not significant, abnormal returns on bank sales while showing positive (in the 110-137 b.p. range) and statistically significant abnormal returns on firm ones. This result indicates that even though not significant, the αs' sign expressed by bank sales is negative as expected, while firm insiders' sales not only are unable to anticipate abnormal negative returns but are even followed by raises in stock prices. The divergency in the outcome of sale transactions between bank and firm insiders is confirmed by the αs of the long-bank-short-firm sell portfolio, which are negative and significant: the difference between earnings (or better, avoided loss) made by bank insiders' sales and firm insiders' sales is statistically different than zero.

Overall, the findings suggest that neither bank insiders nor firm insiders earn abnormal returns on their trades. The result challenges the idea that banks are opaque from the outside in absolute terms. As insiders are not able to earn greater returns than outside market participants, the average bank is not opaque. This is partly in contrast with Spargoli and Upper (2018), who find significant abnormal returns for both type of companies at least on purchases. Even more interestingly, the values of the αs for firm insiders' sales are the opposite to the ones expected, indicating average losses for nonbank insiders selling their stocks. When directly comparing abnormal returns of banks to firms, no indication is obtained that the former are greater than the latter for purchases while for sales there is, however due to the faulty sale decisions of firm insiders

Table 4: Baseline Results

	Buy						Sell					
	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm
MKTRF	0.659***	0.491***	0.608***	0.510***	0.646***	0.370*	0.395**	0.226*	0.284	0.111	0.229	0.044
	(4.75)	(2.99)	(4.20)	(2.97)	(3.95)	(1.92)	(2.06)	(1.78)	(1.43)	(0.86)	(1.02)	(0.30)
SMB	-0.223	-0.977**	-0.248	-0.968**	-0.299	-1.069**	-0.576	-0.072	-0.629	-0.127	-0.802	-0.294
	(-0.63)	(-2.32)	(-0.69)	(-2.29)	(-0.80)	(-2.43)	(-1.17)	(-0.22)	(-1.29)	(-0.40)	(-1.56)	(-0.87)
HML	0.362	-0.517	0.196	-0.467	-0.019	0.165	0.507	0.031	0.148	-0.340	0.751	0.482
	(1.15)	(-1.39)	(0.58)	(-1.13)	(-0.04)	(0.27)	(1.17)	(0.11)	(0.32)	(-1.12)	(1.05)	(1.03)
MOM			-0.273	0.099					-0.592**	-0.611***		
			(-1.25)	(0.38)					(-1.99)	(-3.14)		
CMA					-0.894	0.730					-0.476	-0.130
					(-1.29)	(0.90)					(-0.50)	(-0.21)
RMW					-0.17	-0.816					-1.241	-1.328***
					(-0.27)	(-1.12)					(-1.45)	(-2.36)
α	0.001	-0.005	0.002	-0.0053	0.003	-0.006	-0.011	0.011*	-0.007	0.016**	-0.008	0.0137**
	(0.07)	(-0.56)	(0.34)	(-0.64)	(0.47)	(-0.66)	(-1.14)	(1.83)	(-0.71)	(2.49)	(-0.77)	(2.10)
N	161	161	161	161	161	161	161	161	161	161	161	161
R-squared	0.2003	0.0812	0.2083	0.0821	0.2090	0.0937	0.0715	0.0279	0.0944	0.0857	0.0850	0.0617
α (Long-Short)	0.004		0.007		0.008		-0.023**		-0.024**		-0.022**	
	(0.47)		(0.72)		(0.85)		(-2.31)		(-2.26)		(-2.09)	

*Table 4: The table presents the performance evaluation results for the four portfolios: buy-bank, buy-firm, sell-bank, sell-firm. The estimates are shown together with the t-test statistics (in parenthesis) of the factors included in the 3, 4 and 5 factor models. The variable of interest is the intercept of the line regression α. The two bottom lines show the α and their t-test statistics estimated on a portfolio long on banks and short on firms: on the left for purchases and on the right for sales. The symbols *,** and *** indicate statistical significance at the 10, 5 and 1% levels.*

(as firm insiders miss on positive abnormal returns on their stocks after their sales, the difference with respect to bank insiders avoided loss is enlarged to the point of being statistically different than zero and in favor of bank insiders because of the change of sign).

The fact that the results are not statistically significant does not discredit the importance of the analysis. In fact, given the structure of the performance evaluation test, statistically equal to zero αs imply no *abnormal* returns earned by insiders. The above results suggest therefore that insiders do not enjoy an informational advantage, which in turn means that the companies in analysis were not opaque during the sample period because insiders did not capitalize on information that also the market could predict. Obviously, such result could be the product of the specific sample selection strategy or the EU enforcement producing data on disclosures by insiders that does not match the actual trading behavior of directors[18]. On the other hand, the absence of abnormally profitable insider trading could be the result of regulation itself, which made banks, and firms, less opaque. The following Sections reflect around these perspectives. Spargoli and Upper (2018) find US banks to be opaque, even though no more than firms, for positive information driving purchases. As the above findings for the EU show that neither banks nor firms can be declared opaque, both absolutely and relatively to other firms, while hinting at firm insiders' sales not to be motivated by actual negative information, the empirical analysis is developed further to disentangle the surprising results on sales and to better capture insiders' informational advantage along the sample's time dimension.

3.3.2 Routine vs Opportunistic Trading

The interpretation of the findings of the previous section implicitly relies on the assumption that insiders trade when in possess of private information, to exploit their advantage towards the outside informational environment. However, as anticipated in Section 2.1.3 insiders might trade motivated by other reason than the will to capitalize on their privileged positions. For example, stocks can be sold for diversification reasons in the perspective of disengagement from the performance of the company, to which wage and stock compensation are tied. Also, liquidity needs can be indulged by the sale of shares, which consequently might not necessarily take place in favorable market times and prices. On the other hand, insider purchases might be driven by discount plans on the

[18] It must not be forgotten that the data only refers to disclosed trades, while the possibility that transactions were illegally made without notification remains.

company's stocks or special programs to promote stock ownership of managers and directors. If these motivations to trade are more common for bank insiders than firm insiders, the bank-firm differences estimated previously would have to be viewed as downward biased.

In reality, it would be impossible to assign the true trading motif to each insider trade, in an attempt to isolate all information driven trades. Empirical advice on such issue come from Cohen, Malloy and Pomorsky (2012), who point out that the insider trades that are not motivated by an informational advantage should abide by certain time patterns. For instance, insiders could sell their shares at regular intervals as a result of specific aims like signaling their position towards the firm's ownership or due to an exit strategy. Also, some insiders might buy stocks after receiving bonuses, which are typically given out around the same time of the year. In the same way, some insiders might want to liquidate right away their regularly-scheduled compensation they receive via stocks and options. To address this trading feature, Cohen, Malloy and Pomorsky (2012) define a trade as routine after it is made by the same trader in a certain month consecutively for three years. For example, a given trader has three consecutive March trades (of the same sign): all the subsequent March trades are considered as routine trades; on the contrary, his/her trades happening in all other months and not following the same path are regarded to as opportunistic.

Under this classification, in the sample of bank transactions 0 purchases and 4 sales are routine trades. For firms, the count goes up to 3 routine purchases and 26 routine sales. This implies an higher degree, still, result of an arbitrary approach, of informative power by bank insiders transactions: as almost the entirety of bank trades can be attributed to an opportunistic behavior, they are more likely to yield abnormal returns. The count somewhat reflects Table 4's results for buy-bank and sell-bank portfolios, which exhibit the expected signs for the αs. On the contrary, the absence of abnormal returns earned by firm insiders on purchases, and the statistically significant positive (instead of negative) returns after sales could then be linked to the substantially higher amount of routine trades in the sample of firm sales. Because some of the trades could be attributed to trading motifs different from the opportunity to exploit an informational advantage, the resulting returns might not reflect the possession of private positive or negative information. The brief sample statistic is consistent with firm insiders being more commonly compensated through stock and options, which might make them more prone to trade regularly for liquidity or diversification reasons. The results of Spargoli and Upper (2018), ascribing no abnormal returns on firms' (and also banks') insider sales are in line with this logic. The potential differences in trading motifs, rather than relative opacity, might explain why the baseline results indicate that bank insiders earn

more than firm insiders only on their sales. Nonetheless, since overall the number of routine trades remains relatively small or negligible to the whole sample of insider trades, the opportunistic trait carried by the sample trades motivates further analysis distinguishing across different time periods to check the validity over time of the baseline results. In what follows anyway, the tendency of firm sales to be driven by other trading motifs should be kept in mind.

3.3.3 Time Variation in Opacity

The baseline results indicate that the average bank is not more opaque than other firms. Such findings though relate to the period from 1st January 2007 to 31st December 2019, a pretty wide window of time. As Section 3.1.2 reports, the dataset is the result of information that typically lacks consistency over time in publishment and is function of the different national authority's level of enforcement. While the number of disclosures overall is limited in the first years of the sample, it increases with time and gains consistency, perhaps due to the upgrade of insider trading regulation (see Figure 8). Therefore, to check whether diverse conclusions can be drawn on bank opacity depending on the temporal span chosen, the performance-evaluation method is repeated in relation to specific transparency and insider trading regulatory events. In particular, the periods before and after the "January 2015 Standard" for Pillar 3 disclosure requirements revised by the BCBS, and the periods preceding and following the July 2016's MAR introduction are inspected.

Table 5 reports the results for the performance-evaluation method applied to trades reported from 1st January 2007 to 31st December 2014. The findings are analogous to the baseline results: insiders do not earn significant abnormal returns on neither purchases nor sales and thus do not result opaque in such period. Table 6 displays the same estimates for the post- "January 2015 Standard". Also during this subperiod, insiders of both banks and firms do not earn significant abnormal returns on their trades.

Perhaps the "January 2015 Standard" is not the type of regulatory act that, even though aiming at greater transparency, changes directly how directors disclose their trades. For this reason, a similar test is to check the subperiods prior and after the 2016 MAR, which deliberately includes provisions on insider trading conduct. The MAR was introduced in July 2016, which then splits the sample in two subperiods. The results for these time windows are displayed in Table 7 and Table 8, however no new insight is retrieved as insiders do not earn abnormal returns in any subperiod.

Table 5: Pre - "January 2015 Standard"

	Buy						Sell					
	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm
MKTRF	0.558***	0.456*	0.507***	0.474*	0.458**	0.252	0.134	0.249*	0.024	0.094	-0.119	0.004
	(3.12)	(1.86)	(2.76)	(1.88)	(2.19)	(0.88)	(0.62)	(1.8397)	(0.11)	(0.78)	(-0.48)	(0.02)
SMB	0.054	-1.053*	-0.011	-1.129	-0.126	-1.281*	-0.686	-0.062	-0.825	-0.258	-0.936*	-0.289
	(0.12)	(-1.69)	(-0.02)	(-1.63)	(-0.26)	(-1.87)	(-1.26)	(-0.18)	(-1.54)	(-0.86)	(-1.66)	(-0.83)
HML	0.846*	-0.271	0.615	-0.18	0.439	0.506	1.205**	0.422	0.713	-0.275	1.806**	1.134**
	(1.86)	(-0.44)	(1.25)	(-0.27)	(-0.63)	(0.53)	(2.22)	(1.23)	(1.24)	(-0.85)	(2.20)	(2.25)
MOM			-0.313	0.11					-0.667**	-0.945***		
			(-1.23)	(0.32)					(-2.24)	(-5.86)		
CMA					-1.221	0.564					-0.007	0.254
					(-1.24)	(0.42)					(-0.01)	(0.36)
RMW					-0.695	-1.444					-1.787**	-1.741***
					(-0.90)	(-1.38)					(-1.96)	(-3.10)
α	0.002	-0.003	0.004	-0.004	0.009	-0.002	-0.005	0.011*	-0.0004	0.017***	-0.0003	0.014*
	(0.25)	(-0.27)	(0.34)	(-0.32)	(0.88)	(-0.14)	(-0.45)	(1.83)	(-0.04)	(2.75)	(-0.02)	(1.84)
N	96	96	96	96	96	96	96	96	96	96	96	96
R-squared	0.2492	0.0738	0.2616	0.0748	0.2651	0.0979	0.1244	0.1704	0.0944	0.3437	0.1619	0.2070
α (Long-Short)	0.005		0.008		0.011		-0.016		-0.018*		-0.021	
	(0.35)		(0.54)		(0.66)		(-1.52)		(-1.67)		(-1.22)	

*Table 5: The table presents the performance evaluation results for the four portfolios, for the trades disclosed in the period 1st January 2007 to 31st December 2014: buy-bank, buy-firm, sell-bank, sell-firm. The estimates are shown together with the t-test statistics (in parenthesis) of the factors included in the 3, 4 and 5 factor models. The variable of interest is the intercept of the line regression α. The two bottom lines show the α and their t-test statistics estimated on a portfolio long on banks and short on firms: on the left for purchases and on the right for sales. The symbols *,** and *** indicate statistical significance at the 10, 5 and 1% levels.*

Table 6: Post - "January 2015 Standard"

	Buy						Sell					
	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm
MKTRF	0.782***	0.452**	0.826***	0.472**	0.983***	0.593***	0.833**	-0.068	0.807	0.160	-1.078**	0.122
	(3.19)	(2.52)	(3.07)	(2.39)	(3.44)	(2.90)	(2.02)	(-0.24)	(1.78)	(0.53)	(2.25)	(0.37)
SMB	-0.756	-0.701*	-0.787	-0.715	-0.423	-0.241*	-0.377	-0.199	-0.359	0.039	-0.2832	0.531
	(-1.25)	(-1.59)	(-1.29)	(-1.60)	(-0.63)	(-0.50)	(-0.37)	(-0.28)	(-0.35)	(0.06)	(-0.25)	(-0.68)
HML	-0.187*	-0.826***	-0.092	-0.784**	-1.297	-1.421**	-0.301**	-0.462	-0.357	0.026	-1.903	-1.504
	(-0.43)	(-2.63)	(-0.19)	(-2.19)	(-1.39)	(-2.13)	(-0.42)	(-0.94)	(-0.44)	(0.05)	(-1.21)	(-1.41)
MOM			0.202	0.091					-0.121	1.049*		
			(0.41)	(0.53)					(-0.14)	(1.92)		
CMA					-0.841	0.501					-2.501	-0.721
					(-0.79)	(0.66)					(-1.40)	(-0.59)
RMW					1.595	1.874**					0.915	1.569
					(-1.23)	(2.02)					(0.42)	(1.04)
α	-0.003	-0.008	-0.004	-0.009	-0.002	-0.008	-0.023	0.011	-0.021	0.003	-0.021	0.012
	(-0.26)	(-1.10)	(0.37)	(-0.32)	(-0.17)	(-1.18)	(-1.36)	(0.90)	(-1.24)	(0.31)	(-1.18)	(0.96)
N	65	65	65	65	65	65	65	65	65	65	65	65
R-squared	0.1513	0.1599	0.1537	0.1608	0.1775	0.2266	0.0638	0.0200	0.0642	0.0738	0.0948	0.0408
α (Long-Short)	0.004		0.004		0.006		-0.016		-0.027		-0.032*	
	(0.48)		(0.38)		(0.62)		(-1.52)		(-1.34)		(-1.67)	

*Table 6: The table presents the performance evaluation results for the four portfolios, for the trades disclosed in the period 1st January 2015 to 31st December 2019: buy-bank, buy-firm, sell-bank, sell-firm. The estimates are shown together with the t-test statistics (in parenthesis) of the factors included in the 3, 4 and 5 factor models. The variable of interest is the intercept of the line regression α. The two bottom lines show the α and their t-test statistics estimated on a portfolio long on banks and short on firms: on the left for purchases and on the right for sales. The symbols *,** and *** indicate statistical significance at the 10, 5 and 1% levels.*

Table 7: Pre – 2016 MAR

	Buy						Sell					
	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm
MKTRF	0.565***	0.435**	0.508***	0.457**	0.504***	0.251	0.163	0.253**	0.049	0.096	-0.074**	0.065
	(3.42)	(1.99)	(3.00)	(2.02)	(2.59)	(0.97)	(0.84)	(2.00)	(0.25)	(0.84)	(2.25)	(0.44)
SMB	-0.159	-1.006*	-0.223	-0.981	-0.342	-1.206**	-0.749	-0.251	-0.875*	-0.425	-1.065	-0.441
	(-0.39)	(-1.86)	(-0.54)	(-1.80)	(-0.78)	(-2.07)	(-1.56)	(-0.80)	(-1.85)	(-1.53)	(-0.25)	(-1.35)
HML	0.792*	-0.346	0.532	-0.245**	0.242	-0.29	1.126**	0.298	0.610	-0.413	1.529	1.013**
	(-1.93)	(-0.63)	(1.18)	(-0.40)	(0.38)	(-0.34)	(2.33)	(0.95)	(1.17)	(-1.35)	(-1.21)	(2.12)
MOM			-0.337	0.131					-0.669**	-0.924***		
			(-1.40)	(0.41)					(-2.40)	(-5.64)		
CMA					-1.278	0.383					-0.281	0.505
					(-1.45)	(0.33)					(-1.40)	(0.76)
RMW					-0.388	-1.285					-1.632	-1.317**
					(-0.54)	(1.36)					(0.42)	(-2.48)
α	0.0008	-0.001	0.003	-0.002	0.007	0.005	-0.005	0.014*	-0.001	0.017***	-0.0002	0.012*
	(0.09)	(-0.10)	(0.37)	(-0.18)	(0.79)	(0.04)	(-0.58)	(1.65)	(-0.11)	(2.93)	(-0.02)	(1.65)
N	114	114	114	114	114	114	114	114	114	114	114	114
R-squared	0.2419	0.0699	0.2553	0.0714	0.2572	0.0884	0.1271	0.0962	0.1711	0.3006	0.1574	0.1557
α (Long-Short)	0.001		0.005		0.006		-0.017*		-0.018**		-0.012*	
	(0.11)		(0.36)		(0.46)		(-1.79)		(-1.94)		(-1.16)	

*Table 7: The table presents the performance evaluation results for the four portfolios, for the trades disclosed in the period 1st January 2007 to 31st June 2016: buy-bank, buy-firm, sell-bank, sell-firm. The estimates are shown together with the t-test statistics (in parenthesis) of the factors included in the 3, 4 and 5 factor models. The variable of interest is the intercept of the line regression α. The two bottom lines show the α and their t-test statistics estimated on a portfolio long on banks and short on firms: on the left for purchases and on the right for sales. The symbols *,** and *** indicate statistical significance at the 10, 5 and 1% levels.*

Table 8: Post – 2016 MAR

	Buy						Sell					
	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm
MKTRF	0.775**	0.612***	0.885***	0.612***	0.826**	0.586**	0.900	-0.323	0.911	-0.023	1.251**	-0.182
	(2.49)	(2.94)	(2.66)	(2.72)	(2.27)	(2.59)	(1.60)	(-0.87)	(1.50)	(-0.06)	(2.25)	(-0.41)
SMB	-0.438	-0.918	-0.568	-0.918	0.071	-0.394	-0.243	1.388	-0.255	1.034	-0.685	1.708
	(-0.52)	(-1.63)	(-0.66)	(-1.59)	(0.07)	(-0.64)	(-0.16)	(1.39)	(-0.16)	(1.07)	(-0.25)	(1.50)
HML	-0.305	-0.793**	-0.113	-0.793**	-1.011	-1.167	-0.413	-0.431	-0.395	0.092	-1.573	-1.371**
	(-0.62)	(-2.41)	(-0.21)	(-2.20)	(-0.89)	(-1.58)	(-0.46)	(-0.73)	(-0.40)	(0.15)	(-1.21)	(-1.01)
MOM			0.561	0.002					0.053	1.592**		
			(0.93)	(0.01)					(0.04)	(2.24)		
CMA					0.875	1.563					-4.904	-0.378
					(0.54)	(1.50)					(-1.40)	(-0,19)
RMW					2.334	2.274*					-1.381	1.649
					(1.17)	(1.76)					(0.42)	(0.69)
α	-0.0004	-0.013	-0.004	-0.014	0.004	-0.008	-0.024	0.014	-0.032	0.004	-0.031	0.011
	(-0.03)	(-1.61)	(-0.31)	(-1.52)	(0.30)	(-1.02)	(-1.09)	(0.97)	(-1.05)	(0.29)	(-1.28)	(1.06)
N	114	114	114	114	114	114	114	114	114	114	114	114
R-squared	0.1302	0.2169	0.1480	0.2169	0.1598	0.2917	0.0609	0.0650	0.0609	0.1653	0.1053	0.0788
α (Long-Short)	0.012		0.008		0.012		-0.041		-0.035		-0.048*	
	(0.98)		(0.64)		(0.89)		(-1.56)		(-1.13)		(-1.77)	

*Table 8: The table presents the performance evaluation results for the four portfolios, for the trades disclosed in the period 1st July 2016 to 31st December 2019: buy-bank, buy-firm, sell-bank, sell-firm. The estimates are shown together with the t-test statistics (in parenthesis) of the factors included in the 3, 4 and 5 factor models. The variable of interest is the intercept of the line regression α. The two bottom lines show the α and their t-test statistics estimated on a portfolio long on banks and short on firms: on the left for purchases and on the right for sales. The symbols *,** and *** indicate statistical significance at the 10, 5 and 1% levels.*

The above findings are proof of no time variation in asymmetric information between banks (and firms) and the outside: insiders of both type of firms do not enjoy an informational advantage, meaning that the outside market participants had not less material information for the evolution of stock prices, both before and after regulatory intervention on transparency. The fact that these provisions do not identify a point in the sample when insiders stopped earning abnormal returns does not mean such interventions were not helpful from a transparency point of view. In fact, these regulatory acts might have helped to just keep constant the absence in asymmetry between banks' and firms' effective business status and the financial markets: to this extent regulatory efforts in the 2007-2019 period might have produced transparent companies.

Another analysis along the time dimension springs from Section 1.2.2, which highlighted how opacity can be exacerbated during crisis, when the inability of outsiders to assess the value of companies' assets can peak. For instance, outside investors became hesitant to lend after the subprime mortgage shock of August 2007, because bank solvency was all but certain to evaluate from the outside. As the discrepancy between what insiders and outsiders know grows in such periods, trades by bank insiders should be more profitable in crisis times, due to more accurate informational advantage insiders possess. This indirectly implies that if insiders foresaw the financial crisis of 2007-2009 their trades exploiting such advantage should be more profitable than in normal times and compared to other firms. To carry out the test normal vs turbulent times, I isolate the trades being executed specifically during or before the arrival of the financial crisis. Following Flanner, Kwan and Nimalendran (2014) the crisis period starts on August 2007 and lasts until 6 September 2012, when the European sovereign debt crisis was virtually calmed[19]. The transposition of the approach to the performance-evaluation method sees the estimation of the usual regression with the addition of two dummies, taking the value of one in the calendar months January 2007 to July 2007 (pre-crisis period), August 2007 to September 2012 (crisis period) and zero otherwise. These two dummies PRE_CRISIS and $CRISIS$ capture variation in abnormal returns during the pre-crisis and crisis period relative to the level of abnormal returns in normal times (the intercept α). There is no worry for the estimated abnormal returns to only capture market-wide variation coming from the general drop in prices due to the crisis, because all the regressions include the empirically-established asset pricing factors discussed in the previous sections.

[19] Differently to Spargoli and Upper (2018), whose crisis period ends in September 2009, this date is chosen in consistency with the European longer-lasting turmoil settings. On 6th September 2012, the ECB reassured financial markets through the employment of yield-lowering Outright Monetary Transactions.

If bank insiders anticipated the financial crisis and banks became opaquer coincidently to greater financial fears both relative to normal times and other firms, the coefficients on the pre-crisis and crisis dummies should be positive in the bank buy portfolios and in the long-bank-short-firm purchase portfolios, or negative in the bank sell portfolios and in the long-bank-short-firm sell portfolios. The results are contained in Table 9. The estimated αs indicate, once again, no statistically significant abnormal returns in normal times for both banks and firms. Moreover, there is no difference during pre-crisis and crisis period with respect to normal times, as the dummies are statistically equal to zero in all portfolios and specifications: for bank purchases, if anything, the pre-crisis and crisis periods reduce returns; for bank sales instead the pre-crisis and crisis dummies contribute to more negative abnormal returns while remaining statistically insignificant. These results indicate no informational advantage of bank insiders during pre-crisis or crisis period, for neither positive nor negative information. Finally, the estimates of the long-bank-short firm portfolios reveal no difference in the profitability of bank and firm insider purchases or sales in all specifications, neither in pre-crisis, nor in crisis times. In normal times the more profitable sales of bank insiders are once again given by firm insiders' sales anticipating positive stock returns, as in the baseline results. The EU findings on time variation of opacity through normal and distress times are consistent with the results obtain for the US by Spargoli and Upper (2018), who find that bank insiders earn lower profits on purchases during pre-crisis and crisis periods and unchanged returns on sales. The results of Table 9 therefore contribute to the idea that asymmetric information between banks operations and the markets remains durably null throughout the time dimension of the sample.

3.3.4 Bank Balance Sheet Characteristics

Results in the previous sections do not reveal a greater opacity of banks, neither ahead of regulatory intervention, neither during times of distress. The evidence gathered until now though refers to the comparison of the average bank and firm insiders' trades: the fact that banks are not opaque on average does not prevent some banks from being opaquer than others. By investigating if that is the case for the sample of banks in examine, it is possible to establish whether there exists a link between bank opacity and certain balance sheet characteristics. Such analysis thus focuses on within banking sector variation and aims at empirically connecting abnormal returns on bank

Table 9: Normal vs Turbulent Times

	Buy						Sell					
	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm	Bank	Firm
MKTRF	0.6551***	0.489***	0.601***	0.507***	0.646***	0.368*	0.398**	-0.231	0.285	0.116	0.235	0.053
	(4.68)	(2.96)	(4.12)	(2.93)	(3.92)	(1.89)	(2.05)	(1.80)	(1.42)	(0.88)	(1.04)	(0.35)
SMB	-0.2411	-0.985**	-0.271	-0.975**	-0.304	-1.077**	-0.568	-0.054	-0.631	-0.118	-0.783	-0.263
	(-0.67)	(-2.30)	(-0.75)	(-2.27)	(-0.80)	(-2.41)	(-1.14)	(-0.16)	(-1.27)	(-0.37)	(-1.50)	(-0.77)
HML	0.3675	-0.519	0.195	-0.461	-0.0004	0.166	0.519	0.046	0.160	-0.321	0.768	0.507
	(1.16)	(-1.38)	(0.57)	(-1.13)	(-0.0007)	(0.27)	(1.19)	(0.15)	(0.34)	(-1.04)	(1.06)	(1.06)
MOM			-0.282	0.095					-0.588*	-0.601***		
			(-1.28)	(0.36)					(-1.95)	(-3.06)		
CMA					-0.837	0.74					-0.441	-0.076
					(-1.18)	(0.88)					(-0.45)	(-0.11)
RMW					-0.138	-0.816*					-1.219	-1.292***
					(-0.21)	(-1.09)					(-1.40)	(-2.67)
α	0.0004	-0.004	0.007	-0.005	0.006	-0.005	-0.010	0.012	-0.005	0.017**	-0.008	0.012
	(0.48)	(-0.35)	(0.77)	(-0.42)	(0.62)	(-0.42)	(-0.75)	(1.44)	(-0.36)	(2.07)	(-0.66)	(1.53)
PRE-CRISIS	-0.016	0.005	-0.013	0.004	-0.007	0.003	-0.029	0.036	-0.025	-0.031	-0.018	-0.028
	(-0.42)	(0.10)	(-0.37)	(0.09)	(-0.20)	(0.07)	(-0.60)	(-1.10)	(-0.51)	(-1.00)	(-0.36)	(-0.83)
CRISIS	-0.008	-0.003	-0.009	-0.002	-0.006	0.003	-0.0005	0.002	-0.004	-0.0008	0.003	0.005
	(-0.52)	(-0.15)	(-0.70)	(-0.12)	(-0.40)	(-0.18)	(-0.02)	(0.17)	(-0.18)	(-0.06)	(0.16)	(0.38)
N	161	161	161	161	161	161	161	161	161	161	161	161
R-squared	0.2027	0.0815	0.2111	0.0822	0.2099	0.0940	0.0736	0.0363	0.0960	0.0917	0.0861	0.0678
Long-Short: α	0.008		0.011		0.010		-0.022*		-0.022*		-0.022	
	(0.61)		(0.85)		(0.77)		(-1.67)		(-1.65)		(-1.62)	

Table 9: Normal vs Turbulent Times (Continued)

Long-Short: PRE-CRISIS	-0.024	-0.021	-0.014	0.003	0.003	0.006
	(-0.48)	(-0.427)	(-0.28)	(0.061)	(0.06)	(0.11)
Long-Short: CRISIS	-0.006	-0.008	-0.003	-0.002	-0.003	-0.002
	(-0.30)	(-0.40)	(-0.14)	(-0.13)	(-0.13)	(-0.08)

*Table 9: The table presents the performance evaluation results for the four portfolios, buy-bank, buy-firm, sell-bank, sell-firm adding the dummy PRE-CRISIS for observation on the period January 2007 to August 2007 and the dummy CRISIS for the period August 2007 to September 2012. The estimates are shown together with the t-test statistics (in parenthesis) of the factors included in the 3, 4 and 5 factor models. The variable of interest is the intercept of the line regression α. The two bottom lines show the α, the dummies and their t-test statistics estimated on a portfolio long on banks and short on firms: on the left for purchases and on the right for sales. The symbols *,** and *** indicate statistical significance at the 10, 5 and 1% levels.*

insiders to the determinants of bank opacity assessed at the beginning of this work in Chapter 1, which see loans, trading book and leverage as bank features making banks intrinsically opaque.

To this end, time series of balance sheet characteristics are retrieved for the three different determinants, for all banks. For loans, the $EOP\ Loans/EOP\ Deposits$ ratio is used; for the trading book, the $Securities\ \%\ Avg.Earning\ Assets$ key metric is employed; for leverage, the $Assets/Equity$ leverage ratio is taken. For each bank, the time series are made of quarterly data of the three metrics for the same time period analyzed until now, January 2007 to December 2019, to enable a consistent comparison. Consequently, for each of the three determinants, the mean level among the sample banks is computed, and the group of banks is split between above average and below average. For instance, regarding loans, the group made of Banco Santander, BBVA, Intesa San Paolo, ING and Unicredit has an above average $EOP\ Loans/EOP\ Deposits$ ratio, while the group made of BNP Paribas, Credit Agricole, Deutsche Bank and KBC Group shows a below average $EOP\ Loans/EOP\ Deposits$ ratio. This yields six groups, two for each balance sheet metric, which are displayed in Figure 10.

Metric	Banks	Group
Loans/Deposits (84.27%)	Above: Banco Santander, BBVA, Intesa San Paolo, ING, Unicredit	A
	Below: BNP, Credit Agricole, Deutsche Bank, KBC Group	B
Trading Book (31.04%)	Above: BNP, Deutsche Bank, KBC, ING	C
	Below: Banco Santander, BBVA, Intesa San Paolo, CA, Unicredit	D
Leverage (22.05%)	Above: BNP, Credit Agricole, Deutsche Bank, ING	E
	Below: Banco Santander, BBVA, Intesa San Paolo, KBC,Unicredit	F

Figure 10: groups A-F, with respect to the three metrics. In parenthesis the sample's average, which splits banks into two groups for each balance sheet characteristic.

The resulting six groups of banks can be seen as groups of different type of companies, like banks and firms in the previous chapter, on which to apply the performance-evaluation methodology with respect to every one of the three metrics. In fact, the six groups virtually represent six portfolios of bank stocks traded by insiders For simplicity, these groups are named A, B, C, D, E, F. Since Chapter 1's theory predicts that a higher level of all three of these metrics should produce greater opacity, a comparison between abnormal returns earned by above-average banks and below-average banks can be made, with respect to purchases and sales, using the same methodology of

the previous sections. To this purpose, I build twelve additional buy-bank sell-bank portfolios (one buy portfolio and one sell portfolio for each A, B, C, D, E, F group of banks), each one containing insider trades only of the banks attaining to one of the six groups of Figure 10. Basically, the bank stocks not in the group of interest are dropped in turn from the old buy-bank and sell-bank portfolios of previous sections in order to give birth to the twelve new portfolios. Once again, it is like a shadow mutual fund following the purchases or the sales of all the insiders of one group combined. The objective is to compare one vs one the portfolios that are product of the same metric, namely $A\ vs\ B, C\ vs\ D$ and $E\ vs\ F$, as if A, C, E were banks and B, D, F were firms: however, A, C, E are banks with above average loans, trading book size and leverage respectively and B, D, F are banks with below average levels of the same metrics. If insiders of banks with higher level of loans, trading book size and leverage earn higher abnormal returns, then opacity can be associated to such metrics.

Following the logic of the performance-evaluation test for banks vs firms, if the insiders of banks attaining to either of the group obtains abnormal returns, the respective buy (sell) portfolios will show positive (negative) αs. Furthermore, if abnormal returns earned by A, C or E groups are greater than the ones earned by the B, D or F groups, positive (negative) αs on the long-A, C, E-short-B, D, F buy portfolios (long-A, C, E-short-B, D, F sell portfolios) indicate a higher degree of market inefficiency for bank stocks with higher loans, trading book size and leverage, implying that a strategy replicating all the transactions made by those bank insiders earns greater returns than one following the other bank insiders' trades.

Tables 10, 11 and 12 contain the results for comparison of $A\ vs\ B$, $C\ vs\ D$ and $E\ vs\ F$ respectively. For loans-to-deposit ratio and leverage, all group of banks, namely A, B and E, F fail to earn abnormal returns statistically different than zero, on both purchases and sales, for all specifications. The same stands for purchases of groups C, D compared through their trading book level. As Table 11 denotes instead, group C earns (avoids losses) statistically significant negative abnormal returns on sales, up to 70 basis points, for the three-factor model specification, while group D does not. This means that C, the group composed by insiders of BNP Paribas, Deutsche Bank ING and KBC group, which shows a trading book size larger than average, can be linked to absolute opacity. However, the α in the long-C-short-D portfolio is negative but not statistically different than zero, indicating that group C is not relevantly more opaque than group D composed by Banco Santander, BBVA, Credit Agricole, Intesa San Paolo, Unicredit. As the earned negative abnormal returns by C are not greater than those earned by D, relative opacity of banks with higher

Table 10: Loan Book group A vs group B

	Buy						Sell					
	A	B	A	B	A	B	A	B	A	B	A	B
MKTRF	0.523***	0.691***	0.501**	0.669***	0.479**	0.721***	0.275	0.436**	0.190	0.339	0.090	0.281
	(2.66)	(4.62)	(2.43)	(4.28)	(2.08)	(4.11)	(1.53)	(2.15)	(1.01)	(1.61)	(0.43)	(1.17)
SMB	-0.446	-0.127	-0.457	-0.138	-0.613	-0.179	-0.542	-0.589	-0.565	-0.635	-0.680	-0.831
	(-0.88)	(-0.33)	(-0.90)	(-0.36)	(-1.16)	(-0.45)	(-1.13)	(-1.13)	(-1.22)	(-1.22)	(-1.41)	(-1.50)
HML	0.283	0.279	0.211	0.208**	-0.397	-0.395***	0.959**	0.443	0.685	0.131	1.888***	0.521
	(0.63)	(0.83)	(0.43)	(0.56)	(-0.54)	(-0.70)	(2.35)	(0.96)	(1.55)	(0.26)	(2.82)	(0.68)
MOM			-0.119	-0.117					-0.452	-0.514		
			(-0.38)	(-0.49)					(-1.60)	(-1.62)		
CMA					-1.719*	-1.265*					0.883	-0.777
					(-1.76)	(-1.70)					(0.98)	(-0.76)
RMW					-0.456	0.111					-1.261	-1.196
					(-0.52)	(0.17)					(-1.57)	(-1.32)
α	-0.008	0.002	-0.007	0.003	-0.002	0.006	-0.008	-0.011	-0.005	-0.008	-0.008	-0.007
	(-0.833)	(0.32)	(-0.73)	(0.41)	(-0.23)	(0.76)	(-0.86)	(-1.14)	(-0.51)	(-0.78)	(-0.92)	(-0.70)
N	161	161	161	161	161	161	161	161	161	161	161	161
R-squared	0.0732	0.1799	0.0771	0.1812	0.0955	0.1953	0.0961	0.0679	0.1108	0.0834	0.1166	0.0813
α (Long-Short)	-0.011		-0.011		-0.009		0.003		0.003		-0.002	
	(-1.27)		(-1.24)		(-0.97)		(0.36)		(0.30)		(-0.21)	

*Table 10: The table presents the performance evaluation results for the four portfolios buy-A, buy-B, sell-A, sell-B, long on banks A and short on banks B for both purchases and sales, for the trades disclosed in the period 1st January 2007 to 31st December 2019. The estimates are shown together with the t-test statistics (in parenthesis) of the factors included in the 3, 4 and 5 factor models. The symbols *,** and *** indicate statistical significance at the 10, 5 and 1% levels. The group A is composed by banks: Banco Santander, BBVA, ING, Intesa San Paolo, Unicredit. Group B is composed by banks: BNP Paribas, Credit Agricole, KBC group, Deutsche Bank.*

Table 11: Trading Book group C vs group D

	Buy						Sell					
	C	D	C	D	C	D	C	D	C	D	C	D
MKTRF	0.673***	0.657***	0.621***	0.626***	0.671***	0.697***	0.363**	0.374*	0.253	0.244	0.241	0.178
	(4.59)	(4.42)	(4.06)	(4.03)	(3.88)	(3.99)	(2.25)	(1.81)	(1.53)	(1.15)	(1.27)	(0.73)
SMB	-0.219	-0.237	-0.244	-0.252	-0.283	-0.269	-0.675	-0.427	-0.728*	-0.489	-0.821*	-0.668
	(-0.58)	(-0.62)	(-0.65)	(-0.66)	(-0.72)	(-0.67)	(-1.63)	(-0.81)	(-1.78)	(-0.93)	(-1.89)	(-1.20)
HML	0.307	0.405	0.137	0.305	-0.103	-0.249	0.566	0.681	0.212	0.261	0.885	1.147
	(0.92)	(1.20)	(0.38)	(0.83)	(-0.18)	(-0.45)	(1.55)	(1.46)	(0.54)	(0.52)	(1.47)	(1.49)
MOM			-0.279	-0.164					-0.584**	-0.691**		
			(-1.21)	(-0.71)					(-2.34)	(-2.16)		
CMA					-0.897	-1.161					-0.049	-0.177
					(-1.23)	(-1.56)					(-0.06)	(-0.17)
RMW					-0.096	0.195					-0.885	-1.430
					(-0.14)	(0.29)					(-1.23)	(-1.55)
α	-0.0007	0.003	0.001	0.004	0.002	0.006	-0.007*	-0.013	-0.003	-0.008	-0.006	-0.010
	(-0.10)	(0.34)	(0.15)	(0.48)	(0.27)	(0.74)	(-1.65)	(-0.90)	(-0.43)	(-0.77)	(-0.71)	(-0.94)
N	161	161	161	161	161	161	161	161	161	161	161	161
R-squared	0.1831	0.1840	0.1907	0.1866	0.1909	0.1974	0.1002	0.0678	0.1319	0.0949	0.1089	0.0822
α (Long-Short)	-0.004		-0.003		-0.004		0.005		0.004		0.003	
	(-0.84)		(-0.66)		(-0.87)		(0.61)		(0.50)		(0.43)	

*Table 11: The table presents the performance evaluation results for the four portfolios buy-A, buy-B, sell-A, sell-B, long on banks A and short on banks B for both purchases and sales, for the trades disclosed in the period 1st January 2007 to 31st December 2019. The estimates are shown together with the t-test statistics (in parenthesis) of the factors included in the 3, 4 and 5 factor models. The symbols *,** and *** indicate statistical significance at the 10, 5 and 1% levels. The group C is composed by banks: BNP Paribas, ING, KBC group, Deutsche Bank. Group D is composed by banks: Banco Santander, BBVA, Credit Agricole, Intesa San Paolo, Unicredit.*

Table 12: Leverage group E vs group F

	Buy						Sell					
	E	F	E	F	E	F	E	F	E	F	E	F
MKTRF	0.641***	0.781***	0.580***	0.735***	0.610***	0.783***	0.343*	0.355**	0.237	0.239	0.178	0.177
	(4.32)	(5.56)	(3.76)	(5.02)	(3.49)	(4.71)	(1.68)	(2.13)	(1.13)	(1.39)	(0.74)	(0.90)
SMB	-0.198	-0.593*	-0.227	-0.620*	-0.282	-0.632*	-0.55	-0.691	-0.606	-0.746	-0.775	-0.921**
	(-0.52)	(-1.65)	(-0.60)	(-1.71)	(-0.70)	(-1.66)	(-1.05)	(-1.61)	(-1.16)	(-1.76)	(-1.41)	(2.06)
HML	0.381	0.284	0.185	0.137	0.136	0.034	0.537	0.732*	0.194	0.358	0.815	1.080*
	(1.14)	(0.89)	(0.51)	(0.39)	(0.24)	(-0.06)	(1.16)	(1.94)	(0.39)	(0.89)	(1.07)	(1.74)
MOM			-0.320	-0.241					-0.564*	-0.614**		
			(-1.38)	(-1.09)					(-1.77)	(-2.38)		
CMA					-0.705	-0.525					-0.397	-0.322
					(-0.95)	(-0.74)					(-0.39)	(-0.38)
RMW					-0.278	-0.030					-1.223	-1.312*
					(-0.41)	(-0.04)					(-1.34)	(-1.76)
α	-0.002	-0.001	0.0006	0.0003	0.0009	0.0003	-0.011	-0.004	-0.008	0.0003	-0.009	-0.0009
	(-0.21)	(-0.19)	(0.08)	(0.04)	(0.12)	(0.04)	(-1.21)	(-0.45)	(-0.81)	(0.05)	(-0.87)	(-0.11)
N	161	161	161	161	161	161	161	161	161	161	161	161
R-squared	0.1753	0.2466	0.1853	0.2524	0.1808	0.2493	0.0564	0.1096	0.0751	0.1408	0.0679	0.1277
α (Long-Short)	-0.0009		-0.0004		-0.0001		-0.009		0.004		-0.009	
	(-0.21)		(-0.9)		(-0.02)		(-1.30)		(0.50)		(-1.22)	

*Table 12: The table presents the performance evaluation results for the four portfolios buy-A, buy-B, sell-A, sell-B, long on banks A and short on banks B for both purchases and sales, for the trades disclosed in the period 1st January 2007 to 31st December 2019. The estimates are shown together with the t-test statistics (in parenthesis) of the factors included in the 3, 4 and 5 factor models. The symbols *,** and *** indicate statistical significance at the 10, 5 and 1% levels. The group E is composed by banks: BNP Paribas, ING, Credit Agricole, Deutsche Bank. Group F is composed by banks: Banco Santander, BBVA, KBC Group, Intesa San Paolo, Unicredit.*

level of securities in their earning assets, with regards to negative information driving sales, is rejected.

Overall, these results confirm one more time that bank insiders seem to fail in obtaining abnormal returns. Banks with larger loan and trading books and higher leverage do not appear more opaque than other banks, even though there is evidence that banks with a relatively larger trading book might be opaque in absolute levels. The findings resemble the ones obtained by Spargoli and Upper (2018) for the US, and the absence of a link between profitability of ban insider trading and balance sheet characteristics such as presumed determinants of bank opacity is in contrast with the theoretical literature presented in Chapter 1, which points out a certain degree of intrinsicality in bank opacity. According to Spargoli and Upper (2018), this could be ascribed to the role loans or trading assets have for insiders: the informational advantage possessed by insiders might be more about the overall bank performance or specific events rather than on the quality of loans or trading assets in holding. In this view, loan and trading book might not be able to explain earnings on insider trading, but would be easier to link to measures of opacity that judge banks from the outside, like credit split ratings as the existing literature has shown, because they affect outsiders valuation ability rather than directly drive insider trading.

CONCLUSIONS

This work inquires bank opacity, both in absolute scope and relative to other firms, by contrasting the returns on trades earned by bank and firm corporate insiders. In doing so, it contributes to the bank opacity literature by advancing an alternative measure of asymmetric information between financial institutions and market participants, exploiting the notifications of trade made publicly available by insiders under the disclosure requirements laid down by the European Market Abuse Regulation of 2016. The rationale for testing whether insiders score abnormal profitability on their trades is that, because of the difficulty in valuating a bank from the outside, bank insiders should relish a greater informational advantage than firm insiders. From such hypothesis, bank insiders should empirically show higher profits on their trades, i.e. the stock returns should increase more for banks than firms after insiders' purchases and, symmetrically, decrease more after sales.

The empirical evidence brought by the employment of performance-evaluation methods does not back the hypothesis that banks are less transparent than other firms. For purchases, neither bank nor firm insiders earn abnormal returns, while the difference between these groups' profitability also remains statistically equal to zero. For sales, both bank and firm insiders do not avoid abnormal losses; if the former outperform the latter, it is only due to the wrong timing of firm insiders' sales, which are followed by increases in stock prices. This result suggests that firm insiders' sales might be driven by reasons other than the possession of private information, which is confirmed by the percentage of firm insiders' sales ascribable to routine type of trades. On the contrary, almost the entirety of bank insiders' transactions is attributable to opportunistic type of trades. Hence, the findings not only discard relative opacity of banks, but also questions the view of conventional economic wisdom maintaining banks inherently opaque, both with respect to positive information concerning purchases opportunities and negative information cruising sales. This is a result not precedented in the previous literature, which ignored the separation between buy-sell transactions and the type of information they are driven by, and contrasted banks to firms not on the basis of a transparency benchmark, which the performance-evaluation does.

Time variation is opacity is also investigated. Bank insiders fail to earn abnormal returns during periods prior and during the financial and sovereign debt crisis of the period 2007-2012, even though information asymmetries should in theory widen during those times. This implies that bank insiders might not enjoy greater informational advantage during times of financial distress. When comparing pre- and post- regulatory intervention subperiods, like before and after the

introduction of new transparency laws such as the extended disclosure requirements of Pillar III in 2015 or the updated code on insider trading in 2016's MAR, no proof of bank insiders' abnormal profitability is found in all subperiods, consistently to the base line results. This does not mean that the regulations were not useful to market participants because outsiders' ability to assess the operations of banks is not poorer than bank insiders' themselves for the whole sample period.

Within bank variation is also taken into analysis. Although insiders of banks with higher-than-average trading book size seem to avoid abnormal losses with respect to sales, overall banks with large loan and trading book and high leverage, the three main theoretical determinants of bank opacity, do not earn greater profits when compared to insiders of banks with below average levels of the same measures. Therefore, while the trading activity appears to have some grounds for being regarded to as an opacity determinant, comprehensively these three metrics cannot be linked to greater opacity, at least for this work's sample of EU banks. This at the same time suggests that as insider trading is reasonably not directly impacted by specific information on loans and holdings of securities, it might not explain why banks should be less transparent than nonbanks if drawn near to these balance sheet characteristics.

In conclusion, the above results allow some broader considerations. Stricter bank regulation such as capital and disclosure requirements is justified by upholding outsider investors' ability to effectively assess their solvency harmed by lack of transparency associated to core bank activities. Even though here no evidence is found of greater bank opacity, it is possible that it is this kind of regulations rather than the intrinsic nature of different business models that has made banks apparently more transparent. Examining this hypothesis is however unfeasible in practice, as data from banks not subject to such regulation would be needed. From a policy perspective, how much transparency is enough should be a balanced product between marginal benefits of further transparency with respect to the regulatory burden placed on financial institutions: as this work's findings detect that the market assesses a bank's condition quite effectively, when thinking of further regulation to compensate banks' special nature the focus should also be on what bank opacity measure is used to supplement traditional supervisory activities.

To this extent, insider trading profitability outcomes' contribution is to add an alternative measure of asymmetric information between banks and outsiders. EU banks largely mimic the results already established by Spargoli and Upper (2018) for the US and appear not opaque. Though, the discrepancy with some of the works in the bank opacity literature warns on the importance of the benchmark and type of information chosen to analyze this peculiar topic: while

the obtained results are consistent with informed trading theory and US evidence, one clear bottom line of the analysis of insider trading activity in EU is that the researcher's ability to find evidence regarding financial institutions' opaqueness depends on the quality of the disclosures' data published by authorities fragmented on a national level, and thus indirectly on the degree of enforcement and insiders' will to legally report their trades.

APPENDIX A

Jan-16			Feb-16			Mar-16			Apr-16		
8/20/2015	Banco San	3.61	8/20/2015	Banco San	3.552						
9/7/2015	Banco San	4.013	9/7/2015	Banco San	3.399	9/7/2015	Banco San	3.967			
12/14/2015	Banco San	3.973	12/14/2015	Banco San	3.489	12/14/2015	Banco San	4.364	12/14/2015	Banco San	3.953
	VW RET	-0.15203	2/4/2016	Banco San	3.5	2/4/2016	Banco San	3.985	2/4/2016	Banco San	3.655
			2/8/2016	BNP	41.08	2/8/2016	BNP	45.66	2/8/2016	BNP	41.94
			2/9/2016	DB	14.8	2/9/2016	DB	15.37	2/9/2016	DB	12.49
			2/10/2016	BNP	40.08	2/10/2016	BNP	46.15	2/10/2016	BNP	42.31
			2/11/2016	BNP	37.07	2/11/2016	BNP	48.7	2/11/2016	BNP	42.31
			2/18/2016	BNP	41.7	2/18/2016	BNP	45.62	2/18/2016	BNP	45.73
			2/25/2016	BBVA	5.44	2/25/2016	BBVA	5.719	2/25/2016	BBVA	6.218
			2/25/2016	Intesa	2.1525	2/25/2016	Intesa	2.408	2/25/2016	Intesa	2.4
			2/26/2016	BBVA	5.63	2/26/2016	BBVA	5.661	2/26/2016	BBVA	6.547
				VW RET	-0.09969	3/8/2016	BBVA	6.19	3/8/2016	BBVA	5.239
							VW RET	0.147542	4/29/2016	BBVA	6.15
										VW RET	-0.07412

A.1: detail of the buy-bank portfolio for the baseline results, months January 2016 to April 2016. When the stocks reach the holding period of six months, they are dropped, like Banco Santander reaching March 2016 in the first line. Month by month, the newly executed trades are added and the value-weighted (VW) returns are computed. The dates refer to the execution dates.

Dec-13			Jan-14			Feb-14			Mar-14		
6/10/2013	Enel	3.09									
6/24/2013	LVMH	129.95									
7/18/2013	L'Oreal	123.8	7/18/2013	L'Oreal	125.15						
7/18/2013	L'Oreal	123.8	7/18/2013	L'Oreal	125.15						
8/9/2013	LVMH	131	8/9/2013	LVMH	122.95	8/9/2013	LVMH	133.5			
9/20/2013	LVMH	129.8	9/20/2013	LVMH	127.5	9/20/2013	LVMH	137.15	9/20/2013	LVMH	129.3
9/30/2013	LVMH	132.2	9/30/2013	LVMH	122.5	9/30/2013	LVMH	131.05	9/30/2013	LVMH	131.95
11/5/2013	L'Oreal	122.35	11/5/2013	L'Oreal	125.4	11/5/2013	L'Oreal	120.85	11/5/2013	L'Oreal	121.5
11/15/2013	Iberdrola	4.69	11/15/2013	Iberdrola	4.69	11/15/2013	Iberdrola	4.69	11/15/2013	Iberdrola	4.69
11/15/2013	L'Oreal	125.5	11/15/2013	L'Oreal	122.6	11/15/2013	L'Oreal	122.95	11/15/2013	L'Oreal	116.8
11/18/2013	Allianz	125.5	11/18/2013	Allianz	133.9	11/18/2013	Allianz	129.9	11/18/2013	Allianz	122.9
12/11/2013	LVMH	129.2649	12/11/2013	LVMH	125.8	12/11/2013	LVMH	134.5	12/11/2013	LVMH	130.9
12/24/2013	LVMH	130.0055	12/24/2013	LVMH	124.2	12/24/2013	LVMH	137.15	12/24/2013	LVMH	128.45
	VW RET	-0.03858	1/2/2014	Iberdrola	4.615	1/2/2014	Iberdrola	4.262	1/2/2014	Iberdrola	4.488
			1/2/2014	Iberdrola	4.645	1/2/2014	Iberdrola	4.262	1/2/2014	Iberdrola	4.488
				VW RET	-0.01414	2/5/2014	ASML	62.8	2/5/2014	ASML	65.24
						2/5/2014	ASML	62.88	2/5/2014	ASML	65.24
							VW RET	0.040699		VW RET	-0.02518

A.2: detail of the sell-firm portfolio for the baseline results, months December 2013 to March 2014. The mechanism computing VW returns is the same for all portfolios throughout the performance-evaluation analysis.

APPENDIX B

```
function Reg=OLSReg(y,X);
%function [beta,u,Omega,var_beta,ttest,Rsquared]=OLS(y,X);

[T,K]=size(X);

z=X'*y;
P=X'*X;
beta=P\z;
u=y-X*beta;

Proj=X/(X'*X)*X'; % Projection matrix
y_hat=Proj*y;% Fitted value
u_hat=y-y_hat;% Residuals are equal to u


%variance of the residuals:
RSS=u'*u;
Omega=[u'*u]./(T-K);
%and  Standard Error of Regression (SER)
%s=sqrt(Omega);


%variance of the OLS-estimator, var(vec(beta));

XXI=inv(X'*X);
var_beta=kron(Omega,XXI);

%Variance Covariance Matrix of the OLS estimator
%Omega_beta=Omega*inv(X'*X);

betadiag=zeros(size(beta));
betadiag(:)=sqrt(diag(var_beta));

ttest=beta./betadiag;


%this loop enables the calculation of R-squared in a system of sur.
for l=1:size(y,2);
    y_mean=mean(y(:,l));
    y=y-y_mean;

    Rsquared(l,1)=1- ([RSS(l,l)]/[y(:,l)'*y(:,l)]);
    %Rsquared(l,1)= 1 - [(1-Rsquared(l,1))*((T-1)/(T-K))];%adjusted R


end;

Reg.b=beta;
Reg.u=u;
Reg.Omega=Omega;


Reg.tstat=ttest;
Reg.Rsquared=Rsquared;
Reg.var_b=var_beta;
Reg.yhat=y_hat;
```

B.1: MATLAB code referring to a function built for the OLS estimation of the baseline regression. The function is used for the estimation of all portfolios' performances.

```
%-------- buy banks 1 ------------

r_buy_banks=ret_buy_banks-rf;

three_factors_1=OLSReg(r_buy_banks(:),[ones(size(r_buy_banks,1),1),MKTRF(:),SMB(:),HML↙
(:)])

%--------- sell banks 2 -----------

r_sell_banks=ret_sell_banks-rf;

three_factors_2=OLSReg(r_sell_banks(:),[ones(size(r_sell_banks,1),1),MKTRF(:),SMB(:),↙
HML(:)])

%-------- buy firms 3 ------------

r_buy_firms=ret_buy_firms-rf;

three_factors_3=OLSReg(r_buy_firms(:),[ones(size(r_buy_firms,1),1),MKTRF(:),SMB(:),HML↙
(:)])


%-------- sell firms 4 ------------

r_sell_firms=ret_sell_firms-rf;

three_factors_4=OLSReg(r_sell_firms(:),[ones(size(r_sell_firms,1),1),MKTRF(:),SMB(:),↙
HML(:)])

%-------- long-short buy 5 ------------

ret_buy_longshort=ret_buy_banks-ret_buy_firms;
r_buy_longshort=ret_buy_longshort-rf;

three_factors_5=OLSReg(r_buy_longshort(:),[ones(size(r_buy_longshort,1),1),MKTRF(:),SMB↙
(:),HML(:)])


%-------- long-short buy 6 ------------

ret_sell_longshort=ret_sell_banks-ret_sell_firms;
r_sell_longshort=ret_sell_longshort-rf;

three_factors_6=OLSReg(r_sell_longshort(:),[ones(size(r_sell_longshort,1),1),MKTRF(:),↙
SMB(:),HML(:)])
```

B.2: MATLAB code of the estimation of the portfolios' performance, in particular for the three-factors model. The same structure is repeated for all specifications and portfolios in the study.

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