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Graduate School of Management

Master in Corporate Finance

DISCLOSURE PRACTICES AND RISKINESS OF
FINANCIAL INSTITUTION

Master's Thesis by the 2nd year student

Concentration — Master in Corporate Finance

Aidar Zaripov

Research advisor:

Associate Professor, Irina V. Berezinets

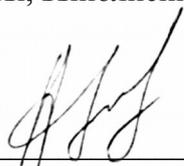
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ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

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_____ 26 May 2016

_____ (Date)

АННОТАЦИЯ

Автор	Зарипов Айдар Ирекович
Название магистерской диссертации	«Раскрытие информации и рискованность финансового института»
Факультет	Высшая школа менеджмента
Направление подготовки	080200 «Менеджмент» (Профиль: Корпоративные финансы)
Год	2016
Научный руководитель	Ирина Владимировна Березинец, к.ф.-м.н., доцент
Описание цели, задач и основных результатов	Цель данного исследования заключается в выявлении взаимосвязи между степенью раскрытия информации и рискованностью финансового института. Для достижения цели исследования я тщательно изучил теоретические основы оценки рисков, роль раскрытия информации на рынке капитала, а также произвел обзор предыдущих исследований, связанных с вопросом взаимосвязи между степенью раскрытия информации и рискованностью финансового института. Затем мной производилась оценка агрегированного, систематического, идиосинкратического рисков, а также риска падения для 66 крупнейших публичных банковских холдинговых компаний США. Оценка степени раскрытия производилась путем расчета сконструированного индекса степени раскрытия информации. Панельно-регрессионный анализ выявил, наличие обратной взаимосвязи между степенью раскрытия информации и рискованностью финансового института. Полученные результаты позволяют сделать вывод о том, что более высокая степень раскрытия информации может способствовать снижению информационной асимметрии и таким образом привести к сниженной рискованности банковской холдинговой компании.
Ключевые слова	Раскрытие информации, рискованность финансового института, агрегированный риск, риск падения, систематический риск, идиосинкратический риск, асимметрия информации

ABSTRACT

Master Student's Name	Aidar Zaripov
Master Thesis Title	“Disclosure practices and riskiness of financial institution”
Faculty	Graduate school of management
Main field of study	080200 “Management” (specialization: Master of Corporate Finance)
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Academic Advisor’s Name	Irina V. Berezinets, PhD in Physico-mathematical sciences, Associate Professor
Description of the goal, task and main results	The goal of the research paper is to investigate the relationship between disclosure and riskiness of a financial institution. In order to achieve the goal I scrutinized the theoretical grounds of risk assessment, the role of disclosure in capital markets and conducted overview of prior research related to the relationship between disclosure and riskiness of a financial institution. Then for the sample of 66 publicly listed U.S. bank holding companies (BHCs) I estimated the aggregated risk, the downside risk, the systemic risk and the idiosyncratic risk for each BHC. The level of disclosure was measured by constructed disclosure index. The panel regression analysis identified that there is negative relationship between disclosure and riskiness of financial institution. The obtained results suggests that increased disclosure may help to mitigate some of information asymmetry and thus lead to decreased riskiness of bank holding company.
Keywords	Disclosure, riskiness of financial institution, the aggregated risk, the downside risk, the systemic risk, the idiosyncratic risk, information asymmetry

Table of contents

Introduction.....	7
Chapter 1. Theoretical grounds of risk assessment.....	10
1.1. Standard Deviation as a measure of aggregated risk.....	10
1.2. Downside deviation as a measure of downside risk.....	13
1.3. Beta as a measure of systemic risk.....	15
1.4. Idiosyncratic risk and its measurement.....	19
Chapter 2. Corporate disclosure.....	22
2.1. The role of disclosure in capital markets.....	22
2.2. Regulation of disclosure and financial reporting.....	24
2.3. Relationship between disclosure and different types of risk.....	27
Chapter 3. Empirical study on relationship between disclosure and risk.....	30
3.1. Hypotheses development.....	30
3.2. Methodology.....	30
3.3. Sample selection and descriptive statistics.....	34
3.3.1. Sample selection.....	34
3.3.2. Descriptive statistics.....	35
3.4. Regression results and discussion.....	39
3.4.1. Regression results.....	39
3.4.2. Discussion.....	41
Conclusion.....	44
List of References.....	46
Appendix 1.....	49
Appendix 2.....	51

Introduction

Demand for corporate disclosure arises due to the existences of information asymmetry, when managers have better information about the company's performance than investors and other external stakeholders do, and agency problem, when managers act on their own interest by putting the shareholders' interests on the second place. Information and agency problems create some obstacles for optimal allocation of resources in capital markets. In particular, limited information, high level of complexity, opacity of banks contribute to mispricing of risks by investors.

Requirements to increase the level of disclosure by managers might be a potential solution towards mitigating these problems. Hence, the issue of transparency through greater disclosure has been an important theme discussed by regulatory authorities. Over the past years, some measures were taken in order to increase the transparency of financial institutions. For instance, Basel Committee introduced Basel II, Pillar 3 that includes a number of disclosure requirements aimed to improve the ability of investors to assess the bank's risk and value. Whether such initiatives provide any benefits is an open question.

Corporate disclosure reduces information asymmetry between investors and company's managers. A number of studies argue that enhanced disclosure and reduced information asymmetry have some desirable capital market consequences. Among these are efficient allocation of resources, improved liquidity of the stock, lower risk, development of capital market, decreased cost of capital.¹

The main goal of this research paper is to investigate the relationship between disclosure and riskiness of a financial institution. Since higher disclosure reduces the information asymmetry between the company's management and investors, then it may in turn affect the investor's assessment of bank riskiness.

The review of existing literature reveals that the effect of corporate disclosure on enterprise risks is ambiguous. Prior empirical researches that investigate this issue provide mixed evidence. On one hand, a number of studies reveal that the level of disclosure is positively associated with the stock return volatility (Ross; 1989 and Leuz and Verrecchia; 2000). However a number of studies argue that higher level of disclosure decrease stock price volatility (Bushee and Noe; 2000, Baumann and Nier; 2004, and Kothari, Li, and Short; 2009).

¹See Diamond and Verrecchia (1991), Verrecchia (1994), Botosan (1997) Bushee and Noe (2000), Easley et al. (2002), Easley and O'Hara (2004), Baumann and Nier (2004), Kothari, Li, and Short (2009), Lambert et al. (2007)

To reach the goal of the paper a number of objectives were set:

- scrutinize the grounds of risk assessment, specifically, define different types of risk and describe methods for their measurement
- scrutinize the role of corporate disclosure in capital markets and provide an overview of prior research devoted to the relationship between disclosure and different types of risk
- conduct empirical study to examine whether there is any relationship between corporate disclosure and riskiness of financial institution
- analyze empirical results and draw conclusions

Based on the analysis of prior research, four hypotheses about the relationship between disclosure and riskiness of a financial institution were stated. The hypotheses are formulated as follows.

H1. The higher the level of bank's disclosure in the current year the lower the aggregated risk in the following year.

H2. The higher the level of bank's disclosure in the current year the lower the systemic risk in the following year.

H3. The higher the level of bank's disclosure in the current year the lower the idiosyncratic risk in the following year.

H4. The higher the level of bank's disclosure in the current year the lower the downside risk in the following year.

For testing these hypotheses a data set on 66 publicly listed United States bank holding companies over the period 2010-2013 was formed. Panel regression model was employed in order to analyze the relationship more thoroughly. The results of this empirical research will enable us to make conclusions about the relationship between disclosure and riskiness of a financial institution and provide some possible policy implications.

The research is divided into three chapters. The first chapter of this paper concentrates on theoretical grounds of risk assessments. Particularly we describe different types of risk that investor face while making investment decisions. As it was already mentioned, we focus on four types of risk: the aggregated risk, the systemic risk, the idiosyncratic risk and the downside risk. For each type of risk we provide the definition, describe the approach for their measurement and review prior research where each risk measure was employed. In the second chapter we discuss the role of corporate disclosure in capital markets, describe the disclosure regulation in the United States. Additionally we provide an overview of prior researches related to the analysis of

relationship between disclosure and different types of risk. Chapter 3 is devoted to the empirical analysis of the relationship between disclosure and different types of risk. The hypotheses, sample description and the results of the analysis are presented in this chapter. Based on the results some managerial implications are provided.

Chapter 1. Theoretical grounds of risk assessment

Investing in capital markets is concerned with investor's decision-making process about what securities to invest in, how large investments should be and when to make those investments. In broad sense investments means sacrificing current dollars for future dollars. Generally investing involves two attributes: **risk** and time. The sacrifice usually is made in the present and reward comes later.

First, we need to start with the definition of risk. The literature review reveals that there are many definitions of risk. Economist Frank Knight in his work "Risk, Uncertainty and Profit" 1921 provided the most popular definition of risk. Frank Knight distinguishes measurable and unmeasurable uncertainty. He defines only quantifiable uncertainty to be risk. His definition emphasizes that risk is related to uncertainty and tasks dealing with risk usually require uncertainty to be quantified.

In order to make wise investments every investor must be able to identify and understand the types of risk they face and measure those risks accurately. The quantification of risk is crucial task because based on this investor can make a decision about cancellation of the investment if the risks are too high compared to the expected financial return. If investor make a decision to go ahead with investment then his capital must be sufficient to cover the risks it faces.

Investors face different types of risks while making investments. Understanding the types of investment risk allows an investor to manage risk and optimize outcomes. In this paper I will focus on four types of risks: the aggregated risk, the downside risk, the systemic risk and the idiosyncratic or firm-specific risk.

Next sections provide brief overview of these four types of risk. I will provide the definition of each of those types of risk, describe the methods for measuring them, provide some relevant examples and make the overview of prior studies in which those risk measures were employed.

1.1. Standard Deviation as a measure of aggregated risk

As it was stated previously majority of securities available for investment are risky due to uncertain outcomes and it is important to quantify risk accurately for effective investing. One possible way is to measure historical stock market volatility. By knowing volatilities we can compare risk and reward between different stocks and other types of securities. This comparison

enables to determine the appropriate strategic asset allocation for an investor, given his objectives and risk tolerance.

Variance (or Standard deviation) became the most common risk measure that is used by investors. Markowitz introduced this measurement approach in 1952 in his research paper Portfolio Selection and this approach is also known as Mean Variance Analysis. His paper is considered as the origin of the modern portfolio theory approach to investing.

Variance and standard deviation are standard statistical measures of spread. The variance of the asset return is the expected squared deviation from the expected return (1.1). In other words,

$$V[r] = E[(r - E[r])^2] \quad (1.1)$$

where r is the actual return and $E[r]$ is the expected return. We can get the standard deviation by taking the square root of the variance (equation 1.2):

$$\sigma = \sqrt{E[(r - E[r])^2]} \quad (1.2)$$

The basic problem facing each investor is to determine which particular risky securities to own. Because a portfolio is a collection of securities, this problem is equivalent to the investor selecting the optimal portfolio from a set of possible portfolios. Hence, it is often called as the portfolio selection problem. One solution to this problem was suggested by Harry Markowitz in his paper that was mentioned previously.

For the Markowitz's approach some assumptions are made. An investor has a particular sum of money to invest at the present time. This capital will be invested for a particular period of time, also known as the investor's holding period. At the end of the holding period, the investor has two possible options. First, he can sell the securities that were bought at the beginning of the period and then spend money on consumption. Second, he can reinvest the capital by purchasing new securities. This approach can be viewed as a single-period approach. Investor must decide which particular securities to buy at the beginning of the period denoted $t = 0$ and hold them until the end of the period denoted $t = 1$.

In making this decision at $t = 0$, the investor should recognize that security returns (and thus portfolio returns) over the forthcoming holding period are unknown. Nevertheless, the investor could estimate the **expected** (or mean) **returns** on the various securities under consideration and then invest in the one with the highest expected return. Markowitz notes that

this would generally be an unwise decision because the typical investor, although wanting "returns to be high," also wants "returns to be as certain as possible." Thus the investor, in seeking to both maximize expected return and minimize uncertainty (that is, **risk**), has two conflicting objectives that must be balanced against each other when making the purchase decision at $t = 0$. The Markowitz approach for how the investor should go about making this decision gives full consideration to both of these objectives.

According to Markowitz a useful measure of risk should somehow estimate the extent to which the actual outcome is likely to diverge from the expected outcome. Standard deviation is a measure that does this, because it is an estimate of the likely divergence of an actual return from an expected return. By calculating the standard deviation, investor can get an idea of what is normal, and what is outside the range of normality. A low standard deviation means that returns are more likely to be in a narrow range and it is better for investor, in contrary large standard deviation means that returns are more likely to be scattered.

While standard deviation are indeed useful as a risk measure, there are limitations to its use. Standard deviation is inappropriate tool for investments with asymmetric return distribution. When security returns are normally distributed, the normal distribution curve should look symmetric. Return values should be equally likely to plot around the middle. As we can see from the diagram (fig. 1.1) below the distribution curve is skewed on the right side of the mean. In this case skewed distribution of returns might limit the usefulness of the standard deviation as a risk measure since the returns are unlikely fall in that range.

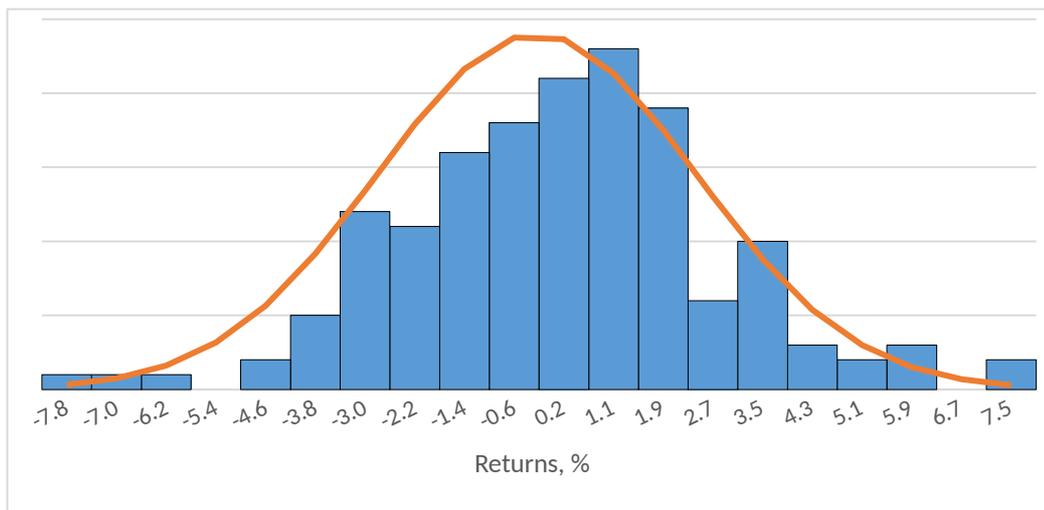


Figure 1.1 Histogram of Cullen/Frost Bankers, Inc. weekly rates of return, 2011-2013

Another issue with standard deviation is that it can reflect only historical volatility. To gain any knowledge about future volatility, an investor has to make an assumption that future volatility is represented by the distribution of historical volatility results.

Despite the fact that there are a number of weaknesses associated with relying on the standard deviation of returns as a measure of the aggregated risk, standard deviation does provide some insight, and in many circumstances is in fact meaningful.

Demsetz, Saidenberg, and Strahan (1997) in their study for the sample of 367 U.S. bank holding companies chose the annualized standard deviation of the weekly stock return for a given bank holding company as main risk measure. Authors justify the choice of this risk measure by the fact that it incorporates risks associated with all of the BHC's assets, liabilities and off-balance sheet positions, and reflects BHC leverage. Sorescu and Spanjol (2008) in their research paper use total firm risk as one of the facets of firm performance. They justify the choice by telling that total risk has a systemic component that is of interest only to shareholders, as well as an idiosyncratic component that affects not only shareholders but also managers and other firm stakeholders. They focus on total risk because it affects the utility of shareholders and other stakeholders alike.

1.2. Downside deviation as a measure of downside risk

Downside risk is a financial risk that is associated with losses.² Put differently, it is a risk of the actual returns being below the expected returns. For instance, if investor is worried about losing money he would consider the possibility of getting negative returns risky.

The history of downside risk began with the publication of two papers in 1952. In the first paper "Portfolio selection" by Markowitz a quantitative framework for measuring portfolio risk and return was introduced. Markowitz used mean returns, security variances and covariances to build an efficient frontier where every portfolio on the frontier maximizes the expected return for a given variance or minimizes the variance for a given expected return.

An economist Andrew Roy in 1952 published the paper called "Safety First and the Holding of Assets". In his research author tries to develop the Markowitz's framework and suggests the best risk-return tradeoff while constructing the investment portfolio. Roy realized that downside losses and upside gains are not similar for investors and they care differently about them. Roy claimed that investor would prefer the investment with the smallest probability of going below the desired return or target return.

²Downside risk. Investopedia. Retrieved from <http://www.investopedia.com/terms/d/downsiderisk.asp?layout=infini&v=5B&orig=1&adtest=5B>

Later Markowitz recognized the importance of this idea. In paper “[Portfolio Selection: Efficient Diversification of Investments](#)” published in 1959 Markowitz assumed that investors are inclined to minimize downside risk for two reasons. First, only downside risk is relevant to an investor. Second, security returns may not be normally distributed. For those reasons downside risk measure would help investor to make right decision when faced with non-normal security return distributions. Markowitz highlights that when security returns are normally distributed both downside risk measure as well as standard deviation provide accurate results. However, in case when the returns distribution is not normal only the downside risk measure provides the appropriate results.

Hence, standard deviation as a measure of the aggregated risk describes the volatility around the mean of an investment’s returns. However, this risk measure has several significant disadvantages:

- Standard deviation includes both variation above the mean below the mean. However, this behavior does not represent the risk preferences of majority investors. Majority investors only consider variation below acceptable return as undesirable risk.
- Standard deviation assumes that the returns are symmetric. This is not valid for exotic investments techniques like options or short selling.
- Standard deviation assumes that all investors have the same definition of risk.³

Downside deviation (semi-deviation) is commonly used measurement approach of downside risk. This approach could be viewed as standard deviation of returns below minimum accepted returns (MAR). Downside deviation as a risk measure overcomes some disadvantages of standard deviation, which makes no distinction between upside volatility and downside volatility. In case of standard deviation both upside and downside volatility equally influence the calculation of this risk measure. However, downside deviation considers only returns below a minimum acceptable value and ignores upside deviation.

Downside deviation of returns is defined by the following equation (1.3):

$$\sigma = \sqrt{E[\min[(r - c), 0]^2]} \tag{1.3}$$

³“Downside Deviation as a Risk Measure.” Invest Excel. 2011. Accessed May 25, 2016. <http://investexcel.net/downside-deviation-excel/>.

where r is the actual return below c . The most frequently used values for c are the risk-free rate, a minimum acceptable return of 0.0%, or the mean of the return series itself.

Similar to standard deviation, the lower the downside deviation the better for investors. However, it is important to look at the downside deviation of a relevant benchmark security or an appropriate peer group in order to get an understanding of normal value for the downside deviation.

The graph below (fig. 1.2) shows a volatile series of Cullen/Frost Bankers, Inc. returns used for the calculation of both standard deviation and downside deviation. Standard deviation incorporates all of the data points in the series. With downside deviation only the returns below 0.0% are counted.

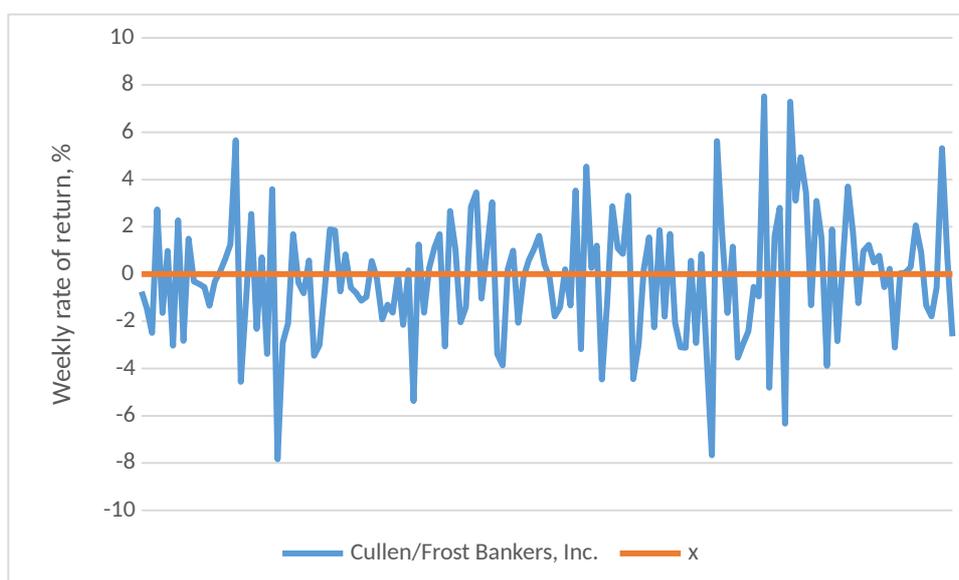


Figure 1.2 Cullen/Frost Bankers, Inc. weekly rate of return, 2011 - 2013

In this example of Cullen/Frost Bankers, Inc., the downside deviation of 1.59% is lower than the standard deviation of 2.60%. This means that the downside volatility in this return stream is lower than the overall volatility. If the reverse was true (where the downside deviation was higher than the standard deviation), that would mean that the Cullen/Frost Bankers, Inc. negative weeks are much more volatile than the positive weeks. Both standard deviation and downside deviation have unique qualities in assessing risk and can be used differently.

Ang, Chen and Xing (2005) in their report investigated whether the cross-section of stock returns reflects a premium for downside risk. They highlight the importance of downside risk because investors care differently about downside losses versus upside gains. Agents who place greater weight on downside risk demand additional compensation for holding stocks with high sensitivities to downside market movements.

1.3. Beta as a measure of systemic risk

Systemic risk is a difficult concept to define precisely. A recent report by the Group of Ten countries (2001) on financial sector consolidation defined systemic risk as “the risk that an event will trigger a loss of economic value or confidence in, and attendant increases in uncertainty about, a substantial portion of the financial system that is serious enough to quite probably have significant adverse effects on the real economy.”⁴

However, there is a common point in various definitions of systemic risk. Occasionally a trigger event such as an economic shock or institutional failure takes place that in turn result in a chain of bad economic consequences. The consequences may range from significant losses to financial institutions or substantial financial-market price volatility to financial institution or market failures, and they affect financial institutions, markets, or both. This situation is often called a domino effect.

The failure of banks and other financial institutions as important sources of capital, especially in significant numbers, can result in lack of capital available for society and its increased costs. Increased cost of capital as well as decrease in its availability, are the most severe consequences of a systemic failure.

A “bank run” could be one of the classic examples of systemic risk. A “bank run” occurs when a large number of bank’s customers withdraw money from their deposits and bank is not able to satisfy these demands. This in turn cause other banks or their creditors to fail. This situation occurs when customers believe that financial institution might become insolvent and they try to withdraw their monies quickly. Banks normally keeps a small amount of their assets as cash, they might have insufficient cash to satisfy demands, causing it to default and ultimately fail. Since banks are closely interconnected financially, specifically they lend to and borrow from each other, hold deposit balances with each other, and make payments through the interbank clearing system, this may cause a chain of subsequent failures of the banks.

Previously we discussed how investors use mean variance approach for the optimal portfolio construction. Now I will discuss the Capital Asset Pricing Model (CAPM) of how assets are priced. The major implication of the CAPM is that the expected return of an asset will be related to a measure of systemic risk for that asset known as beta. The CAPM looks as follows (equation 1.4)

⁴*Report on Consolidation in the Financial Sector*. Place of Publication Not Identified: Publisher Not Identified, 2001.

$$E[r_i] = r_f + \beta_i(E[r_m] - r_f) \quad (1.4)$$

where:

$E[r_i]$ – the expected return on the capital asset

r_f – the risk-free rate

β_i – beta of the security

$E[r_m]$ – the expected return of the market

The term β_i in CAPM is also known as beta coefficient represents the sensitivity of the security's returns to the market index's returns and can be viewed as a measure of systemic risk. The β_i term in the CAPM is equal to:

$$\beta_i = \frac{\sigma_{i,m}}{\sigma_m^2}$$

(1.5)

where $\sigma_{i,m}$ denotes the covariance of the returns on stock i and the market index, and σ_m^2 denotes the variance of returns on the market index.

The estimates of beta can be obtained through the market model (equation 1.6). Market model is an empirical version of CAPM and it captures the relationship between security and market returns.

$$r_i = \alpha_{i,m} + \beta_{i,m} r_m + \varepsilon_{i,m} \quad (1.6)$$

where:

r_i – the return on security i for some given period

r_m – the return on market index for the same period

$\alpha_{i,m}$ – the intercept term

$\beta_{i,m}$ – the slope term

$\varepsilon_{i,m}$ – the random error term

The slope $\beta_{i,m}$ in a security's market model measures the sensitivity of the security's returns to the market index's returns and can be viewed as an estimate of systemic risk.

Some interpretations of beta are explained in the table:

Table 1.1 Interpretation of beta value

Value of Beta	Interpretation
$\beta < 0$	Asset movement is in the opposite direction of the market index
$\beta = 0$	Asset movement is uncorrelated to the market index
$\beta > 0$ to 1	Asset moves in the same direction as the market index, with less volatility
$\beta = 1$	Asset moves in the same direction as the market index, with the same volatility
$\beta > 1$	Asset moves in the same direction as the market index, with the higher volatility, and is very sensitive to systemic risk

For example, the beta of United Community Banks, Inc. for 2012 is 1.5 in relation to the market index, such as the NASDAQ. If the market increases by 2%, then United Community Banks, Inc. stock price will generally increase by 3%. Likewise, if the market decreases by 2%, United Community Banks, Inc. stock price generally decreases by 3%. United Community Banks, Inc. stock price is sensitive to systemic risk, but the risk can be reduced by [hedging](#).

Under modern portfolio theory, investors and other market participants can protect themselves from risk by diversifying their investments. To the extent risk is negatively correlated, or uncorrelated, with market risk, the randomly distributed risks of a diversified investment portfolio “would tend to cancel out, producing a riskless portfolio” (fig. 1.3). However, you can’t avoid systemic risk, regardless of how much you diversify. Systemic risk stems from the fact that there are other economy wide perils that threaten all businesses. That is why stocks have a tendency to move together. And that is why investors are exposed to market uncertainties, no matter how many stocks they hold.

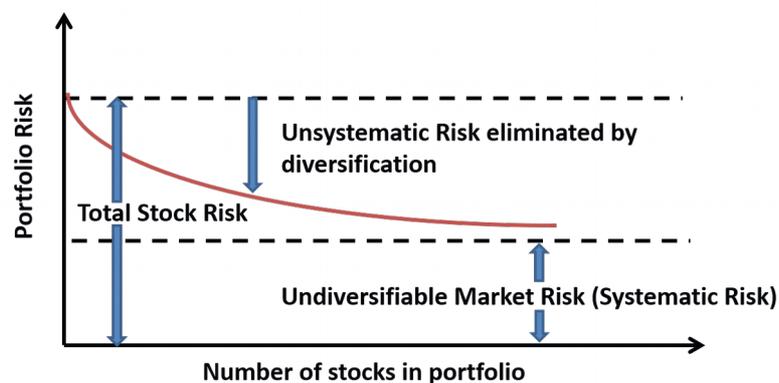


Figure 1.3 Modern portfolio theory. Source: Investopedia (2006)

For a reasonably well-diversified portfolio, only systemic risk matters. If you have only a single stock, specific risk is very important; but once you have a portfolio 20 or more stocks, diversification has reduced specific risk. Therefore, the predominant source of uncertainty for a diversified investor is that the market will rise or plummet, carrying the investor's portfolio with it.⁵

Taking into account significant interconnection among financial market participants and institutions, systemic risk is quite important for researchers. Particularly Lambert (2007) uses nondiversifiable or systemic risk in his research where he examines whether and how accounting information about a firm manifests in its cost of capital, despite the forces of diversification. Lambert claims that most analytical models in accounting examine the role of information in single-firm settings. While this literature yields many useful insights, its applicability to cost of capital issues is limited. In single-firm settings, firm-specific variance is priced because there are no alternative securities that would allow investors to diversify idiosyncratic risk.

1.4. Idiosyncratic risk and its measurement

The idiosyncratic or firm-specific risk is unpredictable variability in the earnings of the issuing firm that is attributable to events that are specific to that firm, rather than to systemic macroeconomic events. Idiosyncratic risk is predominant within any organization because of influence of internal factors. These factors usually can be controlled by organization. It is a micro in nature as it affects only a particular organization. This type of risk is can be managed and or organization can take particular actions to reduce the effect of idiosyncratic risk.⁶

According to the market model, the total risk of any security i , measured by its variance and denoted σ_i^2 , consists of two parts: idiosyncratic risk and systemic risk. That is, total risk σ_i^2 equals the following:

$$\sigma_i^2 = \beta_{\beta}^2 \sigma_m^2 + \sigma_{ei}^2 \quad (1.7)$$

where σ_m^2 denotes the variance of returns on the market index. Thus $\beta_{\beta}^2 \sigma_m^2$ denotes the systemic risk of security i , and σ_{ei}^2 denotes the idiosyncratic risk of security i as measured by the variance of the random error term, appearing in equation 1.7.

⁵Brealey, Richard A., and Stewart C. Myers. *Principles of Corporate Finance*. New York: McGraw-Hill, 1991.

⁶Bradfield, James. *Introduction to the Economics of Financial Markets*. Oxford: Oxford University Press, 2007.

At this point, it might be interesting: why divide risk into two parts. For the investor, it would seem that risk is risk – whatever its source. Systemic risk is related to the beta of the company. According to CAPM, companies with larger betas will have larger expected returns. However, idiosyncratic risk is not related to the beta. There is no reason why companies with higher idiosyncratic risk should have higher expected returns. Thus according to the CAPM, investors are rewarded for bearing systemic risk but not for bearing idiosyncratic risk.

Since this research is related to financial institutions let's have a look at the main sources of idiosyncratic risk in the banking sector (fig. 1.4):

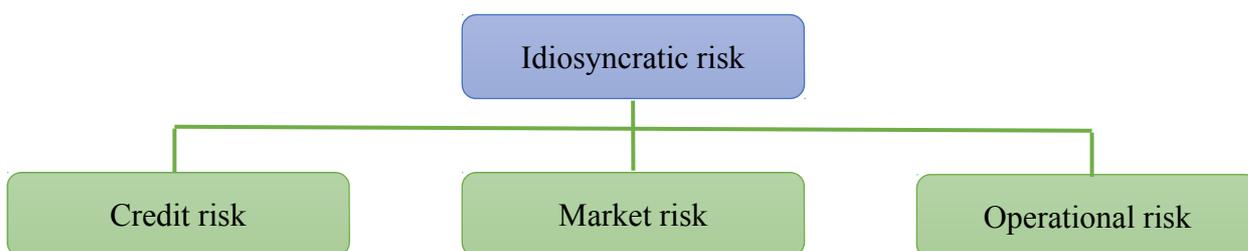


Figure 1.4 Types of idiosyncratic risk in banking sector. Source: Investopedia (2007)

Credit risk is the potential loss a bank would suffer if a bank borrower, also known as the counterparty, fails to meet its obligations— pay interest on the loan and repay the amount borrowed— in accordance with agreed terms. Credit risk is the single largest risk most banks face and arises from the possibility that loans or bonds held by a bank will not be repaid either partially or fully. Credit risk is often synonymous with default risk.⁷

For instance, the large Swiss bank UBS incurred huge losses in value of loans that were made to high-risk borrowers. As a result, the bank announced a loss of \$ 10 billion. Most of high-risk borrowers were not able to repay their loans, at the same time the complex models used by Swiss bank UBS to predict the likelihood of credit losses were incorrect. There are many similar cases when major banks all over the world incur losses due to assessing the probability of default on mortgage payments incorrectly.

Market risk is the risk of loss resulting from changes in market prices that is due to changes in foreign exchange rates, interest rates, commodities and equity prices. The major components of market risk are:

⁷Apostolik, Richard, Christopher Donohue, and Peter Went. *Foundations of Banking Risk: An Overview of Banking, Banking Risks, and Risk-based Banking Regulation*. Hoboken, NJ: John Wiley, 2009. p. 14-15

- Interest rate risk is the potential loss due to movements in interest rates. This risk arises because bank assets (loans and bonds) usually have a significantly longer maturity than bank liabilities (deposits).
- Equity risk is the potential loss due to an adverse change in the price of stock.
- Foreign exchange risk is the risk that the value of the bank's assets or liabilities changes due to currency exchange rate fluctuations.
- Commodity risk is the potential loss due to an adverse change in commodity prices⁸.

Operational risk is the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk.⁹

An example of operational risk could be the collapse of Baring Brothers and Co. Ltd. after incurring losses of £ 827 million in 1995. The main reason of bank's collapse was the failure of its internal control processes and procedures. Bank's traders was able to authorize their trading activities and book them into the bank's systems without any supervision. Only after the trades started to lose significant amounts of money and it was no longer possible for the trader to keep the trades and the losses secret the trader's supervisors were alerted.

The idiosyncratic risk is also important for researchers for some reasons. Campbell (2001) received the following result - the level of average stock return volatility mostly attributable to idiosyncratic volatility has increased considerably from 1962 to 1997 in the United States. At the same time Morck (2000) found that the ratio of idiosyncratic risk to systemic risk has surged over time in the United States. Motivated by results of Campbell Rajgopal and Venkatachalam (2010) focused on the idiosyncratic risk while investigating relationship between quality of accounting information and idiosyncratic risk.

⁸Apostolik, Richard, Christopher Donohue, and Peter Went. *Foundations of Banking Risk: An Overview of Banking, Banking Risks, and Risk-based Banking Regulation*. Hoboken, NJ: John Wiley, 2009. p. 15-18

⁹Apostolik, Richard, Christopher Donohue, and Peter Went. *Foundations of Banking Risk: An Overview of Banking, Banking Risks, and Risk-based Banking Regulation*. Hoboken, NJ: John Wiley, 2009. p. 18-19

Chapter 2. Corporate disclosure

2.1. The role of disclosure in capital markets

Corporate disclosure is a key element for the functioning of capital markets. The optimal allocation of savings to investment opportunities is one of the most crucial issues that every economy faces. Typically, there are many companies that want to attract financial resources to fund their activities as well as savers that would like to allocate their capital with the expectation of a future financial return. However, there are at least two reasons that prevent both parties to make business with each other and match savings with investment opportunities. First, there is so called information problem, when companies have better information about business investment opportunities than investors do. Second is the agency problem, when there is a conflict of interest between the needs of the investors and the needs of the company's management.

The information problem arises when investors do not have the same degree of information about company's activities necessary to make a wise investment decision. The problem of information asymmetry between the buyer and [seller](#) of an investment also called "lemons" problem was discussed by a 1970 research paper by [economist](#) George Akerlof. The "lemons" problem may potentially lead to ineffective functioning of the capital market or even to its failure. For example, let's think about the situation where half of banks perform significantly riskier activities than the other half. Investors are rational and make their investment decisions based on the information that they possess. If investors can not distinguish the riskiness of the investment opportunities they will assess it at the average level. Hence, if the "lemons" problem exists in the economy then the capital market will reasonably undervalue some good investments opportunities and overvalue some bad investment opportunities relative to the information available to investors.¹⁰

One way to mitigate the "lemons" problem is solid, timely, and granular information disclosure. Higher disclosure decreases the level of information asymmetries between the bank management and investors. This in turn may affect investors' assessment of the riskiness of the firm and reduce the diversity of judgments about the true value of the firm.

Better disclosure can support market discipline and increase financial stability in non-crisis times. Good information can help investors to price risks more accurately and this in turn can act as a disciplining force on banks. If banks are taking too much risks and are not able to

¹⁰Akerlof, George A. "The Market for "Lemons": Quality Uncertainty and the Market Mechanism." *The Quarterly Journal of Economics* 84, no. 3 (1970): 488.

provide an attractive trade-off between risks and returns then investors are less likely to provide funding to those banks. Thus, managers of the bank will carefully ponder the risk-taking decisions. This market discipline mechanism ensure investors that managers act in their interests. Therefore providing better information may reduce the probability of future financial crisis.

The financial crisis of 2007-2009 could be a good example of information asymmetry problem. Introduction of new types of securities increased the level of information asymmetry in financial markets. Due to complexity of new instruments and the lack of transparency, it was a complicated task for investors to assess securitized assets properly. Structured products, such as collateralized debt obligations (CDOs), were created from diversified portfolios of mortgages and other types of assets, such as corporate bonds, credit cards, and auto loans. This information problem resulted in market freezes since majority of market participants believed that most securities in the market were of low quality. For example, during the crisis, the demand for asset-backed securities (ABS) in the United States collapsed from over \$ 500 billion in 2007 to \$ 20 billion in 2009.¹¹

The agency problem comes out because usually investors that provide capital to the companies typically are not supposed to play an active role in its management and that responsibility is delegated to the company's management. Consequently, once investors have invested their funds in a company, the management has an incentive to make decisions in their own interest. For example, if investors acquire an equity stake in a company, the management can use those funds to acquire perquisites, pay excessive compensation, or make investment or operating decisions that are harmful to the interests of outside investors (Jensen and Meckling, 1976).

The possible solution to the agency problem may be the optimal contracts between management and investors, such as compensation agreements and debt contracts aimed to adjust the interests of the company's managers with interests of outside stakeholders. These contracts often require company's management to provide relevant information that allows investors to check compliance with contractual agreements and to assess whether managers have managed the company's resources in the interests of company's investors.

The case of well-known US telecommunication corporation WorldCom can be a good example of agency problem that was not resolved by mean of corporate disclosure. In 2001 WorldCom CEO Bernard Ebbers managed to take from the company more than \$ 400 million in loans at the favorable interest rate of 2.15 percent. The details of this transaction were not

¹¹Kirabaeva Kirabaeva. *Adverse Selection and Financial Crises*. Working paper. Bank of Ca Nada Review, 2010.

presented in company's annual report and they did not come out until WorldCom accounting scandal.¹²

2.2. Regulation of disclosure and financial reporting

There are sufficient number of regulations governing corporate disclosure and reporting in each country all over the globe. For instance, in the United States every company accessing capital markets must follow Securities and Exchange Commission (SEC) rules concerning corporate disclosure. All disclosure rules and requirements set by SEC have statutory authority, and some amendments to these regulations could be implemented over time. For example, after introduction of the Sarbanes-Oxley Act in the summer of 2002, significant amendments were made to regulations governing corporate disclosure in the United States. This act came out because of unexpected bankruptcy of huge energy-trading company Enron.

The primary goal of SEC regulations is to require publicly owned companies to disclose certain types of information to the SEC and to the company's stockholders. Moreover, when company is going to issue new securities, such as stocks and bonds, the SEC's disclosure rules require the provision of relevant information about company's business and financial information to potential investors. The system of mandatory disclosure is also called the integrated disclosure system. In order to make disclosure system less burdensome for companies SEC standardized various forms and decreased the level of variation in disclosure rules to the SEC and company's investors.

According to SEC disclosure requirements, publicly owned companies must provide two annual reports, one for the Securities and Exchange Commission and another for company's shareholders. The annual report prepared for SEC is called Form 10-K and the content of this form is strictly regulated by federal statutes. However, the information provided in annual reports for shareholders was not strictly governed. Over the years, the SEC managed to get more influence on the annual reports' content.

In the annual reports for shareholders and potential investors companies must include certified financial statements and other specific items. The content of financial statements comprises two-year audited balance sheet and a three-year audited statement of income and cash flows. Additionally annual reports must contain five years of selected financial data, including income or loss from continuing operations, net sales or operating revenues, total assets, long-

¹²Bebchuk, Lucian Arye, and Jesse M. Fried. "Executive Compensation as an Agency Problem." *SSRN Electronic Journal SSRN Journal*.

term obligations and redeemable preferred stock, and cash dividends declared per common share.¹³

Specifically for banking industry The Basel Committee on Banking Supervision (BCBS) issued the document Basel II that is a global, voluntary regulatory framework on bank [capital adequacy](#), [market liquidity risk](#), and [stress testing](#). The BCBS recognizes market discipline as a key objective and claims that the provision of meaningful information about common key risk metrics to market participants is a fundamental tenet of a sound banking system. It reduces information asymmetry and helps promote comparability of banks' risk profiles within and across jurisdictions.

The primary goal of Pillar 3 of the Basel II framework is to encourage market discipline through regulatory disclosure rules. Disclosure requirements enable market participants to obtain important information of the company's capital, risk assessment processes, risk exposures and hence the capital adequacy of the institution. The availability of this information in turn promote market discipline.

The Basel Committee on Banking Supervision has formulated five guiding principles for banks' Pillar 3 risk disclosures. These principles will enable market participants to understand the bank's business and its risks clearly. The principles are as follows:

1. **Disclosures should be clear.** All information provided through corporate disclosure should be displayed in a way that company's stakeholder can easily understand it. Important points in disclosure should be highlighted. Additionally if report contain some complex issues, they should be explained in simple language. Related risk information should be presented together.
2. **Disclosures should be comprehensive.** Disclosure should provide information about bank's main activities, all major risks incorporated in those activities, some qualitative and quantitative information on how bank identifies, measures and manages those risks. All should be described in a way that bank's key stakeholders could better understand bank's risk tolerance.
3. **Disclosures should be meaningful to user.** The most important current and emerging risks and how they are managed should be highlighted in the disclosure. Managers should provide relevant references to balance sheet and income

¹³"SEC Disclosure Laws and Regulations." Inc. Accessed May 10, 2016. <http://www.inc.com/encyclopedia/sec-disclosure-laws-and-regulations.html>.

statement. The information that is not actual and may mislead users must be eliminated.

4. **Disclosures should be consistent over time.** According to this principle, disclosure should be consistent over time in order to enable main users of disclosure to spot main trends in a bank's risk profile across all significant aspects of its business.
5. **Disclosures should be comparable across banks.** The format of disclosure presentation should enable the market participants to conduct meaningful comparisons of business activities, risk management and risks between different banks.¹⁴

Moreover, in order to achieve an appropriate level of bank transparency and to help users of disclosure to assess bank's risks correctly, The Basel Committee on Banking Supervision in its report "Enhancing bank transparency" identified the following six categories of information that should be provided in clear manner and appropriately detailed.

1. **Financial performance.** The bank need to provide information about its profitability for several periods. This type of information will help market participants and regulators to assess the effectiveness of usage of bank's resources, changes in the future financial performance and ability of bank to repay its liabilities and deposits.
2. **Financial position (including capital, solvency and liquidity).** This category of information generally includes balance sheet of the bank that shows different types of assets, liabilities and sources of equity capital. These will help market participants and regulators to assess the ability of bank to meet its liabilities and other financial commitments.
3. **Risk management strategies and practices.** Disclosure should include the description of bank's management approach in managing risks, particularly, the information about how risks arise, how they are managed and controlled. This category might be helpful in assessing the current condition of the bank, its future performance and the effectiveness of bank's management.
4. **Risk exposures (including credit risk, market risk, liquidity risk, and operational, legal and other risks).** Banks should provide some quantified

¹⁴ Revised Pillar 3 Disclosure Requirements Standards. Basel: Bank for Internat. Settlements, 2015.

information about potential losses of its activities. This information reflect the financial strengths of the bank as well as its ability to perform in stress periods.

5. **Accounting policies.** Disclosure should provide information on different accounting policies employed by the bank. It will help to understand how different items are measured and to interpret information properly.
6. **Basic business, management and corporate governance information.** This category includes basic information about bank's business and management. Disclosure on these is important because it helps to evaluate the financial performance, financial position, risk management policies, risk exposure in the context of bank's business.¹⁵

Thus, The Basel Committee on Banking Supervision considers consistent corporate disclosure as the key element in supporting stable financial system. In the next section we will look at prior researches that investigated the consequences of disclosure in capital markets, particularly we will focus on the influence of disclosure on enterprise risks.

2.3. Relationship between disclosure and different types of risk

Prior studies examined the capital market consequences of managers' corporate disclosure decisions. These studies identify following affects for companies that make extensive voluntary disclosures: improved liquidity of the stock, lower risk, decreased cost of capital, increased following by financial analysts.¹⁶

We will focus on the supposed impact of voluntary disclosure on different types of risks discussed earlier. As described in chapter 1 there are number of risks such as the aggregated risk, the systemic risk, the idiosyncratic risk and the downside risk.

There are a number of research papers that have examined the relationship between these risk measures and disclosure. Prior empirical research provides mixed evidence on the impact of disclosure on stock price volatility or the aggregated risk. On one hand, a number of studies reveal that the level of disclosure is positively associated with the stock return volatility. For instance, Lang and Lundholm (1993) on the basis of the analysis of U.S. companies concluded that the corporate disclosure is positively associated with company's stock return volatility. They used data from the Report of the Financial Analysts Federation Corporate Information

¹⁵ Kraus, Susan. *Enhancing Bank Transparency: Public Disclosure and Supervisory Information That Promote Safety and Soundness in Banking Systems*. Basle: Basle Committee on Banking Supervision, 1998.

¹⁶ See Diamond and Verrecchia (1991), Verrecchia (1994), Botosan (1997) Bushee and Noe (2000), Easley et al. (2002), Easley and O'Hara (2004), Baumann and Nier (2004), Kothari, Li, and Short (2009), Lambert et al. (2007)

Committee as a measure of the informativeness of a firm's disclosure policy. A study conducted by Leuz and Verrecchia (2000) supported this result. Based on the sample of German firms, authors found that the change of reporting from German to U.S. generally accepted accounting principles, which is interpreted as an increase in disclosure, increased the overall volatility.

On the contrary, some studies provide evidence that disclosure decreases stock price volatility. For example, Bushee and Noe (2000) in their study concluded that enhanced disclosure reduce the volatility of a firm's stock price. It is explained by the fact that for the sample U.S. companies more forthcoming disclosure attract quasi-indexers. This institution exhibits long investment horizons and low portfolio turnover. Attracting this type of institution helps reduce the volatility of a firm's stock price. Authors measured disclosure using the annual ranking of corporate disclosure practices published by the Association for Investment and Management Research (AIMR). Additional support to this finding is provided by Baumann and Nier (2004). They found that banks that disclose more information on key items of disclosure show lower measures of stock volatility than do banks that disclose less information. The study was conducted on the basis of 600 banks across thirty-one countries over the period 1993-2000.

Recently, a new stream of literature has emerged to investigate the impact of information quality on both idiosyncratic risk and systemic risk. Lambert (2007) examined how the quality of a firm's accounting information affects its cost of capital. He demonstrated that the quality of accounting information influences a firm's cost of capital directly by affecting market participants' perceptions about the distribution of future cash flows. The direct effect occurs because the quality of disclosures affects the assessed covariance between a firm's cash flow and other firms' cash flows that is systemic risk. These effects entirely consistent with the CAPM. That is, the information effects are fully captured by an appropriately specified forward-looking beta and the market wide premium for risk. Ashbaugh-Skaife (2009) investigated whether disclose of internal control deficiencies by U.S. firms results in higher systemic risk, higher idiosyncratic risk, and higher cost of equity relative to firms with effective internal controls. In cross-sectional tests, authors found that firms with internal control deficiencies have significantly higher betas, idiosyncratic risk, and cost of equity capital relative to firms not reporting internal control deficiencies. In addition, Rajgopal and Venkatachalam (2010) on the sample of firms from NYSE, AMEX and NASDAQ explored whether financial reporting quality has any impact on idiosyncratic volatility. They used earnings quality as proxies for financial reporting quality. The main finding of the research is that worsening earnings quality is positively associated with rising return volatility over the 40-year period.

There are a few number of research studies that investigates the relationship between the level of disclosure and the downside risk. Ederington and Lee (1996) investigated the impact of information releases on the downside risk in the Deutschemark market. As a measure of downside risk authors employed implied standard deviation from option market. On one hand, authors found that scheduled information releases lead to decrease in the implied standard deviation. On the other hand, unscheduled information announcements cause an increase in the implied standard deviation. Additionally Rogers, Skinner, and Van Buskirk (2009) examined how disclosure of management earnings forecasts influences uncertainty. Similar to Ederington and Lee they measured downside risk by using implied standard deviation derived from equity option prices. Authors revealed that disclosure of management earnings forecasts increases the short-run volatility and at the same time decreases long-run volatility.

Chapter 3. Empirical study on relationship between disclosure and risk

3.1. Hypotheses development

In the first chapter we discussed different types of risk that investors typically face while making investments in capital markets.

In chapter 2 the role of disclosure in capital markets and the relationship between disclosure and different types of enterprise risks were discussed. As it was stated previously the main role of disclosure is to reduce information asymmetry between managers, analysts and investors as well as to resolve the agency problem. As argued above, lowering information asymmetry is viewed as desirable because it affects investors' assessment of the riskiness of the firm. However, as we can see from the literature review the relationship between disclosure and enterprise risks is ambiguous.

The purpose of this empirical study is to identify the presence and the nature of the relationship between disclosure and different types of risk.

To investigate the influence of disclosure on different enterprise risks econometric analysis has been selected.

Based on the examination of different studies devoted to the chosen topic the following research hypotheses have been formulated.

Hypothesis H1: The higher the level of bank's disclosure in the current year the lower the aggregated risk in the following year.

Hypothesis H2: The higher the level of bank's disclosure in the current year the lower the systemic risk in the following year.

Hypothesis H3: The higher the level of bank's disclosure in the current year the lower the idiosyncratic risk in the following year.

Hypothesis H4: The higher the level of bank's disclosure in the current year the lower the downside risk in the following year.

3.2. Methodology

In order to test the main hypothesis I employ the panel regression models:

$$yagrisk_{i,t+1} = \beta_0 + \beta_1 * disc_{i,t} + k * X_{i,t} + \varepsilon_{i,t} \quad (3.1)$$

$$sysrisk_{i,t+1} = \beta_0 + \beta_1 * disc_{i,t} + k * X_{i,t} + \varepsilon_{i,t} \quad (3.2)$$

$$yidiorisk_{i,t+1} = \beta_0 + \beta_1 * disc_{i,t} + k * X_{i,t} + \varepsilon_{i,t} \quad (3.3)$$

$$ydownrisk_{i,t+1} = \beta_0 + \beta_1 * disc_{i,t} + k * X_{i,t} + \varepsilon_{i,t} \quad (3.4)$$

where:

$yaggrisk_{i,t+1}$ – the aggregated risk

$sysrisk_{i,t+1}$ – the systemic risk

$yidiorisk_{i,t+1}$ – the idiosyncratic risk

$ydownrisk_{i,t+1}$ – the downside risk

β_1 – the coefficient on disclosure

$disc_{i,t}$ – the aggregated disclosure index

k – the vector of coefficients

$X_{i,t}$ – the vector of control variables

$\varepsilon_{i,t}$ – random error term

The dependent variables comprise four types of risk that were discussed in the first chapter: the aggregated risk, the systemic risk, the idiosyncratic risk and the downside risk. The calculation and motivation for these risks are described below in more detail.

The first type of risk is the aggregated risk ($yaggrisk_{i,t+1}$). I estimate the aggregated risk as the standard deviation of a stock market asset's weekly returns. The standard deviation was calculated using the equation 3.5:

$$s_{i,t} = \sqrt{\frac{1}{w_{i,t} - 1} \sum_{w=1}^{w_{i,t}} (r_{i,w} - \hat{r}_i)^2} \quad (3.5)$$

where $w_{i,t}$ is the number of weeks available in year t for bank i ; $r_{i,w}$ is the equity return of bank i in week w , \hat{r}_i is the expected equity return of bank i .

I estimate the idiosyncratic risk ($yidiorisk_{i,t+1}$) as well as the systemic risk ($sysrisk_{i,t+1}$) from the following market model (equation 3.6):

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i (r_{m,t} - r_{f,t}) + \varepsilon_{i,t} \quad (3.6)$$

quantitative information that financial institution provides in its disclosure: liquidity risk, group structure, intra-annual information and spillover risk. All categories comprise 14 sub-indices. For each sub-index the score 1 is given when BCH provides the relevant information in its 10-K statements, annual, or proxy reports for a particular year. However, we need to mention that the scores assigned to sub-indices do not represent the quality judgment of that disclosure.

I calculate the aggregated disclosure score by using the equation 3.8.

$$disc_{i,t} = \alpha_1 LIQ_{i,t} + \alpha_2 GRP_{STRI,t} + \alpha_3 INTRA_{i,t} + \alpha_4 SPIL_{i,t} \quad (3.8)$$

where:

$LIQ_{i,t}$ – the disclosure score on liquidity risk

$GRP_{STRI,t}$ – the disclosure score on group structure

$INTRA_{i,t}$ – the disclosure score on intra-annual information

$SPIL_{i,t}$ – the disclosure score on spillover risk

α_1 , α_2 , α_3 , α_4 – the weights of disclosure categories

The first set of sub-indices $LIQ_{i,t}$ captures the information on BCH liquidity risk. Basically the liquidity risk relates to the possibility that financial institution may not be able to raise new funds and repay its current creditors. It is argued that banks that rely more on short-term and non-local currency funding are more inclined to suffer in period of stress in financial markets. Therefore, in this category I assess whether particular BCH disclose information on the breakdown of liabilities by term and different currencies. After that, I looked for the liquidity ratios and level or ratio of high-quality unencumbered assets.

The second main category is group structure information ($GRP_{STRI,t}$). This type of information helps investors to assess the riskiness of particular BHC segment due to the fact the failure of one segment may cause the systemic failure of bank holding company as a whole. In case of complex large financial groups the disclosure of information related to subsidiaries is not mandatory. Therefore, here I search for balance sheets and risk ratios of BHC's subsidiaries. Moreover, I focus on the same information related to BHC main segments such as the card services, derivatives desk, and insurance services.

Intra-annual information ($INTRA_{i,t}$) is the next crucial area since it provides the broader view of risks. End-of-year snapshot of balance sheet is not enough in assessing the risk

due to possible volatility of BHC's activity during the reporting period. Hence, I search for the detailed annual average figures of balance sheet items, balance sheet items provided on quarterly basis, and different risk ratios.

Fourth category is information on spillover risk ($SPIL_{i,t}$) that can help investors to assess the network risk of risk spillover within the financial system, and the risk of explicit or implicit exposures to off-balance sheet entities. Therefore, I looked whether a bank holding company in its report provides the detailed breakdown of the off-balance sheet items and maximum loss exposure to special purpose vehicles (or variable interest entities).

In order to obtain the weights of described disclosure categories I use principal component analysis (PCA). The weights for each bank holding company i at year t are obtained from the equation 3.9:

$$\alpha_{1,2,3,4} = PCA(LIQ_{b,t}, GRP_{STRb,t}, INTRA_{b,t}, SPIL_{b,t}) \quad (3.9)$$

Control variables, $X_{i,t}$, are motivated from the existing literature and are described as follows. The size of the bank holding company ($size_{it}$) is included as a control variable because prior research suggest that larger institutions tend to be less risky (Barrell, Davis, Fic, and Karim; 2010, Hermalin and Weisbach; 2012). Therefore, we expect the coefficient to be negative. The size of BHC represents the natural logarithm of the year-ended total market capitalization. The capital buffer of a BHC ($capbuf_{it}$) calculated as the ratio of bank's equity capital to total liabilities at the fiscal year-end. Since institutions with higher capital buffer tend to be less risky I expect the coefficient to be negative (Baumann and Nier; 2003). The non-performing loans ratio (npl_{it}) is calculated as the sum of loans past due 90 days or more and non-accrual loans as a proportion of bank's total assets. Institutions with higher level of non-performing loans result in higher uncertainty therefore I expect the coefficient to be positive. Return on equity (roe_{it}) calculated as the ratio of the net income to total book equity. We expect the positive relationship between return on equity and the riskiness of financial institution. Finally, I include the level of deposits ($depo_{it}$) which is calculated as the natural logarithm of total deposits. Since higher level of deposits is associated with banks performing riskier activities, we expect the sign to be positive. The description of variables used in the analysis presented in the Appendix 2.

3.3. Sample selection and descriptive statistics

3.3.1. Sample selection

The sample comprises the 66 largest publicly traded United States bank holding companies ranked by asset value at the end of 2010 for the period 2010-2013. The list of BHCs are provided in the Appendix 1. The focus of this study on bank holding companies is due to several reasons. First, they provide 10-K statements, annual reports to the Securities and Exchange Commission. All these periodic reports are freely available through SEC-Edgar system. After that, U.S. bank holding companies are supervised by the Federal Reserve and the FDIC. As a result, all BHCs have the same requirements for compulsory disclosures, which is important to identify voluntary disclosures. Finally, a typical bank holding company has a complex structure. Usually a BHC performs a wide range of financial activities and consist of several independent subsidiaries. This in turn increase the usefulness of BHCs' periodic reports for investors because disclosure enables correctly identify and assess risks.

Multiple sources of information were employed to form the data set. The information related to the disclosure index was collected from the annual reports and 10-K statements of bank holding companies. All reports were obtained from SEC-Edgar system.

In order to estimate the four risk measures such as the aggregated risk, the systemic risk, the idiosyncratic risk and the downside risk for a BHC for a given date, I used the stock prices from NASDAQ and NYSE stock markets official web sites.

I obtained data on market capitalization, bid and ask prices of the equity, equity capital, total liabilities, total assets, total deposits, non-performing loans and return on equity for each BHC from Thomson Reuters Datastream. The risk free rates were obtained from U.S. Department of the treasury official web site.

3.3.2. Descriptive statistics

Let us start with the analysis of results of the descriptive statistics for dependent variables presented in the table 3.1.

Variable	Mean	Std. Dev.	Min	Max
Dependent variables				
$yaggrisk_{i,t+1}$	0,28	0,12	0,11	0,73
$sysrisk_{i,t+1}$	1,10	0,33	0,04	2,23
$yidiorisk_{i,t+1}$	0,21	0,09	0,10	0,72
$ydownrisk_{i,t+1}$	0,15	0,07	0,03	0,56

Table 3.1 Descriptive statistics of dependent variables

The annualized aggregated risk ($yaggrisk_{i,t+1}$), is equal 28% on average which is slightly lower than that of the prior evidence – 30% and 36% for U.S. bank holding companies (Demsetz, Saidenberg, and Strahan; 1997 and Nier and Baumann; 2006 respectively). The minimum aggregated risk value is 11% and increases up to 73%. The systemic risk ($sysrisk_{i,t+1}$) measured as a bank’s beta has an annual mean of 1.10. Its value ranges from 0.04 to 2.23 with standard deviation of 0.33. Results indicate that the average annualized idiosyncratic volatility ($yidiorisk_{i,t+1}$) is about 21% and ranges from 10% to 72%. Finally, the annualized downside risk ($ydownrisk_{i,t+1}$) has a mean of 15%. The minimum downside risk value is 3% and increases up to 56%. For some cases, we can observe quite low level of the systemic risk 0.04 and the downside risk 3%, this can be explained by the fact that some bank holding companies were delisted at some point of the year and their stocks were not traded at the capital markets.

Comparative descriptive statistics for dependent variables are presented in Table 3.2. The test for equality of means suggests that for all dependent variables means are statistically different from each other. In overall, we can see clear downside trend and this trend is in line with U.S. economic environment of 2011-2013. The period 2011-2013 can be characterized as the beginning of U.S economy recovery after the recession of 2007 to 2009.

Variable	2011	2012	2013	Avg.
$yaggrisk_{i,t+1}$	0.379	0.264	0.197	0.281
$sysrisk_{i,t+1}$	1.112	1.274	0.914	1.101
$yidiorisk_{i,t+1}$	0.263	0.201	0.170	0.212
$ydownrisk_{i,t+1}$	0.220	0.138	0.095	0.152

Table 3.2 Comparison of means of dependent variables in 2011-2013

Let us move to the analysis of the descriptive statistics of the independent variable reflecting the level of disclosure presented in the table 3.3. Results indicate that the aggregated disclosure index is about 1.04 and ranges from 0.10 to 3.34.

Variable	Mean	Std. Dev.	Min	Max
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Independent variable				
<i>disc_{it}</i>	1.04	0.68	0.10	3.34

Table 3.3 Descriptive statistics of independent variable

Table 3.4 represents the descriptive statistics for all sub-indices of the disclosure index. The number of banks that disclosure a particular information throughout the sample period, the number of banks that never disclosure a particular information throughout the whole period, average score as well as standard deviation are presented in the table. The majority of U.S. bank holding companies disclose funding breakdown by term, risk ratios of subsidiaries and average balance sheet figure with an average score close to 1. However currency breakdown of funding sources, balance sheets of subsidiaries as well as risk ratios on quarterly basis have relatively lower scores.

Table 3.4 Descriptive statistics of Disclosure sub-indices

Sub-index	Disclosing in	Disclosing in	Average	St. Dev
	all periods	no periods		
L1: term breakdown	83%	9%	0,87	0,33
L2: currency breakdown	9%	88%	0,11	0,31
L3: liquidity ratio	36%	55%	0,41	0,49
L4: unencumbered assets	21%	67%	0,28	0,45
G1: B/S info of subsidiaries	12%	85%	0,14	0,34
G2: B/S info of sectors/sub-units	29%	65%	0,32	0,47
G3: risk ratios of subsidiaries	92%	3%	0,95	0,22
G4: risk ratios of sectors/sub-units	8%	92%	0,08	0,27
I1: average B/S figures	95%	2%	0,97	0,17
I2: quarterly B/S figures	24%	74%	0,25	0,43
I3: risk ratios on quarterly basis	11%	89%	0,11	0,31
S1: credit exposure to financial inst.	21%	76%	0,23	0,42
S2: off-balance sheet items	42%	52%	0,44	0,50
S3: exposure to SPEs	36%	61%	0,38	0,49

Figure 3.1 presents scores for the main categories and aggregated disclosure index averaged through all bank holding companies. As we can see there is an improvement in aggregated disclosure index throughout the sample period that is mainly due to increased score in liquidity disclosure as well as group structure information. On the other hand spillover risk and intra-annual information are stable throughout 3 years period. Liquidity disclosure has the highest average score while intra-annual information disclosure has the lowest score among four main categories.

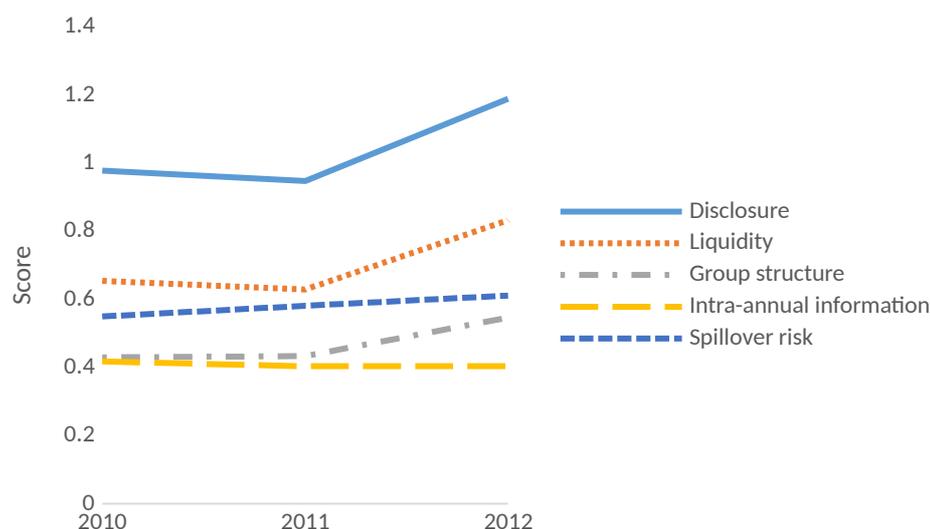


Figure 3.1 Aggregated disclosure score and sub-indices

Let us move to the descriptive statistics of control variables that reflect general characteristics of the company. The results are presented in the table 3.5.

Table 3.5 Descriptive statistics of independent variable

Variable	Mean	Std. Dev.	Min	Max
Control variables				
$size_{it}$	14.923	1.853	0.026	19.008
$vola_{it}$	0.035	0.018	0.016	0.150
$capbuf_{it}$	0.149	0.250	0.012	2.612
npl_{it}	0.016	0.014	0.000	0.087
roe_{it}	0.035	0.330	-3.758	0.622
$depo_{it}$	16.781	1.933	0.0005	20.900

As we can infer from the table the average size of the bank holding companies ($size_{it}$) measured as the natural logarithm of market capitalization is equal to 14.923. That is \$ 2 987 million.

Capital buffer ($capbuf_{it}$) is mandatory capital that [financial institutions](#) are required to hold in addition to other minimum [capital requirements](#). The average capital buffer ratio across the sample equals 14.9% and the value ranges from 1.2% to 261.2%. For some bank holding companies equity capital exceeds its total liabilities therefore capital buffer ratio exceeds 100%.

The average non-performing loans ratio (npl_{it}) measured as the bank's non-performing loans as a proportion of its total assets is equal to 2%. The value ranges from 1% to 9%.

The return on equity (roe_{it}) that represents the amount of net income returned as a percentage of shareholders equity equals on average 5.2%. The value ranges from -375.8% to 62.2%. We observe bank holding companies with huge negative return on equity, that is due to huge losses incurred by bank holding companies in some years.

The average amount of the bank holding companies' deposits ($depo_{it}$) measured as the natural logarithm of total deposits is equal to 16.84. That is \$ 20 583 million.

Finally, I divided all bank holding companies into two groups: high-disclosed and low-disclosed bank holding companies. Into high-disclosed group all BHC with aggregated disclosure index above median in a particular year are included and on the contrary into low-disclosed group all BHC with aggregated disclosure index below median. Then I employed the test for comparison of means between these two groups. The results are presented in the table 3.6. The results show that BHCs disclosing more information related to their risk profiles have higher systemic risk in the following year. After that BHC in high-disclosed group are larger in size. This may be explained by the fact that larger bank holding companies are more complicated in structure and they are involved in wide range of riskier non-banking activities. Thus, they have higher incentives to provide more information compared to the smaller bank holding companies. Additionally, high-disclosed bank holding companies have higher level of deposits.

	High disclosed	Low disclosed	p-value
$\gamma_{aggrisk}_{it+1}$	0.277	0.284	0.1673
$\gamma_{sysrisk}_{it+1}$	1.15	1.053	0.0386
$\gamma_{vidiorisk}_{it+1}$	0.202	0.222	0.1624
$\gamma_{downrisk}_{it+1}$	0.151	0.152	0.9161
$disc_{it}$	1.537	0.551	0.0000
$size_{it}$	15.77	14.10	0.0000
$vola_{it}$	0.032	0.038	0.0079
$capbuf_{it}$	0.135	0.162	0.4480
npl_{it}	0.014	0.017	0.1806
roe_{it}	0.058	0.012	0.3277
$depo_{it}$	17.650	15.938	0.0000

Table 3.6 Comparison of high and low disclosed Bank holding companies

3.4. Regression results and discussion

3.4.1. Regression results

This section examines whether disclosure has any impact on enterprise risks. The empirical analysis proceeds as follows. For each dependent variable, I start with the baseline specification, which only contains key control variables characterizing the size of the financial

institution, the volatility of the equity, bank's capital buffer, non-performing loans, return on equity and the level of deposits. Then I introduce the aggregated disclosure index into the baseline specification. The principal estimation method is the fixed-effects estimator.

	<i>yaggrisk</i> _{<i>i,t+1</i>}	<i>yaggrisk</i> _{<i>i,t+1</i>}	<i>sysrisk</i> _{<i>i,t+1</i>}	<i>sysrisk</i> _{<i>i,t+1</i>}	<i>yidiorisk</i> _{<i>i,t+1</i>}	<i>yidiorisk</i> _{<i>i,t+1</i>}	<i>ydownrisk</i> _{<i>i,t+1</i>}
	I	II	III	IV	V	VI	VII
<i>disc</i> _{<i>i,t</i>}		-0.170 ***		-0.582 ***		-0.073 **	
<i>disc</i> _{<i>i,t</i>}	-0.004	0.005	-0.281 ***	-0.267 ***	-0.080 ***	-0.078 ***	0.079 ***
<i>vola</i> _{<i>i,t</i>}			5.186 **	2.193	0.149	-0.226	2.737 ***
<i>capbuf</i> _{<i>i,t</i>}	-1.738 **	-1.608 **	2.234	1.938	-0.068	-0.105	-1.330 ***
<i>npl</i> _{<i>i,t</i>}	9.381 ***	7.055 ***	14.959 ***	8.778 **	4.701 ***	3.927 ***	3.937 ***
<i>roe</i> _{<i>i,t</i>}	0.023	-0.015	0.282 *	0.046	-0.024	-0.054	0.100 ***
<i>depo</i> _{<i>i,t</i>}	0.012	0.003	0.257 ***	0.231 ***	0.068 ***	0.065 ***	-0.049 ***
<i>cons</i>	0.192	0.411 ***	0.262	1.347 ***	0.178 *	0.314 ***	-0.215 ***
<i>Obs.</i>	191	191	191	191	191	191	191
<i>Prob > F</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>adj R²</i>	0.406	0.464	0.519	0.589	0.522	0.563	0.487

Note: (*), (**) and (***) significance at the 1%, 5% and 10% level, respectively.

Table 3.7 contains the results of panel regression analysis, where the dependent variables are the average value of defined above four risk measures over a year following an announcement of an annual report. Table 3.7 presents the results for baseline specification and for the models with included aggregated disclosure index.

Table 3.7 Regression analysis results

All models are statistically significant. The significance of the following variables is observed: the independent variable $disc_{i,t}$ as well as control variables $\ln i_{i,t}$, $vola_{i,t}$, $capbuf_{i,t}$, $npl_{i,t}$, $roe_{i,t}$, $depo_{i,t}$.

Column I shows the estimation results for the baseline specification, where the dependent variable is the aggregated risk ($yaggrisk_{i,t+1}$). I observe statistically significant coefficients on bank's capital buffer and non-performing loans ($capbuf_{i,t}$ and $npl_{i,t}$) and insignificant coefficients on the firm size, return on equity and the level of deposits ($\ln i_{i,t}$, $roe_{i,t}$ and $depo_{i,t}$). As expected, the BHC's aggregated risk negatively related to the bank's capital buffer in other words increased capital buffer in the previous year decreases the aggregated risk of bank holding company in the following year. Additionally increased level of the non-performing loans in the previous year results in increased aggregated risk of bank holding company.

Column III and V reveals a negative and significant relationship between the firm size ($\ln i_{i,t}$) and systemic risk as well as idiosyncratic risk ($sysrisk_{i,t+1}$ and $yidiorisk_{i,t+1}$). Additionally we can see positive and significant relationship between the non-performing loans and the level of deposits. As expected, the bigger bank holding companies benefit from lower systemic risk and idiosyncratic risk, which could be a result of implicit too-big-to-fail guarantees. Moreover higher accounting risks expressed by the non-performing loans and the level of deposits lead to increased systemic and idiosyncratic risks of the bank holding company.

Finally, Column VII shows the estimation results for the baseline specification, where the dependent variable is the downside risk ($ydownrisk_{b,t+1}$). As we can see all coefficients are statistically significant. However not all of the parameter estimates before variables have expected signs. The results state negative relationship between the level of deposits ($depo_{i,t}$) and downside risk. This could be explained as follows: deposits are likely to have long-term maturity hence maturity gap between loans and deposits is not so big.

After adding the aggregated disclosure index, we can see that in all specifications disclosure index ($disc_{i,t}$) is significant and negatively associated with the enterprise risks such as the aggregated risk, the systemic risk, the idiosyncratic risk and the downside risk. Additionally the sign and significance of each control variable are preserved.

3.4.2. Discussion

Results of the research enable us to make a conclusion about the existence of the relationship between disclosure and different enterprise risks. In particular, it can be observed that there is significant relationship between such enterprise risks as the aggregated risk, the systemic risk, the idiosyncratic risk, the downside risk and the aggregated disclosure index. The significance of disclosure index allows us to accept the hypotheses about the negative relationship with enterprise risks.

The expected sign of disclosure on the aggregated risk is uncertain. As it was said previously a number of studies argue that disclosure is positively associated with stock prices volatility (Ross; 1989, Leuz and Verrecchia; 2000). On the other hand, some studies reveal that enhanced disclosure decreases stock volatility (Bushee and Noe; 2000, Baumann and Nier; 2004, Kothari, Li, and Short; 2009, and So; 2011). The results provide evidence supporting the second group of studies telling that the higher the level of bank's disclosure in the current year the lower stock volatility in the following year. This can be explained as follows, by mitigating uncertainty disclosure may reduce the degree of the impact of news about bank's performance that in turn would reduce stock volatility (Lang and Lundholm; 1993, Bushee and Noe; 2000). After that the simple theories of market microstructure suggests that increased level of disclosure decreases the information asymmetry among different investors and lower the advantage to be better-informed. This in turn decreases the price impact of trade actions of informed investors (Diamond and Verrecchia 1991). Hence, the increased level of disclosure may lower diversity of investors' beliefs about real value of the bank as a result reducing the volume traded and stock price volatility.

Column IV and VI shows that enhanced level of disclosure decreases both systemic and idiosyncratic risks of bank holding companies. This finding support the results of Lambert et al. (2007) and Ashbaugh-Skaife et al. (2009). Here we can conclude that disclosure is an important determinant of systemic and idiosyncratic risks. Easley and O'Hara; 2004 and O'Hara (2003) claim that a firm's financial reporting quality can influence the firm's information environment and in turn its systemic and idiosyncratic risks. Hence, bank holding companies with lower level of disclosure present higher information risk to investors that in turn is translated into higher systemic and idiosyncratic risks.

Finally, in column VIII regression analysis has revealed a significant negative relationship between the downside risk and the aggregated disclosure index. The finding support the results of Ederington and Lee (1996) and Rogers, Skinner, and Van Buskirk (2009) who showed that the disclosure of certain type information is associated with lower downside risk.

From managerial point of view, the results of the study may be useful for outside investors as well as banks. Enhanced information disclosure may influence the investment decisions of outside investors. Controlling for a number of bank holding company financial characteristics, such as the size, the volatility, the capital buffer, the non-performing loans ratio, return on equity and the level of deposits, we find that bank holding companies that provide more information in their disclosure show lower measures of the aggregated risk, the systemic risk, the idiosyncratic and the downside risk than do banks that provide less information. It seems that investors tend to invest more in companies with lower level of risk. Moreover, the results suggest that higher level of disclosure may be beneficial for banks as well, if lower level of enterprise risks will be translated into reduced cost of capital.

Conclusion

Information problem as well as agency problem is argued as one of the main reasons that impede the optimal allocation of resources in capital markets. In periods of market turbulence, market participants prefer safe haven investments. Hence, investors with low quality information about assets reduce their holdings, while holders of high quality assets are unwilling to sell at prevailing market prices, leading to a collapse of market functioning. One of the possible ways to mitigate the problem is requirement to increase the level of corporate disclosure.

This master thesis is devoted to the analyses of the relationship between disclosure and riskiness of a financial institution. The structure of the master thesis is constructed in the way that enables consistently achieve the goal. In the first chapter, four types of risks that investors typically face while making investment decisions are defined. Moreover, the methods to measure these risks are also described. In the second chapter, we describe the role of disclosure in capital market and peculiarities of corporate disclosure in U.S. Then based on the review of previous studies different consequences of disclosure have been identified, additionally the relationship between disclosure and riskiness of a financial institution has been argued. At the third chapter, we formulated the research hypotheses and described models and the main variables. To test the hypotheses a sample of 66 U.S. publicly listed bank holding companies has been formed.

To measure the level of disclosure I used the method proposed by Rhiannon Sowerbutts, Peter Zimmerman and Ilknur Zer in Banks' disclosure and financial stability report. The authors identified four main groups in corporate disclosure related to the riskiness of financial institution: liquidity risk, group structure, intra-annual information and spillover risk. All categories consist of 14 sub-indices. For each sub-index the score 1 is given when bank holding company provides the relevant information in its 10-K statements, annual, or proxy reports for a particular year. However, no judgments on the quality of disclosed information was made. The Principal Component Analysis for calculation of the aggregated disclosure index were employed.

The results presented in this paper suggests that disclosure may help to mitigate some of information asymmetry. In particular, I show that after controlling for a number of bank holding company financial characteristics, such as the size, the volatility, the capital buffer, the non-performing loans ratio, return on equity and the level of deposits an increased disclosure is followed by decreased aggregated risk, systemic risk, idiosyncratic risk, and downside risk.

Obtained results provide some possible managerial implications. Higher level of disclosure may be useful for investors as well as banks themselves. First, enhanced information

disclosure may influence the investment decisions of outside investors. It seems that investors tend to invest more in companies with lower level of risk. Second, higher level of disclosure may be useful for banks as well, if lower level of enterprise risks will be translated into reduced cost of capital.

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Appendix 1

Table 1 List of Bank holding companies

Name	2010 TA (\$ bn)	State	Sample
ASSOCIATED BANC CORP	21.80	WI	2010-2013
BANCORPSOUTH	13.62	MS	2010-2013
BANK OF AMER CORP	2264.91	NC	2010-2013
BANK OF HI CORP	13.13	HI	2010-2013
BANK OF NY MELLON CORP	247.26	NY	2010-2013
BB&T CORP	156.23	NC	2010-2013
BOK FC	23.94	OK	2010-2013
BOSTON PRIVATE FNCL HOLD	6.16	MA	2010-2013
CAPITAL ONE FC	197.50	VA	2010-2013
CATHAY GEN BC	10.67	CA	2010-2013
CENTRAL PACIFIC FC	3.94	HI	2010-2013
CITIGROUP	1913.90	NY	2010-2013
CITIZENS REPUBLIC BC	9.97	MI	2010-2013
CITY NAT CORP	21.25	CA	2010-2013
COMERICA	53.67	TX	2010-2013
COMMERCE BSHRS	18.50	MO	2010-2013
CULLEN/FROST BKR	17.62	TX	2010-2013
CVB FC	6.38	CA	2010-2013
EAST W BC	20.70	CA	2010-2013
FIFTH THIRD BC	111.01	OH	2010-2013
FIRST BC	15.59	PR	2010-2013
FIRST CITIZENS BSHRS	20.81	NC	2010-2013
FIRST COMMONWEALTH FNCL	5.81	PA	2010-2013
FIRST HORIZON NAT CORP	24.70	TN	2010-2013
FIRST MIDWEST BC	8.03	IL	2010-2013
FIRSTMERIT CORP	14.14	OH	2010-2013
FNB CORP	8.96	PA	2010-2013
FRANKLIN RESOURCES	10.71	CA	2010-2013
FULTON FNCL CORP	16.17	PA	2010-2013
HANCOCK HC	8.13	MS	2010-2013
HUNTINGTON BSHRS	53.82	OH	2010-2013
INTERNATIONAL BSHRS CORP	11.94	TX	2010-2013
JPMORGAN CHASE & CO	2117.61	NY	2010-2013
KEYCORP	91.41	OH	2010-2013
M&T BK CORP	68.02	NY	2010-2013
MB FNCL	10.32	IL	2010-2013
NATIONAL PENN BSHRS	8.76	PA	2010-2013
NEW YORK CMNTY BC	41.10	NY	2010-2013
NORTHERN TR CORP	83.84	IL	2010-2013
OLD NAT BC	7.17	IN	2010-2013
PACIFIC CAP BC	6.09	CA	2010-2012
PARK NAT CORP	7.30	OH	2010-2013
PNC FNCL SVC GROUP	264.28	PA	2010-2013
POPULAR	38.33	PR	2010-2013
PROSPERITY BSHRS	9.48	TX	2010-2013
PROVIDENT BSHRS CORP	6.79	MD	2010-2013
REGIONS FC	132.35	AL	2010-2013
STATE STREET CORP	158.72	MA	2010-2013
STERLING FC	9.49	WA	2010-2013

SUNTRUST BK	172.84	GA	2010-2013
SUSQUEHANNA BSHRS	13.95	PA	2010-2013
SVB FNCL GRP	17.49	CA	2010-2013
SYNOVUS FC	30.09	GA	2010-2013
TCF FC	18.47	MN	2010-2013
TRUSTMARK CORP	9.52	MS	2010-2013
U S BC	307.79	MN	2010-2013
UMB FC	12.40	MO	2010-2013
UMPQUA HC	11.66	OR	2010-2013
UNITED BSHRS	7.11	WV	2010-2013
UNITED CMNTY BK	7.28	GA	2010-2013
VALLEY NAT BC	14.14	NJ	2010-2013
WEBSTER FNCL CORP	17.93	CT	2010-2013
WELLS FARGO & CO	1258.13	CA	2010-2013
WHITNEY HC	11.65	LA	2010-2011
WINTRUST FC	13.98	IL	2010-2013
ZIONS BC	50.49	UT	2010-2013

Appendix 2

Table 2 Variables description

Variable	Title	Measurement approach
Dependent variables		
$\gamma_{aggrisk_{it+1}}$	The aggregated risk	Standard deviation of weekly equity returns $s_{i,t} = \sqrt{\frac{1}{w_{i,t}-1} \sum_{w=1}^{w_{i,t}} (r_{i,w} - \hat{r}_i)^2}$ <p>where $w_{i,t}$ is the number of weeks available in year t for bank i; $r_{i,w}$ is the equity return of bank i in week w, \hat{r}_i is the expected equity return of bank i.</p>
$\gamma_{sysrisk_{it+1}}$	The systemic risk	Beta estimated from security market model $r_{i,t} - r_{f,t} = \alpha_i + \beta_i (r_{m,t} - r_{f,t}) + \varepsilon_{i,t}$ <p>where $r_{i,t}$ is the weekly stock return for bank holding company i in week t. $r_{f,t}$ is the weekly return from holding a 3-month risk-free treasury-bill, $r_{m,t}$ is the weekly return for NYSE or NASDAQ market index in week t, α_i is the intercept term, β_i (or beta) is the slope term, and $\varepsilon_{i,t}$ is a random error term.</p>
$\gamma_{idiorisk_{it+1}}$	The idiosyncratic risk	Standard deviation of the weekly residuals of market model
$\gamma_{downrisk_{it+1}}$	The downside risk	Downside deviation of a stock market asset's weekly returns below minimum accepted returns $sd_{i,t} = \sqrt{\frac{1}{w_{i,t}-1} \sum_{w=1}^{w_{i,t}} \min(r_{i,w} - c, 0)^2}$ <p>where $w_{i,t}$ is the number of weeks available in</p>

		year t for bank i ; $r_{i,w}$ is the equity return of bank i in week w , c is minimum accepted return which is equal 0.0% for the purpose of this research
Independent variable		
$disc_{b,t}$	The aggregated disclosure index	<p>Measured by the formula:</p> $disc_{i,t} = \alpha_1 LIQ_{i,t} + \alpha_2 GRP_{STRI,t} + \alpha_3 INTRA_{i,t} + \alpha_4 SPIL_{i,t}$ <p>where:</p> <p>$LIQ_{i,t}$ – the disclosure score on liquidity risk</p> <p>$GRP_{STRI,t}$ – the disclosure score on group structure</p> <p>$INTRA_{i,t}$ – the disclosure score on intra-annual information</p> <p>$SPIL_{i,t}$ – the disclosure score on spillover risk</p> <p>$\alpha_1, \alpha_2, \alpha_3, \alpha_4$ – the weights of disclosure categories</p>
Control variables		
$\ln i_{i,t}$	Size	This variable calculated as the natural logarithm of bank's market capitalization at the end of the year.
$vola_{i,t}$	Volatility	<p>Measured by the formula:</p> $vola_{i,t} = \sqrt{\frac{1}{w_{i,t}} \sum_{w=1}^{w_{i,t}} \left(\frac{P_{i,w}^H - P_{i,w}^L}{P_{i,w}^C} \right)^2}$ <p>where $w_{i,t}$ is the number of weeks available in year t for stock i; $P_{i,w}^H$, $P_{i,w}^L$ and $P_{i,w}^C$ are the average weekly highest, the average weekly lowest and closing prices for equity of bank i in week w</p>
$capbuf_{i,t}$	Capital buffer	Capital buffer ratio calculated as the bank's equity capital as a proportion of its total liabilities
$npl_{i,t}$	The Non-performing loans ratio	The Non-performing loans ratio calculated as bank's non-performing loans as a proportion of its total assets
$roe_{i,t}$	Return on equity	Calculated as the ratio of the income before extraordinary items to total book equity.
$depo_{i,t}$	The level of deposits	Calculated as the natural logarithm of total deposits.