

HOW SYSTEMATIC IS DEFAULT RISK?



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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

This study aims to provide an extensive analysis of systematic (market-wide) and systemic (sector-wide and industry-wide) components of the idiosyncratic default risk. We detect significant heterogeneity among the default risk structure of various industry groups. More specifically, the default probability of institutions affiliated with certain industry groups is more strongly linked to industry-wide risks while others are more heavily tied to sector-wide risks. We further show that systematic and systemic components of default risk alter also relative to up/down market cycles for each industry group. That is, the default risk of companies associated with certain industry groups proves systematic in both uptrends and downtrends whereas others induce the market risk during only bullish or bearish market states.

We further consider a scenario where higher default risk of firms belonging to a specific industry group aggravates the sector risks other than its own and find that an increase in the default risk of various industry groups can in fact destabilize one or more sectors. We notice that the stability of firms within specific industry groups matter more than others for the health of an economy and the wealth of its participants, regardless of the market state while others carry weight with respect to market cycles. Our findings on the direct linkages between idiosyncratic default risk and systematic and systemic risks among financial and non-financial firms provide valuable insights for investors as well as policy makers.

Keywords: Systematic risk, systemic risk, default risk

ÖZET

Bu çalışma, firmaların temerrüt riskinin sistematik (piyasa çapında) ve sistemik (sektör veya endüstri çapında) bileşenlerinin kapsamlı bir analizini sağlamayı amaçlamaktadır. Çeşitli endüstri gruplarına ait şirketlerin temerrüt riski yapısı arasında önemli derecede heterojenlik tespit ediyoruz. Daha spesifik olarak, belirli endüstri gruplarına bağlı kurumların temerrüt olasılığı endüstri genelindeki riske daha güçlü bir şekilde bağlıyken, diğerlerinin sektör genelindeki riske daha fazla etki ettiğini tespit ediyoruz. Buna ek olarak, temerrüt riskinin sistematik ve sistemik bileşenlerinin her bir sektör grubu için yukarı/aşağı piyasa döngülerine göre de değiştiğini gösteriyoruz. Yani, bazı endüstri gruplarıyla ilişkili şirketlerin temerrüt riski hem yükseliş hem de düşüş trendlerinde sistematik olarak ortaya çıkarken, diğerleri sadece yükseliş veya düşüş piyasası durumlarında piyasa riskini tetiklemektedir.

Ayrıca, belirli bir endüstri grubuna ait firmaların temerrüt riskinin artmasının kendi sektörü dışındaki sektör risklerini de artırdığı bir senaryoyu ele alıyor ve çeşitli endüstri gruplarının temerrüt riskindeki artışın aslında bir veya daha fazla sektörün istikrarını bozabileceğini buluyoruz. Belirli endüstri gruplarındaki firmaların istikrarının, piyasa durumundan bağımsız olarak bir ekonominin sağlığı ve piyasa katılımcılarının refahı için diğerlerinden daha önemli olduğunu, diğerlerinin ise piyasa döngülerine göre aynı konuda ağırlık taşıdığını görüyoruz. Finansal ve finansal olmayan firmalar arasında, firma bazında temerrüt riski ile sistematik ve sistemik riskler arasındaki doğrudan bağlantılara ilişkin bulgularımız, yatırımcıların yanı sıra politika yapıcılar için de değerli bilgiler sağlamaktadır.

Anahtar Kelimeler: Sistematik risk, sistemik risk, temerrüt riski

To my parents and my lovely sister,



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1. Introduction

Stock market is a key component of an economy and serves as a barometer of economic confidence due to its multi-layered effect on the latter. Essentially, it supports the growth of industries by providing a way for companies to raise funds to invest in and expand their businesses. In other words, companies may offer part of their ownership to the investors in exchange of some capital. Accordingly, investors evaluate the financial performance of companies and make profit if the future value of the companies that they invested in is worth more than their initial investment value. This mechanism gives the investors an opportunity to efficiently allocate their limited funds to companies that are demonstrating a potential to create wealth.

Intuitively, rising stock values may make consumers, especially stockholders, feel wealthier in such a manner that drive them to spend more and thus, stimulate the broader economy. Although the percentages of household-level marginal propensity to consume out of the stock market wealth differ in terms of magnitude, recent research on the relationship between the stock market, consumption and real economy points out to the presence of a stock market *wealth effect* (see among others, Paiella and Pistaferri, 2017; Di Maggio et al., 2018; Chodorow-Reich et al., 2019). Furthermore, the domestic wealth effect of stock markets may grow into an *international wealth effect*. Stock markets of various countries tend to move in the same direction and prove to be linked closely. Mainstream explanations for this phenomenon include economic similarities, business climate, and increase in trade openness and financial capital flows between countries. Considering higher levels of international and global financial integration, variations in stock prices may affect the import and export decisions of certain countries and implicate a wealth effect on an international scale besides the domestic one. More specifically, stock price shocks may cause alterations in the trade

balance through the consumption of imported goods and services (Holinski and Vermeulen, 2012). In brief, the state of the stock market can influence households, businesses, and thus, the broad economy at both national and international grade through increased levels of financial integration. Though, the most relevant and most directly affected group by stock markets and price movements covers market participants such as individual investors, institutional investors, and publicly traded companies.

Investors are exposed to certain risks as a result of trading in stock markets. Those risks are strongly associated with the default probability of companies. Thereof, investors charge a form of compensation, a risk premium, for the extra risk they bear over that of investing in a risk-free asset. All models that examine the relationship between risk and return share a similar notion: Only the risk of adding an asset to a diversified portfolio matter; hence, it should be measured and rewarded. As a matter of fact, this approach separates the risk of an investment into two components, namely a firm-specific (idiosyncratic) and a market component. The former component measures risk that is affiliated solely with that stock or with a few stocks carrying similar characteristics. On the other hand, the market component contains risk that impacts all stocks or a large subset of the whole stock market. It is also referred to as systematic risk. As such, the latter risk factor, is not diversifiable and should be compensated. Consequently, idiosyncratic default probability may affect equity risk premium if it is or becomes systematic under certain circumstances.

A noteworthy property of stock returns is the *volatility clustering* (Mandelbrot, 1967). That is, calm and turbulent periods tend to cluster together. Large positive (negative) movements are followed by large positive (negative) movements. Likewise, small changes, of either sign, are accompanied by small changes. A second stylized fact about stock returns is that they react to positive and negative price shocks in an asymmetric fashion. Their response to negative shocks is more pronounced relative to positive ones; meaning that the negative shocks can

further intensify volatility in comparison to positive shocks of the same amplitude (Christie, 1982; French et al., 1987; Campbell & Hentschel, 1991). Since the stock markets are good indicators of business cycles and market participants react to price shocks in an asymmetric manner as a result of increased uncertainty and asymmetric information during stock market downturns, high volatility clusters are more of a concern because higher volatility is often associated with higher risk and uncertainty. Furthermore, persistently high volatility and instability in stock prices may lead to major stock market crises under certain conditions. If the idiosyncratic default risk is the source of these market-wide changes then the failure of such companies may cause a domino-like effect.

Default risk of a company can broadly be defined as the probability that a company will be unable to fulfil its debt obligations. Especially the Global Financial Crisis (GFC) re-raised concerns about the default risk and its decomposition; after the cascade effect of the failure of institutions, researchers as well as macro-prudential regulators turned their attention to the structure of default risk. Since the default risk can turn out systematic if the failure of an institution affects other institutions, the structural composition of the default risk is of high interest not only during crisis periods but also throughout bull-bear market cycles.

An institution is classified as systemically important if its failure have adverse consequences on the broad market economy and the financial system. The health and stability of the economy is closely related to that of the financial sector since financial firms provide loans, mortgages, and insurances to consumers (Chiu et al., 2017; Wang et al., 2017). More specifically, financial institutions allocate funds from savers to borrowers and further, facilitate the coping mechanisms of businesses and households with economic uncertainties through pricing, sharing and hedging risks. Thus, a strong financial sector helps diminishing the cost and risk of producing and trading goods and services, leading the overall economy to operate more efficiently. Moreover, research show that the default risk may be transferred

between financials sector and the government during financial crises (Dieckmann and Plank, 2011; Alter and Schüler, 2012), reinforcing the intuitive rationale. Hence, financial institutions constitute the primary concern due to their role in promoting the spread and diffusion of crises.

On the other hand, one should take into consideration the high interconnectedness and integration level of certain institutions and sectors as well. The failure or the distress of other systematically important institutions, either due to their size or due to their interconnectedness with financial institutions or the rest of the market, can generate a substantial instability in the financial system and hence, in the broader market. For instance, the two recent (mid-2014 and early 2016) dramatic and sustained falls in oil prices triggered high distress on energy-intensive firms (and sector). This, eventually, put significant pressure on certain banks due to their expanded investments in, and loans to, energy-intensive companies. In other words, significant decline in oil prices stressed various corporate balance sheets -especially oil companies' balance sheets- and raised non-performing loans. Empirical studies support this intuitive explanation as well. Poledna et al. (2018) show that non-financial firms' contribution to systemic risk resembles to that of banks and all firms together generate a greater systemic risk compared to the entire financial sector in Austria. Li et al. (2019) obtains similar results analyzing systematically important firms in Chinese stock market. They detect a higher contribution of manufacturing firms to systematic risk compared to other industry firms, including banks. To this end, it is prominent to consider these linkages and to investigate the default risk decomposition of non-financial firms beside financial ones.

To what extent do financial and non-financial institutions differ in terms of their default risk's systematic (market-wide) and systemic (sector-wide or industry-wide) components? Do the systematic and systemic importance of institutions vary relative to up and down-market conditions? Do we observe industry-to-sector type systemic default risk connections among

firms? If so, do these interdependencies alter with respect to market cycles? In an attempt to answer aforementioned questions, this study aims to conduct a comprehensive analysis of firm-level default risk and systematic and systemic risk linkages among various industry groups.

The contribution of this study is three-fold. First, we investigate the default risk structure of non-financial institutions aside financial ones and further consider sector and industry-wide systemic default risk differences. That is, institutions affiliated with a specific sector may categorically possess a certain level of heterogeneity although they share a set of common features and are part of the same cluster. If, for instance, the financial sector is put under the microscope, the differences between the functions, business models or risks of insurance, diversified financials and banking industries can easily be noticed. Same applies to other, non-financial, sector-industry group clusters. The default and systemic risk linkages among firms within the same industry group may be quite stronger than that of at the sectoral level; possibly reflecting the absence or limited extent of inter-industry financial flows within the same sector group. In contrast, these firms may have a more complex and significant default risk ties with firms belonging to different industry but the same sector group, rather than with firms within their industry group. Moreover, even if the default risk of firms within a particular industry group is neither systematic nor systemic on an intra-industry level, these institutions may indirectly destabilize the market assuming that their intra-sector systemic default risk is significant and that the default risk of other industry groups within the same sector possess a systematic component. Therefore, we further differentiate between all constituent industry-groups for each sector within a market. In addition to identifying *systematically important* industries, this intra-industry analysis reveals whether a firm that is classified among a specific industry group is significantly connected to the institutions affiliated with the same-industry or same-sector group (or both) in terms of its default risk.

Most of previous work do not differentiate between financial and non-financial institutions. Papers which differentiate between financial and non-financial firms focus mostly on the default risk structure of banks. There are rather small number of studies investigating the systematic importance of diversified financials and insurance industry. The numbers become even smaller in the case of, for instance, energy, health care equipment, software and services, retailing or capital goods industry groups. However, determining sectors and industry groups of which the default poses threat to the entire market is of high importance not only for investors but also for policymakers. Although the strand of research investigating systematic and systemic default risk is growing rapidly, none of the former studies distinguish between every industry group within markets and examine their default and systemic risk interdependencies at both intra-industry and sector scale and scope.

Second, we consider up and down-market conditions because the systematic and/or systemic components of the default risk may not manifest themselves during both upward and downward market trends in each sector and industry group. Since various sectors or industries benefit from additional investments when the market cycle is in an upward trend and whereas, in principle, systematic default risk is mostly associated with downturns, it is interesting to examine the structure of an institution's default risk under different market conditions. Systematic or systemic default risks may in fact present themselves or even increase as financial imbalances and vulnerabilities build up during upswings and then, materialize in crises followed by recessions. In the same spirit, there may exist some "*strategically important*" sectors or industries of which the default of a firm causes a cascade effect and lead to the failure of other institutions only during upswings while their default may be insignificant under bearish market conditions because other institutions' default generate relatively higher distress during subsequent downturns. In other words, the institutions affiliated with such sectors or industries may be the cause of a distress propagated, through

time, along other industries, and sectors and thus, along the overall market. Although it is beyond the scope of this study, a possible explanation is that those firms may be valued in excess of their fundamental value by a large margin, extremely sensitive to firm-specific news and prone to investor panic, fear, overreaction and herding. A significant increase in the default risk of these institutions would induce market-wide distress, causing a downward trend in the prices. Since systematic defaults are often observed during downturns, determining institutions that endanger an entire industry, sector and/or market under bullish market conditions may reveal the foundation of market destabilization. Another possibility is that there may be certain industries that may pose a threat to the entire market during both up and down-market periods. Surviving institutions that fall in this latter category can be considered as “*too interconnected to fail*” besides being “*too systematically important to fail*” and, may harm the market regardless of its state; that is, they may trigger a downturn or aggravate and prolong a down market into a deeper recession. To the best of our knowledge, this is the first study to analyze the direct impact of idiosyncratic default risk on the systematic and, industry and sector level systemic risks with respect to up and down-market conditions.

Third, we examine the firm-level industry-to-sector type systemic risk linkages with respect to default risk. More specifically, we investigate whether an increase in the odds of default of an institution belonging to a specific industry group directly affects the variations in other sectors’ risk or not. For instance, an institution affiliated with the semi-conductors and semiconductor equipment industry group is categorized under the information technology sector. Consider a scenario where an increase in the default risk of such firm does not significantly impact the information technology sector risk but enhances the sectoral risk of one or more non-financial sectors (other than information technology), or even that of financial sector. Although its default risk is not systematic (and systemic in terms of

information technology sector), an increase in the odds of insolvency of such institution may indirectly destabilize the market via putting pressure on a sector of which the default risk is systematic. Determining these ties and the circumstances under which the firm-level default risk leads to an increase in the sector level systemic risk other than its own sector is essential in detecting possible source of the contagion effect. Thus, our analysis on the industry-to-sector type systemic default risk aims to provide further regulatory implications about various industry groups.

The remainder of this research is structured as follows: Next section deliver a brief literature review. Section 3 and Section 4 uncover the hypothesis development, and data and methodology, respectively. Fifth section presents the empirical findings on firm-level analysis of the relationship between institutions' default risk and the systematic (market) and systemic (sectoral or industrial) risk with regard to up and down-market conditions. It also reveals the channels through which the default risk of an institution affects the systematic and/or systemic risk. In other words, it discloses the intra-sector and intra-industry default risk structure. Industry-to-sector type systemic default risk is also revealed in this section. Final section discusses the main findings, offers insights for further research, and concludes the study.

2. Literature Review

This section is devoted to a concise discussion of two bodies of research that provide a theoretical foundation for this research. First, we consider the definitions of systematic and systemic risk that fall within the scope of this study. We review previous findings on the systematic and systemic nature of the default risk. Second, we explore how up and down-market cycles relate to the structure of default risk.

2.1. Is Default Risk Systematic?

“Systematic risk” and “systemic risk” terms are used interchangeably in the finance literature. Nevertheless, there exist a difference between systematic and systemic risk. In the context of

this study, it is prominent to make the distinction between those two terms: Systematic risk represents the undiversifiable or market risk whereas systemic risk refers to the risk that may cause instability in an entire industry or sector. Although the systemic risk is diversifiable whereas the systematic risk is undiversifiable, both are detrimental to financial markets and the economy. The main difference lies within the causes and the management of these two types of risks.

If the default risk of a company possesses a systematic (undiversifiable) component it may initiate a domino-like cascade effect and lead to the failure of other institutions in the market. In a similar manner, if a firm's default risk is systemic this may destabilize the entire industry or sector to which it belongs to. Hence, several studies investigate the systematic and the diversifiable components of the default risk (Dichev, 1998; Vassalou and Xing, 2004; Campbell et al., 2008; Fiordelisi and Marques-Ibanez, 2013; Filipe et al., 2016; Anginer and Yildizhan, 2018). However, they reach mixed results. A possible explanation concerns the measures utilized to calculate systematic and systemic risks. That is, one branch of literature examines the contribution of the firms to the systematic risk by conditional value at risk (CoVaR), marginal expected shortfall (MES), or expected capital shortfall (SRISK) measures (Tobias and Brunnermeier, 2016; Acharya et al., 2017; Brownlees and Engle, 2017; Zhang et al., 2020; Foglia et al., 2022). A second strand of research considers the direct link between the indicators of individual firms and systematic risks or take an inductive approach to examine whether distressed firms provide higher returns (Chava & Purnanandam, 2010; Fiordelisi & Marques-Ibanez, 2013; Anginer & Yıldızhan, 2018; Liu et al., 2019). Another possible explanation is related to the measures of idiosyncratic default risk. Several studies utilize accounting models or credit risk to estimate the distance to default of companies (Vassalou and Xing, 2004; Puliga et al., 2014; Anginer & Yıldızhan, 2018).

Most of previous work analyzing the structure of the default risk focus on financials sector, more specifically, on banking industry for obvious reasons. First, interbank activities allow banks to be interconnected within their industry group. Second, banks are expected to be highly integrated with the other firms in the overall market due to their role as credit suppliers (Boot and Thakor, 2009). The failure of such banks may trigger an increase in the default risk of other institutions and influence other firms' stocks in the market. Thus, banks' default risk is more likely to be both systematic and systemic (Fiordelisi & Marques-Ibanez, 2013).

Financials sector includes two more industry groups besides banking industry, namely diversified financials, and insurance. Diversified Financials industry group is mostly composed of investment banks and brokerage houses. Relatively recent studies point out to a change and strengthening in the linkages between investment banks and other industry groups (Cummins and Weiss, 2014) within financials sector. Therefore, the default risk of institutions belonging to diversified financials industry is more likely to be directly related to their systematic and systemic risks. Research about the systematic risk of insurance firms, on the other hand, show that the traditional insurance activities do not really contribute to systematic risk. However, non-traditional insurance activities such as underwriting financial derivatives and providing financial guarantees may induce systematic risk (Acharya and Richardson, 2014).

Although financial institutions are recognized as potentially systemically important institutions, non-financial firms may generate a domino effect in the market as well. Recently, Poledna et al. (2018) considers credit linkages and examine, in a network analysis framework, the tie between all interbank liabilities and the total deposits and liabilities of firms towards financial institutions in the Austrian market. They find that non-financial firms' contribution to systemic risk resembles to that of banks and all firms together generate a greater systemic risk compared to the entire financial sector. Authors suggest that most of the firms generating

systemic risk belongs to banking industry as expected however, 8th systemically important firm is a non-financial institution. The default risk of the latter would impact up to 39% of the Austrian financial system. Li et al. (2019) obtains similar results analyzing systematically important firms in the Chinese stock market. In their systemic risk analysis based on bank-firm network, authors detect a higher contribution of manufacturing firms to systematic risk compared to other firms, including banks.

Unfortunately, none of the previous work distinguish between the sector-wide and industry-wide systemic default risk structure of institutions. To the best of our knowledge, this is the first study to consider the heterogeneity and differences between sector and industry groups with respect to idiosyncratic default risk. We further contribute to the existing literature by considering idiosyncratic default risk as a source of industry-to-sector (to other than its own) type systemic linkages.

2.2. Systematic Default Risk and Market Cycles

Default risk changes with respect to business cycles (Denis and Denis, 1995). Although a relatively small number of studies consider the distinction between financial and non-financial institutions, they mostly neglect to account for the diverse impacts of up and down-market conditions on default risk's systematic, systemic, and idiosyncratic components. In this regard, the systematic and systemic components of a financial institution's default risk may be more pronounced under bearish market conditions since various sectors benefit from additional investments when the business cycle is in an upward trend.

Bühler & Prokopczuk (2010) considers credit default swap (CDS) and collateralized debt obligation (CDO) spreads to estimate firms' default risk and investigate whether bank default risk is systemic or not. The authors demonstrate that the systemic risk in the banking sector is significantly higher during adverse market conditions in comparison to that of under non-adverse conditions. Florakis et al. (2017), on the other hand, examines whether firms with

high default risk provide higher returns and show that high default risk stocks outperform during bull markets and perform poorly during Global Financial Crisis (GFC). More recently, Foglia et al. (2022) analyzes the tail risk interdependence between financial institutions under extreme conditions. Their findings point out to a heterogeneous effect between risk spillovers and highlights the role of bearish market conditions in the sectoral propagation of risk spillover.

Prior work use either sample time intervals excluding crisis periods or concerns with only crisis periods in the examination of systematic and systemic default risks. Very few studies distinguish between the up and down-market states and focus on financial sector, however, none of them consider sector-wide and industry-wide heterogeneity. We believe, this is the first study to analyze sectoral and industrial differences with respect to up and down-market conditions.

3. Hypothesis Development

We begin our analyses by investigating whether an institution's default risk is directly affecting the systematic and/or systemic risk or not. If not, we detect the channels through which it may become systematic and/or systemic. To this end, we hypothesize that if the default risk of a company significantly impacts its sensitivity to excess broad market index (sector and/or industry index) price changes, namely its market (sectoral and/or industrial) risk in the presence of firm-specific control variables, it may have a systematic (systemic) element. If this impact is still significant while controlling for the industry-specific and country-specific factors then, the default risk of a company has a direct impact on systematic or systemic risk. In this case, we deduce that the default risk of such institutions is systematic and/or systemic. Otherwise, we infer that it becomes systematic (systemic) through industry-specific or macroeconomic channels.

Previous research points out to a straightforward notion: firms differ with respect to their default risk structure. That is why, we first detect systematically and systemically important firms and determine the extent of the linkages in their default risk structure on an industry-group level. However, we expect a certain degree of variation among firms' systemic default risk on a sector-group and industry-group basis as well. More specifically, although firms associated with a specific industry appears to represent a more homogeneous group in comparison to that of associated with a specific sector, an increase in their default risk may pose a greater danger to the firms belonging to other firms in their sector-group than their industry-group. For example, due to interbank linkages, an increase in the default risk of a bank may cause more distress in banking industry group while, depending on the link between insurers and banks, an increase in the default risk of an insurance firm may generate more distress within financial sector instead of within insurance industry. Thus, we check whether:

H1: Certain firms are more strongly interconnected within their sector group than within their industry group with respect to their default risk.

Up and down-market states play an important role in the functioning and dynamics of the financial markets. Especially systematic and systemic components of firms' default risk may manifest themselves differently during upward and downward market trends. It is more likely to observe systematic default risk during bearish market states. However, if the default risk of certain industries is systematic when markets follow an upward trend, investors and policymakers should be cautious about the possible adverse impacts of these institutions under the circumstances. Hence, we investigate if and where:

H2: Systematic and systemic components of the idiosyncratic default risk vary with respect to up and down-market cycles.

Systemic default risk linkages may emerge on an industry-to-sectoral level as well. An increase in the default risk of a bank, for instance, may destabilize firms within a sector other

than the financials sector. Moreover, if the default risk of the institutions associated with that non-financial sector is systematic, an increase in the odds of insolvency of such firms may further harm the market functioning. To this end, we test whether:

H3: An increase in the default risk of a firm within an industry-group associated with a specific sector-group may cause significant distress in another sector-group.

4. Data and Methodology

This section uncovers the characteristics of the data set and variables subject to this study followed by a comprehensive definition of the methodology employed for the analyses.

4.1. Data

The primary sample dataset consists of daily stock prices and quarterly accounting information of all companies headquartered in EU-15 countries covering the period between January 2004 and June 2016¹. Firms are classified by sector according to Global Industry Classification Standards (GICS). The sector groups include consumer discretionary, consumer staples, energy, financials, health care, industrials, information technologies, materials, real estate, telecommunication services, and utilities sectors. Sectors are further divided into a total of 24 industry groups² since the companies that constitute these sectors differ considerably in terms of goods and services they offer. Table 1 depicts number of institutions by sector and industry-group for the sample data.

¹ Stock market and accounting data are obtained from Bloomberg database. We excluded firms with inapplicable, insufficient or unavailable stock price or accounting data from the sample. The exclusion of such institutions restricts our sample data set to surviving firms throughout the sample period. This, in return, causes survivorship bias in the research. That is, the results depict only the systematic and systemic importance of surviving institutions and neglect the impact of distress caused by defaulted firms during the same time interval. In other words, our findings underestimate the systematic and systemic components of the default risk. As it may seem as a limitation of this study, it shows the systematic importance of firms that survived throughout up and down-market cycles. Identifying firms that both pose a threat to the entire market (sector or industry) and still manage to survive is valuable in the sense that their potentially destabilizing behavior may re-present itself unless appropriate regulatory measures are taken. On the other hand, the inclusion of every defaulted institution would provide overestimated results about the systematic and systematic nature of default risk. Considering there is no simple resolution for this reverse survivorship bias (Linnainmaa, 2013) either, we focus on the extent of the possible distress caused by an increase in the default probability of surviving institutions.

² Industry groups are also defined according to Global Industry Classification Standards (GICS) (available at <https://www.msci.com/gics>).

Table 1. Number of firms by sector and industry-group.

Sector	Industry Group	Number of Firms	
Consumer Discretionary	<i>Automobiles and Components</i>	30	306
	<i>Consumer Durables and Apparel</i>	88	
	<i>Consumer Services</i>	48	
	<i>Media</i>	66	
	<i>Retailing</i>	74	
Consumer Staples	<i>Food and Staples Retailing</i>	17	127
	<i>Food Beverage and Tobacco</i>	92	
	<i>Household and Personal Products</i>	18	
Energy	<i>Energy</i>	37	37
Financials	<i>Banks</i>	64	117
	<i>Diversified Financials</i>	35	
	<i>Insurance</i>	18	
Health Care	<i>Health Care Equipment and Services</i>	56	113
	<i>Pharmaceuticals, Biotechnology and Life Services</i>	57	
Industrials	<i>Capital Goods</i>	284	414
	<i>Commercial and Professional Services</i>	85	
	<i>Transportation</i>	45	
Information Technology	<i>Software and Services</i>	139	255
	<i>Technology Hardware and Equipment</i>	97	
	<i>Semi-conductors and Semiconductor Equipment</i>	19	
Materials	<i>Materials</i>	117	117
Telecommunication Services	<i>Telecommunication Services</i>	25	25
Utilities	<i>Utilities</i>	41	41
Real Estate	<i>Real Estate</i>	119	119
Total			1671

We utilize Altman z-score as a proxy for the default risk³ in order to cover as many firms as possible. The Z-Score has been extensively used in the literature in order to measure a financial institution's default risk as well (Boyd et al., 2007; Uhde and Heimeshoff, 2009; Čihák and Schaeck, 2010; Barry et al., 2011; Anginer et al., 2014). Therefore, we proxy the default risk⁴ of each financial firm in the sample with a modified version of z-score⁵ as follows:

$$z\text{-score} = \frac{\overline{ROA} + \overline{E/TA}}{\sigma_{ROA}} \quad (1)$$

In Eq. (1), $\overline{ROA}$ is the mean value of return on assets (ROA), $\overline{E/TA}$ represents the mean value of equity to assets ratio and σ_{ROA} refers to the standard deviation of ROA. Z-score is inversely related to a financial firm's insolvency. Thus, higher (lower) values of a firm's z-score imply a lower (higher) probability of default for this institution.

Several factors may influence the systemic or systematic risk of a firm, besides its default risk. The sensitivity of an institution to the market, sector or industry wide variations may increase due to changes in competition, GDP, inflation, etc. To this end, we utilize various firm-specific, industry-specific, and country-specific variables in order to control for the impact of those factors.

4.2. Methodology

This section explains how firm-level market, sector and industry betas are calculated and modeled to take account of the impact of an institution's default risk on the market, sector and industry betas under different market conditions. More specifically, we explain the

³ The z-scores for non-financial firms are obtained from Bloomberg database.

⁴ Some other default risk measures such as the probability of default based on Moody's ratings or the expected default frequency from Moody's KMV may be used, partly for robustness purposes. However, this would lead to a further removal of many firms from the dataset due to inapplicability of those measures. In addition, the coefficients from Fiordelisi and Marques-Ibanez (2013) point out to qualitatively similar results of three default risk measures in EU-15 banking industry. Although it is beyond the scope of this study, further research is needed to confirm whether qualitatively similar results hold with different data sets.

⁵ We utilize the natural logarithm of z-score values in the panel data regressions because the distribution of z-score proves highly skewed.

methodologies that we utilize to assess the systematic and systemic components of an institution's odds of insolvency. At the last part of this section, we describe the model that we implement in order to measure the industry-to-sector type interdependencies in such way that we analyze industry-to-sector level systemic default risk.

4.2.1. Dynamic Conditional Betas

The dependent variables are the systematic and systemic risks proxied by the sensitivity of an institution to the changes in the entire market and in the relevant sector and industry, respectively. We slightly modify the model from Fiordelisi and Marques-Ibanez (2013) that accounts only for the market-wide systematic and industry-wide systemic risks and make use of the following equations when obtaining the systematic (market-wide) and systemic (sector-wide and industry-wide) risk measures⁶:

$$R_{sec,t} = a_0 + b_1 R_{mkt,t} + \varepsilon_{sec,t} \quad (2)$$

$$R_{ind,t} = c_0 + d_1 R_{mkt,t} + d_2 \varepsilon_{sec,t} + \varepsilon_{ind,t} \quad (3)$$

$$R_{industry,t} = f_0 + \beta_1 R_{mkt,t} + e_{ind,t} \quad (4)$$

$$R_{i,t} = g_0 + \beta_2 R_{mkt,t} + \beta_3 e_{ind,t} + \varepsilon_{i,t} \quad (5)$$

$$R_{i,t} = \alpha_0 + \beta_4 R_{mkt,t} + \beta_5 \varepsilon_{sec,t} + \beta_6 \varepsilon_{ind,t} + v_{i,t} \quad (6)$$

⁶ We estimated these time series regressions with “R Project” software and made use of “rmgarch” package in our algorithms.

In Eq. (5) and (6), $R_{i,t}$ represents excess return of stock i belonging to a specific industry group at time t . $R_{mkt,t}$ refers to excess market returns. In order to overcome the problem of multicollinearity, we orthogonalize sector and industry returns. To do so, we regress, in Eq. (2), the excess sectoral index returns on the excess market returns and utilize the error term series $\varepsilon_{sec,t}$ as the excess sectoral return in Eq. (3) and (6). In the same way, we regress the excess industry index returns on the excess market return and on the error term series obtained from equation (2). Then, we collect the error term series $\varepsilon_{ind,t}$ from equation (3) and employ them as industry excess return in Eq. (6). We estimate Eq. (4) separately for the same purpose and utilize the error term series e_{ind} in Eq. (5).

Rolling window regressions ensure a variation between unconditional beta estimates. However, they fail to capture the correlation clustering between returns. In other words, performing an analysis based on a static estimation technique will cause the market, sectoral and industrial beta coefficients to remain constant over the fixed estimation window. This methodology may lead to unrealistic results since the riskiness of a company's cash flow and its correlation with systematic and systemic shocks change through time (Bali et al., 2016). Considering the limitations of static estimation methods, we extract dynamic conditional beta coefficients from the estimated conditional covariance between the excess returns⁷ on an institution's stock and the broad market, sectoral and industrial index based on the mean-reverting dynamic conditional correlation (DCC) model of Engle (2002). As such, DCC market (sectoral and industrial) betas are calculated by the ratio of conditional covariance between the excess return on an institution's stock and the market (sectoral and industrial) index over a risk-free rate to conditional variance of the market (sector and industry)⁸.

⁷ Excess returns are calculated using short term bond yields from each country. Use of long-term bond yields in calculations lead to qualitatively similar results.

⁸ DCC-betas are obtained from Equations (5) and (6) in the following way: For each quarter, the DCC-betas are estimated by running separate regressions using daily excess returns over the past 252 trading days (with at least 200 observations available). More specifically, in order to obtain the market, sectoral and industrial DCC-betas

4.2.2. Systematic and Systemic Default Risk during Up and Down-Market Conditions

We employ market, sector and industry-level quarterly DCC-betas, extracted from Eq. (5) and (6), to determine whether the default probability of an institution belonging to a specific industry group is systematic and/or systemic or neither. Although we make use of some firm-specific, industry-specific and country-specific control variables, certain unobservable factors such as global shocks or regional impacts may also exist and affect the institutions. Those common factors induce error cross-sectional dependence which will, eventually, cause biased estimation results if not taken into account⁹. Considering the high likelihood of cross-sectional dependence, first, we perform cross-sectional dependence (CD) test of Pesaran (2015). The null hypothesis of the test is that the variable, or the error term in case of post-estimation diagnosis, is weakly cross-sectionally dependent against the alternative hypothesis of strong cross-sectional dependence. If the test results point out to a strong form of CD, factor models that account for CD are better suited. According to the CD test results variables prove strongly cross sectionally dependent. Hence, we employ the common correlated effects mean group (CCEMG) estimator of Chudik and Pesaran (2015) which estimates heterogeneous coefficient models using common correlated effects. Systematic component of default risk may persist or exist temporarily across up and down-market cycles. An increase in the default probability of institutions that are affiliated with particular industries may cause distress on the entire market (sector or industry) under both up and down-market cycles while other institutions' default risk may pose a threat for the market (sector or industry) during solely

of an institution “i” belonging to a specific sector and industry group for Q1 2005 (Q2 2005), we estimate the equation (6) covering the period from Q1 2004(Q2 2004) through Q1 2005 (Q2 2005) and so on.

⁹ General method of moments is also one of the most widely utilized methodologies for the estimation of dynamic panel data models. However, it is mostly useful if one deals with very small time dimension or micro panel data. On the other hand, cross-sectional dependence test is relevant when working with macro panel data. Since we analyze a period long enough relative to the number of firms within each industry group, a dynamic panel data methodology that accounts for the effects of cross-sectional dependence is more appropriate instead of, for instance, general method of moments or fixed effects instrumental variable methodology per se.

upswings or downswings. Consequently, we estimate the following dynamic panel data models in order to disentangle between up and down-market conditions' impact while investigating the relationship between institutions' default risk and their systemic (sectoral or industrial) and systematic (market) risk¹⁰:

$$\begin{aligned} \beta_{k,i,t} = & \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} \\ & + \theta_2 D_{up} Default_{i,t} + \sum_{n=1}^N \delta_n D_{down} Control_{n,i,c,t} + \sum_{n=1}^N \gamma_n D_{up} Control_{n,i,c,t} \\ & + u_{i,t} \end{aligned} \quad (7)$$

$$u_{i,t} = g_i f_t + z_{i,t} \quad (8)$$

In Eq. (7), $\beta_{k,i,t}$, for $k = \{2,3,4,5,6\}$, are obtained either from Eq. (5) or Eq. (6) and they refer to DCC-market and sectoral (and industrial) betas of institution i at time t . $\beta_{k,i,t-1}$ shows lagged dependent variables. D_{up} and D_{down} are up and down-market dummy variables¹¹. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,c,t}$ consists of firm-specific (market cap, debt to asset ratio and operating cost to operating income ratio)¹², industry-specific (Herfindahl-Hirschman Index (HHI)), and country-specific (GDP growth

¹⁰ We performed these regressions on the Stata software and made use of "xtccce2" package in our analyses.

¹¹ Following Cooper et al. (2004), we define the market state as bearish when market's six-month cumulative return is negative and bullish otherwise. We replicated our analyses with dummy variables calculated with respect to one-year cumulative returns and reached qualitatively similar results.

¹² Other firm-specific variables such as the book-to-market ratio, total loan to total deposit ratio, non-interest to operating income ratio, or non-deposit liabilities to total deposit ratio are utilized in the literature when investigating the default risk structure of financial institutions (see e.g., Fiordelisi and Marques-Ibanez, 2013). Taking into account the consistency of the analyses for each sector and industry groups, we excluded such control variables in this study. However, as a robustness check we performed several analyses with one and more of these control variables. We also experimented with certain variables which may have a significant impact on the firms' market or sectoral and industrial risk, i.e., oil price changes in case of energy sector. Our overall findings were qualitatively very similar.

and inflation) variables. $u_{i,t}$ is the error term; f_t is an unobserved common factor loading and g_i represents a heterogeneous factor loading¹³.

4.2.3. Measuring Industry-to-sector Systemic Default Risk

In a similar way to the previous analyses, we calculate DCC-betas for every institution with respect to each sector within the market. More specifically, we consider a scenario where a firm belonging to a specific industry is subject to the risks in every sector group within the relevant market besides those in the overall market. We extract quarterly DCC-market and DCC-sector betas (as explained in Section 4.2.1.) from Eq. (9) as follows:

$$R_{i,t} = \alpha_0 + \beta_0 R_{mkt,t} + \sum_{m=1}^{M=11} \beta_m \varepsilon_{secm,t} + \epsilon_{i,t} \quad (9)$$

In Eq. (9), $R_{i,t}$ represents excess return of stock i belonging to a specific industry group at time t . $R_{mkt,t}$ refers to excess market returns. $\varepsilon_{secm,t}$ are collected from Eq. (2) and represent excess sectoral returns. $\epsilon_{i,t}$ is the error term. Subsequently, we regress DCC-betas on idiosyncratic default risk and a set of firm-specific, industry-specific and country-specific control variables taking into consideration up and down-market cycles as follows:

$$\begin{aligned} \beta_{0(m),i,t} = & \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{0(m),i,t-1} + \alpha_4 D_{up} \beta_{0(m),i,t-1} + \theta_1 D_{down} Default_{i,t-1} \\ & + \theta_2 D_{up} Default_{i,t-1} + \sum_{n=1}^N \delta_n D_{down} Control_{n,i,c,t} + \sum_{n=1}^N \gamma_n D_{up} Control_{n,i,c,t} \\ & + u_{i,t} \end{aligned} \quad (10)$$

¹³ Some of the DCC-betas obtained from Eq. (5) and (6) have negative signs. Thus, as a robustness check we re-estimate the Eq. (7) by considering solely the impact of idiosyncratic default risk on the positive value systematic and systemic risks. The results from these analyses are qualitatively same.

$$u_{i,t} = g_i f_t + z_{i,t} \quad (11)$$

In Eq. (10), $\beta_{0(m),i,t}$ refer to DCC-market and sectoral (and industrial) betas of institution i at time t , respectively. $\beta_{0(m),i,t-1}$ shows lagged dependent variables. D_{up} and D_{down} are up and down-market dummy variables. $Default_{i,t-1}$ represents lag of each firm's default risk measure, z-score¹⁴. $Control_{n,i,c,t}$ consists of firm-specific (market cap, debt to asset ratio and operating cost to operating income ratio), industry-specific (Herfindahl-Hirschman Index (HHI)), and country-specific (GDP growth and inflation) variables. $u_{i,t}$ is the error term; f_t is an unobserved common factor loading and g_i represents a heterogeneous factor loading.

5. Empirical results

This section reveals various estimation results for each industry group.

5.1. Systematic and Systemic Components of the Default Risk

We examine the firms belonging to each industry group separately and determine whether an increase in their default risk is detrimental to the entire market, sector, or industry. To this end, we estimate Eq. (7) with dynamic conditional betas obtained from Eq. (6)¹⁵ considering three different specifications (namely, Model 1, Model 2 and Model 3) and further evaluate the channels through which the default risk becomes systematic or systemic. Recall that the default risk measure, *Z-score*, is inversely related to the firm's insolvency. Hence, negative and significant coefficients of the default risk variable under both up and down-market conditions indicate that the relevant industry-group's default risk possesses systematic (“*DCC Market Beta*” columns) and systemic (“*DCC Sector Beta*” and “*DCC Industry Beta*”

¹⁴ Here, we consider the possibility of reverse causality and use lagged idiosyncratic default risk. The results serve also as robustness checks for market and same-sector analyses as in Eq. (7).

¹⁵ As a robustness check, we re-estimate Eq. (7) utilizing DCC betas obtained from Eq. (5). The results from these analyses are qualitatively same and consistent with the overall findings, and are presented in Appendix A.

columns) components. More specifically, the results from Model 3 show whether the default risk of firms associated with a given industry group has a direct impact on the systematic and/or systemic risk. In other words, negative and statistically significant coefficients of default risk variables in Model 1 demonstrate that the default risk of firms affiliated with a given industry group may be systematic and/or systemic. If these coefficients remain negative and significant in Model 3, we deduce that the firms belonging to this industry group to be systematically and systemically important. If not, we infer that their default risk becomes systematic and/or systemic through industry-specific and/or country-specific factors.

5.1.1. Financials Sector

In view of the fact that the financial sector, especially banking industry, is the backbone of economy, we initially examine three constituent industry groups (i.e., banking, diversified financials and insurance) associated with the financial sector.

Table 2 depicts the systematic and systemic components of the banking industry's default risk. All "*z-score*" variables in Model 1, Model 2 and Model 3 prove negative and significant. Significant *z-score* coefficients in Model 3 show a direct relationship between the default risk of a bank and its sensitivity to market, sector, or industry risk since it accounts for sector and country-specific factors. Thus, the results indicate that an increase in the default risk (or a decrease in the *z-score*) of a bank generates an increase in its market risk (DCC-Market Beta), sectoral risk (DCC-Sector Beta) and industry risk (DCC-Industry Beta). In other words, the increased odds of a banks' failure cause distress on the other banks and the other financial institutions as well as the other firms in the entire market. The magnitude of the coefficients differs through up and down-market cycles in such way that the systematic and systemic components of their default risk prove greater under bearish market conditions. Moreover, the amplitudes of *z-score* coefficients in DCC-Industry Beta column are higher than that of DCC-Sector Beta column; and the latter is superior to those of DCC-Market Beta column. This

finding implies a relatively stronger default risk linkage among banks: an increase in a bank's default risk has a greater effect on banking industry in comparison to that of on the financial sector as a whole or on the entire market.

As a robustness check, we consider the case where a firm is subject to market and industry-level systemic risk, neglecting its sectoral risk and collect DCC-Market and DCC-Industry betas from Eq.5 to estimate Eq.7. The results in Table A1 (see Appendix A), are qualitatively same as those from Table 2. That is, all *z-score* coefficients are statistically significant, pointing out to the existence of systematic and industry-level systemic components of a bank's default risk. Systematic and systemic default risk of banks are more pronounced under bearish market conditions although they are significant throughout both up and down-market cycles. Again, the industry-wise systemic default risk of banks proves higher than their systematic default risk.

Table 2. *Systematic and systemic default risk in the banking industry group.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Banking Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	3.5172 (0.99)	(-0.5) -5.7047	3.7574* (1.66)	6.142 (1.05)	-1.3901 (-0.6)	-0.8095 (-0.5)	5.5854 (1.12)	2.7626* (1.89)	7.3768 (1.1)
Down Market	-1.9034 (-0.61)	2.2971 (0.38)	-2.5091 (-0.68)	-2.8413 (-0.7)	5.5762 (0.88)	0.4653 (0.09)	-6.4815 (-1.17)	-2.196 (-0.67)	0.0252 (0.01)
DCC Beta(-1)*Down Market	0.2888 (1.47)	0.0015 (0.01)	0.2342 (0.38)	0.2646 (1.03)	-0.0825 (-0.09)	-0.3075 (-0.42)	-0.316 (-0.48)	-0.711 (-1.39)	0.3043 (0.8)
DCC Beta(-1)*Up Market	0.2969** (2.03)	0.1248** (2.2)	0.2578*** (4.29)	0.3425* (1.72)	0.3765*** (2.76)	0.2606*** (3.04)	0.2081 (1.53)	0.2122* (1.7)	0.197*** (3.51)
Z-score*Down Market	-0.6329* (-1.81)	-0.9466* (-1.66)	-1.1909* (-1.86)	-0.5852** (-2.1)	-0.9212** (-2.54)	-0.9782* (-1.82)	-0.6760** (-1.98)	-0.8172** (-2.39)	-1.1771* (-1.66)
Z-score*Up Market	-0.1846* (-1.79)	-0.1096** (-2.04)	-0.1760** (-2.16)	-0.1427* (-1.66)	-0.1999* (-1.66)	-0.1768* (-1.92)	-0.1130* (-1.87)	-0.1206* (-1.96)	-0.2450* (-1.79)
Market Cap*Down Market	-0.2466 (-0.52)	0.4632 (0.91)	-2.2318 (-0.89)	-0.4494 (-0.57)	-2.8161* (-1.94)	0.299 (0.38)	-0.1456 (-0.16)	1.3831 (1.47)	-0.6438 (-0.57)
Market Cap*Up Market	-0.4184 (-0.87)	-0.5489* (-1.93)	-0.0061 (-0.04)	-0.7125 (-0.89)	-0.3288 (-1.19)	0.0752 (0.48)	-0.6851 (-1.03)	0.2361 (0.73)	-0.9539 (-0.95)
Debt to Asset Ratio*Down	9.4213	3.9952*	4.6824*	6.5786	-1.6675	-2.0804	14.1816	8.8343	-11.5328

Market	(1.26)	(1.74)	(1.81)	(0.94)	(-0.49)	(-0.36)	(1.04)	(0.63)	(-1.16)
Debt to Asset Ratio*Up	-1.5262**	0.8871	0.252	-2.1749**	-2.7767	-7.3391*	-3.2578**	-3.5468*	-0.0621
Market	(-2.4)	(0.76)	(0.31)	(-2.29)	(-0.88)	(-1.7)	(-2.59)	(-1.8)	(-0.05)
Cost/Income Ratio*Down	0.1316*	-0.1577	-1.0385	0.1508	0.457*	-0.1254	0.3782	0.6478*	0.3759*
Market	(1.67)	(-1.14)	(-1.34)	(1.62)	(1.77)	(-1.52)	(1.21)	(1.71)	(1.96)
Cost/Income Ratio*Up	0.062*	-0.0141	0.0017	0.0819*	-0.019	-0.2043*	0.1068**	-0.0338	0.0293
Market	(1.7)	(-0.5)	(0.07)	(1.75)	(-0.19)	(-1.76)	(2.03)	(-0.77)	(0.69)
HHI*Down Market				-0.2663	-25.5328*	-19.3722*	0.929	-21.1639*	2.4152
				(-0.03)	(-1.79)	(-1.92)	(0.05)	(-1.77)	(0.24)
HHI*Up Market				-11.0156*	2.228	-0.0591	-2.5129	-4.3141	-11.4858*
				(-1.84)	(0.3)	(-0.01)	(-0.58)	(-0.88)	(-1.92)
GDP Growth*Down							-29.6131	-10.1309**	9.1306
Market							(-0.76)	(-2.19)	(0.3)
GDP Growth*Up Market							-9.7196**	2.2065	0.564
							(-2.29)	(0.5)	(0.09)
Inflation*Down Market							-0.037	-0.406*	-0.0522
							(-0.2)	(-1.69)	(-0.23)
Inflation*Up Market							0.0952*	0.0643	0.2236*
							(1.79)	(0.89)	(1.76)
CD Test	0.45	-1.4	-0.7	1.03	0.02	-1.07	0.17	-1.4	-0.62
	[0.6544]	[0.1617]	[0.4856]	[0.3036]	[0.9834]	[0.2825]	[0.8627]	[0.1629]	[0.5322]

According to the results from Table 3, the default risk of firms within diversified financials industry group is systematic and systemic as well. All z-score coefficients are negative and significant, suggesting that an increase in the default risk of a firm belonging to diversified financials industry group leads to a rise in its market, sector and industry risk. This effect appears at a higher magnitude during down markets in comparison to up markets. Similar to banking industry group, systematic component (DCC-Market Beta columns) of the default risk proves smaller than the sector and industry-level systemic default risk (DCC-Sector Beta and DCC-Industry Beta columns, respectively) in the matter of diversified financial institutions. However, unlike banks, the default risk of firms associated with diversified financial industry group enhances the sector-wide systemic risk more than the industry-level systemic risk. In other words, an increase in the default risk of a diversified financials company puts more pressure in the entire financial sector but causes relatively less distress in the diversified financials industry group. This points out to a more pronounced intra-sector default linkages relative to intra-industry ones in the case of diversified financial firms.

Table A2 (see Appendix A) reinforces the findings that the systematic and systemic components of a diversified financial institution's default risk is more relevant under bear market conditions and that an increase in the default risk of such institutions intensifies the industry-level systemic risk to greater extent than the systematic (market) risk. This signifies that although an increase in the default risk of a diversified financial institution has an adverse undiversifiable effect on the other firms in the market, a higher industry-wide distress is caused by a diversified financial firm as its default risk augments during down market cycles.

Table 3. *Systematic and systemic default risk in the diversified financials industry group.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Diversified Financials Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	-6.1613 (-1.17)	8.6667 (1.58)	-0.3552 (-0.49)	-1.0756 (-1)	-0.3063 (-0.22)	0.38 (0.45)	-1.9622** (-2.13)	1.3742 (0.75)	2.2844 (1.36)
Down Market	12.5431 (1.05)	-2.4207 (-1.13)	3.9323** (2.24)	-2.1103 (-0.77)	1.9553 (0.27)	1.615 (0.12)	1.4842 (0.33)	-17.1201* (-1.72)	-0.6139 (-0.37)
DCC Beta(-1)*Down Market	0.317 (0.71)	-0.2072 (-0.31)	0.4692 (0.27)	-0.0881 (-0.48)	-0.3462 (-1.17)	-0.2538 (-0.99)	-3.8154 (-0.88)	-2.6558 (-0.98)	-1.1902 (-0.88)
DCC Beta(-1)*Up Market	0.2359** (2)	0.174** (2.05)	0.1383* (1.86)	0.1799*** (2.71)	0.1557* (1.89)	0.1361** (2.33)	0.1937* (1.69)	0.1198 (1.35)	0.1211* (1.75)
Z-score*Down Market	-0.1428* (-1.94)	-1.5876** (-2.43)	-1.0289** (-2.26)	-0.1607* (-1.7)	-1.2907** (-2.36)	-1.1483* (-1.71)	-0.1356* (-1.71)	-1.6068** (-2.07)	-1.0437* (-1.76)
Z-score*Up Market	-0.1157** (-2.59)	-0.1501** (-2.5)	-0.1244** (-2.37)	-0.0914* (-1.68)	-0.1959** (-2.34)	-0.1072* (-1.8)	-0.1121* (-1.76)	-0.1417* (-1.68)	-0.1308* (-1.66)
Market Cap*Down Market	-0.4003 (-0.2)	1.038** (2.26)	-0.0183 (-0.07)	1.788* (1.66)	0.0998 (0.08)	-0.0252 (-0.2)	-1.0543 (-0.21)	1.5324** (2.13)	4.2465 (1.14)
Market Cap*Up Market	1.0667	-0.211	0.1051	0.095	0.0554	0.0129	0.5063	-0.4393* (-1.68)	0.0339

	(1.15)	(-0.88)	(0.96)	(0.71)	(0.35)	(0.12)	(1.26)	(-1.72)	(0.12)
Debt to Asset Ratio*Down Market	-10.1158*	-3.4664*	1.9437	8.3141	2.8197*	1.7121	1.5785	15.1441	-7.4447
	(-1.89)	(-1.67)	(0.82)	(0.73)	(1.91)	(0.66)	(1.55)	(0.96)	(-1.01)
Debt to Asset Ratio*Up Market	3.8656	-1.4231	4.1067*	-1.1234	4.8483	-2.0731	2.5152*	3.1776	-0.0905
	(1.11)	(-0.95)	(1.68)	(-0.97)	(1.45)	(-0.26)	(1.71)	(0.57)	(-0.13)
Cost/Income Ratio*Down Market	7.7415	-7.5818	-5.1626	-2.9041	-2.1148	-0.1217*	0.7971	2.4457	0.8471
	(1.19)	(-0.99)	(-0.99)	(-1)	(-1.54)	(-1.71)	(0.86)	(0.99)	(1.19)
Cost/Income Ratio*Up Market	0.071	-0.0615	0.0235	0.0575	-0.0758	0.0148	0.039	-0.1129	-0.0101
	(0.69)	(-0.91)	(0.51)	(0.78)	(-0.98)	(0.3)	(1.16)	(-1.64)	(-0.21)
HHI*Down Market				2.1008	-2.1715*	0.6225	-1.7545	8.4782	5.9929***
				(0.9)	(-1.84)	(0.65)	(-0.18)	(1.18)	(2.86)
HHI*Up Market				1.7663*	0.5255	-5.8576*	2.5664*	0.8096	-0.6786
				(1.85)	(0.4)	(-1.82)	(1.65)	(0.57)	(-0.51)
GDP Growth*Down Market							-2.9898	9.5313*	-6.0104
							(-0.1)	(1.74)	(-0.69)
GDP Growth*Up Market							-5.8833	2.2951	8.6757**
							(-0.41)	(0.21)	(2.26)
Inflation*Down Market							-0.4963	-0.8366**	0.4868
							(-0.7)	(-2.02)	(1.29)
Inflation*Up Market							0.3116**	-0.0116	-0.0023
							(2.38)	(-0.22)	(-0.03)
CD Test	0.26	-0.09	-0.88	-0.31	0.43	-1.06	-1.34	-0.12	-1.15
	[0.7949]	[0.9277]	[0.3795]	[0.7598]	[0.6702]	[0.2897]	[0.18]	[0.9019]	[0.2482]

The estimation of Eq. (7) considering firms associated with the insurance industry group provide interesting results. These are depicted in Table 4. All *z*-score coefficients are negative and significant except for DCC-Industry beta column in Model 2. That is, an increase in the default risk of an insurance firm augments systematic (market) and systemic (sector-wide and industry-wide) risks. Parallel to the other two industry groups within financial sector, namely banking and diversified financials, the default risk of insurance firms rises systematic and systemic risks more under bearish market than under bullish market conditions. *Z*-score coefficients are smallest in DCC-Market Beta columns for each model specification (Model1, Model2 and Model3) during both up and down-market cycles, pointing out to a more noticeable systemic (sector-wide or industry-wide) component relative to systematic (market) one in the insurance firms' default risk. On the other hand, industry-wide systemic default risk proves stronger than sector-wide systemic risk during up markets while this relationship inverts so that, under bull market conditions, an increase in the default risk of an insurance firm aggravate sectoral systemic risk more than industrial systemic risk. This finding is intriguing in the sense that it highlights the effect of various dimensions of market state on the market dynamics with respect to default risk structure of insurance firms. It also emphasizes the relevance of a more granulated analysis since the default risk structure of insurance firms differs considerably from that of banks and diversified financial institutions.

Table A3 (in Appendix A) provides the results of the Eq. (7) estimated with DCC-betas obtained from Eq. (5) instead of Eq. (6) as a robustness check. The findings support that of from Table 4. More specifically, a rise in the default risk of an insurance company augments the systemic industry risk more than the systematic (market) risk. This holds under both up and down-market conditions. In addition, the magnitudes of *z*-score coefficients appear higher in down markets than those of in up market cycles.

Table 4. *Systematic and systemic default risk in the insurance industry group.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} +$$

$$\sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Insurance Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	2.1817** (2.14)	5.0645 (1.12)	7.6912* (1.86)	1.9676 (1.61)	2.6015 (0.94)	2.4993* (1.85)	4.1054*** (2.71)	-0.2081 (-0.11)	0.5498 (0.36)
Down Market	-7.5408 (-1.37)	-1.1531 (-0.22)	-4.8249 (-1.22)	-7.5809 (-1.14)	1.0454 (0.29)	-2.2206 (-0.61)	-3.3745 (-0.2)	27.6008 (1.14)	-3.1206 (-0.74)
DCC Beta(-1)*Down Market	0.3194 (1.4)	0.2352 (1.58)	-0.719* (-1.76)	0.5506 (1.4)	0.4056 (1.23)	-0.0971 (-0.61)	-0.1173 (-0.09)	0.2977 (0.9)	-0.3838 (-0.87)
DCC Beta(-1)*Up Market	0.2563*** (3.27)	0.1838** (2.08)	0.2378** (2.03)	0.1625* (1.87)	0.2215** (2.44)	0.2033* (1.72)	0.0324 (0.21)	0.3182** (2.59)	0.1409 (1.11)
Z-score*Down Market	-0.1203* (-1.81)	-0.3389* (-1.8)	-0.5430* (-1.87)	-0.1993* (-1.79)	-0.7581* (-1.66)	-0.6959 (-0.64)	-0.0972* (-1.89)	-0.5571** (-2.04)	-0.6557* (-1.78)
Z-score*Up Market	-0.0195* (-1.92)	-0.1799*** (-2.69)	-0.0671* (-1.65)	-0.0151** (-2.01)	-0.1171* (-1.81)	-0.0733** (-2.08)	-0.0241** (-2.48)	-0.1520* (-1.83)	-0.0575* (-1.81)
Market Cap*Down Market	0.6506 (0.71)	-0.4724 (-1.3)	-0.6374 (-0.86)	-0.1948 (-0.45)	-0.7609** (-2.17)	-0.2743 (-1.17)	0.846 (0.61)	-0.2601 (-0.64)	-0.0106 (-0.03)
Market Cap*Up Market	-0.305** (-2.28)	-0.484 (-0.89)	-0.8426* (-1.7)	-0.3492* (-1.94)	-0.1013 (-0.29)	-0.2797* (-1.87)	-0.6117*** (-3.02)	0.0315 (0.12)	-0.9867* (-1.95)
Debt to Asset Ratio*Down Market	-9.698 (-0.4)	17.5383 (1.48)	2.1734 (0.05)	-2.678 (-0.13)	-2.0968 (-0.05)	-6.7912 (-0.35)	-11.7755 (-0.95)	7.5152 (0.14)	4.066 (0.49)
Debt to Asset Ratio*Up	0.6891	-4.0147	-1.7875	-2.6527	-2.1589	-4.8192	-3.3355	-7.9106*	2.23

Market	(0.12)	(-1.07)	(-0.51)	(-0.53)	(-0.69)	(-0.86)	(-0.37)	(-1.77)	(1.05)
Cost/Income Ratio*Down Market	0.0817	-0.7536**	-0.1446**	0.0781	0.1481	-0.0141	-1.4392	0.3778	0.2373
	(0.21)	(-2.07)	(-1.99)	(0.23)	(0.52)	(-0.15)	(-1.03)	(1.25)	(0.52)
Cost/Income Ratio*Up Market	0.2608	0.0346	-0.066	0.2055	0.0357	-0.0134	-0.0017	0.0712	0.0062
	(1.22)	(1.04)	(-1.58)	(1.37)	(0.89)	(-0.98)	(-0.09)	(1.03)	(1.02)
HHI*Down Market				-3.6067	8.6262	8.2546	-5.4277	-0.6967	10.5862
				(-0.53)	(1.35)	(0.78)	(-0.48)	(-0.07)	(0.68)
HHI*Up Market				5.0266**	3.7572*	2.6152**	5.1409**	4.6231*	3.1207*
				(2.07)	(1.68)	(2.13)	(2.46)	(1.92)	(1.82)
GDP Growth*Down Market							-6.4957	-4.4096	14.7144**
							(-0.24)	(-0.27)	(2.15)
GDP Growth*Up Market							-1.0397	-13.1536**	-2.7623
							(-0.08)	(-2.53)	(-0.71)
Inflation*Down Market							0.4771*	0.0675	0.2015
							(1.65)	(0.7)	(1.45)
Inflation*Up Market							0.0142	-0.1014***	-0.0833*
							(0.29)	(-2.93)	(-1.68)
CD Test	0.84	-1.56	-0.72	-0.12	-1.26	-1.39	-0.12	-0.96	-1.57
	[0.4037]	[0.1197]	[0.4742]	[0.9057]	[0.2068]	[0.1651]	[0.9034]	[0.3392]	[0.1169]

5.1.2. Consumer Discretionary Sector

Automobiles and components, consumer durables and apparel, consumer services, media, and retailing are five sub-categories constituting consumer discretionary sector. Essentially, the companies associated with these industry groups provide non-essential goods and services to consumers. Therefore, they are sensitive to the strength of the economy. Thus, it is interesting to examine their systematic and/or systemic importance throughout up and down-market cycles.

Z-score coefficients in Table 5 are negative and significant only under bull market conditions and in the first two specifications (Model 1 and Model 2) which account for firm-specific and industry-specific factors. An increase in the default risk of a firm belonging to the automobiles and components industry group augments the systemic sector risk more than the systemic industry risk whereas systematic (or market) risk rises relatively less if the default risk of such institutions increases. In Model 3 which controls for country-specific factors besides the firm-specific and industry-specific factors, however, this effect disappears. Accordingly, we deduce that while there may exist a certain level of systematic and systemic characteristics to the idiosyncratic default risk of automobiles and components companies, these only become relevant indirectly via macro channels and during bull markets. The results from Table A4 (Appendix A) are consistent with these findings.

Table 6 depicts the estimation results for consumer durables and apparel industry group. None of the *z-score* coefficients prove statistically significant. This means that an increase in the default risk of consumer durables and apparel companies does not impact the market, sector or industry-wide risk. In other words, these firms do not appear to be systematically or systemically important. Robustness analyses in Table A5 (Appendix A) conform to this outcome.

The default risk of firms within consumer services industry group does not directly affect the systematic risk (see Table 7, Model 3, column DCC-Market Beta). It does, however, have an indirect impact on the systematic (market) risk through macro channels during downward market conditions. As for the systemic components of the consumer services companies' default risk, negative and significant coefficients in the DCC-Sector Beta and DCC-Industry Beta columns for each specification point out to a direct relationship between the default risk and the sector-wide and the industry-wide systemic risk when the market experiences a downtrend. That is, the default risk of a consumer services firm is systemic during bearish market conditions. When comparing the systemic risk at the sector and industry level, the insolvency risk of a consumer services firm increases the industry-level risk more than sector-level risk. We re-estimate Eq. (7) utilizing DCC-betas collected from Eq. (5) and report the results in Table A6 (Appendix A). The indirect impact of a consumer services firm's default risk on the systematic (market) risk via macroeconomic channels in bear markets remains significant, but the systemic default risk turns statistically insignificant. Consequently, to avoid any ambiguity stemming from model specification differences between Eq. (5) and Eq. (6), we concur that the individual consumer services firm's insolvency problems indirectly affect the overall market via macro channels and only in bear markets.

Higher probability of a media company's default does not significantly influence market risk; thus, it is not systematic (see Table 8). Only negative and significant *z-score* coefficients appear in DCC-Industry Beta columns and in Model 1 (-0.2037) and Model 2 (-0.2708) under up market conditions. This suggests that the default risk of media companies has an indirect impact on industry risk, through macroeconomic factors during downward market periods. These findings are robust to the estimation results presented in Appendix A, Table A7.

Table 5. Systematic and systemic default risk in the automobiles and components industry group. Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Automobiles & Components	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	0.6015 (0.41)	-2.6074 (-1.26)	-1.8688 (-1.47)	-5.3808 (-0.47)	-1.7591 (-0.79)	0.0211 (0.01)	-0.0361 (-0.03)	5.3181 (0.86)	-4.4579 (-0.44)
Down Market	3.8601 (1.57)	-2.0006 (-0.5)	-2.6803 (-1.26)	0.869 (0.36)	2.7235** (2.11)	-0.4537 (-0.2)	3.5158 (0.36)	-2.688 (-0.52)	-1.7484 (-0.99)
DCC Beta(-1)*Down Market	0.1119 (1.14)	-0.0353 (-0.3)	-0.0192 (-0.15)	0.3445 (1.01)	0.0113 (0.09)	-0.1544 (-1.2)	0.1195 (0.91)	-0.9438*** (-2.6)	0.4407 (0.67)
DCC Beta(-1)*Up Market	0.2496** (1.99)	0.2094** (1.99)	0.1995** (2.08)	0.3741* (1.81)	0.2116* (1.87)	0.1643* (1.87)	0.2337* (1.85)	-0.1677 (-0.57)	-0.2979* (-1.76)
Z-score*Down Market	-1.331 (-1.21)	-0.8458 (-1.19)	-1.8264 (-1.08)	-0.706 (-0.42)	-0.4994 (-0.66)	-0.8886 (-1.41)	-0.5306 (-0.78)	-0.2292 (-0.2)	-0.7248 (-0.81)
Z-score*Up Market	-0.1048* (-1.7)	-0.6616* (-1.81)	-0.393* (-1.86)	-0.4464* (-1.65)	-1.2304** (-1.99)	-1.1458* (-1.69)	-0.0766 (-0.2)	-1.4588 (-1.39)	-0.3615 (-0.55)
Market Cap*Down Market	-0.2412 (-0.78)	0.0654 (0.35)	0.3068*** (3.09)	-0.0706 (-0.12)	0.1376 (0.77)	0.3151*** (2.86)	0.017 (0.03)	0.7821 (1.32)	0.3202* (1.75)
Market Cap*Up Market	0.0999 (0.31)	0.2799* (1.78)	0.1348 (1.52)	-0.2559 (-0.33)	0.2991* (1.85)	0.1691 (1.64)	0.0545 (0.22)	1.0303* (1.74)	-0.1666 (-0.41)
Debt to Asset Ratio*Down Market	-9.5301* (-1.73)	4.0148 (1.37)	11.496 (1.18)	-12.0137* (-1.78)	-5.2638 (-0.95)	-6.0401 (-0.72)	-13.5336 (-1.59)	9.3579*** (3.02)	9.5367** (2.03)

Debt to Asset Ratio*Up Market	-4.1793** (-2.14)	1.4926 (0.7)	1.1673 (0.76)	-3.8375 (-0.74)	2.0741 (0.7)	2.4261 (1.47)	-2.0158* (-1.82)	-7.6129* (-1.89)	5.2352 (1.25)
Cost/Income Ratio*Down Market	0.0191 (1.24)	0.0014 (0.05)	-0.0343* (-1.86)	-0.0313 (-0.45)	-0.0338** (-2.39)	-0.0153* (-1.73)	-0.174 (-1.57)	-0.0476 (-0.88)	-0.0979* (-1.83)
Cost/Income Ratio*Up Market	0.0693* (1.76)	0.0144** (2.08)	0.0128 (0.71)	0.1174* (1.66)	0.0703 (0.84)	-0.0068 (-0.86)	-0.0135 (-1.17)	0.0912* (1.73)	-0.1169 (-1.04)
HHI*Down Market				5.4845 (0.61)	-4.4141 (-0.49)	-12.2952* (-1.71)	-0.26 (-0.02)	-0.7227 (-0.07)	13.2032 (1.6)
HHI*Up Market				-13.9949** (-2.54)	-15.3427* (-1.95)	-7.6489 (-0.68)	-12.4359* (-1.9)	-19.9331* (-1.72)	-0.3441 (-0.02)
GDP Growth*Down Market							-0.1534 (-0.92)	-0.5221* (-1.96)	-0.1636 (-0.89)
GDP Growth*Up Market							-0.1178* (-1.66)	-0.223 (-0.64)	-0.3585* (-1.91)
Inflation*Down Market							-0.1455 (-1.13)	0.4433 (0.93)	0.0115 (0.04)
Inflation*Up Market							-0.0777 (-0.99)	-0.17 (-0.83)	-0.3724* (-1.75)
CD Test	-0.54 [0.5866]	-0.37 [0.708]	0.78 [0.4375]	1.09 [0.2771]	-0.69 [0.4888]	1.17 [0.2438]	1.07 [0.2854]	-0.79 [0.4315]	-0.78 [0.4328]

Table 6. Systematic and systemic default risk in the consumer durables and apparel industry group. Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Consumer Durables and Apparel Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	1.8606 (0.92)	0.2163 (0.11)	3.3072 (1.24)	-1.3022 (-0.28)	-0.6356 (-0.4)	0.6736 (0.53)	0.3532 (0.26)	1.7084** (2.06)	1.7824 (1.16)
Down Market	-1.9619 (-0.86)	1.4519 (0.56)	0.9855 (0.19)	2.8564 (0.62)	3.9511 (1.16)	-3.1437 (-0.92)	-1.6873 (-0.88)	-4.8811 (-0.75)	-5.1069*** (-2.76)
DCC Beta(-1)*Down Market	-0.5072* (-1.68)	0.3934 (1.25)	-0.2927 (-0.79)	-0.0887 (-0.39)	0.1314 (0.27)	-1.153 (-0.66)	-0.6104 (-1.16)	-0.1124 (-0.37)	-0.2058 (-0.52)
DCC Beta(-1)*Up Market	0.6295 (1.3)	0.4612*** (3.15)	0.2527* (1.71)	-0.6546* (-1.67)	0.2087* (1.68)	0.5283* (1.73)	0.2163* (1.67)	0.2167 (1.46)	0.293* (1.85)
Z-score*Down Market	0.5124 (1.34)	0.3239 (1.09)	-0.3186 (-1.14)	0.2228 (0.13)	0.4447 (1.45)	1.3099 (1.13)	0.2886 (0.57)	0.1549 (0.54)	-0.2619 (-0.72)
Z-score*Up Market	-0.2781 (-0.56)	-0.344 (-0.3)	0.2442 (1.19)	-1.3135 (-0.89)	-0.176 (-0.47)	0.1037 (0.23)	-0.442 (-1.45)	-0.2788 (-0.29)	0.1227 (0.92)
Market Cap*Down Market	-0.6047* (-1.81)	-0.4985* (-1.75)	-0.4689* (-1.76)	-0.3199 (-1.32)	-0.7405** (-2.06)	-0.2832* (-1.69)	-0.5915* (-1.68)	0.7111* (1.66)	0.887 (1.61)
Market Cap*Up Market	-0.6729 (-1.29)	-0.2252 (-0.48)	-0.5586 (-1.46)	1.9364 (0.72)	-0.1175 (-0.32)	-1.4953 (-0.56)	-0.3661 (-0.67)	-0.0763 (-0.25)	-0.2158 (-0.93)
Debt to Asset Ratio*Down Market	0.2963 (0.18)	0.0601 (0.02)	-4.4457** (-2.06)	-0.8499 (-0.51)	1.1392 (0.39)	-3.2291* (-1.75)	0.5234 (0.13)	2.6332 (0.47)	-6.6725* (-1.67)

Debt to Asset Ratio*Up Market	0.6623 (0.36)	-1.0894** (-2.09)	0.8575 (0.43)	-1.2421* (-1.78)	-2.6566* (-1.71)	2.4338 (1.28)	4.5556 (0.9)	-3.351 (-1.07)	-0.1059 (-0.07)
Cost/Income Ratio*Down Market	0.0221* (1.7)	0.011* (1.78)	-0.0301 (-1.09)	0.0238* (1.87)	0.0302* (1.68)	0.0204 (0.25)	0.0246* (1.69)	0.0233** (2.49)	-0.0678* (-1.72)
Cost/Income Ratio*Up Market	0.0263* (1.73)	-0.0715 (-0.94)	0.0198 (0.84)	-0.0035 (-0.18)	-0.0979 (-0.97)	-0.0166** (-2.06)	-0.0319 (-0.7)	0.0039 (0.88)	-0.0205 (-1.12)
HHI*Down Market				-1.4125 (-0.16)	-5.9086 (-0.54)	-9.5056** (-2.01)	6.5459 (0.69)	0.8143 (0.06)	-4.0234* (-1.86)
HHI*Up Market				-13.0383** (-2.13)	12.5486** (2.12)	1.1472 (0.31)	-11.109*** (-2.7)	3.68 (0.34)	-1.8914 (-0.26)
GDP Growth*Down Market							-0.0992 (-0.92)	0.017 (0.15)	-0.7898 (-1.09)
GDP Growth*Up Market							0.0867 (0.75)	-0.1555* (-1.85)	0.0038 (0.06)
Inflation*Down Market							0.1735 (1.48)	-0.0911* (-1.71)	0.1978** (2.18)
Inflation*Up Market							0.1676* (1.84)	0.0397 (0.74)	-0.0382 (-0.65)
CD Test	-0.42 [0.6757]	-0.25 [0.8008]	-0.4 [0.6856]	-0.8 [0.4239]	0.08 [0.9397]	-0.8 [0.4214]	-0.06 [0.9523]	-0.27 [0.7869]	-1 [0.3196]

Table 7. *Systematic and systemic default risk in the consumer services industry group.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Consumer Services Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	-0.5062 (-0.34)	-0.4195 (-0.32)	3.3171 (1.06)	-3.5901 (-1.44)	-2.43* (-1.79)	6.4822* (1.93)	-14.5072* (-1.86)	-2.5056 (-1.16)	-5.0543 (-1.25)
Down Market	2.6546 (0.83)	1.1966 (0.79)	-5.7597* (-1.75)	4.8301 (1.56)	2.8681** (2.02)	-16.1102** (-2.48)	0.4976 (0.08)	1.714 (0.64)	6.559* (1.72)
DCC Beta(-1)*Down Market	0.1575 (1.12)	0.3241*** (3.09)	0.0266 (0.16)	0.5057* (1.94)	0.2417** (2)	-0.3316 (-1.24)	0.0837 (0.51)	0.2352* (1.69)	-0.2703 (-1.34)
DCC Beta(-1)*Up Market	0.1466** (1.99)	0.0768 (0.67)	0.7732** (2.55)	-0.2793 (-0.98)	0.1014 (0.59)	0.243 (0.49)	-1.1459 (-1.55)	0.1756 (0.83)	0.0096 (0.05)
Z-score*Down Market	-0.1968* (-1.77)	-0.2966** (-2.45)	-0.4382** (-1.99)	-0.0972* (-1.85)	-0.1561* (-1.79)	-0.3573* (-1.76)	-0.3438 (-1.49)	-0.1904** (-1.99)	-0.2755* (-1.67)
Z-score*Up Market	-0.1433 (-1.58)	0.1854 (1.05)	-0.7885 (-1.49)	-0.1520 (-0.88)	0.2133 (0.75)	-0.1259 (-0.34)	-0.1541 (-0.34)	0.2117 (0.79)	-0.0736 (-0.24)
Market Cap*Down Market	-1.1232* (-1.96)	0.0605 (0.4)	-0.3579 (-0.18)	-0.3652 (-0.98)	0.307** (2.51)	0.9119* (1.68)	-1.3287* (-1.77)	0.7795** (2.46)	-0.4726* (-1.79)
Market Cap*Up Market	0.0471 (0.22)	-0.3331** (-2.34)	0.7099* (1.88)	0.16 (0.65)	-0.0197 (-0.13)	-0.6567 (-1.03)	-0.2593 (-0.37)	-0.3001 (-0.76)	0.7071* (1.83)
Debt to Asset Ratio*Down	-2.7495	-1.5472**	-0.5519	-3.2439*	-1.1961*	-1.4964	-2.9102*	-0.1129	-1.809

Market	(-0.84)	(-2.17)	(-0.35)	(-1.8)	(-1.81)	(-0.43)	(-1.75)	(-0.15)	(-0.87)
Debt to Asset Ratio*Up Market	-4.8625*	-1.6249	-4.5164**	-3.2153	0.3922	-5.2899*	-3.7693*	0.2923	-1.6305
	(-1.69)	(-1.18)	(-2.15)	(-1.46)	(0.56)	(-1.69)	(-1.83)	(0.38)	(-0.91)
Cost/Income Ratio*Down Market	0.026*	0.017*	0.0772*	0.0336*	0.002	0.0165*	0.0828	-0.0203	0.0266*
	(1.75)	(1.8)	(1.79)	(1.69)	(0.36)	(1.91)	(1.09)	(-0.87)	(1.86)
Cost/Income Ratio*Up Market	0.3184	0.0921**	-0.0204	0.9644	0.0235	-0.0688	1.1973	0.0618*	0.3405
	(0.86)	(2.11)	(-0.56)	(1.02)	(1.23)	(-1.49)	(1.06)	(1.76)	(1.11)
HHI*Down Market				-3.7701	5.0511*	12.2985**	-10.2162	7.7088*	3.9048
				(-0.54)	(1.65)	(2.27)	(-1.28)	(1.65)	(0.53)
HHI*Up Market				20.3576	8.2851	-11.8597	8.7733	9.0287	9.1858*
				(1.24)	(1.6)	(-1.2)	(1.42)	(0.91)	(1.67)
GDP Growth*Down Market							-0.1437***	-0.0403	-0.0351
							(-2.82)	(-0.84)	(-0.82)
GDP Growth*Up Market							0.0711	0.136***	0.1732*
							(0.46)	(3.45)	(1.77)
Inflation*Down Market							-0.011	-0.1072**	0.0329
							(-0.18)	(-2.16)	(0.34)
Inflation*Up Market							-0.4483**	-0.0506	0.1154**
							(-2.52)	(-0.88)	(2.06)
CD Test	-0.28	-0.16	-0.69	-0.25	-1.31	-1.29	-0.56	-0.77	-0.86
	[0.7775]	[0.8737]	[0.4915]	[0.8058]	[0.1887]	[0.1986]	[0.5776]	[0.4398]	[0.3896]

Table 8. *Systematic and systemic default risk in the media industry group.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} +$$

$$\sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Media Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	3.4406* (1.67)	1.5112** (2.01)	-2.049* (-1.7)	-8.9002 (-0.7)	0.5255 (0.18)	0.7069 (0.48)	0.9297 (0.48)	2.218 (1.5)	3.8728 (1.4)
Down Market	-1.681 (-0.72)	1.3249 (1.02)	-0.097 (-0.06)	12.9111 (0.99)	-3.8274 (-1.31)	0.1509 (0.07)	-2.7849 (-1.51)	-2.5304 (-1.03)	-4.1605 (-1.33)
DCC Beta(-1)*Down Market	0.549*** (3.56)	0.2557*** (2.6)	-0.1484 (-0.29)	0.6254** (2.11)	0.1316* (1.92)	0.0847 (0.33)	0.4082** (2.2)	0.0238 (0.19)	0.4041* (1.66)
DCC Beta(-1)*Up Market	0.3321** (2.55)	0.2732*** (3.44)	0.2573** (2.49)	-0.0584 (-0.2)	0.3602** (2.32)	0.5079** (2.07)	0.1483 (1.15)	0.365** (2.33)	-0.1708 (-0.64)
Z-score*Down Market	-0.1268 (-0.91)	0.021 (0.21)	-0.1259 (-0.65)	-0.0567 (-0.45)	-0.0153 (-0.13)	-0.1143 (-0.49)	-0.0008 (-0.01)	-0.0173 (-0.24)	0.0478 (0.33)
Z-score*Up Market	-0.2034 (-1.02)	0.1593 (0.55)	-0.2037* (-1.85)	-0.5254 (-0.63)	-0.0189 (-0.04)	-0.2708* (-1.73)	-0.7918 (-1.6)	0.6928 (1.25)	-0.5486 (-0.93)
Market Cap*Down Market	-0.1061 (-0.36)	-0.646** (-2.31)	-0.2924*** (-2.67)	-0.186 (-1.24)	-0.3125*** (-3.03)	-0.4437** (-2.54)	0.178 (1.18)	0.0599 (0.37)	-0.2746* (-1.65)
Market Cap*Up Market	-0.8734* (-1.89)	-0.8804** (-2.06)	-0.2842 (-1.21)	-1.5476** (-2.42)	-0.447 (-0.71)	-0.3792 (-1.54)	-0.1558 (-0.72)	-0.536* (-1.77)	-0.1718 (-1.44)
Debt to Asset Ratio*Down Market	1.2263* (1.73)	-0.4777 (-0.49)	-0.5051 (-0.39)	0.2799 (0.17)	-1.7826* (-1.7)	1.1227 (0.35)	0.7879* (1.67)	-1.6975* (-1.84)	-1.0168 (-0.7)

Debt to Asset Ratio*Up Market	-7.9256 (-1.14)	2.4148 (0.59)	2.1868 (1.12)	-1.9748 (-1.52)	1.9416 (1.28)	2.7059 (1.07)	1.1909 (0.77)	2.0974 (1.23)	0.7735 (1.03)
Cost/Income Ratio*Down Market	0.0187* (1.68)	-0.0369* (-1.74)	-0.025 (-1.14)	0.0237* (1.65)	-0.0883 (-1.26)	-0.1295 (-1.21)	0.0095 (0.38)	-0.0199** (-2.18)	-0.0201 (-1.4)
Cost/Income Ratio*Up Market	0.0005 (0.04)	-0.0187 (-1.51)	-0.017* (-1.71)	0.0085 (0.61)	-0.0001 (-0.01)	0.0146 (0.5)	0.0065 (0.43)	-0.0097 (-0.99)	-0.0106* (-1.78)
HHI*Down Market				5.9127** (2.34)	7.7681* (1.74)	8.9354* (1.93)	8.8238* (1.66)	10.7946* (1.69)	11.2827** (2.25)
HHI*Up Market				0.7091 (0.02)	2.2423 (0.1)	-1.9417 (-0.21)	6.4787 (0.84)	7.2502 (0.75)	-3.3044 (-0.63)
GDP Growth*Down Market							-0.2218* (-1.87)	-0.1795** (-2.2)	-0.4887* (-1.83)
GDP Growth*Up Market							-0.0642 (-0.93)	0.1445 (0.98)	0.0488 (0.69)
Inflation*Down Market							0.0731** (2.32)	0.047 (0.54)	0.0412 (0.62)
Inflation*Up Market							0.0686 (0.68)	0.0842 (1.17)	-0.0168 (-0.15)
CD Test	-0.83 [0.4041]	-0.93 [0.3502]	-0.12 [0.9078]	0.48 [0.6322]	0.76 [0.4473]	-1.16 [0.2443]	-0.36 [0.7208]	-1.52 [0.1287]	0.1 [0.9211]

Table 9. Systematic and systemic default risk in the retailing industry group. Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Retailing Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	4.9226 (1.64)	-2.8859* (-1.81)	-1.9536** (-1.97)	1.6223 (1.5)	-1.9104** (-2.38)	-1.5311 (-1.32)	0.1976 (0.08)	-1.6622 (-1.34)	-4.2106* (-1.67)
Down Market	-6.6088* (-1.72)	-0.6508 (-0.49)	1.9017** (2.05)	-1.8348 (-1.2)	-0.1994 (-0.16)	1.9635* (1.89)	0.888 (0.32)	1.7214 (1.32)	6.117** (2.51)
DCC Beta(-1)*Down Market	0.5563*** (3.38)	0.1607* (1.8)	0.0789 (0.77)	0.1557** (2.23)	0.1142* (1.68)	0.1357* (1.68)	0.18 (0.7)	0.0139 (0.1)	-0.1251 (-0.78)
DCC Beta(-1)*Up Market	0.1312 (0.26)	0.2521** (2.38)	0.4109** (2.54)	0.166 (0.71)	-0.0943 (-0.32)	0.2306* (1.8)	1.2189* (1.76)	0.1517* (1.68)	0.2388 (1.26)
Z-score*Down Market	-0.2394** (-2.42)	-0.1347* (-1.75)	-0.2006* (-1.68)	-0.1409* (-1.75)	-0.1022* (-1.74)	-0.1248* (-1.84)	-0.1305* (-1.73)	-0.0763 (-0.26)	-0.1158* (-1.82)
Z-score*Up Market	-0.1986 (-1.25)	-0.2861* (-1.88)	-0.1571 (-1.23)	0.1758 (0.58)	-0.2127* (-1.88)	-0.2788 (-1.33)	-0.0638 (-0.7)	-0.1794 (-0.99)	-0.038 (-0.17)
Market Cap*Down Market	0.4526 (1.61)	0.0342 (0.35)	0.1567 (1.46)	0.1077 (0.62)	-0.3088* (-1.66)	0.1313 (1.32)	-0.3131 (-0.73)	-0.2506* (-1.74)	0.028 (0.16)
Market Cap*Up Market	-1.6503* (-1.94)	0.3542* (1.87)	0.4277* (1.76)	-0.2909 (-0.74)	0.4578** (2)	0.3768** (2.33)	-0.6307 (-1.13)	0.1803 (1.33)	0.9631* (1.74)

Debt to Asset Ratio*Down Market	0.8393* (1.73)	2.2241 (0.78)	0.8331 (0.8)	1.7305* (1.68)	1.2648 (0.69)	1.1234 (0.91)	-0.2605 (-0.15)	0.1902 (0.18)	1.4601 (0.73)
Debt to Asset Ratio*Up Market	-1.9826 (-0.37)	-4.4952** (-2.26)	3.7292* (1.9)	-3.5791 (-1.18)	0.983 (0.71)	1.7401 (1.55)	-6.9387*** (-2.67)	1.2999 (0.59)	-0.5067 (-0.18)
Cost/Income Ratio*Down Market	-0.047 (-0.92)	0.0045 (0.48)	-0.015 (-1.29)	0.0183* (1.77)	0.0004 (0.04)	0.0066 (0.95)	0.0245* (1.68)	0.0049 (0.49)	-0.0129 (-1.44)
Cost/Income Ratio*Up Market	-0.2785 (-0.9)	0.0876 (0.89)	0.0353 (0.49)	-0.2278 (-0.96)	0.0898 (0.89)	0.0537 (0.81)	0.023 (0.55)	-0.0562* (-1.89)	0.0414 (0.48)
HHI*Down Market				0.1448 (0.03)	-0.5202 (-0.13)	15.8552** (2.34)	0.5597 (0.09)	2.7738 (0.51)	11.6205* (1.68)
HHI*Up Market				-10.2653** (-2.06)	8.1316** (2.19)	6.1568* (1.66)	-9.7582*** (-2.72)	6.5865** (2.22)	8.1173 (1.08)
GDP Growth*Down Market							-0.0223 (-0.12)	0.1174* (1.67)	0.1089 (1.02)
GDP Growth*Up Market							-0.4983* (-1.9)	-0.0534 (-0.71)	-0.0658 (-0.39)
Inflation*Down Market							-0.1064 (-1.09)	-0.0091 (-0.15)	-0.1312* (-1.86)
Inflation*Up Market							0.2912** (2.12)	0.0562 (1.5)	0.0757 (0.6)
CD Test	0.6 [0.5487]	-1.41 [0.1585]	1.61 [0.1066]	0.13 [0.8964]	-0.85 [0.3952]	1.28 [0.2023]	-1.61 [0.1074]	-0.75 [0.4517]	-0.18 [0.8567]

Table 9 provides evidence that an increase in a retailing firm's default risk have a direct influence on the overall market risk (Model 3, column "DCC-Market Beta") during down markets. That is, higher probability of retailing firm's default augments the systematic risk when the market follows a downward trend. The amplitude of *z-score* coefficients in DCC-Market Beta columns prove higher relative to those in DCC-Sector Beta and DCC-Industry Beta columns. This suggests firm-level distress in an institution affiliated with the retailing industry-group increases the market risk more than the retailing industry-wide risk. This finding is intriguing as it reveals that the undiversifiable component of the retailing firms' idiosyncratic default risk is greater than the systemic one under bearish market conditions. Examining the results from Table A8 (Appendix A), the systematic importance of firm default within retailing industry remains significant.

5.1.3. Consumer Staples Sector

"Food beverage and tobacco", "food and staples retailing" and "household and personal products" industry groups constitute consumer staples sector. Contrary to consumers discretionary, consumer staples sector encompasses institutions providing essential goods such as food, beverages, hygiene products or household goods for consumers.

An increase in the default risk of a firm within food beverage and tobacco industry group induces distress in the overall market, sector and industry under different circumstances (see Table 10). Higher insolvency probability of a "food beverage and tobacco" company has a direct impact on the systematic (market) risk during up markets while such firm's default risk affects this risk via macro channels under bearish market conditions. The magnitude of significant *z-score* coefficients in each DCC-Market Beta column prove higher, suggesting a more pronounced systematic component relative to systemic one. A "food beverage and tobacco" firm's default directly affects other firms within the same industry if the market follows an upward trend whereas it augments directly the sectoral risk during downtrend

periods. Robustness analyses presented in Table A9 (Appendix A) provides further evidence on the possible detrimental impact of a “food beverage and tobacco” firm’s insolvency. That is, the default risk of these companies tends to be systematic in up markets.

Table 11 depicts the estimation results with respect to food and staples retailing industry group. In Model 3, the only negative and significant z-score coefficient appears in column DCC-Industry Beta under bullish market conditions. This signifies that the default risk of such institutions is industry-wide systemic when the market follows an upward trend. The findings from Table A10 (Appendix A) supports this result. A food and staples retailing firm’s idiosyncratic default risk influences other firms within the same industry directly, however, it does not have a direct impact on the entire system.

As for the household and personal products industry group, Table 12 reveals that up market periods matter for the systematic structure of the idiosyncratic default risk. More specifically, the default risk of “household and personal products” firm directly impacts the overall market risk in upward market cycles. It further directly influences the sector-wide and industry-wide systemic risks during these up-market periods. When the market follows a downward trend, the idiosyncratic default risk proves only systemic (at both sector and industry level). Negative and significant z-score coefficients in Table A11 Model 3 (see Appendix A) reflects qualitatively same results.

Table 10. *Systematic and systemic default risk in the food beverage and tobacco industry group.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Food Beverage and Tobacco Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	-1.2196 (-0.29)	-2.9351 (-1.32)	0.5449 (0.41)	1.2161 (0.15)	-0.9213 (-0.3)	1.5636 (0.56)	-8.6513 (-1.2)	-3.0135 (-0.95)	0.5555 (0.34)
Down Market	1.0399 (0.24)	4.0012* (1.81)	0.2707 (0.24)	1.0044 (0.74)	1.678* (1.8)	-1.7121 (-0.63)	0.6795 (0.16)	3.1247 (0.89)	-1.4742 (-0.73)
DCC Beta(-1)*Down Market	0.1021 (1.23)	0.0103 (0.1)	0.1158* (1.73)	0.2001 (1.23)	0.0069 (0.05)	0.1689 (0.92)	-0.0189 (-0.2)	-0.0536 (-0.28)	0.209 (1.43)
DCC Beta(-1)*Up Market	0.8439* (1.96)	0.4529*** (2.86)	1.2997 (1)	1.5571* (1.79)	0.4054 (0.85)	-0.366* (-1.71)	0.8244** (2.01)	0.4348* (1.72)	0.3654* (1.89)
Z-score*Down Market	-0.5104* (-1.84)	-0.2046** (-2.06)	-0.018 (-0.36)	-0.3051** (-2.17)	-0.2221** (-2.09)	-0.0314 (-0.24)	-0.1772 (-0.31)	-0.315** (-1.97)	0.0824 (0.41)
Z-score*Up Market	-0.7187* (-1.82)	0.2917 (0.84)	-0.6173* (-1.74)	-0.8058** (-1.97)	0.0303 (0.13)	-0.4306** (-2.11)	-0.4724** (-1.96)	-0.4285 (-0.76)	-0.3488* (-1.91)
Market Cap*Down Market	0.3929* (1.96)	0.1499 (0.61)	0.0381 (0.28)	0.3738** (2.05)	-0.8556* (-1.79)	-0.1722 (-0.98)	0.0644 (0.24)	0.0962 (0.17)	0.2033 (0.66)
Market Cap*Up Market	-0.73 (-0.41)	0.3587 (0.88)	-0.5317* (-1.68)	0.9825 (0.44)	-0.7771 (-0.53)	-1.6578* (-1.88)	-0.1418 (-0.37)	1.1167** (2.03)	-0.4348* (1.68)
Debt to Asset Ratio*Down Market	-0.2451 (-0.36)	-1.7181 (-1.39)	2.6872** (2.19)	-0.5566 (-0.43)	-2.5205** (-2.07)	-0.9532 (-0.69)	-0.363** (-2.23)	-1.8412 (-1.05)	0.4021 (0.47)

Debt to Asset Ratio*Up Market	-3.9803* (-1.7)	3.8945* (1.71)	-0.6467 (-0.63)	-3.8989* (-1.7)	-0.7258 (-0.19)	-5.2631* (-1.78)	-1.9383 (-0.2)	0.1586 (0.16)	2.3987 (1.19)
Cost/Income Ratio*Down Market	0.0207 (1.43)	0.0014 (0.08)	-0.0107 (-0.92)	0.0143 (0.85)	0.0035 (0.2)	0.0051 (0.25)	0.0324* (1.68)	0.0279** (1.99)	-0.0136 (-0.52)
Cost/Income Ratio*Up Market	0.0973* (1.86)	-0.0175 (-1.19)	-0.1397* (-1.91)	0.0755* (1.81)	-0.1037* (-1.84)	-0.1089* (-1.75)	0.1581** (2.01)	0.0907 (0.96)	-0.0645* (-1.66)
HHI*Down Market				-6.6152** (-2.36)	6.1933* (1.94)	0.8514 (0.38)	-3.7389* (-1.68)	5.3508** (2.02)	0.518 (0.26)
HHI*Up Market				-1.9465 (-0.15)	9.3641 (0.54)	14.2543* (1.88)	5.5492 (0.31)	10.8065 (0.8)	-15.5083* (-1.65)
GDP Growth*Down Market							-0.0121 (-0.35)	-0.0186 (-0.51)	-0.038 (-0.93)
GDP Growth*Up Market							-0.1919 (-1.35)	-0.0211 (-0.25)	-0.0027 (-0.06)
Inflation*Down Market							0.0421* (1.68)	-0.0658 (-1.31)	-0.0379* (-1.8)
Inflation*Up Market							-0.9744* (-1.8)	-0.0026 (-0.02)	-0.0005 (-0.01)
CD Test	-0.56 [0.5739]	-1.13 [0.2598]	1.35 [0.1758]	-1.58 [0.1146]	-0.83 [0.4085]	-0.39 [0.6998]	1.4 [0.1623]	1.06 [0.2875]	-1.18 [0.2397]

Table 11. *Systematic and systemic default risk in the food and staples retailing industry group.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Food and Staples Retailing Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	1.6168 (0.88)	0.2664 (0.77)	2.3148 (1.04)	1.6993 (1.1)	0.767 (1.55)	-0.853 (-0.73)	2.1754 (1.08)	2.0771** (2.13)	-0.7828 (-0.41)
Down Market	-1.2865 (-0.99)	-0.9612 (-0.44)	1.9134* (1.88)	-1.8803* (-1.75)	1.369 (0.44)	2.4303* (1.8)	2.0367 (1.09)	-2.2343 (-0.66)	1.7855 (1.62)
DCC Beta(-1)*Down Market	1.6944* (1.93)	0.3287* (1.86)	-0.29 (-0.53)	0.5281 (1.31)	-0.1887 (-0.62)	-0.195 (-0.36)	0.1699 (0.32)	0.289 (1.17)	-1.1065 (-1.04)
DCC Beta(-1)*Up Market	0.191 (0.66)	0.3444** (2.01)	0.3385*** (3.1)	0.5646** (1.97)	0.3061* (1.68)	0.2203 (0.57)	0.2447* (1.75)	0.8505* (1.8)	0.7393*** (3.84)
Z-score*Down Market	0.2706 (0.85)	0.0372 (0.19)	1.8539 (1)	0.0742 (0.09)	-0.1275 (-0.31)	0.1668 (0.57)	0.2226 (0.63)	0.2463 (1.41)	-0.0937 (-0.57)
Z-score*Up Market	0.2494 (1.36)	0.111 (0.65)	-0.4595*** (-2.82)	0.0907 (1.41)	0.1359 (0.91)	-0.556* (-1.85)	0.4352 (1.05)	0.0217 (0.11)	-0.5907** (-2.52)
Market Cap*Down Market	-0.2801** (-2.07)	-0.2571** (-2.34)	-0.2434** (-2.22)	-0.0175 (-0.06)	-0.3296* (-1.93)	-0.6697*** (-2.89)	-0.2658** (-2.46)	-0.7231* (-1.76)	-0.2728** (-2.55)
Market Cap*Up Market	-0.6781* (-1.66)	0.0252 (0.14)	0.504*** (3.18)	-0.2358* (-1.91)	0.1197 (0.41)	0.6762*** (2.75)	3.1809** (2.27)	-0.1266 (-0.75)	0.6379* (1.74)
Debt to Asset Ratio*Down Market	5.0357*** (3.23)	5.294* (1.73)	-7.9149 (-1.07)	7.9198* (1.83)	3.8347* (1.84)	2.2592*** (4.76)	0.5973 (0.55)	4.8978* (1.82)	5.1409* (1.79)

Debt to Asset Ratio*Up Market	6.1034 (0.85)	-3.4964* (-1.96)	-1.5493 (-1.03)	4.7938 (0.86)	5.5209 (0.69)	-2.6294 (-1.59)	24.6661 (0.94)	-3.8681 (-1.51)	-58.4255 (-1.06)
Cost/Income Ratio*Down Market	0.0214 (0.86)	-0.0115 (-1.27)	-0.004 (-1.12)	0.0087** (2.12)	0.0029** (2.28)	0.0124 (0.97)	0.0063*** (2.62)	-0.0089* (-1.67)	-0.0037 (-0.25)
Cost/Income Ratio*Up Market	-0.0182 (-1.02)	-0.017 (-1)	-0.0263 (-1.09)	0.006** (2.16)	0.0205 (1.13)	-0.0275 (-0.9)	0.2145 (1.01)	-0.0055 (-1.06)	-0.0301 (-1.15)
HHI*Down Market				5.3083 (1.56)	7.0954* (1.73)	8.7428** (2.4)	-6.0638** (-2.29)	3.5868* (1.93)	6.3774*** (2.6)
HHI*Up Market				-5.7157** (-2.09)	-2.9744 (-0.6)	6.5494 (0.72)	-10.1178 (-0.72)	-4.1256 (-1.04)	10.904 (1.63)
GDP Growth*Down Market							0.0223 (0.39)	0.0102 (0.31)	-0.1008 (-0.79)
GDP Growth*Up Market							0.1103** (2.08)	-0.0274 (-1.46)	0.0054 (0.06)
Inflation*Down Market							0.2401* (1.81)	0.0329 (0.7)	0.1552* (1.81)
Inflation*Up Market							0.0265 (0.91)	0.0501* (1.71)	0.3353 (0.91)
CD Test	0.24 [0.8098]	-0.06 [0.9546]	-0.09 [0.9263]	-1.11 [0.2657]	-1.48 [0.1388]	-1.45 [0.148]	-1.32 [0.1868]	0.56 [0.5738]	-1.58 [0.1148]

Table 12. *Systematic and systemic default risk in the household and personal products industry group.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Household and Personal Products	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	-4.1259 (-1.18)	3.4774 (1.55)	3.129 (1.13)	-3.7573 (-1.32)	1.6662 (0.72)	2.937* (1.73)	4.2169** (1.97)	1.1918 (0.44)	2.8948 (1.04)
Down Market	3.6721 (1.16)	0.8241 (0.33)	-0.2068 (-0.14)	5.4841 (1.24)	2.7994 (1.08)	-0.8684 (-0.33)	-0.0864 (-0.04)	1.561 (0.68)	0.671 (0.16)
DCC Beta(-1)*Down Market	-0.1329 (-1.25)	-0.1073 (-0.76)	-0.0386 (-0.12)	-0.081 (-0.54)	-0.0562 (-0.43)	-0.5471 (-1.13)	1.1591 (0.82)	-0.2897 (-1.5)	-0.7528 (-1.33)
DCC Beta(-1)*Up Market	0.3374* (1.73)	0.557* (1.76)	-0.3223** (-2.06)	0.1452* (1.65)	0.3606* (1.66)	-0.4202** (-1.97)	-0.0895 (-0.26)	0.4417* (1.82)	-0.4595* (-1.81)
Z-score*Down Market	-0.2343** (-2.29)	-0.4733* (-1.81)	-0.5203*** (-3.43)	-0.3127 (-1.17)	-0.3283** (-1.97)	-0.3703*** (-2.7)	-0.0378 (-0.09)	-0.372** (-2.59)	-0.3622*** (-2.88)
Z-score*Up Market	-0.2671* (-1.65)	-0.1567* (-1.74)	-0.0864* (-1.66)	-0.2422** (-2.24)	-0.1848** (-2.15)	-0.1646* (-1.9)	-0.1032** (-2.38)	-0.1245* (-1.88)	-0.1777* (-1.86)
Market Cap*Down Market	-0.5405** (-2.57)	-0.6818* (-1.71)	-0.8042* (-1.75)	-0.6626** (-2.35)	-0.2535*** (-2.69)	0.2212 (1.51)	-0.2567** (-2.23)	-0.0753 (-0.32)	0.0397 (0.21)
Market Cap*Up Market	0.0912 (0.39)	0.0212 (0.11)	-0.0382 (-0.18)	0.4928 (1.17)	0.0966 (0.45)	-0.3462** (-2.41)	-0.4147 (-1.04)	0.1695 (0.53)	-0.4438* (-1.71)
Debt to Asset Ratio*Down Market	1.6012* (1.76)	-1.5156 (-0.93)	2.6886* (1.68)	0.8988 (0.65)	-2.2587 (-1.45)	0.264 (0.13)	2.4101*** (6.55)	-3.6755*** (-2.84)	0.9049 (0.42)

Debt to Asset Ratio*Up Market	-2.2459* (-1.68)	-3.2075* (-1.78)	1.7685 (1.09)	-3.1564** (-2.16)	-2.1712* (-1.71)	-1.6449 (-0.91)	5.0391 (0.64)	-0.9769 (-0.8)	-3.725 (-1.07)
Cost/Income Ratio*Down Market	0.0169 (0.82)	-0.0115 (-0.82)	-0.0136 (-0.79)	0.0234 (0.8)	-0.0371 (-0.93)	0.0243** (1.99)	-0.0178 (-0.65)	-0.0277 (-0.78)	-0.0191 (-0.86)
Cost/Income Ratio*Up Market	0.0353 (1.15)	0.0056 (0.32)	0.0346** (2.05)	0.0733 (1.34)	-0.0146 (-0.36)	-0.0009 (-0.04)	-0.0519 (-0.95)	-0.0246 (-0.53)	-0.0242 (-1.54)
HHI*Down Market				10.5162* (1.76)	-5.1327 (-1.44)	-7.1048 (-1.31)	6.1477 (1.09)	-5.4378* (-1.89)	1.3747 (0.32)
HHI*Up Market				1.8912 (0.19)	-4.5773* (-1.69)	-3.7736* (-1.87)	3.2522 (0.27)	-2.9145 (-1.58)	-6.0692* (-1.71)
GDP Growth*Down Market							-0.2945** (-2.32)	-0.0362 (-0.66)	-0.0145 (-0.49)
GDP Growth*Up Market							0.1856 (0.86)	-0.052* (-1.75)	0.0797 (1.08)
Inflation*Down Market							0.2121* (1.76)	0.0578 (0.62)	-0.0773* (-1.67)
Inflation*Up Market							0.0199 (0.16)	0.0877* (1.76)	0.0496 (0.79)
CD Test	0.11 [0.9143]	-1.29 [0.1964]	0.04 [0.9651]	0.19 [0.8499]	-0.89 [0.3729]	-1.48 [0.1386]	-1.24 [0.2155]	-0.94 [0.349]	-0.12 [0.901]

5.1.4. Energy Sector

Energy sector represents companies that produce or supply energy. These firms are important drivers of industrial growth in an economy as they provide power to the rest of the market. According to the Global Industry Classification (GCIS), the energy industry includes the same group of inter-related firms that offer various types of energy as in the energy sector. Hence, we do not differentiate between sector and industry-level systemic risks when performing our analyses.

The estimated coefficients in Table 13 show that an energy firm's default risk directly influences both overall market and industry-wide (hence sector-wide) risk. This signifies that an increase in the probability of an energy firm's insolvency put distress on the energy industry (or sector) as well as the entire market. These systematic and systemic components of energy company's default risk manifest themselves only during bear markets.

The magnitude of negative and significant *z-score* coefficients in DCC-Industry Beta columns prove greater than that of DCC-Market Beta columns. This is valid for each model specification (Model 1, Model 2 and Model 3). Therefore, we infer that a rise in the individual indicator of energy firm default risk contributes to the increase of sector-wide risk to a greater extent in comparison to that of the whole market under bearish market conditions.

Table 13. *Systematic and systemic default risk in the Energy Sector.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Energy Sector	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC- Industry Beta	DCC-Market Beta	DCC- Industry Beta
Constant	-2.5961 (-1.43)	-0.0465 (-0.06)	-4.0086* (-1.91)	-0.7307 (-0.32)	3.6653 (0.62)	-1.8273 (-1.08)
Down Market	3.4751** (1.98)	0.9694 (0.57)	7.988*** (4.08)	-5.0648 (-0.77)	8.544** (2.11)	-7.2811** (-2.04)
DCC Beta(-1)*Down Market	-0.1434 (-0.56)	0.2274* (1.96)	0.0173 (0.09)	0.6177 (0.94)	-0.3769 (-0.72)	0.1926 (0.39)
DCC Beta(-1)*Up Market	-0.0192 (-0.25)	0.2757*** (3.3)	-0.021 (-0.26)	0.4216* (1.83)	-0.4301 (-1.16)	0.341** (2.52)
Z-score*Down Market	-0.1664** (-2.49)	-0.1872* (-1.65)	-0.2275** (-2.21)	-0.4971*** (-2.69)	-0.2105* (-1.7)	-0.3001* (-1.69)
Z-score*Up Market	-0.0838 (-0.53)	-0.1217 (-1.06)	-0.0263 (-0.42)	0.2481 (0.72)	-0.0166 (-0.17)	0.131 (0.59)
Market Cap*Down Market	0.0559 (0.3)	0.0044 (0.02)	-0.2032 (-0.58)	0.7272 (1.41)	-0.8116** (-2.4)	0.5958** (2.26)
Market Cap*Up Market	0.2892* (1.68)	0.0532 (0.55)	0.4324* (1.83)	-0.0284 (-0.1)	0.3137 (0.8)	-0.1326 (-0.5)
Debt to Asset Ratio*Down Market	-1.2492	0.3132	0.432	3.2473	-0.3852	3.284

	(-1)	(0.28)	(0.32)	(0.86)	(-0.17)	(1.22)
Debt to Asset Ratio*Up Market	-0.9894*	-0.3274	0.9758	1.6354*	-0.3417	3.116*
	(-1.69)	(-0.42)	(0.72)	(1.84)	(-0.43)	(1.69)
Cost/Income Ratio*Down Market	-0.0251	0.0067	-0.2533	-0.1918	-0.2513	-0.114
	(-0.43)	(0.17)	(-1.49)	(-0.8)	(-1.24)	(-0.78)
Cost/Income Ratio*Up Market	0.0329	0.018*	0.057	-0.0938	0.0639	-0.0809
	(0.8)	(1.77)	(0.88)	(-0.71)	(0.81)	(-0.63)
HHI*Down Market			-23.1419	9.6188*	6.625	23.042
			(-1.52)	(1.75)	(0.74)	(1.31)
HHI*Up Market			-14.957*	4.6406	-6.7947	2.6245
			(-1.83)	(0.83)	(-1.16)	(0.86)
GDP Growth*Down Market					-0.1349*	0.1366
					(-1.68)	(0.45)
GDP Growth*Up Market					0.0259	-0.1049*
					(0.59)	(-1.84)
Inflation*Down Market					-6.7506	14.4462
					(-0.75)	(1.27)
Inflation*Up Market					4.7836	-0.4637
					(0.77)	(-0.04)
CD Test	0.97	-1.39	-0.43	-1.11	0.13	1.29
	[0.3296]	[0.1634]	[0.666]	[0.2656]	[0.8938]	[0.1972]

5.1.5. Health Care Sector

The health care sector consists of institutions involved in the supplying of medical goods and services. It possesses two industry groups, namely, the “health care equipment and services” industry, and the “pharmaceuticals, biotechnology and life sciences” industry. The latter includes firms that are associated with the development, creation, and distribution of medications whereas the former represents the companies that manufacture health care devices, medical products and provide health care services.

Health care equipment and services company’s default risk directly enhances systematic risk (see Model 3 in Table 14 and Table A13) when the market follows a downward trend whereas it increases the industry-wide systemic risk during uptrend periods. The tie between idiosyncratic default and industry-wide systemic risk proves relatively stronger. Negative and significant z-score coefficients showing the impact of increased default risk on the systematic risk in up markets (in Model 1) turns insignificant on Model 2 and Model 3. This implies a possible indirect linkage via sectoral and macro factors.

In Table 15, which examines pharmaceuticals, biotechnology and life sciences companies, the default risk does not appear to possess a direct impact on the overall market risk. However, it directly affects the entire healthcare sector risk in down markets while an increase in the probability of a such firm’s default risk induces industry-wide risk in up markets (see Table A14 for robustness).

Table 14. Systematic and systemic default risk in the health care equipment and services industry. Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Health Care Equipment and Services Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	1.3267 (1.1)	-0.4214 (-0.18)	-2.6923 (-0.47)	1.2204 (0.4)	1.7156* (1.72)	-1.1303 (-0.66)	-1.8679 (-0.88)	0.2728 (0.21)	2.708 (1.39)
Down Market	6.1998 (0.97)	0.0968 (0.04)	4.8466 (0.68)	-0.3422 (-0.16)	0.345 (0.15)	-0.6649 (-0.55)	-0.6955 (-0.29)	-2.2731 (-0.88)	-0.8547 (-0.36)
DCC Beta(-1)*Down Market	-0.0657 (-0.14)	0.2866* (1.78)	0.2756*** (2.9)	0.4027*** (2.98)	0.0198 (0.1)	0.2255* (1.78)	0.0261 (0.1)	0.8562** (2.33)	0.2508* (1.7)
DCC Beta(-1)*Up Market	0.2755* (1.66)	0.1526 (0.66)	0.209 (0.81)	-0.0946 (-0.29)	0.2862*** (2.82)	0.1344 (1.58)	0.2084* (1.72)	-0.4712 (-1.05)	0.074 (0.32)
Z-score*Down Market	-0.1223* (-1.67)	-0.5379** (-1.99)	0.3627 (1.1)	-0.3212* (-1.73)	-0.6234** (-2.18)	0.0242 (0.22)	-0.1343* (-1.88)	-0.1989 (-1.23)	0.0728 (0.59)
Z-score*Up Market	-0.2944* (-1.66)	-0.5041* (-1.65)	-0.4407* (-1.67)	0.1083 (0.43)	-0.4233* (-1.81)	-0.1266* (-1.75)	0.3908 (0.3)	-0.211 (-0.91)	-0.3540* (-1.66)
Market Cap*Down Market	-0.463** (-2.18)	0.6979** (2.03)	-0.4155* (-1.76)	-0.5407** (-2.21)	1.3624 (1.19)	0.3149 (1.05)	0.1148 (0.32)	0.9477* (1.87)	-0.1599 (-0.78)
Market Cap*Up Market	-0.1859 (-1.08)	0.2261 (0.65)	-0.8728* (-1.76)	-0.1991 (-0.39)	0.006 (0.04)	-0.4477** (-2.03)	-0.3092 (-1.29)	0.3153 (1)	-0.864** (-2.1)
Debt to Asset Ratio*Down Market	0.0682 (0.02)	-4.1332 (-1.48)	-2.4828 (-0.47)	-3.757* (-1.78)	-0.7008 (-0.41)	2.0648 (0.2)	-6.4059* (-1.74)	-3.5982 (-0.9)	-4.2507 (-0.77)

Debt to Asset Ratio*Up Market	-1.5802 (-1.01)	-0.9479 (-0.46)	-3.3617* (-1.87)	-2.4078 (-0.78)	-4.4965*** (-3.08)	-4.0909* (-1.73)	1.8488 (1.11)	-2.3584* (-1.69)	-3.8466 (-0.67)
Cost/Income Ratio*Down Market	0.0282 (0.49)	0.0179 (0.21)	0.004 (0.05)	-0.0378 (-1.18)	0.0162 (0.33)	-0.0354 (-0.67)	-0.0839 (-1.03)	-0.0837 (-0.52)	0.0111 (0.22)
Cost/Income Ratio*Up Market	0.0143 (0.31)	0.017 (0.24)	0.0548 (1.04)	0.1615 (1.6)	-0.0169 (-0.29)	0.0285 (1.11)	0.1037 (0.97)	-0.1707 (-1.31)	-0.1166 (-1.41)
HHI*Down Market				8.2141* (1.94)	-4.4452 (-0.77)	18.2739 (1.03)	11.0141* (1.95)	-3.7851 (-0.83)	-4.6844 (-0.89)
HHI*Up Market				-4.3803 (-0.31)	2.48 (0.78)	9.1426* (1.7)	0.0586 (0.01)	-1.9794 (-0.47)	7.6993* (1.67)
GDP Growth*Down Market							-0.1003* (-1.77)	-0.1291 (-0.72)	0.0722 (0.71)
GDP Growth*Up Market							0.0288** (2.12)	0.2844** (2.3)	-0.0592 (-1.03)
Inflation*Down Market							0.0353 (0.46)	0.1211* (1.65)	0.1301* (1.93)
Inflation*Up Market							0.1259* (1.66)	-0.2626*** (-2.76)	-0.2302* (-1.87)
CD Test	-0.69 [0.4915]	0.33 [0.7396]	-1.08 [0.2811]	-0.53 [0.5978]	-0.66 [0.5123]	-0.07 [0.9425]	-1.15 [0.2506]	1.32 [0.188]	-1.51 [0.1313]

Table 15. Systematic and systemic default risk in the pharmaceuticals, biotechnology & life sciences industry. Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Pharmaceuticals, Biotechnology & Life Sciences Industry	Model 1			Model 2			Model 3		
	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	-1.8607** (-2.08)	0.6958 (0.33)	-1.7758 (-0.86)	-1.4619* (-1.72)	2.0915 (1.26)	-0.03 (-0.01)	1.0814 (0.74)	0.9859 (0.56)	-2.5783 (-1.42)
Down Market	0.684 (0.44)	-2.565 (-0.78)	3.4817 (1.61)	1.7671 (0.51)	1.883 (0.27)	1.1569 (0.32)	0.6547 (0.22)	-1.8741 (-0.43)	0.9861 (0.31)
DCC Beta(-1)*Down Market	0.147 (1.5)	0.1901 (1.42)	0.4735 (0.69)	0.2112 (0.89)	0.2481 (1.39)	0.2552 (0.87)	0.1467 (0.51)	-0.0425 (-0.14)	0.3874 (0.9)
DCC Beta(-1)*Up Market	0.2262** (2.47)	0.2355** (2.36)	0.4956* (1.78)	0.703** (2.11)	0.3464*** (2.67)	0.4974* (1.72)	0.4408** (2.19)	0.7549** (1.99)	0.2984*** (2.96)
Z-score*Down Market	-0.0318* (-1.68)	-0.1405* (-1.66)	-0.1178 (-0.32)	-0.078 (-1.63)	-0.2007* (-1.78)	-0.187 (-0.81)	-0.0358 (-0.28)	-0.2601** (-2.05)	-0.2767 (-0.51)
Z-score*Up Market	-0.1061 (-0.98)	-0.2512 (-0.93)	-0.2656** (-2.11)	-0.1079 (-0.67)	-0.121 (-0.66)	-0.1163* (-1.66)	-0.1142 (-1.45)	0.0806 (0.3)	-0.1137* (-1.86)
Market Cap*Down Market	0.013 (0.07)	-0.667* (-1.69)	-0.4868* (-1.7)	-0.472* (-1.76)	-0.6462* (-1.81)	-0.6768* (-1.84)	-0.9213 (-1.47)	-0.5499* (-1.75)	-0.2574 (-1.35)
Market Cap*Up Market	0.2316* (1.74)	-0.439 (-1.56)	0.1069 (0.48)	-0.0497 (-0.17)	-0.348 (-1.03)	-0.1745 (-1.06)	-0.456 (-1.21)	-0.0183 (-0.04)	-0.6139** (-2.08)
Debt to Asset Ratio*Down Market	2.8957* (1.81)	-0.4607 (-0.19)	6.2107 (1.48)	3.3821* (1.82)	-2.2527 (-0.31)	3.024 (0.78)	4.8175** (2.39)	-1.1685 (-0.31)	-2.6985 (-1.24)

Debt to Asset Ratio*Up Market	6.1595 (1.54)	-4.2545 (-0.33)	4.2044* (1.72)	5.1907 (0.93)	1.4171 (0.32)	5.0604*** (2.61)	3.8635 (1.37)	2.0356 (0.5)	3.5466 (1.53)
Cost/Income Ratio*Down Market	0.0324 (0.28)	-0.1312 (-0.34)	0.4419 (1.15)	0.5424 (1.26)	-0.3001 (-0.88)	-0.5832 (-1.5)	-0.3198 (-1.6)	-0.7449 (-1.57)	4.0425 (1.24)
Cost/Income Ratio*Up Market	-0.0081 (-0.16)	0.3179* (1.72)	0.4319* (1.95)	0.0467 (0.13)	0.2888* (1.78)	0.4069* (1.9)	0.1596 (0.33)	0.3251* (1.68)	0.7738** (2)
HHI*Down Market				-5.7132 (-0.57)	2.5798 (0.48)	6.5493* (1.91)	9.1327 (0.62)	1.7633 (0.16)	-1.0144 (-0.1)
HHI*Up Market				-7.249 (-1.55)	-6.6831** (-2.32)	-3.8095 (-1.07)	-5.8812*** (-3.04)	-5.8884** (-2.01)	-1.8531 (-0.34)
GDP Growth*Down Market							0.0258 (0.48)	0.0674 (0.43)	0.2352 (0.81)
GDP Growth*Up Market							0.0243 (0.35)	0.0223 (0.09)	-0.1731 (-1.36)
Inflation*Down Market							0.2742** (2.16)	0.1749 (1.47)	0.0833 (0.97)
Inflation*Up Market							0.225* (1.75)	-0.4913** (-2.3)	-0.1242* (-1.66)
CD Test	0.22 [0.8244]	0.75 [0.4554]	-0.58 [0.5617]	0.27 [0.7908]	0.4 [0.6863]	0.57 [0.5714]	-0.26 [0.7967]	-0.7 [0.4817]	-0.22 [0.8249]

5.1.6. Industrials Sector

Industrials sector encompasses companies that manufacture and distribute capital goods, offers commercial and professional services, and provides transportation services. Accordingly, it includes three industry-groups: “capital goods”, “commercial and professional services”, and “transportation”. Since the industrials sector constitutes the largest sector in the sample data, it is important to examine the default risk structure within this sector.

The estimated coefficients from Table 16 points out to the fact that a capital goods firm’s probability of default directly influences market-wide, sector-wide and industry-wide risks but these impacts differ throughout market cycles. Systematic component of the default risk persists through down markets however insignificant *z-score* coefficients in all model specifications show that it does not present itself in any way under up market conditions. Sector-level systemic risk follows a similar pattern during adverse market conditions, yet the default risk of a capital goods company affects indirectly the sector risk via sectoral and macro channels. Industry-wide systemic default risk on the other hand, prove significant in up markets but insignificant during down markets. Table A15 (Appendix A) supports these findings.

Considering the commercial and professional services industry, Table 17 reveals that an increase in the firm’s default risk has a direct effect solely on the sector-wide systemic risk and in downtrend periods. Otherwise, an increase in the such institution’s insolvency risk augments the market-wide and sector-wide risks via macroeconomic factors under bearish market conditions. This indirect relationship is also present in the robustness analyses (Table A16) for this industry-group.

The structure of firm-level default risk within transportation industry proves systematic in up markets (see Table 18 and, see Table A17 for robustness). In other words, an increase in the

transportation company's probability of default rises the undiversifiable market-wide risk when the market follows an uptrend. This effect disappears under bearish market conditions. A rise in the probability of insolvency of a single company within the transportation industry group puts pressure on the entire industrials sector when the market follows an upward trend. That is, a transportation firm's default risk proves sector-wide systemic in up markets. Again, this pattern does not prevail during down market periods. Comparing the magnitudes of negative and significant z-score coefficients, the undiversifiable component of a transportation company's default risk proves relatively greater than that of systematic one.



Table 16. *Systematic and systemic default risk in the capital goods industry.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Capital Goods Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	-0.2744 (-0.27)	0.6569 (0.8)	3.5532** (2.09)	1.1975** (1.99)	1.4076 (0.94)	2.2897 (1.49)	2.6205 (1.24)	0.5563 (0.23)	-0.6147 (-0.31)
Down Market	-0.1937 (-0.13)	1.2896 (0.92)	-0.2425 (-0.26)	1.0893 (0.75)	-0.2085 (-0.18)	0.428 (0.49)	0.9874 (0.29)	0.6367 (0.22)	1.1481 (0.49)
DCC Beta(-1)*Down Market	0.1463 (1.32)	0.1317* (1.65)	-0.0417 (-0.07)	0.1401 (1.4)	0.1124 (1.54)	0.3987 (1.49)	0.1492 (0.98)	0.0824 (0.87)	0.0825 (0.75)
DCC Beta(-1)*Up Market	0.6796* (1.66)	0.1653*** (2.83)	0.2131** (2.39)	0.1761 (0.72)	0.2157*** (3.51)	0.1774** (2.05)	0.3543* (1.71)	0.238** (2.45)	0.1615* (1.81)
Z-score*Down Market	-0.537* (-1.68)	-0.3013** (-2.1)	1.1049 (1.18)	-0.3699* (-1.74)	-0.2366* (-1.93)	0.0873 (0.81)	-0.2301*** (-2.62)	-0.292* (-1.73)	0.1608 (0.78)
Z-score*Up Market	-0.0387 (-0.22)	-0.9309** (-1.97)	-0.4677** (-2.1)	-0.0344 (-0.2)	-0.6443 (-0.94)	-0.3513** (-2.03)	0.0482 (0.86)	-0.4744 (-1.43)	-0.3403** (-2.23)
Market Cap*Down Market	-0.3996* (-1.72)	-0.4192** (-1.98)	-0.4181** (-2.1)	-0.3309 (-1.11)	-0.3633** (-2.31)	-0.1979* (-1.66)	-0.954* (-1.65)	-0.4036* (-1.7)	-0.2303* (-1.76)
Market Cap*Up Market	0.239 (1.5)	-0.0323 (-0.26)	-0.2404 (-0.58)	-0.1099 (-0.49)	-0.219* (-1.68)	-0.7784 (-1.47)	-0.6011 (-1.42)	0.0666 (0.16)	0.0865 (0.32)
Debt to Asset Ratio*Down Market	-7.9996 (-1.62)	-0.2212 (-0.2)	-5.0103 (-0.84)	-3.7417 (-0.3)	-1.6356 (-1.2)	1.1166 (0.39)	5.0393* (1.75)	1.9557 (0.93)	3.1097** (2.07)
Debt to Asset Ratio*Up	0.3304	-0.9119	-5.85*	-6.0254*	-1.3959	-7.1306	0.3288	1.8804	-3.0609

Market	(0.3)	(-1.08)	(-1.67)	(-1.7)	(-0.92)	(-1.33)	(0.17)	(0.8)	(-1.41)
Cost/Income Ratio*Down	-0.0561	0.022*	-0.0199	-0.0149	0.0296*	0.0017	-0.0315	-0.0011	-0.0666
Market	(-1.35)	(1.85)	(-0.34)	(-0.38)	(1.72)	(0.18)	(-1.4)	(-0.06)	(-0.73)
Cost/Income Ratio*Up	0.1584*	-0.006	-0.1043	-0.0299	-0.0299	-0.037	0.0592*	-0.0008	-0.0199
Market	(1.67)	(-0.42)	(-0.64)	(-0.86)	(-1.37)	(-1.26)	(1.88)	(-0.02)	(-0.71)
HHI*Down Market				-2.2755	9.3943*	-3.9409*	-5.4928*	-2.6854	-5.9594***
				(-0.92)	(1.8)	(-1.83)	(-1.96)	(-0.77)	(-3.05)
HHI*Up Market				4.1147*	4.319**	5.1751	3.6681	-2.2681	3.3242
				(1.71)	(2.42)	(1.01)	(0.7)	(-0.56)	(0.73)
GDP Growth*Down							0.0495	-0.2733***	0.0308
Market							(0.62)	(-2.64)	(0.65)
GDP Growth*Up Market							0.1873	0.2147**	-0.0007
							(0.74)	(2)	(-0.01)
Inflation*Down Market							0.2042**	-0.0684	-0.1052*
							(2.33)	(-1.09)	(-1.87)
Inflation*Up Market							0.3308	-0.7312*	-0.0316
							(1.23)	(-1.68)	(-0.38)
CD Test	0.81	1.45	0.39	-0.09	1.38	1.45	0.61	-0.17	0.67
	[0.4166]	[0.1469]	[0.6985]	[0.932]	[0.1681]	[0.1458]	[0.5395]	[0.8676]	[0.504]

Table 17. Systematic and systemic default risk in the commercial and professional services industry. Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} +$$

$$\sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Commercial and Professional Services	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	-1.017* (-1.66)	-1.2677 (-0.85)	2.8308** (1.98)	-0.6941 (-1.6)	0.4486 (0.35)	0.9373 (0.35)	-1.4744 (-1.64)	0.2558 (0.16)	-0.5943 (-0.77)
Down Market	-0.8352 (-0.45)	0.2724 (0.2)	4.1237 (1.23)	0.8188 (0.48)	-0.1069 (-0.08)	2.0896 (0.88)	0.2306 (0.3)	1.1203 (0.4)	1.3779 (1.18)
DCC Beta(-1)*Down Market	-0.2587 (-0.4)	0.2918* (1.72)	-0.9041 (-1.08)	-0.5238 (-1.2)	0.2567** (2.05)	0.4648** (2.5)	0.0397 (0.35)	-1.0897 (-0.94)	0.2566* (1.9)
DCC Beta(-1)*Up Market	0.2391*** (2.79)	0.3067 (1.29)	0.3099* (1.74)	0.3751* (1.83)	0.6452 (1.27)	0.1047 (0.42)	0.2242*** (2.72)	0.1836** (2.21)	0.2793** (2.56)
Z-score*Down Market	-0.2609* (-1.67)	-0.2348** (-2.04)	-0.1609* (-1.75)	-0.1773** (-2.09)	-0.2898** (-2.05)	-0.0265 (-0.21)	-0.1447 (-0.49)	-0.1931* (-1.76)	-0.0753 (-0.59)
Z-score*Up Market	-0.1856* (-1.8)	-0.483 (-1.14)	0.5976 (1.46)	0.0377 (0.1)	-0.6632 (-1.49)	0.0945 (0.58)	0.0907 (0.58)	-0.3583 (-0.94)	0.0483 (0.37)
Market Cap*Down Market	0.1815 (0.47)	-0.073 (-0.25)	-0.7451* (-1.88)	0.3589 (1.34)	-0.1809 (-0.56)	-0.88* (-1.75)	-0.6333* (-1.69)	0.6726 (0.83)	0.0216 (0.11)
Market Cap*Up Market	0.2551* (1.76)	0.5157* (1.84)	0.1517 (1.15)	0.863* (1.72)	0.3752** (2.01)	-0.3565 (-1)	0.3198** (2.22)	-0.0545 (-0.21)	0.1923 (0.89)
Debt to Asset Ratio*Down Market	1.6326 (0.96)	3.608** (2.32)	0.8691 (0.7)	3.0595* (1.76)	2.2849* (1.88)	0.5828 (0.72)	0.6084 (0.85)	-0.7663 (-0.35)	-1.3656 (-1.45)

Debt to Asset Ratio*Up Market	1.6689* (1.78)	-2.4382 (-1.53)	-0.0931 (-0.13)	3.7283 (1.37)	1.7134 (0.68)	-0.5782 (-0.47)	-0.3514 (-0.76)	-1.7261* (-1.91)	1.1656* (1.66)
Cost/Income Ratio*Down Market	-0.0217 (-1.14)	-0.0046 (-0.17)	-0.012 (-0.79)	0.0685 (1.31)	0.0392* (1.78)	-0.0016 (-0.09)	0.0126* (1.76)	0.0434* (1.7)	-0.0115 (-0.85)
Cost/Income Ratio*Up Market	-0.0005 (-0.02)	0.029* (1.76)	-0.0039 (-0.67)	-0.0162 (-0.63)	-0.0047 (-0.76)	0.0102* (1.73)	-0.0106 (-1.24)	-0.0027 (-0.22)	-0.0066 (-1.17)
HHI*Down Market				0.7945 (0.3)	-5.582 (-1.43)	-5.0669** (-2.1)	0.6446 (0.47)	-4.8803 (-0.67)	-4.5282* (-1.83)
HHI*Up Market				-4.7383 (-1.39)	-2.4114 (-1.16)	-0.8026 (-0.41)	-1.2435 (-0.97)	-1.7921 (-0.9)	-3.9858 (-1.36)
GDP Growth*Down Market							0.0087 (0.16)	-0.7237 (-1.19)	-0.069** (-2.35)
GDP Growth*Up Market							-0.0492 (-0.77)	-0.0011 (-0.02)	0.0274 (0.42)
Inflation*Down Market							0.162* (1.69)	-0.5826* (-1.82)	-0.0302 (-0.55)
Inflation*Up Market							-0.0526 (-1.37)	-0.3169** (-1.96)	-0.1363* (-1.85)
CD Test	-1.12 [0.2642]	-0.14 [0.8922]	1.51 [0.1315]	-1.55 [0.1217]	0.08 [0.9394]	0.6 [0.5457]	-1.17 [0.2403]	-0.5 [0.6178]	-0.43 [0.6669]

Table 18. *Systematic and systemic default risk in the transportation industry.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Transportation Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	5.239* (1.94)	3.7544 (0.55)	2.8735** (2.13)	3.38 (1.39)	1.7096 (0.36)	4.5562 (1.03)	5.8111** (2.25)	2.9142 (0.59)	-2.9605* (-1.73)
Down Market	-0.1352 (-0.03)	-0.809 (-0.22)	-2.9656 (-0.78)	3.162*** (5.13)	-4.8153 (-1.52)	0.0475 (0.04)	-0.3876 (-1.16)	-0.1777 (-0.05)	1.1944 (1.51)
DCC Beta(-1)*Down Market	-0.3924*** (-3.37)	0.5351*** (3.19)	0.1854** (2.29)	-1.3966** (-2.57)	-0.0074 (-0.05)	0.137* (1.8)	-0.4178 (-1.08)	0.4308*** (2.64)	0.5129** (2.26)
DCC Beta(-1)*Up Market	-0.1898 (-0.58)	0.2623 (1.32)	0.3225 (1.55)	0.8182 (1.23)	0.7096** (2.04)	0.2055 (0.6)	-0.2879 (-0.73)	0.0722 (0.46)	-0.1052 (-0.66)
Z-score*Down Market	-0.8533 (-1.01)	0.121 (1.09)	-0.165 (-0.61)	-0.2852 (-0.21)	-0.0135 (-0.02)	0.0372 (0.22)	-0.1738 (-0.23)	0.1077 (0.47)	-0.0912 (-0.11)
Z-score*Up Market	-0.3905* (-1.73)	-0.3227** (-2.03)	0.7079 (1.28)	-0.3167* (-1.72)	-0.4813** (-2.29)	0.23 (1.35)	-0.3103* (-1.79)	-0.2013* (-1.93)	-0.0444 (-0.16)
Market Cap*Down Market	-0.0845 (-0.29)	-0.499 (-0.78)	-0.2203 (-0.64)	-1.4276* (-1.73)	0.3881 (1.4)	-0.3283 (-1.01)	-0.6404 (-1.56)	0.041 (0.1)	-0.883* (-1.82)
Market Cap*Up Market	0.142 (0.49)	-0.6491 (-0.62)	-1.017* (-1.75)	0.8927** (2.43)	0.1397 (0.27)	-0.9329* (-1.66)	-0.7457 (-1.08)	0.1185 (0.26)	0.1012 (0.32)
Debt to Asset Ratio*Down Market	2.6571 (1.45)	1.2433 (0.48)	-0.0122 (-0.01)	-0.6034 (-0.65)	1.9704 (1.07)	0.3732 (0.63)	2.8491*** (2.6)	1.9105 (0.59)	2.4699 (0.46)
Debt to Asset Ratio*Up	3.5268**	-0.0494	3.7281*	0.9409	-0.9131	1.1875	0.8755	0.7636	-6.1912

Market	(2.59)	(-0.06)	(1.78)	(0.81)	(-1.51)	(0.9)	(0.98)	(0.94)	(-0.95)
Cost/Income Ratio*Down	-0.0124	-0.0434*	-0.0383*	-0.0198	-0.0346*	-0.025*	0.0227	-0.0321	-0.0274**
Market	(-0.45)	(-1.76)	(-1.68)	(-1.01)	(-1.9)	(-1.94)	(0.38)	(-1.63)	(-2.01)
Cost/Income Ratio*Up	-0.0087	-0.0253	-0.0729	-0.0008	-0.0113	-0.012	-0.0461	-0.0307	-0.0882
Market	(-0.48)	(-0.99)	(-0.99)	(-1.32)	(-0.67)	(-1.44)	(-1.42)	(-1.43)	(-0.99)
HHI*Down Market				-2.2602**	2.8736	-0.1638	-1.803	3.4612	1.6768
				(-2.27)	(0.5)	(-0.09)	(-1.53)	(1.04)	(0.98)
HHI*Up Market				4.2883	-3.2198	-1.9612***	-4.7509	-2.5287	0.1558
				(0.51)	(-0.46)	(-2.81)	(-1.56)	(-1.15)	(0.06)
GDP Growth*Down							1.1473*	0.0251	-0.1958*
Market							(1.73)	(0.19)	(-1.66)
GDP Growth*Up Market							-0.3395**	0.3155**	0.0191
							(-1.98)	(2.1)	(0.29)
Inflation*Down Market							-0.3659*	0.01	-0.0221
							(-1.66)	(0.14)	(-0.13)
Inflation*Up Market							-0.1368	0.3614***	-0.0101
							(-1.23)	(2.94)	(-0.22)
CD Test	-0.93	0.96	-0.12	-0.35	0.62	-0.91	1.47	0.12	-0.19
	[0.3544]	[0.3367]	[0.903]	[0.73]	[0.5367]	[0.3608]	[0.1412]	[0.905]	[0.8504]

5.1.7. Information Technologies Sector

Software and services, technology hardware and equipment, and semi-conductors and semiconductor equipment are the three industry groups within the information technologies sector. Constituting more than 15% of our sample, information technology firms provide several products and services ranging from internet, databases, consulting services to communications and electronic equipment as well as semiconductors. Thus, these firms play an important role in the functioning of other businesses.

The default risk structure of software and services industry-group is depicted in Table 19. The results show that the default risk of software and services companies is sector-wide systemic when the market follows a downward trend. On the other hand, an increase in the probability of default of such institutions does not directly affect the market-wide and industry-wide risks. Idiosyncratic default risk of software and services firms induces indirectly the market and industry-wide risks via sector-specific and macro variables during down-market cycles. Table A18 in Appendix A supports these findings.

In Table 20, the default risk of the technology hardware and equipment firms proves to be both systematic and systemic under down market conditions. An increase in the odds of default of these companies leads to a greater rise in the sector-wide risk relative to industry-wide risk in down-market periods. That is, a technology hardware and equipment firm may cause more harm to the entire information technology sector in comparison to the other firms in its industry group if its default risk augments (for robustness, see also Table A19 in Appendix A). We do not detect any direct relationship between the default risk and systematic or systemic risks but only observe an indirect link via macroeconomic factors during up markets.

Idiosyncratic default risk of the firms affiliated with the semi-conductors and semiconductor equipment industry group is systematic and systemic when the market follows a downward trend (Table 21). An increase in these institutions' probability of default cause higher distress on the sector-wide risk in comparison to industry-wide risk. During uptrend periods, an increase in the odds of insolvency of semi-conductors and semiconductor equipment companies directly impacts the sector-systemic risk by rising the risk of information technologies sector-wide risk. Otherwise, the default risk of semi-conductors and semiconductor equipment companies is not systematic nor industry-wise systemic in up markets; it has an indirect impact on the market and industry risks through macroeconomic factors. The results from robustness analyses in Table A20 (Appendix A) are in line with these findings.

Table 19. *Systematic and systemic default risk in the software and services industry.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Software and Services Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	-0.429 (-1.05)	-0.8843 (-1.12)	-1.3471 (-0.63)	3.6183 (1.51)	-2.3005 (-1.62)	-0.7419 (-0.34)	1.4562 (0.97)	-0.8136 (-0.67)	-0.8643 (-0.91)
Down Market	-0.3903 (-0.51)	-0.7023 (-0.63)	-0.8637 (-0.54)	1.1845 (1.22)	1.2228 (1.01)	1.3614 (0.86)	0.2502 (0.07)	-0.9409 (-0.84)	-0.4324 (-0.42)
DCC Beta(-1)*Down Market	0.3715*** (3.4)	0.3508** (2.17)	0.1388 (1.45)	0.2396** (2.33)	0.2208** (2)	0.1693** (2.31)	0.2875* (1.65)	0.124 (1.05)	0.0525 (0.53)
DCC Beta(-1)*Up Market	0.2182* (1.71)	0.1378 (0.61)	0.2109 (1.42)	-0.4163 (-1.02)	0.2517 (1.11)	0.2222 (1.33)	0.6744 (1.14)	0.2408 (1.4)	0.2454** (2.06)
Z-score*Down Market	-0.0985* (-1.78)	-0.1017** (-2.47)	-0.0665* (-1.72)	-0.076** (2.15)	-0.0729* (-1.78)	-0.0372 (-0.83)	0.1537 (1.56)	-0.0762** (-2)	-0.0332 (-0.76)
Z-score*Up Market	-0.532 (-1.05)	-0.0713 (-0.68)	-0.4453 (-1.4)	-0.5464 (-1.31)	-0.1232 (-1.27)	-0.4695 (-1.38)	-1.0912 (-1.23)	-0.0981 (-1.14)	-0.2669 (-0.89)
Market Cap*Down Market	0.1667 (0.92)	0.407* (1.9)	-0.2807* (-1.87)	0.4037* (1.68)	0.3242** (2.2)	0.1212 (0.83)	0.4671 (1.6)	0.2667** (2.4)	0.0434 (0.32)
Market Cap*Up Market	0.6318 (1.34)	0.2735** (2.16)	0.652* (1.7)	0.7694 (1)	0.2067** (1.97)	0.779* (1.93)	0.7209 (1.19)	0.1902 (0.99)	0.7745* (1.68)
Debt to Asset Ratio*Down Market	-1.1686 (-1.6)	1.4655 (0.35)	3.0512* (1.85)	1.1716 (1.32)	1.9758 (0.43)	3.4976** (2.07)	2.352 (0.61)	-0.9696 (-0.16)	-1.4704 (-0.66)

Debt to Asset Ratio*Up Market	-1.525* (-1.77)	-1.321 (-0.98)	2.3022 (0.46)	-1.9833 (-0.8)	-1.4988 (-0.97)	2.9818 (0.79)	-0.9696 (-1.08)	-1.7357 (-0.99)	-1.2637 (-0.96)
Cost/Income Ratio*Down Market	0.2253 (0.28)	0.006 (0.26)	0.0061 (0.42)	0.1227 (1.15)	0.0049 (0.35)	-0.0107 (-0.86)	0.0276** (2.29)	0.0276* (1.78)	-0.0127 (-0.84)
Cost/Income Ratio*Up Market	-0.002 (-0.57)	0.006 (0.8)	0.0197 (0.29)	0.0433 (1.21)	0.0071 (0.89)	0.0201 (0.27)	-0.2514 (-0.81)	-0.0055 (-0.38)	0.0553 (0.93)
HHI*Down Market				0.0303 (0.01)	1.6771** (2.01)	1.8158** (2.08)	-1.0715 (-1.2)	1.8473* (1.69)	2.4737* (1.79)
HHI*Up Market				2.6909 (0.27)	0.4001 (0.4)	2.2235 (1.54)	-2.32 (-0.39)	0.6337 (0.47)	1.1544 (0.85)
GDP Growth*Down Market							-0.1665*** (-2.79)	-0.0152 (-0.43)	0.0803 (1.57)
GDP Growth*Up Market							-0.0276 (-0.28)	-0.1006** (-2.08)	0.0628 (1.15)
Inflation*Down Market							0.1704* (1.69)	-0.049 (-1.02)	-0.0564 (-0.69)
Inflation*Up Market							0.0089 (0.14)	0.0053 (0.11)	0.1302* (1.93)
CD Test	-0.49 [0.6225]	-0.33 [0.7386]	0.81 [0.4152]	1.37 [0.1712]	-0.46 [0.6437]	0.51 [0.611]	-1.57 [0.1157]	0.57 [0.5663]	1.15 [0.2491]

Table 20. Systematic and systemic default risk in the technology hardware and equipment industry. Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$									
Technology Hardware and Equipment Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	-1.8787* (-1.7)	0.2509 (0.24)	-0.5354 (-0.63)	-1.0587 (-0.32)	-0.6983 (-0.58)	-0.1658 (-0.18)	1.4619 (0.98)	-0.7083 (-0.94)	-1.2319 (-1.36)
Down Market	0.7013 (0.61)	1.4387* (1.74)	1.0189 (1.35)	1.7418* (1.83)	-0.6166 (-0.41)	-1.5259 (-0.15)	1.0624 (0.27)	0.849 (0.85)	2.3388** (2.52)
DCC Beta(-1)*Down Market	0.0781 (0.87)	0.4874* (1.89)	0.231** (2.19)	-0.2091 (-1.17)	0.4781*** (2.99)	0.2715** (1.98)	-0.1932 (-0.66)	0.3403* (1.74)	0.1912 (1)
DCC Beta(-1)*Up Market	0.2676** (2)	0.199** (2.05)	0.1943** (2.01)	0.0164 (0.13)	0.3963** (2.43)	0.182* (1.75)	0.1183** (2.06)	0.3349* (1.68)	0.2935* (1.65)
Z-score*Down Market	-0.1466* (-1.75)	-0.2598** (-2.12)	-0.1494* (-1.7)	-0.1629* (-1.69)	-1.3839* (-1.94)	-0.2545* (-1.65)	-0.1425* (-1.72)	-0.3602* (-1.71)	-0.2189* (-1.66)
Z-score*Up Market	-0.2091** (-2.22)	-0.0049 (-0.04)	-0.1631** (-2.31)	-0.2533* (-1.85)	0.0398 (0.25)	-0.1217* (-1.8)	0.1589 (0.55)	-0.119 (-1.23)	-0.0903 (-1.07)
Market Cap*Down Market	-0.014 (-0.07)	0.1716 (0.97)	-0.0212 (-0.12)	-0.428 (-0.89)	0.1777 (0.96)	1.0688 (0.61)	-0.2562 (-0.28)	0.0844 (0.37)	-0.4248 (-1.6)
Market Cap*Up Market	0.7751** (2.06)	0.6742** (2.28)	0.1691** (1.97)	0.68* (1.65)	0.9861* (1.67)	0.2883* (1.83)	-0.5242 (-0.75)	0.1589 (1.12)	0.2371** (2.29)
Debt to Asset Ratio*Down	4.1862* (1.94)	-6.9314 (-1.18)	-3.877 (-0.97)	3.0234 (1.44)	-9.0766 (-0.78)	-4.5378 (-1.13)	4.0353 (0.51)	-5.4825 (-0.74)	-3.0471 (-0.5)

Market									
Debt to Asset	-7.3058**	-1.0707	-1.5038	-8.3346**	0.4937	-1.9464**	-7.4723*	-0.4305	-2.5404**
Ratio*Up Market	(-2.24)	(-1.2)	(-1.4)	(-2.07)	(0.31)	(-2.3)	(-1.79)	(-0.36)	(-2.03)
Cost/Income	0.0134	0.0461*	0.0196	-0.0129	0.0154*	0.0276*	0.0346*	0.0162*	0.0227
Ratio*Down	(1.01)	(1.81)	(1.63)	(-0.55)	(1.68)	(1.7)	(1.65)	(1.91)	(1.22)
Market									
Cost/Income	0.0031	-0.0043	0.0004	0.0286	-0.0092	-0.0028	-0.05	0.1427**	-0.004
Ratio*Up Market	(0.18)	(-0.55)	(0.06)	(1.17)	(-0.98)	(-0.26)	(-1.04)	(2.41)	(-0.36)
HHI*Down Market				4.2168	3.3693	-4.1927	6.0131	2.1265	2.6738
				(1.18)	(1.13)	(-0.56)	(1.09)	(1.19)	(1.36)
HHI*Up Market				0.176	0.4458	-1.7465	-1.9373	-0.5532	-0.2654
				(0.06)	(0.64)	(-0.66)	(-0.85)	(-1.2)	(-0.58)
GDP							-0.2881	0.006	-0.0521
Growth*Down							(-0.87)	(0.09)	(-0.71)
Market									
GDP Growth*Up							-0.5427***	-0.021	-0.1189*
Market							(-2.96)	(-0.28)	(-1.66)
Inflation*Down							-0.2534	-0.0473	-0.0228
Market							(-0.72)	(-1.4)	(-0.23)
Inflation*Up							0.088	0.1247*	0.0068
Market							(0.63)	(1.69)	(0.09)
CD Test	1.02	0.84	-0.11	-0.07	-1.19	-0.49	0.51	-0.8	-0.37
	[0.3071]	[0.4011]	[0.9098]	[0.9461]	[0.2344]	[0.6213]	[0.6118]	[0.4246]	[0.7096]

Table 21. Systematic and systemic default risk in the semi-conductors and semiconductor equipment industry. Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$									
Semi-conductors and Semiconductor Equipment Industry	Model 1			Model 2			Model 3		
Variables	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Sector Beta	DCC-Industry Beta
Constant	0.4356 (0.32)	0.9246 (0.77)	0.4568 (0.52)	1.7703 (0.96)	-4.283 (-1.5)	0.6102 (0.79)	-1.5142 (-0.69)	1.1757 (1.18)	0.1812 (0.44)
Down Market	-0.615 (-0.49)	-2.4592 (-1.6)	-1.2533 (-0.88)	-1.952 (-0.8)	-5.2303 (-0.52)	-2.1478 (-1.13)	-2.945 (-0.9)	0.5533 (0.09)	4.7579 (1.27)
DCC Beta(-1)*Down Market	0.2522* (1.65)	0.6546 (1.4)	0.3879* (1.66)	-0.0088 (-0.06)	-0.3889 (-0.83)	0.8584 (1.3)	-0.2818 (-1.11)	-0.157 (-0.52)	0.0141 (0.03)
DCC Beta(-1)*Up Market	0.2045*** (2.81)	0.2584** (2.38)	0.2447** (2.3)	0.1861* (1.8)	0.2881* (1.69)	0.0351 (0.18)	-0.1407 (-0.55)	-0.1276 (-0.43)	0.0267 (0.13)
Z-score*Down Market	-0.3032* (-1.86)	-0.4979** (-2.54)	-0.1416* (-1.69)	-0.3784* (-1.71)	-0.9111* (-1.81)	-0.1214* (-1.79)	-0.5433** (-2.21)	-0.7922** (-2.02)	-0.5711** (-2.22)
Z-score*Up Market	-0.4503* (-1.7)	-0.299* (-1.86)	-0.1203* (-1.73)	-0.3312 (-1.15)	-0.1114* (-1.7)	-0.1997** (-2.11)	-0.4215 (-1.21)	-0.1492* (-1.65)	0.0803 (0.66)
Market Cap*Down Market	0.2788 (1.13)	-0.0128 (-0.03)	0.1864 (0.82)	0.0381 (0.13)	1.0802 (0.88)	0.3215 (0.81)	0.5885** (2.25)	0.2614 (0.84)	0.4703 (0.78)
Market Cap*Up Market	0.4534 (1.27)	0.026 (0.3)	0.0763 (0.5)	0.3426 (0.79)	-0.0105 (-0.04)	-0.1833* (-1.84)	0.5504 (1.02)	-0.2249* (-1.85)	-0.1749** (-2.26)
Debt to Asset	-3.7808	-2.9105*	-0.0827	-2.1778	-6.6823	1.6933***	-1.8225	-5.2445**	-8.1074

Ratio*Down Market	(-1.29)	(-1.72)	(-0.05)	(-0.69)	(-1.17)	(5.28)	(-0.48)	(-2.35)	(-1.51)
Debt to Asset Ratio*Up Market	-2.2702	3.1513**	-1.4202*	-1.6395	1.8242	-1.1823	0.0282	-1.0325	2.6323***
Cost/Income Ratio*Down Market	(-1.05)	(2.13)	(-1.85)	(-0.7)	(0.83)	(-1.23)	(0.01)	(-0.51)	(2.75)
Cost/Income Ratio*Up Market	0.0217*	0.0157	-0.0055	0.0198*	0.0973	-0.0192	0.0333*	-0.0383	-0.1237
HHI*Down Market	(1.66)	(1.07)	(-1.05)	(1.71)	(0.92)	(-0.9)	(1.65)	(-1.1)	(-1.23)
Cost/Income Ratio*Up Market	0.0024	-0.0022	-0.0013	0.0017	-0.0025	-0.0015	0.0009	-0.0032*	-0.0007
HHI*Down Market	(1.2)	(-0.83)	(-0.91)	(0.75)	(-0.73)	(-0.71)	(0.21)	(-1.86)	(-0.32)
HHI*Up Market				5.1198	6.4522*	4.1742	5.4887	-0.7447	-1.6579
GDP Growth*Down Market				(0.71)	(1.77)	(1.04)	(0.61)	(-0.05)	(-0.18)
GDP Growth*Up Market				-1.8323**	1.1777	0.3711	0.6163	0.9815	0.4837
Inflation*Down Market				(-2.03)	(0.64)	(0.5)	(0.81)	(0.44)	(0.64)
Inflation*Up Market							-0.0084	0.1152*	0.0866*
CD Test							(-0.1)	(1.66)	(1.68)
							-0.1459**	0.0901	0.0278
							(-2.24)	(1.56)	(0.84)
							-0.0157	0.1809	0.3363**
							(-0.11)	(1.09)	(2)
							-0.1375**	-0.1527*	0.0725
							(-2.01)	(-1.84)	(1.49)
	-0.74	1.55	-1.37	-1.55	0.6	-1.06	-1.31	-0.81	-1.34
	[0.458]	[0.1222]	[0.1692]	[0.1211]	[0.5492]	[0.288]	[0.1904]	[0.4196]	[0.1792]

5.1.8. Materials Sector

Materials sector comprises of firms which are involved in the extraction and manufacturing of raw materials; namely, construction materials, metals, chemicals, minerals, and forest products. This sector category is not further divided into industry-groups according to The Global Industry Classification Standard (GICS). Thus, we do not distinguish between sector-wide and industry-wide systemic risk in our analyses.

Since the companies associated with several industry groups rely on the firms in the materials sector to acquire raw materials to produce goods, the default risk structure of these institutions within the materials sector is of high importance. More specifically, an increase in the default probability of a material company may lead to a cascade effect resulting in the failure of various institutions, notably affiliated with consumer goods, and destabilize several sectors. In this section, however, we particularly focus on the systematic and intra-sector systemic components of the firms' default risk in materials sector.

Estimation coefficients in Table 22 show that the idiosyncratic default risk of materials firms is not systematic nor intra-sector systemic. That is, heightened odds of a basic materials company's insolvency do not significantly impact the market risk throughout up and down-market cycles. On the other hand, we detect an indirect relationship between the firm-level default risk and sector-wide risk when the market follows an uptrend. An increase in the default risk of materials company generates higher sector risk through sectoral and macroeconomic factors, and solely during up cycles.

Table 22. *Systematic and systemic default risk in the materials industry.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} +$$

$$\sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Materials Sector	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	-0.6262 (-0.66)	-1.1304 (-1.12)	-0.7087 (-0.65)	-1.6898* (-1.67)	-1.2237 (-1.09)	-5.1357** (-2.13)
Down Market	-0.72 (-0.07)	0.0818 (0.04)	-1.2783 (-0.29)	1.3456 (0.45)	0.3027 (0.11)	14.0369 (1.27)
DCC Beta(-1)*Down Market	-0.4107** (-2.01)	0.0306 (0.27)	0.6783* (1.65)	-0.0176 (-0.27)	-0.1969 (-0.34)	-2.3619 (-1.5)
DCC Beta(-1)*Up Market	0.208** (2.28)	0.2893*** (4.69)	0.0006 (0.01)	0.2191*** (2.73)	-0.4509** (-2.04)	0.1311 (0.65)
Z-score*Down Market	-0.6932 (-0.59)	0.1813 (0.65)	0.5087 (1.35)	0.2089 (0.69)	0.1382 (0.09)	1.0455 (0.41)
Z-score*Up Market	-0.1237 (-1.24)	-0.428** (-2.1)	-0.1602 (-1.12)	-0.0129 (-0.09)	-0.2263 (-1.12)	-0.162 (-0.99)
Market Cap*Down Market	0.4073 (0.35)	-1.2998 (-0.85)	0.0131 (0.03)	-0.7298** (-1.99)	-0.151 (-0.15)	-2.0204** (-2.01)
Market Cap*Up Market	0.294** (2)	0.3397** (2.06)	0.417** (2.24)	0.2955* (1.85)	0.4204** (2.04)	0.5725** (2.26)
Debt to Asset Ratio*Down Market	-7.0216 (-1.59)	4.7852* (1.8)	-0.2556 (-0.1)	3.7008 (1.3)	-5.1407 (-1.31)	-6.1422* (-1.7)
Debt to Asset Ratio*Up Market	-1.0942* (-1.68)	-1.0819 (-0.77)	-1.1564** (-2.58)	1.1191 (1.13)	-3.8711* (-1.94)	-2.1439 (-1.63)
Cost/Income Ratio*Down Market	0.0556* (1.92)	0.0659 (0.15)	0.0822 (1.19)	-0.2184 (-1.15)	0.043 (0.9)	-0.3498 (-1.08)

Cost/Income	0.0068	0.1545	0.0163	0.0857	0.0205	0.0069
Ratio*Up Market	(0.71)	(1.22)	(0.97)	(0.94)	(0.64)	(0.19)
HHI*Down			12.867	-31.5537	-21.4822	-31.5695
Market			(0.61)	(-1.62)	(-1.18)	(-0.94)
HHI*Up Market			5.0228**	-0.1937	3.3106*	-3.6672
			(2.08)	(-0.07)	(1.68)	(-0.47)
GDP					5.9609	35.0646
Growth*Down					(1.43)	(1.62)
Market						
GDP Growth*Up					-0.743	-9.9883*
Market					(-0.05)	(-1.72)
Inflation*Down					-0.3083	0.6595**
Market					(-1.3)	(2.02)
Inflation*Up					0.0373*	-0.1474
Market					(1.74)	(-1.08)
CD Test	-0.09	0.85	-1.14	0.72	0.26	-1.37
	[0.9256]	[0.3929]	[0.2543]	[0.4718]	[0.7927]	[0.1707]

5.1.9. Real Estate Sector

Real estate sector includes real estate investment trusts (REITs) and real estate management and development companies (REMD). These companies were previously classified under the financial sector; however, they are re-classified as a separate sector due to their growing position and distinction from the other institutions within the financial sector. While REITs are classified under the real estate sector, mortgage real estate investment trusts (MREITs) are still categorized under the financial sector, namely diversified financials industry group.

Real estate sector is composed of companies which are highly leveraged and have relatively low cash holdings. Thus, these companies may be more vulnerable during downturn periods and experience higher distress in comparison to that of during up-markets. However, does the systematic risk increase when the idiosyncratic default risk of a real estate company rises? To what extent does the relationship between the idiosyncratic default and systematic risk differ with respect to up and down-market states?

The results from Table 23 emphasize that the default risk of real estate companies does not have a direct impact on either the market or sector (industry) risk. This finding holds for both up and down-market states. Although the default risk of real estate companies does not appear to be systematic, the significant and negative z-score coefficient in the first column of Table 23 points to the fact that the real estate companies' idiosyncratic default risk enhances the market risk via sectoral and macroeconomic channels in bearish market conditions.

Table 23. *Systematic and systemic default risk in the Real Estate Sector.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$						
Real Estate Sector	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	-0.3952 (-0.34)	1.1357 (1.33)	-3.3942 (-1.58)	2.0456* (1.76)	0.3526 (0.18)	4.946** (2.18)
Down Market	-3.7498 (-1.42)	-0.798 (-0.38)	13.1491** (2.32)	8.1641 (0.72)	5.6453*** (3.7)	-1.1581 (-0.49)
DCC Beta(-1)*Down Market	-0.3344** (-2.06)	-0.0372 (-0.2)	-0.51** (-2.43)	0.8182 (1.27)	-0.444** (-2.59)	-0.3051 (-1.47)
DCC Beta(-1)*Up Market	0.2014 (1.47)	0.233** (2.25)	0.103 (0.99)	0.1564* (1.77)	0.1504 (0.77)	0.2296** (2.43)
Z-score*Down Market	-1.5374* (-1.9)	-0.4152 (-0.56)	-0.9880 (-0.08)	7.5256 (1.1)	-3.3062 (-1.06)	-6.3765 (-0.98)
Z-score*Up Market	-0.0806 (-0.26)	0.2316 (1.36)	0.0192 (0.05)	0.226 (1.33)	0.3188 (1.29)	0.4245 (1.21)
Market Cap*Down Market	0.9235** (2.14)	-0.0083 (-0.04)	-1.2126* (-1.77)	-1.3982 (-0.97)	-0.0058 (-0.02)	-0.1228 (-0.28)
Market Cap*Up Market	0.0225 (0.13)	-0.1888*** (-2.87)	0.1014 (0.56)	-0.2071* (-1.72)	-0.2199 (-0.62)	-0.7111** (-2.01)
Debt to Asset Ratio*Down Market	-1.7726 (-1.04)	0.0211 (0.01)	-1.1495 (-0.71)	0.7369* (1.7)	1.4441 (0.41)	0.3682 (0.58)
Debt to Asset Ratio*Up	1.1446* (1.47)	-0.0504 (-0.15)	1.4382 (0.99)	-1.0516 (-0.77)	3.1461* (1.77)	-1.6006 (-0.43)

Market	(1.79)	(-0.07)	(1.43)	(-0.9)	(1.94)	(-0.83)
HHI*Down Market			-48.6382**	-0.9418	-16.5901*	-10.7764
			(-2.11)	(-0.1)	(-1.67)	(-0.67)
HHI*Up Market			30.2496	-20.0922**	-7.1515	12.0498
			(1.15)	(-2.47)	(-0.32)	(0.75)
GDP Growth*Down Market					4.8777	15.4023
					(1)	(1.58)
GDP Growth*Up Market					16.2563	-11.4003*
					(1.25)	(-1.82)
Inflation*Down Market					-0.4609*	-0.7244
					(-1.7)	(-0.84)
Inflation*Up Market					0.0303	-0.106
					(0.63)	(-1.37)
CD Test	-0.75 [0.453]	-0.48 [0.6329]	0.83 [0.4057]	-0.29 [0.775]	0.4 [0.6927]	0.83 [0.408]

5.1.10. Telecommunication Services Sector

All firms providing communication services through wire or wirelessly constitutes the telecommunication services sector. Until recently the telecommunication services sector was not split into industry groups in The Global Industry Classification Standard (GICS). As of 2018, the name of this sector became “Communication Services Sector”, and it is divided into two distinct industry groups: “telecommunication services” and “media and entertainment”. Considering the span of our sample period, we utilize the previous classification and perform a sector-wise analysis, without differentiating between the two industry-groups. The results are presented in Table 24.

Although telecommunication is a basic sector in the sense that the firms within this sector provide services to several companies in other sectors, our results indicate that the idiosyncratic default risk of telecommunication companies is not systematic. That is, a telecommunication company’s higher odds of insolvency do not significantly influence the market risk. This is valid throughout up and down-market cycles.

The default risk of telecommunication firms proves systemic on a sector (or industry) level. An increase in the odds of insolvency of these firms induce further distress within the entire telecommunication sector (or industry). The direct linkage between the idiosyncratic default risk and the sector-wide (or industry-wide) systemic risk manifests itself solely under down-market conditions. On the other hand, this relationship disappears when the market follows an uptrend.

Table 24. *Systematic and systemic default risk in the Telecommunication Services Sector.* Dependent variables are DCC market, sector and industrial betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$						
Telecommunication Sector	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	3.1841 (1.2)	2.2491* (1.67)	3.1433* (1.74)	0.2886 (0.11)	5.9221 (1.3)	6.462** (2.27)
Down Market	-5.2692* (-1.88)	-0.0891 (-0.04)	4.0865 (1.04)	0.7311 (0.12)	7.7846 (1.29)	-5.2974 (-0.31)
DCC Beta(-1)*Down Market	0.2782* (1.96)	-0.0966 (-0.62)	0.135 (0.47)	-0.9592** (-1.98)	0.1226 (0.14)	-0.9296 (-0.98)
DCC Beta(-1)*Up Market	0.0449 (0.46)	0.0408 (0.48)	0.1513 (1.22)	0.0163 (0.11)	0.294*** (2.9)	-0.2154 (-1.61)
Z-score*Down Market	0.0794 (0.41)	-0.2202* (-1.85)	0.0644 (0.18)	-0.3791* (-1.84)	-0.1168 (-0.35)	-2.1434* (-1.92)
Z-score*Up Market	0.2001 (0.94)	0.0757 (0.9)	0.2673 (1.18)	0.1464 (0.96)	0.1185 (0.78)	0.6654 (1.64)
Market Cap*Down Market	0.0948 (0.38)	0.1106 (0.39)	-0.7548* (-1.72)	-0.1035 (-0.19)	-1.865* (-1.84)	0.7614 (0.57)
Market Cap*Up Market	-0.3604** (-2.39)	0.0653 (0.68)	-0.2206 (-1)	-0.2269 (-0.79)	-0.2011 (-0.69)	-0.2729 (-0.71)
Debt to Asset Ratio*Down Market	4.0422** (2.35)	-0.2826 (-0.29)	3.4416 (0.94)	-4.4528* (-1.68)	3.6079 (0.93)	-0.1299 (-0.02)
Debt to Asset Ratio*Up Market	0.1332 (0.14)	2.789** (2.04)	1.0673 (0.52)	-1.2663 (-0.76)	-0.487 (-0.5)	3.2619 (1.45)

Cost/Income Ratio*Down Market	0.0452* (1.75)	-0.0387 (-0.77)	0.0998* (1.96)	0.1281 (1.15)	0.8132 (1.08)	-0.278* (-1.88)
Cost/Income Ratio*Up Market	-0.0253 (-1.01)	0.0294* (1.9)	-0.0238 (-0.48)	-0.0105 (-0.5)	0.0337* (1.85)	0.0183 (0.6)
HHI*Down Market			13.4852* (1.7)	-3.2021 (-0.54)	11.5976** (2.15)	1.0892 (0.06)
HHI*Up Market			4.4327 (1.61)	-3.3948 (-1.09)	3.8262* (1.73)	9.3576* (1.75)
GDP Growth*Down Market					3.4545 (0.25)	4.5302 (0.38)
GDP Growth*Up Market					-0.4836 (-0.05)	-2.6551 (-0.22)
Inflation*Down Market					0.0071 (0.08)	0.0035 (0.01)
Inflation*Up Market					0.108* (1.86)	0.1273* (1.68)
CD Test	-0.81 [0.4155]	-1.07 [0.2849]	-0.44 [0.6596]	-0.86 [0.3883]	0.13 [0.8947]	-0.53 [0.5989]

5.1.11. Utilities Sector

Companies that provide basic amenities such as natural gas, electricity, water, sewage, and power form the utilities sector. These institutions are characterized as high-demand and heavily regulated since they are a part of the public service infrastructure. In a similar way to energy sector, utilities sector is not further split into specific industry groups; thus, we do not distinguish between the sector-wide and industry-wide systemic risk. Table 25 depicts the coefficients from Eq. (7) estimated with respect to three different specifications.

The default risk of utilities companies is neither systematic nor systemic. More specifically, z-score coefficients are insignificant in both up and down markets (see Model 3). An increase in the idiosyncratic default risk does not directly influence the market-wide or sector-wide (industry-wide) risks.

We detect a possible indirect relationship between the idiosyncratic default risk and systematic and systemic risks. During uptrend periods, an increase in the probability of default of utilities companies rises the systematic risk through macroeconomic channels, causing higher distress levels in the entire market. This effect disappears when the market follows a downward trend. The indirect tie between the idiosyncratic default risk and the sector (industry) risk presents itself only during bearish market cycles. That is, higher level of firm-level default risk leads to a larger sector-wide (industry-wide) risk via macroeconomic factors in the utilities sector solely during down-market periods.

Table 25. *Systematic and systemic default risk in the Utilities Sector.* Dependent variables are DCC market and industry (sector) betas. D_{down} and D_{up} are down and up market dummy variables. $Default_{i,t}$ represents each firm's default risk measure, z-score. $Control_{n,i,t}$ consists of firm-specific, industry-specific, and country-specific variables. Numbers in brackets (square brackets) show t-values (p-values). *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

$$\beta_{k,i,t} = \alpha_1 + \alpha_2 D_{down} + \alpha_3 D_{down} \beta_{k,i,t-1} + \alpha_4 D_{up} \beta_{k,i,t-1} + \theta_1 D_{down} Default_{i,t} + \theta_2 D_{up} Default_{i,t} + \sum_1^N \delta_n D_{down} Control_{n,i,c,t} + \sum_1^N \gamma_n D_{up} Control_{n,i,c,t} + u_{i,t}$$

Utilities Sector	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	0.0424 (0.06)	0.539*** (2.75)	-0.8313* (-1.87)	-2.0968 (-1.21)	-1.415 (-0.85)	2.3124 (0.76)
Down Market	3.0974* (1.66)	-1.5235 (-0.91)	4.458 (1.55)	-0.0262 (-0.01)	1.8855 (0.46)	11.2057 (0.63)
DCC Beta(-1)*Down Market	0.0468 (0.33)	0.3331 (1.13)	-0.0744 (-0.42)	-0.3141 (-0.73)	0.3663 (0.78)	-0.9687 (-0.96)
DCC Beta(-1)*Up Market	0.0188 (0.18)	0.1311* (1.8)	-0.0804 (-0.66)	-0.0137 (-0.12)	0.0714 (0.32)	0.13 (0.78)
Z-score*Down Market	-0.1792 (-0.84)	-0.3768* (-1.75)	-0.1044 (-0.55)	-0.708* (-1.75)	-0.5163 (-1.49)	0.1211 (0.27)
Z-score*Up Market	-0.1968* (-1.75)	0.1854 (1.58)	-0.1729** (-2.04)	-0.0788 (-0.5)	-0.1587 (-1.28)	0.4205 (1.36)
Market Cap*Down Market	-0.3091 (-1.25)	-0.1023 (-0.53)	-0.145 (-0.7)	-0.2701 (-1.37)	0.0483 (0.17)	-0.1819 (-0.36)
Market Cap*Up Market	0.02 (0.21)	-0.0127 (-0.11)	0.2225 (1.24)	0.1188 (0.76)	0.1904 (0.64)	-0.5251* (-1.75)
Debt to Asset Ratio*Down Market	-0.7574 (-0.49)	3.3906* (1.66)	1.8377 (0.95)	2.7952 (1.15)	1.0085 (0.51)	4.5833 (0.66)
Debt to Asset Ratio*Up Market	1.9911** (1.97)	-1.5166 (-1.27)	1.5319 (1.15)	-0.4101 (-0.32)	2.3547 (1.43)	-0.6197 (-0.41)

Cost/Income Ratio*Down Market	-0.0142 (-0.76)	0.0421 (0.82)	-0.039* (-1.9)	-0.067* (-1.69)	-0.0227* (-1.67)	-0.0448* (-1.93)
Cost/Income Ratio*Up Market	0.0129 (1.43)	-0.0013 (-0.15)	-0.0323 (-0.88)	0.0251 (0.96)	-0.0879 (-0.93)	0.001 (0.13)
HHI*Down Market			-9.4469 (-0.61)	15.7753 (0.9)	-1.1013 (-0.04)	-12.4163 (-1.05)
HHI*Up Market			13.1317*** (2.72)	7.8121* (1.79)	3.8192 (0.54)	-1.2101 (-0.11)
GDP Growth*Down Market					4.0378 (0.52)	-25.651 (-1.6)
GDP Growth*Up Market					10.345* (1.76)	18.634* (1.92)
Inflation*Down Market					-0.0308 (-0.22)	0.3471 (1.06)
Inflation*Up Market					0.0229 (0.62)	0.0148 (0.22)
CD Test	-0.89 [0.3733]	-0.47 [0.6358]	-0.52 [0.6063]	1.03 [0.3012]	-0.6 [0.5505]	0.97 [0.3324]

5.2. Industry-to-sector Systemic Default Risk

In the previous section, we detected the industries within which a single company's increase in default risk affects its own sector-wide and industry-wide risks. However, does an increase in the default probability of a single firm within a specific industry group augments the risk of other sectors in the market? If so, which sectors are directly affected by an increase in the default risk of a single company affiliated with this industry-group?

Since the financial sector is the backbone of economy, we are first interested in whether higher distress in a single financial institution may destabilize an entire sector other than financials. To this end, we analyze each constituent industry group separately¹⁶.

In Table 26 (Panel A), we identify industrials, information technologies, and real estate sectors as directly affected sectors by higher bank default risk regardless of the market state. Yet the magnitudes of the significant z-score coefficients prove greater in down markets. An increase in the default risk of a bank intensifies utilities and telecommunication sector risks as well, but only under bearish market conditions.

A rise in the idiosyncratic default risk of diversified financial institutions (Panel B) puts more pressure on the systemic risk of the consumer discretionary sector whereas an increase in the odds of insurance firm's default (Panel C) leads to an augmentation in the industrials sector risk. This is valid through both up and down-market cycles. Higher levels of default risk in insurance (diversified financials) companies generate further distress in the consumer staples (health care) sector during uptrend periods. When market follows a downward trend, on the other hand, a rise in the insurance firms' default risk enhances health care sector risk. As for

¹⁶ In our industry-to-sector analyses, we are interested in the direct relationship between the idiosyncratic default risk and several systemic risks. Therefore, we estimate the complete model with all control variables as in Eq. (10), utilizing DCC-betas collected from Eq. (9). For the sake of conciseness, we only report z-score coefficients obtained from each regression.

Table 26. *Industry-to-sector systemic default risk: industry groups within the financial sector.*

Panel A. Banking Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.34* (-1.79)	-0.27* (-1.9)	-0.09* (-1.85)	-0.47 (-1.08)	-0.02 (-0.28)	-0.36 (-0.59)	-0.18** (-2.23)	-0.05 (-0.82)	-0.66* (-1.94)	-0.28* (-1.92)	-0.07* (-1.76)	-0.42 (-1.31)
Z-score(-1)* Up	-0.09* (-1.83)	-0.20* (-1.66)	-0.05* (-1.94)	-0.01 (-0.26)	-0.00 (-0.01)	-0.14 (-1.17)	-0.17* (-1.82)	-0.04 (-0.91)	-0.04*** (-2.83)	-0.05 (-1.55)	-0.00 (-0.24)	-0.03 (-0.62)
CD Test	1.48 [0.1396]	1.4 [0.1605]	-0.26 [0.7942]	-0.34 [0.7361]	0.49 [0.6223]	1.29 [0.1961]	0.89 [0.3754]	0.78 [0.436]	0.58 [0.5637]	1.54 [0.1246]	-0.53 [0.5955]	0.61 [0.5422]
Panel B. Diversified Financials Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.55* (-1.83)	-0.35* (-1.8)	-0.09* (-1.89)	-0.20* (-1.68)	-0.07*** (-3.06)	0.11 (1.34)	-0.01 (-0.06)	-0.29** (-2.12)	-0.45 (-1.28)	-0.14** (-2.01)	-0.11 (-0.62)	-0.15* (-1.72)
Z-score(-1)* Up	-0.19*** (-2.62)	-0.05* (-1.67)	-0.06 (-1.13)	-0.04* (-1.89)	-0.02 (-1.23)	-0.01* (-1.71)	-0.01 (-0.52)	-0.04 (-1.2)	-0.03 (-1.27)	0.05 (1.47)	0.01 (0.26)	-0.02 (-0.67)
CD Test	1 [0.3162]	-0.12 [0.9082]	0.49 [0.6265]	-0.22 [0.8243]	-0.1 [0.9203]	0.35 [0.7228]	-0.39 [0.6959]	-0.79 [0.4301]	-0.08 [0.933]	1.62 [0.1055]	-1.19 [0.2322]	0.39 [0.694]
Panel C. Insurance Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.19** (-2.2)	-0.54*** (-2.82)	-0.41*** (-2.76)	-0.04 (-0.31)	-0.21 (-1.49)	-0.28* (-1.69)	0.02 (0.64)	0.14 (0.7)	0.10 (1.63)	0.24 (1.33)	-0.22 (-0.77)	0.01 (0.1)
Z-score(-1)* Up	-0.05* (-1.92)	-0.29* (-1.75)	-0.29*** (-4.48)	-0.11 (-1.53)	-0.16** (-2.18)	-0.07 (-1.2)	-0.02 (-0.22)	0.04 (0.57)	0.06 (1.16)	-0.09 (-0.73)	0.20 (0.81)	0.00 (0.03)
CD Test	-1.28 [0.2006]	-0.63 [0.5319]	-1.56 [0.1191]	-0.71 [0.4804]	-1.27 [0.2042]	-0.89 [0.3749]	-1.48 [0.1389]	-0.7 [0.4816]	-0.22 [0.8227]	0.32 [0.7478]	-0.94 [0.3447]	-0.64 [0.5216]

diversified financial institutions, higher idiosyncratic default risk aggravates the risk of four sectors (namely, consumer staples, materials, telecommunication, and energy) in down markets.

Table 27 reveals the estimation coefficients for five industry groups constituting the consumer discretionary sector. An intriguing result relates to the direct relationship between the idiosyncratic default risk of consumer services companies and the financial sector risk. An increase in the consumer services firms' odds of insolvency generate higher distress in the financial sector during both up and down-market cycles. We further notice a similar pattern in the case of retailing companies. The only difference is that the systemic influence of consumer services firms' default risk on the financial sector is more pronounced under bearish market conditions while the opposite is valid with respect to the default risk structure of retailing companies. Automobiles and components firms' and consumer durables companies' default risk appear to directly influence financial sector risk in a negative way as well. However, this holds only in up markets.

When the market follows a downward trend, an increase in the default risk of automobiles and components companies and consumer services firms directly induces the information technologies sector risk whereas the latter is enhanced if the consumer durables firms' default risk augments in up markets. Materials sector risk rises due to higher levels of idiosyncratic default risk of both automobiles and components firms and retailing companies in up cycles. Utilities sector risk is tied to the idiosyncratic default risk of firms within the media and retailing industries. During down-market states, an increase in the idiosyncratic default risk of media and retailing firms leads to higher levels of utilities sector risk. Greater probability of default of a media company intensifies sector-wide risks in the telecommunications sector in up markets. The same pattern manifests itself when the idiosyncratic default risk of the consumer services firms augments. The latter also possesses an unfavorable impact on the

Table 27. Industry-to-sector systemic default risk: industry groups within the consumer discretionary sector.

Panel A. Automobiles & Components Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.49 (-1)	-1.02 (-1.25)	1.65 (1.02)	-0.40 (-1.44)	0.41 (1.02)	-0.19 (-0.56)	-0.02*** (-3.17)	-0.24 (-1.59)	0.03 (1.04)	-0.79 (-1.04)	2.97 (1.01)	0.74 (1.01)
Z-score(-1)* Up	-0.58 (-1.61)	-0.18* (-1.86)	0.20 (0.45)	-0.07 (-0.88)	0.20 (0.28)	-0.06 (-1.19)	-0.13 (-0.78)	-0.13* (-1.67)	0.07 (0.76)	-0.02 (-0.75)	-0.03 (-0.25)	0.03 (0.21)
CD Test	-1.38 [0.1672]	-1.07 [0.2845]	-0.79 [0.43]	-0.06 [0.9513]	-0.65 [0.5147]	-1.42 [0.1555]	-0.75 [0.4519]	-1.49 [0.1363]	-0.77 [0.4388]	-1.39 [0.1631]	-0.41 [0.6795]	0.26 [0.7946]
Panel B. Consumer Services Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.31 (-1.1)	-0.68* (-1.66)	-0.17 (-1.35)	0.04 (0.23)	0.31 (1.29)	-0.11 (-1.51)	-0.14* (-1.75)	0.13 (1.27)	-0.07* (-1.81)	-0.16* (-1.66)	-0.08 (-1.06)	0.21 (1.33)
Z-score(-1)* Up	-0.11 (-1.3)	-0.29* (-1.72)	0.38 (1.03)	0.33 (0.63)	0.02 (0.36)	0.04 (0.41)	-0.03 (-0.4)	-0.12 (-0.45)	0.23 (0.66)	-0.58 (-1.04)	0.03 (0.41)	-0.13 (-1.03)
CD Test	-0.48 [0.6295]	-1.13 [0.2601]	1.32 [0.1852]	0.69 [0.4888]	-0.33 [0.7437]	-0.99 [0.3208]	0.68 [0.4997]	-0.76 [0.4455]	-0.82 [0.4105]	0.45 [0.6505]	-0.25 [0.8022]	-1.22 [0.2216]
Panel C. Consumer Durables and Apparel Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.00 (-0.01)	-0.53 (-0.87)	-0.52*** (-2.76)	-0.34 (-0.77)	-0.30* (-1.67)	0.14 (0.66)	-0.07 (-0.58)	0.04 (0.99)	-0.16 (-0.54)	0.02 (0.2)	0.26 (1.49)	-0.14 (-1.34)
Z-score(-1)* Up	-0.07 (-0.31)	-0.93* (-1.69)	-0.61 (-1.63)	-0.20 (-0.38)	-0.12 (-0.99)	-1.13 (-0.92)	-0.62* (-1.75)	-0.75 (-1.61)	-0.29 (-1.34)	-4.71 (-1.03)	-0.82 (-0.22)	0.00 (0.01)
CD Test	-1.32 [0.1868]	-0.76 [0.4482]	-1.04 [0.2985]	-1.27 [0.2057]	-0.55 [0.5803]	1.22 [0.2215]	-1.64 [0.1014]	0.11 [0.9152]	-0.96 [0.336]	-1.11 [0.2669]	0.31 [0.76]	-0.74 [0.4612]

Panel D. Media Industry

Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	0.14 (1.35)	-0.36 (-0.85)	-0.01 (-0.21)	0.28 (1.26)	0.06 (0.22)	-0.03 (-0.85)	-0.29 (-1.42)	-0.00 (-0.08)	-0.10 (-0.43)	-0.05* (-1.72)	-0.03* (-1.9)	-0.05 (-0.66)
Z-score(-1)* Up	-0.83 (-1.11)	1.91 (0.45)	0.01 (0.03)	1.13 (1.32)	-0.59 (-0.75)	0.11 (1.27)	-0.34 (-1.19)	-0.50 (-0.4)	0.00 (0.06)	-0.12 (-0.53)	-0.21 (-1.28)	0.07 (0.31)
CD Test	0.09 [0.9272]	-1.21 [0.2259]	-0.36 [0.7206]	-0.06 [0.9493]	-0.42 [0.6735]	-0.22 [0.8266]	-1.26 [0.2089]	-1.29 [0.1974]	0.61 [0.5444]	-0.8 [0.4251]	-1.42 [0.1558]	-1.39 [0.1633]

Panel E. Retailing Industry

Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.15* (-1.93)	-0.20* (-1.82)	-0.03 (-0.42)	0.37 (1.02)	-0.04* (-1.92)	0.09 (1.41)	-0.04 (-0.34)	-0.16 (-1.17)	-0.19 (-1.1)	-0.13 (-1.6)	-0.10* (-1.69)	-0.04 (-0.28)
Z-score(-1)* Up	0.03 (0.06)	-0.34* (-1.66)	1.04 (1.1)	0.26 (0.72)	-1.00 (-1)	-0.11 (-1.53)	0.70 (0.78)	-0.29* (-1.65)	0.06 (0.2)	-0.08 (-0.2)	1.33 (1.07)	-0.10 (-0.17)
CD Test	-0.81 [0.4174]	-0.83 [0.4045]	-0.43 [0.6646]	-0.22 [0.8236]	-0.73 [0.4641]	0.08 [0.9352]	-1.39 [0.1654]	1.57 [0.1169]	-1.43 [0.1523]	-1.12 [0.2634]	-0.99 [0.3229]	0.03 [0.976]

companies within the real estate sector. That is, an increase in the consumer services firm's default risk puts more pressure on the companies within the real estate sector. The risk of consumer staples sector is directly affected by higher odds of idiosyncratic default of both retailing and consumer durables companies when market follows an upward trend. Industrials sector risk deepens as the default risk of consumer durables firms heightens in, again, solely up markets.

The systemic characteristics of the default risk of firms within three distinct industry groups associated with the consumer staples sector vis-à-vis the other sectors is examined in Table 28. An increase in the food, beverage, and tobacco (FBT) companies' default risk causes higher distress on the materials and energy sector whereas a rise in the default risk of household and personal product companies puts more pressure on financials, health care, materials, and energy sector during only down markets. Higher odds of food and staples retail firm's default directly impacts the companies within the energy sector by inducing higher sector-wide risks under both up and down-market conditions. Financials, health care, information technologies, and real estate sector risk is intensified by an increase in the default risk of food and staples retail firms solely when the market follows an upward trend. The magnitude of z-score coefficients in Panel C show also that the financial sector is the most affected sector by higher levels of default probability of food and staples retail companies. Overall, an increase in the food, beverage, and tobacco firms' and household and personal product companies' default risks have an adverse effect on several sectors predominantly in down markets while higher odds of food and staples retail firm's default generate higher distress on various sector mainly in up markets.

Table 28. Industry-to-sector systemic default risk: industry groups within the consumer staples sector.

Panel A. Food, Beverage and Tobacco Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.45 (-0.62)	-0.61 (-1.39)	0.04 (0.36)	-0.04 (-1.12)	-0.38*** (-2.66)	-0.16 (-1.08)	0.15 (0.98)	-0.07* (-1.71)	0.17 (1.2)	-0.32 (-1.35)	0.17 (1.62)	-0.14* (-1.86)
Z-score(-1)* Up	-0.61** (-2.31)	0.28 (1.11)	0.48 (0.46)	0.31 (1.15)	-0.71 (-0.45)	-0.57 (-0.94)	0.45 (1.53)	-0.95 (-0.85)	0.12 (0.56)	-0.71 (-1.3)	-1.18 (-1.18)	-0.73 (-0.6)
CD Test	1.61 [0.1064]	-1.02 [0.3077]	0.62 [0.5335]	-0.33 [0.7409]	0.56 [0.5774]	-0.33 [0.7433]	-1.08 [0.2801]	-0.19 [0.8503]	-0.95 [0.3401]	-0.57 [0.5658]	-1.17 [0.244]	-0.38 [0.7017]
Panel B. Food and Staples Retail Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	0.01 (0.05)	-0.45 (-0.95)	-0.58 (-1.03)	-0.23 (-1.53)	0.73 (1.02)	0.18 (0.82)	0.09 (0.77)	0.26 (1.17)	0.15 (1.35)	0.07 (0.2)	0.06 (0.46)	-0.01** (-2.51)
Z-score(-1)* Up	-0.02 (-0.18)	-0.038** (-2.05)	-0.04 (-0.1)	-0.08 (-0.36)	-0.04 (-0.13)	-0.01* (-1.79)	-0.12** (-2.23)	-0.09 (-1.06)	-0.00* (-1.65)	-0.41 (-1.13)	0.17 (1.3)	-0.01* (-1.73)
CD Test	-1.24 [0.2158]	1.59 [0.1109]	0.06 [0.9534]	-0.55 [0.5807]	0.34 [0.7353]	1.18 [0.2398]	-0.01 [0.9951]	-0.79 [0.4297]	-1.4 [0.162]	-1.41 [0.1592]	1.25 [0.213]	-0.18 [0.8571]
Panel C. Household and Personal Products Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	0.13 (0.41)	-0.35*** (-3.14)	-0.08 (-0.6)	-0.12 (-1.14)	-0.23*** (-2.85)	-0.00** (-2.18)	-0.09 (-0.39)	-0.01** (-2.33)	-0.15 (-1.35)	-0.22 (-1.47)	-0.07 (-0.77)	-0.12** (-2.37)
Z-score(-1)* Up	-0.16** (-2.5)	0.21 (0.61)	-0.91 (-1.1)	-1.17 (-1.07)	-0.20*** (-2.61)	-0.03 (-0.32)	0.65 (0.95)	-0.03 (-1.43)	-0.82 (-1.36)	-0.18 (-0.75)	2.01 (0.94)	-0.55 (-1.22)
CD Test	-0.52 [0.6028]	1 [0.3188]	-1.49 [0.1351]	-1.52 [0.1294]	-0.92 [0.3592]	-0.91 [0.3612]	-0.73 [0.4647]	-1.24 [0.216]	-1.63 [0.1034]	-0.33 [0.7447]	-1.44 [0.1485]	-1.42 [0.1543]

In Table 29, we detect a direct relationship between idiosyncratic default risk of health care equipment and services companies and the energy sector risk in down markets. That is an increase in the health care equipment and services companies' default probability elevates the sector-wide risks in the energy sector when the market follows a downtrend. In uptrend periods, on the other hand, higher default risk of health care equipment and services firms puts more pressure on the firms associated with the materials sector leading to an increase in the sector-wide risk in this sector. An increase in the default risk of pharmaceuticals, biotechnology, and life sciences companies has an unfavorable influence on the materials sector as well, however, this effect manifests itself only in down markets. Although to a lesser degree, the detrimental impact of higher default risk of pharmaceuticals, biotechnology, and life sciences companies on the information technologies sector proves significant when the market follows a downward trend. A rise in the odds of pharmaceuticals, biotechnology, and life sciences companies' default leads to an increase in the utilities sector-wide risk in uptrend periods.

Table 30 depicts whether an increase in the default risk of firms affiliated with the capital goods, commercial and professional services, and transportation industry groups may destabilize various sectors other than industrials sector itself. Higher odds of capital good firms' insolvency induce distress in financial firms throughout up and down markets whereas an increase in the default risk of commercial and professional services, and transportation companies leads to greater financial sector-wide risk only in downtrend periods. The detrimental impact of higher default risk of capital goods companies on the financial sector proves greater in up markets relative to down markets. Consumer staples sector risk rises when the default risk of capital goods and transportation companies heightens. This is valid under up market conditions. Higher default probability of capital goods and transportation firms also causes greater distress in the companies associated with materials sector leading to

Table 29. *Industry-to-sector systemic default risk: industry groups within the healthcare sector.*

Panel A. Health Care Equipment and Services Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.15** (-2.08)	-0.42 (-0.71)	0.00 (0.1)	-0.08 (-1.62)	0.02 (0.44)	-0.00 (-0.06)	0.01 (0.28)	-0.04 (-1.24)	0.08 (0.89)	-0.05 (-1.08)	-0.10 (-0.71)	-0.03* (-1.73)
Z-score(-1)* Up	-0.42 (-1.42)	0.19 (0.4)	-0.16 (-0.38)	-0.43 (-1.23)	0.06 (0.91)	-0.21* (-1.68)	-0.10 (-0.56)	-0.15* (-1.82)	-0.01 (-0.05)	0.03 (0.16)	-0.00 (-0.01)	-0.51 (-0.98)
CD Test	-1.49 [0.1353]	-0.87 [0.3829]	-0.59 [0.5535]	-1.23 [0.2197]	-1.23 [0.2173]	-0.55 [0.5828]	0.09 [0.925]	-0.95 [0.3446]	-1.14 [0.2558]	0.15 [0.8838]	-0.47 [0.6392]	-1.32 [0.1866]
Panel B. Pharmaceuticals, Biotechnology & Life Sciences Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.03 (-0.55)	-0.04 (-0.96)	-0.01 (-0.2)	-0.04 (-0.93)	-0.01 (-0.99)	-0.08** (-1.98)	-0.02** (-2.02)	-0.06* (-1.77)	-0.03 (-0.71)	-0.00 (-0.18)	0.02 (0.68)	0.01 (0.4)
Z-score(-1)* Up	-0.01 (-0.24)	-0.03 (-0.79)	-0.07 (-1.53)	0.01 (0.46)	0.01 (0.85)	-0.24 (-1.11)	-0.09 (-0.94)	0.02 (0.71)	0.01 (0.32)	-0.00 (-0.07)	-0.03* (-1.7)	0.01 (0.24)
CD Test	0.06 [0.9539]	0.07 [0.9432]	-1.38 [0.1688]	-0.99 [0.3244]	-0.86 [0.3917]	-0.89 [0.3741]	-1.26 [0.206]	0.61 [0.5406]	0.48 [0.6307]	-1.4 [0.1619]	-0.61 [0.5387]	0.19 [0.848]

Table 30. Industry-to-sector systemic default risk: industry groups within the industrials sector.

Panel A. Capital Goods Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrial s Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Material s Beta	DCC-Real Estate Beta	DCC-Teleco m Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.37** (-2.31)	-0.31** (-2.02)	-0.17* (-1.79)	0.12 (0.92)	0.03 (0.19)	-0.07 (-0.22)	0.26 (0.6)	-0.04* (-1.76)	0.00 (0.02)	-0.04 (-0.53)	-0.10 (-1.12)	-0.01 (-0.26)
Z-score(-1)* Up	0.64 (0.21)	-0.93* (-1.95)	-0.49 (-0.69)	-0.39 (-0.44)	-0.12* (-1.84)	0.02 (0.35)	0.04 (0.79)	0.47 (0.55)	-0.05 (-1.16)	0.52 (0.39)	-0.02 (-0.11)	-0.63 (-0.56)
CD Test	-0.03 [0.9746]	0.79 [0.4281]	0.3 [0.7668]	0.01 [0.9906]	-1.4 [0.1621]	-0.89 [0.3708]	-1.17 [0.2437]	-0.85 [0.3976]	-1.24 [0.2152]	-1.49 [0.136]	-1.46 [0.1436]	-0.21 [0.836]
Panel B. Commercial and Professional Services Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrial s Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Material s Beta	DCC-Real Estate Beta	DCC-Teleco m Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.15 (-0.9)	-0.14* (-1.81)	-0.01* (-1.83)	-0.03 (-0.46)	0.01 (0.38)	0.43 (1.4)	-0.05 (-0.71)	-0.13 (-1.27)	-0.01 (-0.42)	0.04 (0.37)	-0.11 (-1.43)	0.00 (0.15)
Z-score(-1)* Up	0.67 (1.16)	-0.32 (-0.8)	-0.03 (-0.41)	-0.12** (-2.27)	0.13 (0.65)	0.09 (1.01)	-0.24* (-1.73)	0.20 (0.66)	0.04 (0.88)	0.57 (0.84)	0.12 (0.5)	0.13 (0.65)
CD Test	-0.63 [0.5255]	-1.48 [0.1382]	-1.42 [0.1567]	-0.99 [0.321]	-1.59 [0.1127]	-0.44 [0.662]	-0.78 [0.4339]	0.22 [0.8232]	-1.23 [0.2177]	-0.75 [0.450]	0.86 [0.39]	-0.51 [0.6109]
Panel C. Transportation Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrial s Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Material s Beta	DCC-Real Estate Beta	DCC-Teleco m Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.04 (-0.23)	-0.22* (-1.82)	-0.04 (-0.67)	0.17 (1)	-0.40 (-1.34)	-0.04 (-0.5)	-0.00 (-0.01)	-0.04** (-2.3)	-0.01 (-0.14)	0.02 (0.38)	-0.07 (-0.87)	-0.02 (-0.23)
Z-score(-1)* Up	-0.57* (-1.79)	-0.00 (-0.02)	0.51 (1.12)	0.87 (1.31)	-0.09** (-2.05)	0.29 (0.79)	0.16 (0.48)	0.09 (0.37)	-0.87 (-1.04)	-0.35 (-1.47)	0.47 (1.51)	1.13 (1.21)
CD Test	-0.87 [0.3869]	-0.67 [0.5041]	-0.98 [0.3256]	-1.28 [0.1994]	1 [0.3159]	-0.79 [0.4316]	-0.59 [0.5533]	-1.57 [0.1164]	0.96 [0.3382]	-1 [0.315]	-0.1 [0.9209]	-0.93 [0.3528]

higher levels of sector-wide risk, but only during down markets. When the market follows an upward trend, an increase in the default risk of commercial and professional services firms puts more pressure on the information technologies sector. The latter is the most affected sector by increased levels of commercial and professional services firms' default risk in up markets.

The systemic components of the default risk of technology hardware and equipment companies as well as that of the software and services firms are presented in Table 31¹⁷. We note that higher default risk of technology hardware and equipment companies generate greater sector-wide risk in consumer staples sector through both up and down markets. An increase in the odds of technology hardware and equipment firms' insolvency induce distress in health care sector only when the market follows a downward trend. In uptrend periods, on the other hand, a rise in the technology hardware and equipment companies' default risk adversely affects four sectors in the market. These are consumer discretionary, materials, telecommunication, and energy sectors. As for software and services firms, higher probability of default leads to greater distress in telecommunication sector in down markets whereas it significantly induces sector-wide risk in the consumer discretionary sector during only up markets.

Firms affiliated with the remaining five industry groups, namely, materials, energy, real estate, telecommunication, and utilities, also constitute the respective sector groups. The results for these industry groups (or sectors) are displayed in Table 32. An increase in the materials firms' default risk rises consumer discretionary sector risk in down markets while it heightens health care and real estate sector risks during up markets. Financials sector is adversely affected by a rise in the energy firms' default probability when the market follows a downward trend. In up markets, however, higher odds of insolvency of energy companies

¹⁷ The analysis of semiconductor companies' default risk with respect to its impact on the sectors other than information technologies is unavailable due to insufficient dcc-beta values in several sectors.

Table 31. *Industry-to-sector systemic default risk: industry groups within the information technologies sector.*

Panel A. Technology Hardware and Equipment Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.07* (-1.72)	-0.12 (-0.92)	0.06 (0.41)	-0.09 (-0.42)	-0.07* (-1.68)	-0.02** (-2.35)	-0.07* (-1.79)	-0.08 (-1)	-0.49 (-1.1)	0.09 (1.05)	-0.01 (-1.29)	-0.04 (-0.25)
Z-score(-1)* Up	-0.04 (-0.81)	0.00 (0.11)	0.07 (0.95)	-0.07** (-2.54)	-0.05** (-2.29)	-0.00 (-0.12)	-0.01 (-0.63)	-0.03** (-2.25)	-0.00 (-0.13)	-0.04** (-1.97)	0.01 (0.32)	-0.10* (-1.85)
CD Test	0.8 [0.4248]	-1.32 [0.1882]	0.19 [0.8512]	-0.51 [0.6112]	-0.8 [0.4253]	-1.51 [0.1306]	-1.25 [0.2113]	0.1 [0.9212]	-1.01 [0.3103]	-0.98 [0.3292]	1.25 [0.2104]	-1.32 [0.188]
Panel B. Software and Services Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	0.03 (0.24)	0.19 (0.52)	0.01 (0.18)	-0.14 (-0.76)	0.10 (0.91)	0.11 (1.07)	-0.10* (-1.71)	0.03 (0.69)	0.07 (1.57)	-0.01** (-2.09)	-0.06 (-0.47)	0.11 (1.08)
Z-score(-1)* Up	0.25 (0.95)	-0.88 (-1.19)	0.09 (0.08)	-0.28** (-2.35)	0.28 (1.51)	-0.12 (-0.73)	-1.22 (-0.95)	-0.36 (-0.88)	-0.31 (-0.75)	-0.13 (-0.44)	-0.04 (-0.59)	-0.09 (-1.1)
CD Test	0.37 [0.709]	-0.31 [0.7535]	-0.42 [0.6751]	0.53 [0.5975]	-0.9 [0.3661]	-1.14 [0.2557]	-0.21 [0.833]	1.02 [0.3089]	-1.36 [0.1743]	0.57 [0.5658]	-0.42 [0.6747]	-1.24 [0.2159]

generate higher distress in consumer discretionary, health care, materials, and real estate sectors. We detect a direct relationship between the idiosyncratic default risk of real estate companies and the sector-wide risk of both consumer discretionary and telecommunications sectors. This is valid solely under up market conditions. As for telecommunication firms, higher idiosyncratic default risk of these companies induces greater risk in financial, utilities and energy sectors in downtrend periods. Finally, an increase in the default risk of utilities companies directly influences health care sector risk under down market conditions whereas it directly affects industrials and materials sector risks in up markets. That is, an increase in the default risk of utilities companies puts more pressure on these sectors. In addition, telecommunications sector risk rises due to higher default risk of utilities companies through both up and down-market states.

Table 32. Industry-to-sector systemic default risk: materials, energy, real estate, telecommunication, and utilities industries (or sectors).

Panel A. Materials Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industrials Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-2.1 (-0.39)	-0.27 (-1.04)	0.16 (0.37)	-0.16* (-1.71)	0.14 (0.51)	-0.24 (-0.84)	0.08 (0.85)	0.01 (0.05)	-0.47 (-0.85)	-0.28 (-1.43)	0.17 (0.44)	-0.22 (-0.54)
Z-score(-1)* Up	0.35 (1.47)	-0.06 (-0.25)	-0.08 (-0.79)	0.03 (0.4)	0.02 (0.47)	-0.09* (-1.69)	-0.11 (-1.34)	-0.48 (-1.62)	-0.26* (-1.66)	0.08 (1.09)	-0.19 (-1.1)	0.04 (0.52)
CD Test	0.17 [0.8683]	-0.99 [0.3211]	0.33 [0.7413]	-0.71 [0.4784]	-0.22 [0.8273]	-1.38 [0.1682]	-0.07 [0.9479]	-0.1 [0.9216]	1.22 [0.2216]	-0.89 [0.3734]	-0.75 [0.4548]	0.42 [0.6743]
Panel B. Energy Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industry Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.31* (-1.78)	-0.43* (-1.82)	-0.23 (-1.48)	-0.54 (-0.87)	-0.04 (-0.24)	-0.03 (-0.28)	0.13 (1.37)	0.03 (0.29)	-0.05 (-0.92)	-0.07 (-0.85)	0.06 (0.7)	-0.12* (-1.91)
Z-score(-1)* Up	-0.23 (-1.21)	-0.29 (-1.47)	0.1 (0.81)	-0.08* (-1.86)	0.02 (0.55)	-0.05* (-1.71)	0.09 (0.81)	-0.04* (-1.74)	-0.09* (-1.68)	-0.01 (-0.46)	0.05 (0.94)	-0.11 (-0.8)
CD Test	-0.23 [0.8169]	-0.04 [0.9697]	0.93 [0.3535]	-1.05 [0.2929]	-0.47 [0.6363]	-0.09 [0.9312]	-1.34 [0.179]	-1.04 [0.2964]	-0.44 [0.6634]	0.72 [0.4696]	1.55 [0.122]	1.32 [0.1869]
Panel C. Real Estate Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industry Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.17 (-1.18)	-0.45 (-0.83)	0.33 (0.64)	-0.1 (-0.04)	-0.24 (-0.91)	-0.14 (-0.96)	-0.58 (-1.61)	-0.12 (-1.18)	-1.21 (-0.69)	-1.32 (-0.51)	-0.23 (-0.66)	-0.35 (-0.08)
Z-score(-1)* Up	-0.05 (-0.06)	0.22 (1.62)	0.96 (1.53)	-0.40** (-2.01)	-0.11 (-1.27)	0.07 (0.99)	0.16 (1.2)	-0.09 (-0.47)	-0.05 (-0.31)	-0.24** (-2.41)	-0.05 (-0.79)	-0.22 (-0.5)
CD Test	-0.62 [0.5383]	-0.7 [0.4855]	-0.96 [0.3391]	0.82 [0.4118]	-1.15 [0.2483]	-1.02 [0.3087]	-1.02 [0.31]	-1.27 [0.2026]	-0.27 [0.7875]	-0.84 [0.4018]	0.13 [0.9004]	0.78 [0.4379]

Panel D. Telecommunication Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industry Beta	DCC-Consumer Disc. Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecom Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.06 (-0.12)	-0.06** (-2.19)	-0.22 (-0.5)	-0.04 (-0.1)	0.00 (-0.03)	-0.57 (-1.16)	-0.54 (-1.25)	-0.38 (-0.89)	-0.93 (-1.22)	-0.31* (-1.9)	-0.14** (-2.07)	-0.16* (-1.7)
Z-score(-1)* Up	-0.64 (-0.68)	-0.09 (-0.49)	-0.01 (-0.03)	0.18 (1.16)	-0.07 (-1.09)	0.38 (1.5)	0 (-0.02)	-0.3 (-1.13)	-0.37 (-1.1)	0.25 (1.23)	-0.05 (-0.31)	-0.48 (-1.01)
CD Test	-0.82 [0.4132]	-1.5 [0.1326]	-0.6 [0.5495]	-0.49 [0.6216]	-1.21 [0.2262]	-1.53 [0.1248]	-0.12 [0.9082]	-0.25 [0.8059]	-0.34 [0.7327]	-1.15 [0.2494]	-1.49 [0.1373]	-0.12 [0.9052]
Panel E. Utilities Industry												
Variables	DCC-Market Beta	DCC-Financials Beta	DCC-Industry Beta	DCC-Consumer Discretionary Beta	DCC-Consumer Staples Beta	DCC-Health Care Beta	DCC-IT Beta	DCC-Materials Beta	DCC-Real Estate Beta	DCC-Telecommunication Beta	DCC-Utilities Beta	DCC-Energy Beta
Z-score(-1)* Down	-0.01 (-0.03)	-0.23 (-0.54)	-0.56 (-1.06)	-0.83 (-1.48)	0.19 (1.12)	-0.31* (-1.68)	-0.01 (-0.06)	-0.34 (-0.87)	-0.12 (-1.35)	-0.39** (-2.1)	-0.06 (-0.24)	-0.09 (-0.49)
Z-score(-1)* Up	-0.14 (-0.57)	-0.05 (-0.46)	-0.6* (-1.79)	0.09 (0.53)	-0.11 (-0.69)	-0.11 (-0.99)	-0.08 (-0.43)	-0.02** (-2.2)	-0.04 (-0.92)	-0.35* (-1.65)	0.43 (0.65)	-0.1 (-0.84)
CD Test	1.24 [0.2163]	-1.09 [0.2773]	1.02 [0.306]	-1.41 [0.1578]	-0.91 [0.3645]	-1.11 [0.267]	0.47 [0.6378]	1.44 [0.1497]	0.83 [0.4076]	1.31 [0.1897]	0.49 [0.6258]	1.28 [0.2005]

6. Conclusion

This study investigates the systematic and systemic components of the financial and non-financial institutions' default risk considering up and down-market states. We do not only consider the differences between the financial and non-financial institutions' default risk structure but also disentangle between sector-wide and industry-wide systemic default risks when conducting our analyses. We detect significant heterogeneity among the default risk structure of various industry groups. More specifically, the default probability of institutions affiliated with certain industry groups is more strongly linked to industry-wide risks while others are more heavily tied to sector-wide risks. We further show that systematic and systemic components of default risk alter also relative to up/down market cycles for each industry group. That is, the default risk of companies associated with certain industry groups proves systematic in both uptrends and downtrends whereas others induce the market risk during only bullish or bearish market states.

We identify banking, diversified financials, and insurance institutions' default risk to be systematic during both up and down-market conditions. Yet, an increase in the default risk of these financial institutions puts more pressure on the entire market in down market cycles. This finding emphasizes the unique systematic importance of financial institutions.

Retailing, health care equipment and services, capital goods, semi-conductors and semiconductor equipment, technology hardware and equipment, and energy companies' default risk proves to be systematic solely under down market conditions. On the other hand, food, beverage and tobacco, household and personal products, and transportation firms' default risk is systematic only during uptrend periods. The switching importance of the default risk of these companies highlights the differences between the roles of these

institutions within an economy. It also points out to the possible sources of contagion risk under various market states.

Our systemic default risk analyses provide interesting results as well. We find evidence of significant heterogeneity among the default risk structure of various industry groups within the same sector. For instance, an increase in a bank's default risk has a greater effect on banking industry in comparison to that of on the entire financial sector. However, an increase in the default risk of a diversified financials company puts more pressure on the financial sector but causes relatively less distress in the diversified financials industry group during both up and down-market states.

As for the insurance firms, industry-wide systemic default risk proves stronger than sector-wide systemic risk during up markets while this relationship inverts so that, under bull market conditions, an increase in the default risk of an insurance firm aggravate sectoral systemic risk more than industrial systemic risk. These findings, along with other instances in various industry groups, reveal a multi-layered structure of the idiosyncratic default risk.

We further consider the possible impact of an institution's default risk belonging to a specific industry group on the sectors other than its own and find that an increase in the default risk of various industry groups can in fact destabilize one or more sectors. To illustrate, we identify industrials, information technologies, and real estate (consumer discretionary) as sectors which are directly affected by an increase in the idiosyncratic bank (diversified financials) risk. Higher default probability of insurance firms generates greater systemic risk in the entire industrials sector. These results are valid through both up and down-market cycles. We further determine that an increase in the consumer services, retailing, and capital goods companies' default risk have an adverse impact on the financial sector risk in both up and down markets. All combined, we note that the stability of firms within specific industry groups matter more

than others for the health of an economy and the wealth of its participants, regardless of the market state while others carry weight with respect to market cycles.

The sector-wise decomposition of financial markets differs from one another. If an increase in the default risk of institutions associated with specific industry groups induce the risk of the predominant sectors, the failure of such institutions may cause further harm and destabilize the market. We show that higher idiosyncratic default risk of institutions belonging to several industry groups induces information technologies, consumer discretionary, and industrials sectors' risk. Considering these three sectors form approximately 15%, 18% and 24% of our sample, we emphasize the significance of several non-financial industry groups (i.e., consumer durables and apparel, food and staples retail, energy) besides the financial ones for the market functioning. Consequently, our findings on the direct linkages between idiosyncratic default risk and systematic and systemic risks among financial and non-financial firms provide valuable insights for investors as well as policy makers.

Although we consider the distinction between several sectors and industry groups in our analyses of the default risk structure, we note that the classification of sector and industry groups changes through time. Thus, we believe further research in this area would contribute to the literature and reveal the evolution of the systematic and systemic importance of firms within various industries. We also suggest that more research is needed to detect the impact of specific regulations in relevant industry groups on the systematic and systemic default risks.

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Appendix A.

Table A1. Systematic and industry-wise systemic components of banks' default risk.

Banking Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC- Industry Beta
Constant	1.0414 (0.88)	-5.8002 (-1.09)	-5.671* (-1.73)	-3.8676 (-0.74)	1.2761 (0.74)	-4.6695 (-0.98)
Down Market	5.4018** (2)	-12.315 (-1.39)	8.0888* (1.87)	-13.7248 (-1.39)	-3.5843 (-0.63)	7.8431 (1.44)
DCC Beta(-1)*Down Market	0.1497 (0.96)	0.695 (1.03)	0.007 (0.01)	-0.8465 (-0.71)	-1.8999 (-1.24)	0.3402 (1.04)
DCC Beta(-1)*Up Market	0.1405*** (2.92)	0.1336** (2)	0.1246 (1.09)	0.1579** (2.04)	0.1479*** (2.87)	0.1796*** (2.61)
Z-score*Down Market	-0.3089* (-1.74)	-0.6111** (-2.09)	-0.1944* (-1.71)	-0.6138** (-2.16)	-0.1703* (-1.72)	-0.5287* (-1.84)
Z-score*Up Market	-0.0817* (-1.78)	-0.2659* (-1.66)	-0.1667** (-2.44)	-0.2458* (-1.91)	-0.1072** (-2.08)	-0.1956* (-1.75)
Market Cap*Down Market	-0.8283* (-1.8)	1.3053 (1.02)	0.128 (0.26)	2.3715 (1.11)	0.1135 (0.2)	0.3857 (0.53)
Market Cap*Up Market	-0.121 (-0.75)	-0.3695* (-1.73)	0.7316* (1.79)	0.8255 (1.11)	-0.0885 (-0.5)	0.655 (1.03)
Debt to Asset Ratio*Down Market	6.9918 (0.95)	-16.5147 (-0.49)	-3.8552* (-1.96)	0.952 (0.25)	2.6781 (1.31)	-3.5365 (-0.5)
Debt to Asset Ratio*Up Market	-0.0335 (-0.06)	7.1575** (1.98)	4.6635 (1.19)	0.1496* (1.84)	-0.3521 (-0.52)	-0.13 (-0.15)
Cost/Income Ratio*Down Market	0.579 (1.19)	-0.9025 (-1.1)	0.0287 (0.13)	-1.627 (-0.71)	0.5479 (1.21)	0.5218* (1.66)
Cost/Income Ratio*Up Market	0.0647 (0.83)	0.0577 (0.95)	0.1014 (0.7)	0.0339 (0.49)	0.0809 (1.08)	0.0296 (0.69)

HHI*Down Market			-12.8835 (-0.85)	5.6005 (0.73)	-3.1042* (-1.68)	8.0451 (0.82)
HHI*Up Market			2.8693 (0.5)	11.5408* (1.67)	9.1657* (1.74)	2.5983 (0.55)
GDP Growth*Down Market					-15.9012** (-1.98)	-7.4062 (-0.65)
GDP Growth*Up Market					0.9975 (0.22)	15.7784* (1.91)
Inflation*Down Market					-0.2718 (-0.61)	-0.133 (-0.39)
Inflation*Up Market					-0.0035 (-0.12)	0.0941** (2.11)
CD Test	-0.27 [0.7839]	1.07 [0.2861]	-0.78 [0.4328]	1.49 [0.137]	0.06 [0.9491]	0.47 [0.6363]

Table A2. Systematic and industry-wise systemic components of default risk in diversified financials industry.

Diversified Financials Industry	Model 1		Model 2		Model 3	
	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	1.5882* (1.69)	-3.7895** (-2.13)	-2.5343* (-1.83)	-3.6178** (-2.08)	1.2486 (0.8)	0.9482 (0.39)
Down Market	2.2324 (1.52)	-1.4976 (-0.59)	6.1823 (0.73)	2.9274 (0.75)	3.5844 (0.36)	-3.2664 (-0.75)
DCC Beta(-1)*Down Market	0.329 (0.33)	0.0503 (0.23)	0.2296 (0.23)	-1.045 (-0.97)	-1.7164 (-1.14)	0.6774 (0.79)
DCC Beta(-1)*Up Market	-0.3804** (-2.04)	-0.3607** (-2.04)	-0.0497 (-0.38)	-0.2361** (-2.26)	-0.6192* (-1.77)	-0.162* (-1.91)
Z-score*Down Market	-0.6425* (-1.73)	-0.921** (-2.27)	-0.5092* (-1.75)	-0.9205** (-2.07)	-0.3282* (-1.94)	-0.8017* (-1.78)
Z-score*Up Market	-0.2359* (-1.82)	-0.2791* (-1.83)	-0.1474** (-2.18)	-0.1851** (-2.07)	-0.0254** (-2.06)	-0.1259* (-1.82)
Market Cap*Down Market	-1.2069* (-1.65)	0.6042** (2.24)	-1.2039*** (-2.93)	-0.7318 (-0.52)	0.366 (0.31)	0.6474 (1.27)
Market Cap*Up Market	0.6784 (1.53)	0.144 (1.14)	0.5764* (1.79)	0.3665 (0.66)	-0.2911 (-1.4)	0.0769 (0.31)
Debt to Asset Ratio*Down Market	-14.3355 (-1.49)	12.8805 (1.06)	-3.3522 (-0.28)	-13.2847 (-1.25)	4.7756 (0.93)	0.4684 (0.12)
Debt to Asset Ratio*Up Market	4.3203* (1.75)	1.0525* (1.72)	-0.7486 (-0.5)	1.4554*** (2.65)	0.5339 (0.45)	1.8384*** (2.91)
Cost/Income Ratio*Down Market	-0.6326 (-1.52)	0.1075 (0.38)	-0.3218* (-1.67)	1.9215 (0.97)	-0.3797* (-1.9)	-0.0655 (-0.35)
Cost/Income Ratio*Up Market	0.5906 (1.06)	0.1723 (0.91)	0.0022 (0.1)	0.422** (2)	-0.596 (-0.85)	0.0252 (0.8)
HHI*Down Market			-0.5209	-3.5158*	-7.388	-1.4501

			(-0.1)	(-1.84)	(-0.75)	(-0.53)
HHI*Up Market			1.7304**	0.7755	2.0104**	4.2971**
			(2.21)	(0.92)	(2.11)	(2.1)
GDP Growth*Down Market					-13.84**	-9.7511
					(-2.06)	(-0.92)
GDP Growth*Up Market					-8.4006	8.721
					(-1.04)	(1.13)
Inflation*Down Market					0.3619	-0.083
					(1.27)	(-1.31)
Inflation*Up Market					-0.1268*	0.1024*
					(-1.92)	(1.76)
CD Test	0.86	0.44	0.63	1.19	-0.7	-1.46
	[0.3903]	[0.6581]	[0.5312]	[0.2354]	[0.4837]	[0.1447]

Table A3. Systematic and industry-wise systemic components of default risk in insurance industry.

Insurance Industry Variables	Model 1		Model 2		Model 3	
	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	3.3697* (1.77)	1.9597* (1.72)	2.3707* (1.95)	1.9002** (2.4)	1.2503 (1.25)	2.1093 (1.52)
Down Market	-7.7302 (-0.85)	1.9127 (0.72)	-5.4864 (-0.93)	-4.895 (-0.52)	-2.5343 (-0.25)	-14.9673 (-0.62)
DCC Beta(-1)*Down Market	0.0649 (0.15)	0.2223 (1.22)	0.004 (0.02)	1.224 (1.39)	-0.1831 (-0.89)	-0.8293* (-1.74)
DCC Beta(-1)*Up Market	0.1913* (1.8)	0.2849*** (3.05)	0.2245** (2.23)	0.2892*** (3.19)	0.2332** (2.14)	0.2944*** (2.92)
Z-score*Down Market	-0.2623* (-1.79)	-0.2888* (-1.67)	-0.1636* (-1.65)	-0.2983* (-1.78)	-0.1056* (-1.87)	-0.2589* (-1.7)
Z-score*Up Market	-0.0158** (-2.06)	-0.1035* (-1.73)	-0.0415* (-1.71)	-0.0723** (-2.43)	-0.0568* (-1.73)	-0.0742* (-1.92)
Market Cap*Down Market	-1.8481 (-1.5)	-0.4188 (-1.44)	-0.7438** (-2.11)	1.8967 (1.09)	-0.6395** (-2.16)	-0.4832* (-1.76)
Market Cap*Up Market	-0.4989** (-2.29)	-0.1681* (-1.89)	-0.2628** (-2.07)	-0.2122** (-2.46)	-0.17 (-1.54)	-0.2293* (-1.7)
Debt to Asset Ratio*Down Market	-0.3286** (-2.02)	-13.3829* (-1.85)	2.933 (0.47)	2.8558 (0.07)	-4.8838 (-0.23)	-1.7384 (-0.03)
Debt to Asset Ratio*Up Market	-0.8462 (-0.05)	-6.8345 (-1.02)	-2.5074 (-0.92)	0.9001 (0.61)	-1.3628 (-0.61)	-4.445 (-1.18)
Cost/Income Ratio*Down Market	1.0924 (1.57)	-0.0529 (-0.88)	-0.0159 (-0.27)	-0.3316 (-0.9)	0.2251* (1.84)	0.4442 (1.55)
Cost/Income Ratio*Up Market	0.0289 (0.3)	0.0155 (0.22)	0.0487 (0.78)	0.0207 (0.89)	0.036 (0.64)	0.0131** (1.98)
HHI*Down Market			4.4667	-18.3345	8.5883	-13.5027

			(1.11)	(-1.43)	(0.43)	(-1.31)
HHI*Up Market			0.5764	0.0559	1.6874*	0.5888
			(0.63)	(0.07)	(1.67)	(0.38)
GDP Growth*Down Market					5.7398*	7.9955**
					(1.74)	(2.23)
GDP Growth*Up Market					-0.4718	-3.3673
					(-0.07)	(-0.43)
Inflation*Down Market					0.1915*	0.3761*
					(1.67)	(1.79)
Inflation*Up Market					-0.0675*	-0.0471
					(-1.68)	(-0.58)
CD Test	-0.79	-0.66	-1.51	-0.92	-1.39	-1.38
	[0.4277]	[0.5088]	[0.1307]	[0.3584]	[0.1638]	[0.1687]

Table A4. Systematic and industry-wise systemic components of default risk in automobiles and components industry.

Automobiles & Components	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	0.3269 (1.41)	0.9716 (0.3)	0.4601 (1.16)	-2.6852*** (-4.11)	0.4261 (0.83)	-1.9747* (-1.66)
Down Market	-5.5446 (-0.81)	-8.9161* (-1.86)	-8.0637 (-1.05)	-4.3154 (-0.63)	-2.6027 (-1.13)	-6.1986 (-0.81)
DCC Beta(-1)*Down Market	-0.1804* (-1.88)	0.5217 (1.54)	0.096 (0.59)	0.35** (2.49)	0.0553 (0.34)	0.299 (1.48)
DCC Beta(-1)*Up Market	0.2634*** (2.84)	-0.5349* (-1.66)	0.3128*** (3.04)	-0.0815 (-1.18)	0.2115** (2.22)	-0.9201** (-2.27)
Z-score*Down Market	-5.5961 (-0.98)	-4.6974** (-2.08)	-6.2052 (-0.97)	-5.8611 (-1.02)	-1.3637 (-0.85)	-6.8133 (-1.05)
Z-score*Up Market	-0.2122* (-1.81)	-1.4035*** (-2.7)	-0.1896** (-2.43)	-0.7027* (-1.7)	-0.0052 (-0.09)	-0.4539 (-1.34)
Market Cap*Down Market	-0.1626* (-1.8)	1.6755*** (2.6)	-0.1659* (-1.65)	0.1358 (1.52)	-0.3101** (-2.2)	0.1703 (1.11)
Market Cap*Up Market	-0.0593* (-1.66)	0.2572 (1.42)	-0.0243 (-0.58)	0.1406 (1.49)	0.0021 (0.04)	0.1126 (0.88)
Debt to Asset Ratio*Down Market	11.1089 (0.99)	14.8789 (0.95)	10.4758 (0.92)	20.8926 (0.34)	9.6691 (1.06)	14.1986 (1.07)
Debt to Asset Ratio*Up Market	-0.4399 (-1.51)	1.6749 (0.4)	-0.216 (-0.6)	1.749 (1.44)	-0.0473 (-0.09)	2.2501* (1.8)
Cost/Income Ratio*Down Market	0.0433 (0.97)	-0.0244 (-0.49)	0.0304 (0.57)	0.0475 (1.05)	0.0224* (1.75)	0.0314 (0.6)
Cost/Income Ratio*Up Market	-0.0121* (-1.7)	-0.0184** (-2.16)	-0.0074 (-1.47)	0.0102 (0.9)	-0.0153 (-1.53)	0.0223 (1.3)
HHI*Down Market			5.9751**	-9.4689**	8.9419***	-10.6889**

			(2.08)	(-2.38)	(2.84)	(-2.22)
HHI*Up Market			-1.4008	8.6882**	-4.7348*	5.106
			(-0.9)	(2.14)	(-1.84)	(1.09)
GDP Growth*Down Market					0.0724**	0.0022
					(2.17)	(0.05)
GDP Growth*Up Market					-0.0212	-0.251*
					(-0.72)	(-1.79)
Inflation*Down Market					0.0894**	0.1066*
					(2.23)	(1.87)
Inflation*Up Market					-0.0178	-0.0106
					(-0.53)	(-0.17)
CD Test	-1.46	-0.61	-0.83	-1.12	-1.35	-0.8
	[0.1429]	[0.5447]	[0.4093]	[0.2633]	[0.1775]	[0.4238]

Table A5. Systematic and industry-wise systemic components of default risk in consumer durables and apparel industry.

Consumer Durables and Apparel Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	-3.0697* (-1.66)	-0.9345 (-0.77)	-1.6443* (-1.9)	-0.7428 (-0.63)	-0.8389* (-1.77)	-2.3926* (-1.66)
Down Market	2.588 (1.19)	3.4436* (1.68)	3.7142* (1.77)	5.6377** (2.24)	3.486*** (2.93)	-6.5455 (-0.85)
DCC Beta(-1)*Down Market	-0.0707 (-0.17)	0.1415 (0.88)	-0.1069 (-0.41)	0.2881** (2.11)	-0.1443 (-0.29)	0.603* (1.82)
DCC Beta(-1)*Up Market	0.6401* (1.81)	0.4712* (1.91)	0.5005* (1.76)	0.1299 (1.15)	-0.037 (-0.35)	0.0383 (0.36)
Z-score*Down Market	-0.7135 (-1.15)	0.0492 (0.3)	-0.0655 (-0.58)	0.0196 (0.08)	-0.0742 (-0.28)	0.2317 (0.53)
Z-score*Up Market	-0.2607 (-1.35)	-0.3507 (-0.6)	-0.0563 (-0.39)	-0.0257 (-0.14)	-0.0784 (-0.81)	-0.1037 (-0.91)
Market Cap*Down Market	-0.0089 (-0.04)	0.0512 (0.22)	-0.422** (-2.25)	0.196 (1.02)	-0.4499** (-2.26)	-0.1209* (-1.85)
Market Cap*Up Market	-0.2208* (-1.71)	0.4228* (1.84)	0.1635 (0.74)	0.429* (1.72)	0.1209 (0.9)	0.2112 (0.81)
Debt to Asset Ratio*Down Market	1.6832** (2.11)	-4.1324** (-2.12)	0.6957 (0.72)	-3.0766** (-2.02)	0.234 (0.2)	-5.2097** (-2.14)
Debt to Asset Ratio*Up Market	2.2056* (1.9)	2.4399 (1.03)	2.0896* (1.81)	5.3432 (0.98)	1.4748** (2.18)	-3.4298 (-1.13)
Cost/Income Ratio*Down Market	0.0007 (0.21)	-0.0259* (-1.67)	-0.0002 (-0.02)	0.0009 (0.05)	-0.0073 (-1.02)	0.0385 (0.93)
Cost/Income Ratio*Up Market	-0.181 (-1.41)	-0.0765 (-1.43)	-0.1421 (-1.32)	-0.0499* (-1.8)	-0.0084* (-1.76)	-0.0215* (-1.96)

HHI*Down Market			-2.7731 (-0.17)	-3.0516 (-0.35)	-7.5492 (-0.95)	15.3254*** (2.72)
HHI*Up Market			-6.4404* (-1.72)	7.6147** (2.01)	0.3386 (0.17)	8.3781 (1.23)
GDP Growth*Down Market					-0.2154* (-1.67)	-0.2989 (-1.06)
GDP Growth*Up Market					-0.0398 (-0.72)	-0.0955 (-0.83)
Inflation*Down Market					0.3003** (2.12)	0.6493 (0.91)
Inflation*Up Market					-0.0199 (-0.42)	0.0868 (0.9)
CD Test	-0.55 [0.5821]	-1.02 [0.307]	-1.47 [0.1429]	-1.1 [0.2695]	-1.22 [0.224]	-0.98 [0.3287]

Table A6. Systematic and industry-wise systemic components of default risk in consumer services industry.

Consumer Services Industry	Model 1		Model 2		Model 3	
	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	8.5499 (1.01)	-3.2492 (-1.29)	1.5434 (1.23)	-2.3908 (-1.41)	0.2577 (0.31)	-1.3637 (-0.41)
Down Market	-10.4968 (-1.22)	7.1665 (1.61)	-4.7584** (-2.45)	1.141 (0.35)	-2.5925* (-1.74)	6.2448* (1.69)
DCC Beta(-1)*Down Market	0.3168* (1.67)	0.0029 (0.02)	0.6044 (1.05)	0.4627 (1.54)	0.4676* (1.69)	-0.8996 (-1.3)
DCC Beta(-1)*Up Market	2.0445 (1.12)	0.7258* (1.83)	0.9821 (0.9)	-0.4993** (-2.18)	0.2115 (1.19)	0.4247 (1.55)
Z-score*Down Market	-0.1791* (-1.82)	-0.0205 (-0.14)	-0.3994** (-2.53)	-0.601 (-0.97)	-0.0379 (-0.37)	-0.2145 (-0.45)
Z-score*Up Market	-0.2344 (-1.11)	-0.6533 (-1.13)	-0.0751 (-0.21)	0.2073 (0.44)	0.2045 (1.3)	0.5573 (0.7)
Market Cap*Down Market	0.4696* (1.88)	-0.843*** (-2.66)	0.8598** (2.13)	-1.0599* (-1.88)	0.3138 (0.89)	-0.6238*** (-2.8)
Market Cap*Up Market	-1.2981 (-0.87)	-0.6532* (-1.77)	-0.167 (-0.7)	0.1688 (0.51)	-0.1508* (-1.93)	0.3301 (1.01)
Debt to Asset Ratio*Down Market	1.797** (2.01)	-4.0177* (-1.87)	1.2147* (1.71)	-3.7706* (-1.77)	1.0933 (1.16)	-4.856* (-1.81)
Debt to Asset Ratio*Up Market	-1.7342* (-1.84)	2.0011 (0.57)	0.7485* (1.76)	0.2129 (0.09)	1.2846* (1.87)	3.9822 (1.03)
Cost/Income Ratio*Down Market	-0.0172 (-0.99)	-0.0043 (-0.78)	0.005 (0.9)	0.0027 (0.34)	-0.0015 (-0.27)	-0.0022 (-0.23)
Cost/Income Ratio*Up Market	-0.0092 (-0.57)	-0.0378* (-1.79)	-0.0456 (-1.45)	-0.041** (-2)	-0.0091 (-0.4)	0.0852* (1.78)
HHI*Down Market			-3.769	0.9986	10.7886*	-2.8274

			(-0.64)	(0.03)	(1.83)	(-0.23)
HHI*Up Market			-6.6916*	-4.6968*	0.3719	-2.4599
			(-1.74)	(-1.73)	(0.1)	(-0.23)
GDP Growth*Down Market					-0.043	2.1388
					(-1.38)	(0.99)
GDP Growth*Up Market					-0.1667*	0.1717*
					(-1.8)	(1.85)
Inflation*Down Market					-0.0035	0.0725*
					(-0.09)	(1.86)
Inflation*Up Market					-0.0189	-0.4323
					(-0.67)	(-0.83)
CD Test	-0.62	0.49	-1.07	-0.21	-1.36	0.3
	[0.5322]	[0.6261]	[0.2863]	[0.8361]	[0.1743]	[0.7662]

Table A7. Systematic and industry-wise systemic components of default risk in media industry.

Media Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	-2.6089* (-1.66)	-3.5874** (-2.14)	-1.8735 (-1.41)	0.9927 (0.35)	-1.8245 (-0.94)	-1.8467 (-0.87)
Down Market	1.9215 (0.91)	2.3014 (1.18)	4.27 (0.73)	-7.7521* (-1.93)	3.8723** (2.06)	-1.0087 (-0.54)
DCC Beta(-1)*Down Market	-0.0297 (-0.17)	0.0015 (0.01)	-0.342 (-1.47)	-0.2541 (-1.17)	0.0311 (0.23)	0.0568 (0.41)
DCC Beta(-1)*Up Market	0.2571** (2.14)	0.3061*** (3.23)	0.2972* (1.76)	-0.5155 (-0.7)	0.6795 (0.82)	-0.6905* (-1.87)
Z-score*Down Market	-0.0502 (-0.27)	-0.0222 (-0.15)	0.2096 (1.31)	0.0513 (0.27)	0.1725 (0.89)	0.1462 (0.66)
Z-score*Up Market	-0.0388 (-0.35)	-0.2594* (-1.76)	-0.2442 (-0.81)	-0.111* (-1.66)	-1.6424 (-1.08)	-0.0696 (-0.16)
Market Cap*Down Market	-0.0778 (-0.52)	-0.0473 (-0.34)	-0.979* (-1.68)	0.0453 (0.15)	-0.5283** (-2.34)	-0.4818** (-2.31)
Market Cap*Up Market	0.2522 (0.92)	0.5133** (2.25)	-0.1681 (-0.66)	0.3658 (0.66)	1.9098 (1.05)	0.1644 (0.44)
Debt to Asset Ratio*Down Market	2.9688* (1.7)	3.9612* (1.88)	3.3309** (1.99)	3.796* (1.65)	2.9166** (2.1)	2.7022* (1.75)
Debt to Asset Ratio*Up Market	-2.4221 (-0.47)	-2.3199 (-0.46)	-0.1405 (-0.07)	-5.1818 (-0.93)	-0.3674 (-0.13)	-0.1742 (-0.18)
Cost/Income Ratio*Down Market	0.0428* (1.73)	-0.0296 (-1.27)	-0.0391 (-1.07)	-0.0262 (-0.71)	-0.0292 (-1.13)	-0.0332 (-1.06)
Cost/Income Ratio*Up Market	-0.0051 (-0.8)	-0.0135* (-1.7)	0.005 (0.79)	-0.0231** (-1.99)	-0.0026 (-0.27)	0.0023 (0.29)
HHI*Down Market			11.3943**	12.7137*	17.1121**	12.7284*

			(2.51)	(1.96)	(2.34)	(1.75)
HHI*Up Market			-3.462	9.4923	-15.2486	-7.6786
			(-0.5)	(0.45)	(-1.52)	(-0.77)
GDP Growth*Down Market					0.1206*	0.0212
					(1.66)	(0.44)
GDP Growth*Up Market					-0.0431	0.1404**
					(-0.29)	(2.13)
Inflation*Down Market					0.1697**	0.1414*
					(2.54)	(1.95)
Inflation*Up Market					0.5771	0.0085
					(1.11)	(0.09)
CD Test	-0.97	-1.19	-0.54	-0.44	-1.2	-1.38
	[0.3307]	[0.233]	[0.588]	[0.6609]	[0.2286]	[0.1676]

Table A8. Systematic and industry-wise systemic components of default risk in retailing industry.

Retailing Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	-1.2722* (-1.95)	1.9149 (1.42)	-1.0088 (-1.13)	2.3872 (0.72)	-1.6184* (-1.84)	-0.2307 (-0.08)
Down Market	1.3131 (1.09)	-2.6648 (-1.53)	0.9958 (1.03)	-1.3628 (-0.39)	2.4055 (0.84)	0.3544 (0.11)
DCC Beta(-1)*Down Market	0.3308*** (2.8)	0.1099 (0.98)	0.2747** (1.97)	0.3175** (2)	0.3959 (1.36)	0.2109 (1.36)
DCC Beta(-1)*Up Market	0.09 (0.58)	0.2801* (1.87)	0.0051 (0.02)	0.5604*** (3.03)	-0.7645 (-0.75)	0.3592** (2.29)
Z-score*Down Market	-0.2542** (-2.04)	-0.1309 (-1.6)	-0.2248* (-1.89)	-0.1659 (-1.41)	-0.1801* (-1.76)	-0.109 (-0.89)
Z-score*Up Market	-0.0729 (-0.71)	-0.2009 (-1.34)	-0.1941 (-1.01)	0.172 (0.49)	-0.0089 (-0.08)	0.0872 (0.55)
Market Cap*Down Market	-0.2193** (-2.46)	-0.0228 (-0.23)	-0.1034* (-1.81)	0.0682 (0.39)	-0.4906* (-1.74)	0.2447 (1.08)
Market Cap*Up Market	0.262 (1.23)	0.1939* (1.94)	0.1591 (0.84)	-0.9685 (-1.36)	0.2244 (0.73)	0.5091** (2.06)
Debt to Asset Ratio*Down Market	-0.1171 (-0.17)	1.0861** (2.1)	0.3573 (0.43)	0.3069 (0.16)	-0.599 (-0.81)	2.696* (1.89)
Debt to Asset Ratio*Up Market	1.0912* (1.74)	-2.1658 (-1.02)	1.4496* (1.86)	2.2484* (1.9)	0.7259 (1.36)	-1.4754 (-0.38)
Cost/Income Ratio*Down Market	-0.0191* (-1.66)	0.0066 (1.38)	-0.031* (-1.67)	-0.0136 (-0.69)	-0.0206* (-1.74)	0.0131 (0.55)
Cost/Income Ratio*Up Market	0.0197 (1.12)	-0.0412* (-1.7)	0.0205 (1.38)	-0.0652** (-2.5)	0.1198 (1.18)	-0.0466 (-1)
HHI*Down Market			4.1046*	-10.4375	4.6867	-12.3445*

			(1.65)	(-0.87)	(0.75)	(-1.75)
HHI*Up Market			-0.2217	6.2712	4.8644**	-3.5041
			(-0.05)	(0.33)	(2.05)	(-0.48)
GDP Growth*Down Market					0.0304	0.0495
					(0.61)	(0.7)
GDP Growth*Up Market					-0.0783**	0.1135*
					(-1.97)	(1.77)
Inflation*Down Market					0.1466	0.0493
					(0.81)	(0.53)
Inflation*Up Market					0.1325	0.1108
					(1.4)	(1.15)
CD Test	-1.43	1.01	-1.55	0.98	-1.36	1.44
	[0.1529]	[0.3122]	[0.1214]	[0.3259]	[0.1723]	[0.1489]

Table A9. Systematic and industry-wise systemic components of default risk in food beverage and tobacco industry.

Food Beverage and Tobacco Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	-0.072 (-0.3)	1.6514* (1.74)	1.0614 (1.05)	0.9238* (1.73)	0.6962 (0.57)	-1.2548 (-0.83)
Down Market	-0.832 (-0.61)	1.6385 (1.27)	-0.8031 (-0.58)	0.7266 (0.69)	-1.2781 (-0.95)	0.1166 (0.12)
DCC Beta(-1)*Down Market	0.3236*** (3.66)	0.1767 (1.54)	0.321*** (2.87)	0.7943 (1.41)	0.4952** (2.21)	0.0618 (0.62)
DCC Beta(-1)*Up Market	0.4634* (1.73)	0.2949** (2.44)	0.1702 (0.69)	0.2975* (1.83)	-0.3365 (-1.1)	-0.2595* (-1.78)
Z-score*Down Market	-0.031 (-0.5)	-0.2068 (-1.05)	-0.0742 (-0.91)	-0.0306 (-0.15)	-0.0201 (-0.68)	-0.0656 (-0.36)
Z-score*Up Market	-0.6658*** (-2.66)	-0.4748*** (-2.72)	-0.3091*** (-2.7)	-0.5741** (-2.25)	-0.431** (-2.18)	-0.0289 (-0.25)
Market Cap*Down Market	-0.0634 (-0.54)	-0.0242 (-0.15)	-0.0663 (-0.49)	0.0295 (0.13)	0.1338 (1.21)	0.1412 (0.54)
Market Cap*Up Market	0.181** (2.49)	0.2134 (0.85)	0.2164 (1.21)	0.9346*** (2.95)	0.1719 (0.85)	-0.3241 (-0.78)
Debt to Asset Ratio*Down Market	0.3806 (0.6)	1.1767** (2.44)	-0.0497 (-0.08)	-1.6499 (-1.19)	-0.2086 (-0.2)	2.6444* (1.76)
Debt to Asset Ratio*Up Market	-0.7392*** (-2.9)	2.6582 (1.12)	-1.7763** (-2.44)	-1.4612 (-1.23)	-2.0469** (-2.13)	-0.9198 (-0.69)
Cost/Income Ratio*Down Market	0.0416 (0.97)	-0.0176* (-1.76)	0.0021 (0.73)	-0.011 (-1.57)	0.012 (1.16)	-0.0137* (-1.83)
Cost/Income Ratio*Up Market	0.0153* (1.8)	0.0013 (0.06)	0.0108** (1.96)	-0.0306* (-1.69)	0.0276* (1.91)	0.0208 (1.35)

HHI*Down Market			5.2318** (2.11)	5.865* (1.69)	-2.2611* (-1.66)	0.3843 (0.24)
HHI*Up Market			-7.1536* (-1.87)	-2.4177* (-1.67)	-0.6168 (-0.36)	-4.0495*** (-2.69)
GDP Growth*Down Market					0.031** (2.52)	0.075 (0.94)
GDP Growth*Up Market					-0.0049 (-0.17)	0.1008* (1.95)
Inflation*Down Market					-0.0271* (-1.84)	-0.0454 (-0.56)
Inflation*Up Market					0.0079 (0.23)	0.1734* (1.81)
CD Test	-0.45 [0.65]	-1.43 [0.1527]	0.84 [0.4029]	-0.65 [0.5182]	0.32 [0.7498]	0.46 [0.6448]

Table A10. Systematic and industry-wise systemic components of default risk in the food and staples retailing industry

Food and Staples Retailing Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	0.315 (0.62)	-0.5904 (-0.81)	0.8209 (1.14)	0.3226 (0.35)	0.7009 (0.53)	-1.942** (-2.16)
Down Market	0.9582* (1.78)	0.3454 (0.14)	0.2084 (0.25)	-0.8355 (-0.29)	-1.062 (-0.95)	-0.6461 (-0.12)
DCC Beta(-1)*Down Market	0.7023 (1.54)	0.5585*** (3.83)	0.1851** (2.54)	0.5818*** (4.39)	-0.0859 (-0.49)	-0.3378 (-0.52)
DCC Beta(-1)*Up Market	0.2425 (1.02)	-0.2078 (-1.14)	0.1729 (0.74)	-0.3052 (-1.38)	0.2448*** (2.6)	-0.0045 (-0.01)
Z-score*Down Market	-0.3508 (-0.75)	0.268 (1.35)	-0.3158 (-0.73)	0.1509 (0.69)	0.1155 (0.95)	0.7891 (0.82)
Z-score*Up Market	-0.2037* (-1.76)	-0.4397** (-2.41)	-0.1307* (-1.68)	-0.479*** (-9.84)	-0.078 (-0.35)	-0.2145* (-1.72)
Market Cap*Down Market	-0.0708* (-1.7)	0.0435 (0.16)	-0.0368 (-0.62)	0.0311 (0.11)	0.07 (0.68)	0.0032 (0.01)
Market Cap*Up Market	0.194* (1.8)	0.5396*** (4.8)	0.2095* (1.67)	0.4221** (2.37)	0.2285* (1.79)	0.317 (0.5)
Debt to Asset Ratio*Down Market	-3.0331 (-1.14)	1.1604*** (3.62)	-2.7385 (-1.08)	0.7253*** (3.02)	-0.706*** (-3.83)	-1.4887 (-0.52)
Debt to Asset Ratio*Up Market	-1.0117* (-1.76)	-3.6091* (-1.79)	-1.4539** (-2.56)	-4.3483* (-1.89)	4.4931 (1.06)	-3.711*** (-2.97)
Cost/Income Ratio*Down Market	-0.0011 (-0.54)	-0.0055 (-1.27)	-0.0016 (-0.78)	-0.0062 (-1.2)	0.0024 (1.33)	-0.0155* (-1.87)
Cost/Income Ratio*Up Market	-0.0117 (-0.97)	-0.0233 (-1.02)	-0.0106 (-1.01)	-0.0207 (-1)	-0.0107 (-1.15)	-0.0595 (-0.93)

HHI*Down Market			-2.2051 (-1.6)	2.2416** (2.2)	1.6911** (1.98)	3.5927* (1.86)
HHI*Up Market			-3.809** (-2.07)	-3.7258 (-1.12)	-9.1452 (-0.91)	14.5201 (0.67)
GDP Growth*Down Market					-0.0021 (-0.14)	-0.1016 (-0.87)
GDP Growth*Up Market					-0.4436* (-1.67)	0.1055 (0.56)
Inflation*Down Market					-0.0382*** (-3.7)	0.0908 (0.5)
Inflation*Up Market					-0.0246 (-0.51)	0.2434* (1.74)
CD Test	0.93 [0.3523]	-1.61 [0.1063]	1.23 [0.2177]	-1.58 [0.1137]	-0.27 [0.7891]	-0.72 [0.4698]

Table A11. Systematic and industry-wise systemic components of default risk in the household and personal products industry

Household and Personal Products	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	0.5632 (0.34)	2.5502* (1.73)	0.8212 (0.52)	2.7736 (0.68)	0.3753 (0.41)	0.6225 (0.2)
Down Market	7.185 (1.22)	-4.8376 (-1.21)	-2.8136 (-0.9)	-1.6759 (-0.17)	-1.469 (-1.43)	-0.1494 (-0.14)
DCC Beta(-1)*Down Market	-0.3927 (-0.57)	0.029 (0.09)	-0.4548 (-0.62)	0.1098 (0.41)	0.2481 (1.11)	0.9165 (0.37)
DCC Beta(-1)*Up Market	0.4061*** (4.19)	0.1324 (0.76)	0.4628* (1.87)	-0.2738** (-2.35)	0.2478* (1.66)	0.6198* (1.87)
Z-score*Down Market	-0.2377** (-2.03)	-0.7113* (-1.78)	-0.2703** (-2.19)	-0.3206* (-1.83)	-0.3775 (-0.91)	-0.155* (-1.92)
Z-score*Up Market	-0.162* (-1.95)	-0.2303*** (-2.85)	-0.3035* (-1.71)	-0.4877* (-1.88)	-0.0217* (-1.9)	-0.1024** (-2.54)
Market Cap*Down Market	-0.6426* (-1.68)	-1.0484* (-1.66)	-0.6434** (-2.02)	0.4107 (0.87)	-0.3206 (-1.63)	1.7353 (1.07)
Market Cap*Up Market	0.3508 (1.32)	0.0447 (0.27)	-0.1578 (-0.94)	-0.6883* (-1.81)	-0.2947** (-2.17)	-0.5675 (-0.78)
Debt to Asset Ratio*Down Market	1.0006* (1.77)	-4.98* (-1.7)	1.9273 (1.36)	1.4812 (1.64)	0.5285 (1.08)	-0.7153 (-0.37)
Debt to Asset Ratio*Up Market	2.1694* (1.81)	3.8029*** (2.66)	0.8846* (1.78)	4.9049* (1.7)	0.6459 (1.04)	4.8398*** (2.6)
Cost/Income Ratio*Down Market	-0.0425*** (-3.72)	0.0341 (0.82)	-0.0589** (-2.5)	0.0049 (0.08)	-0.0815 (-1.23)	-0.0389 (-0.47)
Cost/Income Ratio*Up Market	-0.0793* (-1.68)	0.0206 (0.75)	-0.0232*** (-2.7)	-0.032 (-0.37)	-0.068 (-1.27)	0.0215 (1.2)
HHI*Down Market			-1.4066	9.736*	-0.4432	5.1373

			(-0.44)	(1.86)	(-0.75)	(0.36)
HHI*Up Market			4.4767*	1.6808	4.104*	-10.4029*
			(1.7)	(0.94)	(-1.84)	(-1.7)
GDP Growth*Down Market					-0.1053	-0.1876**
					(-1.04)	(-2.03)
GDP Growth*Up Market					-0.0096	0.0945
					(-0.33)	(0.98)
Inflation*Down Market					0.0709**	0.3294*
					(2.09)	(1.77)
Inflation*Up Market					0.0924**	-0.1525*
					(2.04)	(-1.66)
CD Test	0.43	-0.83	-0.92	-1.18	-1.56	-0.76
	[0.6675]	[0.4071]	[0.3577]	[0.239]	[0.1188]	[0.4448]

Table A12. Systematic and industry-wise systemic components of default risk in the Health Care Equipment and Services Industry

Health Care Equipment and Services Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	-0.1803 (-0.34)	-0.5673 (-0.27)	-0.7236 (-0.61)	-1.2784 (-0.78)	-1.614 (-1.5)	1.0548 (0.77)
Down Market	0.65 (0.45)	-0.0548 (-0.02)	1.1078 (0.56)	-6.6492 (-1.41)	-1.4163 (-0.91)	3.2047 (1.46)
DCC Beta(-1)*Down Market	-0.5266 (-1.19)	0.0506 (0.26)	0.4939 (1.03)	0.1783 (0.76)	0.0353 (0.07)	0.2971 (1.56)
DCC Beta(-1)*Up Market	-0.7127* (-1.94)	0.8774** (2.01)	-0.6465** (-2.12)	0.3428** (2.43)	0.3261** (2.32)	0.2273* (1.9)
Z-score*Down Market	-0.3607* (-1.93)	-0.2746* (-1.66)	-0.4338* (-1.9)	-0.3092 (-1)	-0.3788* (-1.85)	0.253 (1.11)
Z-score*Up Market	0.0541 (0.38)	-0.7399* (-1.93)	-0.4307 (-1.03)	-0.2305* (-1.71)	0.024 (0.27)	-0.2696* (-1.68)
Market Cap*Down Market	0.1846 (0.91)	-0.7295 (-1.6)	0.6018** (1.99)	1.6415 (1.31)	0.8861* (1.8)	0.8528 (0.78)
Market Cap*Up Market	0.0724 (0.63)	0.7086** (2.36)	0.1448 (1.03)	0.4294* (1.94)	0.4395 (1.28)	0.5401* (1.72)
Debt to Asset Ratio*Down Market	-5.7474*** (-2.69)	6.9711 (1.02)	-5.303* (-1.78)	2.2663 (0.22)	-4.4827 (-1.48)	-3.7603 (-0.61)
Debt to Asset Ratio*Up Market	-0.6908 (-0.99)	1.3377 (0.4)	-1.9243 (-1.35)	-4.2436 (-1.64)	-0.2483 (-0.33)	-0.5466 (-0.33)
Cost/Income Ratio*Down Market	-0.0208 (-1.04)	0.0252 (0.42)	-0.0019 (-0.07)	-0.0331 (-0.79)	-0.0238 (-0.6)	-0.0109 (-0.32)
Cost/Income Ratio*Up Market	-0.0264** (-2.28)	-0.1569* (-1.76)	-0.0196** (-2.1)	-0.0995* (-1.88)	-0.075** (-2.28)	-0.2221 (-1.19)
HHI*Down Market			1.745 (0.39)	-3.6741 (-0.22)	3.2154 (1.47)	-7.4174* (-1.72)

HHI*Up Market			-9.5793 (-0.92)	10.185* (1.84)	6.1554 (1.23)	9.8036** (2.04)
GDP Growth*Down Market					0.0616 (0.37)	0.1141* (1.85)
GDP Growth*Up Market					0.1059* (1.69)	0.0227 (0.2)
Inflation*Down Market					0.1442 (1.29)	-0.0383 (-0.39)
Inflation*Up Market					0.1111** (2.41)	0.2315** (2.58)
CD Test	0.13 [0.8995]	1.29 [0.1968]	-1.22 [0.2227]	0.97 [0.3333]	0.29 [0.7685]	0.32 [0.7465]

Table A13. Systematic and industry-wise systemic components of default risk in the Health Care Equipment and Services Industry

Health Care Equipment and Services Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	-0.1803 (-0.34)	-0.5673 (-0.27)	-0.7236 (-0.61)	-1.2784 (-0.78)	-1.614 (-1.5)	1.0548 (0.77)
Down Market	0.65 (0.45)	-0.0548 (-0.02)	1.1078 (0.56)	-6.6492 (-1.41)	-1.4163 (-0.91)	3.2047 (1.46)
DCC Beta(-1)*Down Market	-0.5266 (-1.19)	0.0506 (0.26)	0.4939 (1.03)	0.1783 (0.76)	0.0353 (0.07)	0.2971 (1.56)
DCC Beta(-1)*Up Market	-0.7127* (-1.94)	0.8774** (2.01)	-0.6465** (-2.12)	0.3428** (2.43)	0.3261** (2.32)	0.2273* (1.9)
Z-score*Down Market	-0.3607* (-1.93)	-0.2746* (-1.66)	-0.4338* (-1.9)	-0.3092 (-1)	-0.3788* (-1.85)	0.253 (1.11)
Z-score*Up Market	0.0541 (0.38)	-0.7399* (-1.93)	-0.4307 (-1.03)	-0.2305* (-1.71)	0.024 (0.27)	-0.2696* (-1.68)
Market Cap*Down Market	0.1846 (0.91)	-0.7295 (-1.6)	0.6018** (1.99)	1.6415 (1.31)	0.8861* (1.8)	0.8528 (0.78)
Market Cap*Up Market	0.0724 (0.63)	0.7086** (2.36)	0.1448 (1.03)	0.4294* (1.94)	0.4395 (1.28)	0.5401* (1.72)
Debt to Asset Ratio*Down Market	-5.7474*** (-2.69)	6.9711 (1.02)	-5.303* (-1.78)	2.2663 (0.22)	-4.4827 (-1.48)	-3.7603 (-0.61)
Debt to Asset Ratio*Up Market	-0.6908 (-0.99)	1.3377 (0.4)	-1.9243 (-1.35)	-4.2436 (-1.64)	-0.2483 (-0.33)	-0.5466 (-0.33)
Cost/Income Ratio*Down Market	-0.0208 (-1.04)	0.0252 (0.42)	-0.0019 (-0.07)	-0.0331 (-0.79)	-0.0238 (-0.6)	-0.0109 (-0.32)
Cost/Income Ratio*Up Market	-0.0264** (-2.28)	-0.1569* (-1.76)	-0.0196** (-2.1)	-0.0995* (-1.88)	-0.075** (-2.28)	-0.2221 (-1.19)
HHI*Down Market			1.745 (0.39)	-3.6741 (-0.22)	3.2154 (1.47)	-7.4174* (-1.72)

HHI*Up Market			-9.5793 (-0.92)	10.185* (1.84)	6.1554 (1.23)	9.8036** (2.04)
GDP Growth*Down Market					0.0616 (0.37)	0.1141* (1.85)
GDP Growth*Up Market					0.1059* (1.69)	0.0227 (0.2)
Inflation*Down Market					0.1442 (1.29)	-0.0383 (-0.39)
Inflation*Up Market					0.1111** (2.41)	0.2315** (2.58)
CD Test	0.13 [0.8995]	1.29 [0.1968]	-1.22 [0.2227]	0.97 [0.3333]	0.29 [0.7685]	0.32 [0.7465]

Table A14. Systematic and industry-wise systemic components of default risk in the Pharmaceuticals, Biotechnology & Life Sciences Industry.

Pharmaceuticals, Biotechnology & Life Sciences Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	0.5137 (0.61)	1.0545 (0.59)	2.1796*** (2.83)	1.1165 (0.25)	0.4923 (1.2)	1.9432 (0.45)
Down Market	-1.1851 (-1.04)	-2.522 (-0.86)	-0.0333 (-0.03)	-3.7543 (-1.11)	-1.1684 (-0.68)	-2.6654 (-0.66)
DCC Beta(-1)*Down Market	-0.0241 (-0.16)	0.5581** (2)	-0.1873 (-0.42)	0.6312*** (2.62)	0.1639 (1.18)	0.9824** (2.15)
DCC Beta(-1)*Up Market	0.6486*** (3.25)	0.213 (1.21)	0.6881** (2.59)	-0.4939 (-0.58)	0.2673** (2.54)	-0.1927 (-0.33)
Z-score*Down Market	-0.0804* (-1.66)	-0.7204 (-0.95)	-0.1748* (-1.78)	-0.2055 (-1.29)	-0.0443 (-1.04)	-0.032 (-0.52)
Z-score*Up Market	-0.0267 (-0.97)	-0.1085* (-1.66)	0.0169 (0.22)	-0.3053** (-1.98)	-0.0118 (-0.35)	-0.502* (-1.79)
Market Cap*Down Market	0.1449 (0.66)	-0.459 (-0.42)	0.0586 (0.31)	-1.0727 (-1.21)	0.3688 (1.51)	0.5294 (1.22)
Market Cap*Up Market	0.1019* (1.65)	-1.7996* (-1.65)	-0.3317** (-1.99)	-0.3797* (-1.72)	-0.0814* (-1.65)	-0.1466 (-0.54)
Debt to Asset Ratio*Down Market	-8.9794 (-1.04)	-4.9467 (-0.84)	4.7027 (0.88)	-5.4463 (-1.2)	6.5909* (1.77)	-3.8606* (-1.79)
Debt to Asset Ratio*Up Market	3.6022 (1.3)	4.888 (1.16)	2.9494** (2.27)	-3.4059* (-1.71)	1.1685 (1.31)	-4.0391 (-1.3)
Cost/Income Ratio*Down Market	-0.038 (-0.4)	-0.8319 (-1.44)	-0.5457 (-1.32)	-0.1572 (-0.29)	-0.3191 (-1.23)	0.467 (1.35)
Cost/Income Ratio*Up Market	-0.0716* (-1.67)	0.4379* (1.84)	-0.4548 (-1.03)	0.7451* (1.84)	0.3583* (1.74)	0.14 (1.1)
HHI*Down Market			2.4563	-7.7664	-3.5827	5.4296

			(0.4)	(-0.35)	(-0.42)	(0.73)
HHI*Up Market			5.8292*	-1.3482	0.3689	-0.5393
			(1.78)	(-0.14)	(0.2)	(-0.04)
GDP Growth*Down Market					-0.1548	-0.39*
					(-0.82)	(-1.65)
GDP Growth*Up Market					0.0066	-0.8036*
					(0.21)	(-1.84)
Inflation*Down Market					0.2715	0.0169
					(1.37)	(0.14)
Inflation*Up Market					-0.3622*	0.0958
					(-1.67)	(0.37)
CD Test	-1.59	0.11	-0.84	-0.17	-0.66	-0.74
	[0.1118]	[0.9145]	[0.4035]	[0.8685]	[0.5098]	[0.4594]

Table A15. Systematic and industry-wise systemic components of default risk in the capital goods industry.

Capital Goods Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	-1.7305 (-0.95)	3.4595 (1.13)	-0.1685 (-0.31)	1.4161 (0.92)	-0.8635* (-1.72)	0.6514 (0.59)
Down Market	2.7882* (1.76)	4.721 (1.07)	1.8783 (1.63)	-1.4575 (-0.97)	1.2494 (0.82)	-1.259 (-0.92)
DCC Beta(-1)*Down Market	0.4619 (1.42)	-0.1013 (-0.25)	0.3693*** (2.63)	0.1058 (0.73)	0.3323* (1.8)	0.1117 (1.28)
DCC Beta(-1)*Up Market	-0.2508* (-1.74)	0.8491** (2.13)	-0.3722 (-1.6)	0.3974*** (3.31)	0.0045 (0.06)	0.2049** (2.19)
Z-score*Down Market	-0.8019* (-1.67)	-0.0054 (0)	-0.2816** (-2.54)	-0.0022 (-0.01)	-0.5571** (-2.33)	-0.1069 (-0.48)
Z-score*Up Market	-0.5793 (-1.03)	-0.8316* (-1.76)	-0.6238 (-1.39)	-0.8283* (-1.91)	0.0295 (0.01)	-0.5168* (-1.66)
Market Cap*Down Market	-0.308** (-2.14)	-0.5057** (-2.39)	0.8214 (1.63)	-0.2803* (-1.72)	-0.0799 (-0.35)	0.2492 (1.44)
Market Cap*Up Market	0.7504* (1.77)	0.5386* (1.67)	0.481** (2.59)	-0.4256* (-1.85)	0.1298 (1.47)	-0.3881* (-1.71)
Debt to Asset Ratio*Down Market	4.4468 (1.19)	3.5511** (2.19)	6.1163* (1.71)	2.7723* (1.86)	5.1141 (1.25)	2.7281* (-1.76)
Debt to Asset Ratio*Up Market	-0.6021 (-0.73)	-3.0422 (-0.87)	-0.0987 (-0.22)	6.6416 (1.61)	-2.5577* (-1.86)	2.3372 (1.24)
Cost/Income Ratio*Down Market	0.048* (1.71)	-0.0061 (-0.14)	0.0591* (1.9)	0.0796 (1.45)	0.0327* (1.8)	0.0154 (1)
Cost/Income Ratio*Up Market	0.0156** (1.99)	-0.5363 (-0.83)	-0.0509 (-0.94)	0.0594 (0.68)	-0.0045 (-0.46)	-0.0466 (-1.58)
HHI*Down Market			4.9986* (1.99)	-5.6061** (-2.13)	6.2631 (1.25)	-7.414** (-2.13)

HHI*Up Market			(1.88)	(-2.23)	(1.53)	(-2)
			8.7671	5.0569	3.3511*	1.255
			(1.26)	(1.6)	(1.82)	(0.3)
GDP Growth*Down Market					-0.0004	-0.1407*
					(-0.01)	(-1.77)
GDP Growth*Up Market					-0.0854**	-0.0744*
					(-2.15)	(-1.92)
Inflation*Down Market					-0.0573	0.0088
					(-0.48)	(0.17)
Inflation*Up Market					-0.0187	-0.0665
					(-0.59)	(-1.29)
CD Test	-1.11	1.58	-0.19	-0.24	1.09	0.99
	[0.2676]	[0.1144]	[0.8484]	[0.8131]	[0.2773]	[0.3233]

Table A16. Systematic and industry-wise systemic components of default risk in the Commercial and Professional Services Industry.

Commercial and Professional Services	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	0.0805 (0.25)	4.6297 (1.62)	0.1599 (0.39)	4.526** (1.97)	-0.2375 (-0.75)	-0.9758 (-0.46)
Down Market	-0.545 (-0.86)	-5.4045 (-1.59)	0.288 (0.36)	1.2782 (0.29)	-1.3514* (-1.68)	-2.9105 (-0.61)
DCC Beta(-1)*Down Market	0.0406 (0.24)	-0.1581 (-0.76)	0.0857 (0.32)	-0.2961 (-0.76)	-0.0345 (-0.16)	0.3404* (1.77)
DCC Beta(-1)*Up Market	0.1653* (1.65)	0.5148** (2.43)	0.2336* (1.8)	0.456* (1.77)	-0.0851 (-0.44)	0.7112 (1.3)
Z-score*Down Market	-0.1604** (-2.23)	-0.3767* (-1.85)	-0.1958* (-1.67)	-0.5649 (-1.21)	-0.0108 (-0.15)	-0.1562 (-0.84)
Z-score*Up Market	0.0326 (0.4)	1.5988 (1.02)	0.2269 (1.02)	0.8885 (1.11)	0.1664 (1.23)	0.0282 (0.09)
Market Cap*Down Market	0.1381 (1.44)	0.9035* (1.78)	0.2645 (0.73)	-0.7388 (-0.78)	0.3865** (2.19)	-0.2538 (-0.94)
Market Cap*Up Market	0.0247 (0.33)	-1.7065 (-1.05)	-0.248* (-1.72)	-0.9439 (-1.61)	-0.021 (-0.22)	-0.3539 (-1.04)
Debt to Asset Ratio*Down Market	1.57* (1.89)	-2.0951 (-0.66)	-1.2112 (-1.47)	-2.0284 (-1.18)	0.0898 (0.16)	-0.101 (-0.1)
Debt to Asset Ratio*Up Market	-1.3705 (-0.67)	-0.9634 (-0.97)	1.167** (2.08)	1.7861* (1.87)	-0.2736 (-0.96)	-1.6032 (-0.69)
Cost/Income Ratio*Down Market	-0.029* (-1.7)	0.0466** (1.99)	-0.0098 (-0.92)	0.0862*** (2.73)	-0.0048 (-0.3)	0.1168** (2.08)
Cost/Income Ratio*Up Market	-0.0096 (-0.94)	0.0173 (0.93)	0.0033 (0.76)	0.0053 (0.53)	0.0498** (2.21)	-0.002 (-0.26)

HHI*Down Market			-0.2242 (-0.14)	3.4612 (0.57)	-2.2796* (-1.92)	7.9346** (2.05)
HHI*Up Market			2.4699** (2.02)	-2.8385 (-0.87)	1.2944 (1.5)	-1.3668 (-0.47)
GDP Growth*Down Market					0.0875 (1.03)	-0.0316 (-0.57)
GDP Growth*Up Market					-0.009 (-0.43)	-0.2321** (-2.04)
Inflation*Down Market					-0.0663 (-0.96)	-0.0063 (-0.09)
Inflation*Up Market					-0.1245** (-1.97)	-0.3614* (-1.65)
CD Test	-0.52 [0.6059]	-1.42 [0.1569]	-0.17 [0.8637]	-0.61 [0.5387]	-0.41 [0.684]	-0.34 [0.7353]

Table A17. Systematic and industry-wise systemic components of default risk in the transportation industry.

Transportation Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	2.9457 (0.94)	0.0076 (0.01)	-0.0358 (-0.06)	0.2373 (0.29)	0.4986 (0.87)	-1.892 (-0.51)
Down Market	0.8531 (0.82)	2.9415 (1.5)	-0.0441 (-0.04)	2.3006 (1.2)	0.619 (0.6)	1.3898 (0.45)
DCC Beta(-1)*Down Market	0.0119 (0.06)	0.2474** (2.21)	0.5674 (1.25)	0.0472 (0.43)	0.1312 (0.92)	-0.0507 (-0.39)
DCC Beta(-1)*Up Market	0.2964* (1.81)	0.2804** (2.2)	0.3374* (1.71)	0.8353* (1.82)	0.4863* (1.9)	0.6375** (2.1)
Z-score*Down Market	-0.1079 (-0.37)	-0.3835 (-1.17)	-0.1711 (1.18)	-0.211 (-0.7)	-0.0797 (-0.39)	0.0865 (0.21)
Z-score*Up Market	-0.364** (-2.08)	0.1734 (0.7)	-0.2713* (-1.81)	0.2522 (1.12)	-0.3954*** (-3.25)	-0.4056 (-0.68)
Market Cap*Down Market	0.0572 (0.18)	-0.3439* (-1.67)	0.0317 (0.3)	-0.2676* (-1.68)	0.1651 (0.73)	-0.1718* (-1.66)
Market Cap*Up Market	0.2581* (1.76)	-0.1652 (-0.93)	-0.041 (-0.27)	-0.2508 (-1.18)	0.8059** (1.99)	0.512 (1.23)
Debt to Asset Ratio*Down Market	0.7774** (2.28)	3.87* (1.89)	2.3446 (1.34)	3.5405** (1.98)	-0.3377 (-0.33)	2.3093* (1.68)
Debt to Asset Ratio*Up Market	-2.2712 (-1.06)	0.5084 (0.43)	1.0958* (1.78)	0.2235 (0.23)	0.4597 (0.15)	-5.9691* (-1.67)
Cost/Income Ratio*Down Market	0.0159* (1.71)	-0.0141 (-0.95)	0.0132*** (2.89)	0.0538* (1.83)	0.0128** (2.11)	-0.0255 (-1.18)
Cost/Income Ratio*Up Market	-0.0163 (-1.32)	-0.0182 (-1.33)	-0.0079 (-0.61)	-0.0172 (-1.17)	-0.003 (-0.21)	-0.0064 (-0.39)
HHI*Down Market			1.0111	-1.0945	-3.3237***	4.4389

			(0.71)	(-0.58)	(-3.25)	(1.2)
HHI*Up Market			-1.3414	-0.6571	3.4064	1.2873
			(-0.69)	(-0.81)	(0.74)	(0.35)
GDP Growth*Down Market					-0.0208	-0.1163**
					(-0.48)	(-2.51)
GDP Growth*Up Market					-0.0603	0.0558
					(-1.19)	(0.78)
Inflation*Down Market					0.0523**	-0.1221**
					(2.02)	(-2.26)
Inflation*Up Market					-0.0062	0.2443
					(-0.05)	(1)
CD Test	-0.43	-0.73	-0.42	-0.19	-1.02	0.15
	[0.6649]	[0.4665]	[0.6717]	[0.8504]	[0.3096]	[0.8797]

Table A18. Systematic and industry-wise systemic components of default risk in the software and services industry.

Software and Services Industry	Model 1		Model 2		Model 3	
	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	0.3849 (0.51)	-0.2339 (-0.35)	-1.1769 (-0.85)	-0.577 (-0.72)	0.3519 (0.19)	-1.4455 (-1.43)
Down Market	0.3904 (0.31)	0.2712 (0.21)	-1.8998 (-1.07)	1.6068 (1.13)	-3.6325 (-1.12)	3.2756 (1.22)
DCC Beta(-1)*Down Market	0.9195** (2.04)	0.2752 (1.13)	-0.4266 (-0.82)	0.3519 (1.17)	0.8308** (2.26)	0.7004** (2.05)
DCC Beta(-1)*Up Market	0.2821*** (2.61)	0.4112** (2.35)	-0.0867 (-0.17)	0.2895** (2.04)	-0.3933 (-0.75)	0.0584 (0.51)
Z-score*Down Market	-0.3622** (-2.04)	-0.2199* (-1.74)	-0.2732** (-2.07)	-0.272* (-1.76)	-0.2245 (-0.98)	-0.4985 (-0.68)
Z-score*Up Market	0.0273 (0.52)	0.058 (0.65)	0.5123 (1.58)	0.1011 (1.17)	0.1708 (0.62)	0.1176 (0.81)
Market Cap*Down Market	0.2533 (1.59)	-1.3597** (-2.22)	0.3474* (1.72)	0.0388 (0.16)	-0.5875 (-0.84)	-1.0784* (-1.82)
Market Cap*Up Market	-0.0098 (-0.09)	0.1178 (0.71)	-0.3352* (-1.83)	-0.9152 (-0.69)	-0.4715* (-1.91)	0.0914 (0.49)
Debt to Asset Ratio*Down Market	-3.1563* (-1.84)	-0.3629 (-0.1)	-2.2877 (-1.12)	0.6031* (1.7)	-2.929 (-1.07)	-1.0568 (-1.12)
Debt to Asset Ratio*Up Market	1.792 (1.64)	0.7389 (0.62)	0.3937 (0.16)	0.9484 (0.67)	-1.9633 (-1.53)	4.2601* (1.76)
Cost/Income Ratio*Down Market	0.0077* (1.94)	0.0006 (0.02)	0.0158* (1.66)	0.0088 (0.3)	0.0214* (1.69)	0.074 (1.09)
Cost/Income Ratio*Up Market	-0.0042 (-1.18)	0.0148* (1.89)	-0.0139 (-1.16)	0.026** (1.99)	-0.001 (-0.18)	0.0163 (0.99)
HHI*Down Market			0.4287* (1.94)	-0.8619 (-0.55)	1.9893 (1.06)	5.7634 (1.2)

HHI*Up Market			1.5102 (0.85)	-1.8933* (-1.65)	0.6802 (0.73)	-0.7632 (-0.55)
GDP Growth*Down Market					-0.096 (-0.69)	0.0609 (0.42)
GDP Growth*Up Market					-0.056 (-1.61)	0.0295 (0.43)
Inflation*Down Market					-0.1301 (-1.42)	-0.2269* (-1.91)
Inflation*Up Market					0.0569* (1.9)	0.1118* (1.8)
CD Test	0.07 [0.9463]	0.19 [0.8456]	-0.71 [0.4768]	0.99 [0.3213]	-0.04 [0.9689]	1.08 [0.2814]

Table A19. Systematic and industry-wise systemic components of default risk in the technology hardware and equipment industry.

Technology Hardware and Equipment Industry	Model 1		Model 2		Model 3	
	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	1.386 (1.5)	-1.6947 (-0.94)	0.9821* (1.74)	-2.6479 (-0.95)	1.0781 (1.13)	-0.7007 (-0.49)
Down Market	-1.2494 (-0.81)	-2.8958 (-0.61)	1.2197 (0.46)	-0.0864 (-0.03)	1.0322 (0.41)	4.3144 (1.07)
DCC Beta(-1)*Down Market	-0.2328** (-2.23)	-0.9125 (-0.88)	-0.1333 (-0.61)	0.1928 (0.85)	-0.5591* (-1.87)	0.1907 (0.83)
DCC Beta(-1)*Up Market	0.073 (0.5)	0.6199** (1.99)	-0.1743 (-0.72)	-0.0507 (-0.34)	-0.7914*** (-2.61)	0.4374* (1.77)
Z-score*Down Market	-0.1166* (-1.87)	-0.2766** (-2.07)	-0.1988* (-1.72)	-0.3135*** (-2.72)	-0.2734* (-1.95)	-0.273* (-1.73)
Z-score*Up Market	0.0295 (0.55)	-0.1054 (-1.42)	-0.1122 (-1.12)	-0.0805 (-0.63)	0.0022 (0.05)	0.0695 (0.48)
Market Cap*Down Market	0.5899** (2.5)	0.6472 (1.19)	0.2671** (2.09)	0.304 (1.31)	-0.1481 (-0.5)	-0.1409 (-0.38)
Market Cap*Up Market	-0.1788 (-1.09)	0.3997* (1.68)	0.1227 (0.5)	0.4556* (1.67)	0.4365** (2.19)	0.6887** (2.08)
Debt to Asset Ratio*Down Market	-3.8117 (-0.4)	-5.4297 (-1.16)	-4.3396 (-0.96)	-6.6309 (-1.07)	-28.7783 (-1.35)	-4.3086 (-1.09)
Debt to Asset Ratio*Up Market	0.5499 (0.79)	0.1524 (0.2)	-0.7619 (-0.93)	-1.4992** (-2.09)	-0.2791 (-0.48)	1.6597** (2.29)
Cost/Income Ratio*Down Market	0.0177* (1.76)	0.1288** (2.05)	0.0511* (1.71)	0.028* (1.95)	0.0235* (1.74)	0.0798* (1.65)
Cost/Income Ratio*Up Market	0.0063 (0.92)	-0.0113 (-0.75)	0.0043 (0.83)	-0.0039 (-0.54)	0.0015 (0.21)	-0.0096 (-0.55)

HHI*Down Market			5.1496*	2.7986	4.3019**	-4.4647
			(1.81)	(1.29)	(2.03)	(-0.66)
HHI*Up Market			-2.8535	1.2425	-1.0294	-4.0567
			(-0.79)	(1.18)	(-0.99)	(-1.22)
GDP Growth*Down Market					0.0775	0.0089
					(0.64)	(0.13)
GDP Growth*Up Market					-0.0374*	0.0333
					(-1.69)	(0.89)
Inflation*Down Market					-0.0956	-0.1559
					(-1.56)	(-1.52)
Inflation*Up Market					0.0331	0.0363
					(0.61)	(0.71)
CD Test	0.34	0.99	-1.49	-0.87	-0.79	-0.28
	[0.7375]	[0.3213]	[0.1363]	[0.3823]	[0.4288]	[0.7807]

Table A20. Systematic and industry-wise systemic components of default risk in the semi-conductors and semiconductor equipment industry.

Semi-conductors and Semiconductor Equipment Industry	Model 1		Model 2		Model 3	
Variables	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta	DCC-Market Beta	DCC-Industry Beta
Constant	0.0227 (0.02)	-0.0592 (-0.06)	-0.4026 (-0.7)	-0.5875 (-0.64)	-0.4849 (-1.59)	-0.4996 (-1.48)
Down Market	3.2326 (0.91)	3.2702 (0.93)	-1.9472 (-1.09)	3.9613 (0.62)	-3.6248 (-1.43)	-3.7251 (-1.49)
DCC Beta(-1)*Down Market	0.2039** (1.99)	0.1855* (1.84)	-0.0781 (-0.2)	-0.529 (-0.8)	0.2213 (0.62)	0.2271 (0.67)
DCC Beta(-1)*Up Market	0.2014** (2.13)	0.1737 (1.18)	0.351* (1.78)	0.327** (2.26)	0.3049** (2.33)	0.3034** (2.3)
Z-score*Down Market	-0.6059* (-1.72)	-0.6792* (-1.75)	-0.5614** (-2.54)	-0.544** (-2.55)	-0.7121* (-1.73)	-0.7183* (-1.74)
Z-score*Up Market	-0.1583* (-1.82)	-0.1996* (-1.88)	-0.0834* (-1.78)	-0.1816* (-1.73)	-0.0336 (-0.96)	-0.0313 (-0.83)
Market Cap*Down Market	-0.6745 (-0.83)	-0.4506 (-0.75)	0.3939 (0.79)	-0.5006 (-0.56)	1.2521** (2.35)	1.2956** (2.46)
Market Cap*Up Market	0.1009 (0.86)	0.2281 (1.08)	0.0536 (0.8)	0.1449 (1.19)	0.048 (0.76)	0.0459 (0.72)
Debt to Asset Ratio*Down Market	3.7588 (0.5)	-0.7904 (-0.5)	2.2314** (2.33)	1.6217** (1.97)	-6.593 (-1.52)	-0.6755 (-1.55)
Debt to Asset Ratio*Up Market	-2.3366** (-2.23)	-0.8775 (-0.98)	0.2872 (0.45)	0.4859 (0.75)	1.243 (1.54)	2.1346* (1.83)
Cost/Income Ratio*Down Market	-0.0127 (-0.98)	-0.0122 (-0.96)	0.0058 (0.45)	0.0447 (1.61)	-0.0225 (-0.34)	-0.0233 (-0.35)
Cost/Income Ratio*Up Market	0.0022*** (2.98)	0.0032* (1.81)	0.0027** (2.31)	0.0032* (1.84)	0.0019*** (2.84)	0.0021*** (2.82)

HHI*Down Market			0.5573 (0.21)	-11.9698 (-0.91)	-2.059 (-1.34)	-2.6661* (-1.91)
HHI*Up Market			-0.2662 (-1.03)	-0.5712* (-1.79)	-0.0684 (-0.18)	-0.1343 (-0.34)
GDP Growth*Down Market					-0.198** (-1.98)	-0.0455 (-1.13)
GDP Growth*Up Market					0.0131 (0.79)	0.0228** (2.09)
Inflation*Down Market					0.0075 (0.06)	-0.0047 (-0.04)
Inflation*Up Market					0.0814* (1.72)	0.0176 (0.27)
CD Test	-0.97 [0.3296]	-1.47 [0.1426]	-1.56 [0.1189]	-0.64 [0.5236]	-1.61 [0.1079]	-1.56 [0.1192]