The impact of sovereign rating changes on firm activities

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Declaration of Original Authorship

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Abstract

This thesis examines the impact of sovereign rating changes on domestic firms' activities. The first empirical chapter investigates the impacts of sovereign ratings on corporate investments. Prior literature focuses on the sovereign ceiling in explaining sovereign-corporate spillovers. I find that government debt overhang is another important channel for the spillovers. Specifically, firms domiciled in a recently downgraded sovereign reduce investments, even if their credit ratings were unchanged following the negative sovereign rating event. Public debt overhangs exacerbate negative impacts of sovereign downgrades on corporate investments. The next chapter examines heterogeneous effects of sovereign rating actions on investments. High leverages magnify negative impacts of sovereign downgrades. Poorer performance, lower investment opportunities and financial constraints are factors reducing a firm's capacity to buffer the negative leverage-investment relationship following sovereign downgrades. Cash holdings are associated with higher levels of investment for high leveraged firms following sovereign downgrades. The final empirical investigation is on the relationship between sovereign downgrades and corporate trade credit policies. Firms increase their trade credit following sovereign downgrades. The impact of sovereign downgrade on corporate trade credit is consistent and broadly independent of firms' products, degrees of financial constraints and market power. Further investigations find that credit extensions are related to different public debt-to-GDP levels during sovereign downgrade periods. In summary, sovereign rating changes plays an important role in firm behaviours, even in cases of firms without credit rating change following the sovereign event. This thesis raises caveats against excessive fiscal expansions for demand stimulus given the negative externals on corporate sectors, hence, negative implications for the aggregate supply. Regulatory attentions on corporate leverages, trade credit and risk management policies are among important practical implications.

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Chapter 1: Introduction

Despite criticism since the 2007–2008 financial turmoil, academics have long recognised that credit ratings still provide valuable functions in managing credit quality for both public and private sectors in international capital markets. A sovereign credit rating is an evaluation of a government's capacity and willingness to service its public debt obligations in full, including principal and interest, and on time. Sovereign creditworthiness plays an important role for business activities. Sovereign debt restructuring deteriorates the ability of private sectors to access to capital markets (e.g., Arteta and Hale. 2008). Borensztein et al. (2013) show that sovereign ratings represent a strong upper bound and an important determinant of corporate ratings. Using aggregate data, Chen et al. (2013) document temporary investment reduction following sovereign rating downgrades due to an increased cost of capital. Almeida et al. (2017) find that firms rated equal or higher than their sovereigns are more likely to curtail investments following a sovereign downgrade. Hill et al. (2018) find significant increases of corporate rating actions immediately follow sovereign-rating changes. The sovereign-to-corporate spill-over is asymmetric. Negative rating actions trigger significant changes while the impact of positive news is more muted. Drago and Gallo (2017a) also find that a sovereign downgrade causes a significant increase in domestic firms' borrowing cost. In summary, prior papers show strong linkages between sovereign rating actions and corporate ratings. This thesis intends to deepen our understanding on how variations in sovereign creditworthiness have affected the corporate sector.

The main theme of this thesis is to investigate the impact of sovereign credit ratings on firm activities. Specifically, I examine the impact of sovereign credit rating actions on firm' investments, leverages and trade credit policies. Three specific empirical topics will be investigated as follows:

The first empirical chapter (Chapter 4) investigates the impact of sovereign rating changes on domestic investments. Firstly, there is a significant relationship between sovereign rating changes and corporate investing activities. The results are consistent with Chen et al. (2013) and Almeida et al. (2017). Secondly, different from previous papers which mainly concentrate on the credit rating channel, the investment reductions are also recorded even in cases of firms without credit rating changes following the sovereign event. The impact of sovereign rating changes is asymmetric. Specifically, there is strong evidence of significant reductions in investments following sovereign downgrades. While there is no evidence of an increase in investments following a sovereign upgrade. Finally, an increased effect of sovereign downgrades arising from high government debts leads to an additional decrease in corporate investments.

The second empirical chapter (Chapter 5) quantifies interactions between firm leverages and sovereign credit rating actions on domestic investments. For highly indebted firms, there is a significant negative leverage-investment link. This finding is consistent with prior literature (e.g., Gebauer, et al. 2018; Myers. 1977) that highly leveraged firm find more difficult in obtaining external sources of finance in good conditions because of greater risks of default and bankruptcy and therefore forgo valuable growth opportunities. This study provides strong evidence for heterogeneity across types of firm. Specifically, highly leveraged firms with lower profitability, lower investment opportunities and financial difficulties experience lower relative-to-investments than other firms during sovereign downgrade periods. This chapter highlights the role of cash holding for high leverage firms following a sovereign downgrade. The findings are consistent with the interpretation that firms hoard more cash under the precautionary motive. Larger cash reserves help firms to reduce less investment and lower the risk of financial distress and bankruptcy.

The third empirical chapter (Chapter 6) examines the impact of sovereign downgrades on trade credit firm policy. Trade credit is an important short-term financing tool for non-financial firms

(e.g., Abdulla et al. 2017; Chen et al. 2017). There is strong evidence that firms increase reliance on trade credit during periods of sovereign downgrade. The heterogeneity of changes in trade credit policy in an event of a sovereign downgrade varies across firms. More specifically, since differentiated products are more difficult to resell and the switching supplier cost is high, a supplier' willingness to extend more trade credit for buyers of differentiated products, following sovereign downgrades. Secondly, financial constrained firms depend relatively more on trade credit in the aftermath of a sovereign downgrade. Firms with a stronger marker power position could negotiate better credit terms with their suppliers, following sovereign downgrades. Firms increase their trade credit related to different public debt-to-GDP levels during sovereign downgrade periods, especially when the public debt level is above 90% of GDP.

The dataset utilised in this thesis is extensive, encompassing the largest possible sample of corporate credit ratings spanning from 1994 to 2020 in the Capital IQ database. In Chapter 4, the sample includes 1328 non-financial firms from 30 high-income countries. Chapter 5 follows the same sample selection, but focuses exclusively on firms in countries that experienced sovereign rating downgrades. Five countries without any downgrades (Australia, Canada, Denmark, Israel, and Sweden) are excluded, resulting in a final sample of 1206 firms from 25 high-income countries. In Chapter 6, the sample expands to include developing countries with sovereign rating downgrades, while excluding service firms. The sample comprises 895 non-financial firms from 38 developed and developing countries.

Methodologies used in the thesis include fixed effects models with different set of control variables. Specifically, Chapter 4 and 5 employ regressions of investment changes one year following sovereign rating changes for investigations on the impact of sovereign rating actions on firm investment. Chapter 6 conduct regressions analyses of trade payable days one year following sovereign downgrades to examine the impact and spill-over effect of sovereign credit rating on

trade credit policies. The regression models incorporate control variables, including corporate ratings, firm characteristics, and macroeconomic variables. To address potential omitted variables, firm fixed effects, year effects, and year-industry effects are included. Number of robustness checks and investigations on subsamples of firms without rating changes are conducted.

The thesis contributes to literature in a number of aspects. Firstly, this thesis documents strong evidence of the impact of sovereign rating changes on corporate sector, even for those firms whose credit ratings were unimpacted by the sovereign event. Specifically, there are reductions in investing activities, especially for highly indebted firms and an increase in trade payable days as an alternative short-term source of funding, in the event of sovereign downgrade. Secondly, government debt is an important channel to explain to spill-over effect of sovereign rating on firm activities. The join effect between sovereign downgrade and government debt overhang put domestic firms under pressures to cut their investments further and extend more trade credit. Systematic risk exposures of public debt overhang have significant negative consequences for the corporate sector. Governments hence should consider negative externalities into public debt management decisions. The findings raise caveats against excessive uses of public debts in financing economic stimulus policies during current crises, especially during the Covid-19 pandemic. It is crucial to strike a fine balance between stimulated demand and hampered corporate investments, hence, adverse implications for aggregate supply. This thesis also holds significant implications for corporate managers. An improvement in working capital management could be beneficial for firms in order to reduce less investment and mitigate the risk of financial distress and bankruptcy following a sovereign downgrade, which in turn increases the shareholder value.

The structure of this thesis is as follows: Chapter 2 provides background knowledge of the credit rating industry. Chapter 3 critically reviews the existing research in sovereign and corporate credit ratings. Chapter 4 starts the empirical investigations in this thesis by examining the impact of

sovereign rating changes on domestic investments. Chapter 5 investigates heterogeneous effects of sovereign rating actions on the relationship between investments and leverages. Chapter 6 examines the impact of sovereign downgrades on trade credit policies. Chapter 7 summarises and concludes the thesis. Discussion of limitations and directions for future research are also included.

Chapter 2: The background of the credit rating industry

2.1. Introduction

Credit rating is the most common and widely used tool in analysing sovereign and corporate creditworthiness. Investors adopt credit ratings to make investment decisions and reallocate their portfolios by changes in credit ratings. Generally, credit ratings are used as investment screens and to allocate regulatory capital by pension funds, banks, and insurance companies. Credit rating agencies (CRAs) earn revenue by selling their assessments of creditworthiness's issuer. Along with the increasing global integration and CRAs' growing prestige, credit ratings critically have long played an essential role in financial markets.

This chapter aims at providing a background of the industry, definitions and explanations of the key concepts relevant to subsequent chapters of this thesis. The chapter is organised as follows. The main CRAs, rating methodologies are discussed in section 2.2. Section 2.3 briefly discusses basic definitions related to credit ratings. Section 2.4 highlights the credit rating industry's functions and its importance to financial markets. Criticism over CRAs is summarised in section 2.5. Section 3 concludes the chapter.

2.2 Main rating agencies, methodologies

2.2.1. Main rating agencies

CRAs play a prominent role of information signalling not only to issuers, to individual investors, to foreign institutional investors but also to policy makers within financial markets. These days, there are several CRAs over the world. However, the global credit rating industry is highly concentrated, the "Big Three" international agencies-Fitch Ratings (Fitch), Moody's Investor Services (Moody's) and Standard and Poor's (S&P)– controlling nearly the entire the ratings

business. In favour of total credit ratings outstanding, S&P, Moody's, and Fitch respectively accounts for 49.2%, 33.1%, and 13.5% of the market (SEC, 2022). Other CRAs' shares, including Japan Credit Rating Agency, Egan Jones, Rating and Investment Information, AM Best Company, Morningstar Credit Ratings, Kroll Bond Rating Agency, DBRS Inc, are minorities, ranging from 0.1% to 2.3% (SEC, 2022). These CRAs cover the global spectrum of corporate, sovereign, financial, and other public entities and the securities and obligations they issue. In term of Government Securities and Corporate Issuers, the biggest three CRAs together control 99% and 88% respectively of the rating market (SEC, 2022). Table 2.1 presents a list of main CRAs.

Table 2.1: Main credit rating agencies

Rating agency	**Focus**
Moody's Investors Service	Global
Standard and Poor's	Global
Fitch	Global
Kroll Bond Rating Agency, Inc. (KBRA)	Global
DBRS, Inc	Global
Dominion Bond Rating Service Inc	North America
Egan-Jones Rating Company	North America
Japan Credit Rating Agency, Ltd	Japan
Rating and Investment Information Inc	Japan
Capital Intelligence	Middle East, Central and Eastern Europe, South Asia
HR Ratings de México, S.A. de C.V	Mexico and Latin America
A.M. Best Company Inc	Financial and Insurance

Morningstar Credit Ratings LLC **(acquired Realpoint LLC in May 2010)**	Asset-backed finance

Source: SEC 2022

2.2.2. Rating methodologies

In term of methodology, credit rating is a process where independent parties as CRAs assign ratings are based on information received from different relevant sources that reflects an obligor's creditworthiness. These sources include both quantitative and qualitative, public and non-public information provided directly by the rated issuer, arranger, sponsor or other third party. Major quantitative determinants of credit ratings are generally agreed by CRAs. Rather than using a fixed weighted average of these determinants, the weights assigned to these factors can substantially deviate over time, to reflect changes in macroeconomic and sector-specific circumstances (Kiff et al. 2010; Afonso et al. 2011). Furthermore, qualitative judgment also varies to a greater extent across CRAs, in response to changes in specific circumstances. For instance, CRAs apply different economic indicators in assessing a sovereign. Generally, debt to GDP ratio, deficit to GDP ratio, deficit trend and inflation rate are considered as the most important drivers the sovereign's creditworthiness. Regarding a corporate rating, relevant factors include the firm's management, capital structure, competitions, financial policies, sector attributes, risk management etc; The qualitative considerations do play an important role in rating process. However, these judgements are ultimately subjective from each CRA (House of Lords, 2011), which therefore leads to differences in rating process among CRAs. Furthermore, CRAs also utilise a variety of monitoring processes. More specifically, the rating process of S&P measure the performance of credit ratings based on the probability of default (S&P, 2018a), while Moody's assigns ratings on the basis of ratings movements, probability of default, and loss given default (Moody's, 2018). Fitch models

typically consist of two sub-components: a probability of default and loss severity/expected recovery, which equals to total due amount less loss given default (Fitch, 2019a). Therefore, rating methodologies vary across CRAs.

2.3. Definitions

2.3.1. What is a credit rating?

Generally, a credit rating, elaborated by a credit rating agency, is a quantified assessment of the creditworthiness of a borrower in terms a particular debt or financial obligation in full, including principal and interest on a timely basis. The quality of a credit rating is a function of its accuracy, timeliness, and stability in measuring default risk (Cheng and Neamtiu, 2009). A credit rating can be assigned to any entity that seeks to borrow money - an individual, corporation, state or provincial authority, or sovereign government. Table 2.2 summarises definitions of credit ratings by S&P, Moody's and Fitch.

Table 2.2: Definition of credit ratings from S&P, Moody's, and Fitch

S&P	Moody's	Fitch
"An S&P Global Ratings credit rating is a forward-looking opinion about the creditworthiness of an obligor with respect to a specific financial obligation, a specific class of financial obligations, or a specific financial program (including	"A Credit Rating is an opinion regarding the creditworthiness of an entity, a debt or financial obligation, debt security, preferred share or other financial instrument, or of an issuer of such a debt or financial obligation, debt security, preferred share or	"Fitch's credit ratings relating to issuers are an opinion on the relative ability of an entity to meet financial commitments, such as interest, preferred dividends, repayment of principal, insurance claims or counterparty obligations"

ratings on medium-term note programs and commercial paper programs)".	other financial instrument, issued using an established and defined ranking system of rating categories".	
Sources: S&P,2018b; Moody's 2018; Fitch,2019b.		

According to CRAs, a credit rating is an independent and objective analysis of credit, but not a buy or sell recommendation. Importantly, credit ratings are entirely forward-looking indicators in measuring the default probability of a particular issuer or debt issue. However, credit ratings are not intended as guarantees of future events. It also does not address market liquidity or volatility risk. Additionally, CRAs explicitly express that credit ratings are not aimed at absolute measures of default probability but ordinal rankings or relative measures of these creditworthiness.

2.3.2. Types of credit ratings

There are numerous ratings provided by CRAs. However, these can be categorised as follows:

Issue versus issuer ratings

An issuer credit rating is the opinion of a CRA, relied on the likelihood that the rated party will go into default with regard to all its financial obligations. It focuses on bankruptcy or liquidation, statutory preferences, or the legality and enforceability of the obligation rather than the nature of and provisions of the obligation (S&P, 2018b). An issuer credit rating is also known as corporate family rating.

An issue credit rating is assigned to a particular debt, a particular financial obligation, a particular class of financial obligations, or a particular financial program (including ratings on medium-term note programs and commercial paper programs). It takes into account the creditworthiness of guarantors, insurers, or other forms of credit enhancement on the obligation and the currency in

which the obligation is denominated. There are several types of issue credit ratings including bonds, commercial papers, preferred stock, bank loans, and structured securities.

Foreign currency and local currency ratings.

Both foreign currency and local currency ratings are internationally comparable assessments (S&P, 2018b; Moody, 2019; Fitch, 2019b). Generally, the economic, financial system and country risks are taken into account in explaining foreign currency and local currency ratings. The probability that an entity would receive external supports in case of financial difficulties is also considered to reflect the entity creditworthiness.

Foreign currency ratings are opinions on the relative ability and willingness of an entity regarding its foreign currency denominated financial obligations. It takes into consideration the likelihood of its government that may directly impact on foreign currency market or constrain foreign currency debt payments (S&P,2018b).

Local currency ratings refer to firm's capacity and willingness to generate sufficient local currency resources to meet its financial obligations in a timely manner without taking into account risks arising from its government actions impacting on the conversion of local currency to foreign currency or on the transfer of foreign currency to residents and non-residents (S&P,2018b).

Long-term versus short-term ratings

A rating expresses the likelihood that the issuer will fulfil its repayment obligations within a given time horizon. Generally, a rating with a time horizon not exceeding 365 days is considered as a short-term rating (Fitch, 2019b; Moody's, 2018; S&P, 2018b). Short-term ratings could be assigned to issuers, short-term programs or to other short-term debt instruments.

On the other hand, a rating with a time horizon more than a year, is considered as a long-term rating. (Fitch, 2019b; Moody's, 2018; S&P, 2018b). Likewise, long-term ratings may be assigned to issuers, long-term bonds, programme and projects.

Solicited versus unsolicited ratings

CRAs typically publish solicited ratings by issuers' requests, while entities do not pay for the issuance of unsolicited ratings. Unsolicited credit ratings are based largely on available information. As a consequence, a degree of public information disclosed is a main driver in explaining systematically lower unsolicited credit ratings than solicited ratings which are relied on both public and unpublic information. Several studies examine whether unsolicited ratings are downward biased. A downward biased rating means that entities with unsolicited ratings are rated at a lower grade than they would obtain if their ratings were solicited. This suggests CRAs strategy behaviours with the aim of putting pressure on borrowers to pay for the full services. Using data sets of S&P credit ratings on 265 firms in different industries across 15 countries spanning from 1998-2000, Poon (2003) provides strong evidence of self-selection bias in the rating process. Unsolicited credit ratings are downward biased compare to solicited ratings after controlling for differences in sovereign risk and key financial characteristics. Further, financial performance of firms with unsolicited ratings are more likely to be poorer than those with solicited ratings. Consistent with this finding, Firth and Poon (2005) also find lower ratings to banks that do not pay fees, compared to their solicited counterparts, using the data on 1,060 ratings of major international banks across 82 countries. Similarly, based on the sample of Fitch and S&P credit rating on banks in Asian areas, Van Roy (2013) provides evidence that unsolicited credit ratings tend to be lower than solicited ones, after taking into account differences in observable bank characteristics. However, there is no evidence that better-quality banks self-select into the solicited group in explaining the downward bias. Furthermore, analysing S&P unsolicited and solicited ratings by using bond-yield data in Japan, Han et al. (2013) find that firms with solicited ratings experience lower information asymmetry and better firm performances. Therefore, firms with unsolicited ratings experience greater costs of borrowing. This leads to stronger volatilities in their bond prices

when their credit ratings change. In other words, a lack of information disclosed in unsolicited ratings process could result in significant differences compared to solicited ratings.

In summary, CRAs typically publish both long-term and short-term ratings on several type of borrowers including an individual, corporation, state or provincial authority, or sovereign government. An issuer/issue may receive both foreign currency and/or local currency ratings which depend on the currency of the issued debts.

2.3.3. Rating scales

CRAs use letter designations (such as AAA, B, CC) on a rating scale in representing the quality of bond. Greater grades are intended to reflect a lower probability of default. For example, Moody's Investors Service employs a scale from "Aaa," representing for the best of the best, to "C," indicating that a bankruptcy petition has been filed in. S&P and Fitch assign bond credit ratings from “AAA”, “AA”,” A”, “BBB”, and so on to, “D” for those at the bottom of the barrel. Currently, Microsoft and Johnson and Johnson are only two companies in the United States with an AAA credit rating. Table 2.3 briefly presents the scales for long-term senior debt ratings using by S&P, Moody’s and Fitch.

The rating scale is divided into "Investment Grade" and "Speculative Grade”. The investment–speculative grade borderline plays an important role in the market participant’s portfolios allocation or reallocation in respect of this credit threshold. Investment grade status is associated with a relatively low to moderate default risk, while speculative grade signals a greater level of uncertainty that a default has already occurred. Issuers rated BBB- or above by S&P and Fitch, and Baa3 or above by Moody’s, are categorised in the investment grade asset class; issuers rated below that threshold are categorised in speculative grade asset class.

Table 2.3: Ratings scales using by three leading agencies				
S&P	**Moody's**	**Fitch**	**Interpretations**	
AAA	Aaa	AAA	highest quality, with minimal credit risk	**Investment Grade**
AA+\AA\AA-	Aa1\Aa2 \Aa3	AA+\AA\AA-	high quality, with very low credit risk	
A+\ A \ A-	A1\ A2\ A3	A+\ A \ A-	upper-medium grade, with low credit risk	
BBB+\BBB\ BBB-	Baa1\Baa2\ Baa3	BBB+\BBB\ BBB-	medium grade, with moderate credit risk, may possess certain speculative characteristics	
BB+\BB\BB-	Ba1\ Ba2\Ba3	BB+\BB\BB-	have speculative elements, substantial credit risk	**Speculative Grade**
B+\B\B-	B1\B2\B3	B+\B\B-	speculative, with high credit risk	
CCC+\CCC\ CCC-	Caa1\Caa2\ Caa3	CCC+\CCC\ CCC-	poor standing, with very high credit risk	
CC\ C	Ca\ C	CC\ C	highly speculative; likely to default, with some prospect of recovery of principal and interest	
R\ SD\ D	D	RD\ D	lowest rated class; typically, in default, with very little prospect for recovery of principal and interest	
Sources: S&P,2018b; Moody's 2018; Fitch,2019b.				

2.3.4. Rating migration

Once CRA republishes a credit rating, they continuously assess the creditworthiness of a borrower. Credit rating (or scoring) transition is the migration of a debt instrument from one rating class to another within a specific time period. This migration is the movement either as an upgrade or a downgrade from an existing rating, indicating the change of issuer's credit quality as the creditworthiness improves or deteriorates. Ben Ayed et al. (2018) explore the rating migrations over periods before and during the financial crisis of 2007–2008. They conclude that before the crisis, CRAs are more likely assign better credit rating to firms. However, during the crisis of 2007–2008, there are downward revisions of these ratings, which raises the question that whether CRAs have overrated several firms. Rating migrations are major inputs are major inputs for modern risk management and models in credit portfolios (Tsaig et al. 2011; Liang et al. 2016),

2.3.5. Watch and outlook notifications

A complete CRA rating process on an issuer includes a credit rating and a rating outlook/watch status. In order to preserve CRAs reputation, one criticism is that they prefer to be slow and right in responding to changes in ratings (Altman and Rijken, 2006). Therefore, outlooks and reviews or watch notifications are considered as supplemental tools to provide indicators of uncertain changes in the credit quality in the near term under a formal review prior to an actual credit rating change. Watch/ outlook review procedures are the sources where CRAs convey private information to the public. More specifically, a rating outlook may take over the next one- to two-year period. CRAs use "positive", "stable", "negative" and "developing" in categorising rating outlook. Credit watch status is a much stronger statement regarding the potential change in ratings likely to happen in a short-term period (ex-ante target of 3 months). CRAs use "watch for upgrade", watch for downgrade", and "watch with direction uncertain" in categorising rating watch (S&P,2018b; Moody's 2018; Fitch,2019b.)

Several empirical studies highlight the important role of credit watch and outlook to all market participants (from investors to regulators). Bannier and Hirsch (2010) examine the economic function underlying outlook/watch procedure and conclude that the primary aim of watch signals is to enhance the delivery of information for the high-quality borrowers. Credit outlooks/watchs also support in identifying issuers that are more likely to default or have withdrawn ratings (Metz and Donmez, 2008). Binici and Hutchison (2018) provide strong evidence of the watch/outlook status as a main factor in explaining market behaviours through a credit default swap (CDS) response estimation to changes in credit rating. Specifically, a downgraded sovereign bond results in the highest CDS price response in case of this bond not placed on watch or outlook status. They also find changes in credit ratings arising from bonds with negative outlook statuses, but no evidence of any rating change when bonds are placed on watch announcements. In term of corporate perspective, outlook and watch statuses provide some insight into the future behaviour of a business. Liu and Sun (2017) examine the impact of credit watch placements on downgraded firms' long-term recovery during the period from in October 1992 to December 2008. They find that firms with watch-preceded downgrades establish greater returns than those who are not placed on watches. Additionally, credit watches are associated with better recovery in firms' operating performance, financial leverage and firms' overall default risk in the post-downgrade period.

2.3.6. Split ratings

Split rating is a situation in which a security is given different ratings by two or more major CRAs. A split rating may occur because CRAs utilise a variety of monitoring processes and qualitative factors in judging the creditworthiness of corporate. Numerous studies attempt to explain the reasons of split ratings. More specifically, Ederington (1986) report that split ratings may happen arising from non-systematic, random errors across CRAs. Furthermore, Hyytinen and Pajarinen (2008) provide strong evidence of firm opaqueness as a main driver in explaining rating

disagreements. Firms with more opaque assets lead to a greater frequency of split ratings due to lack of high-quality information. In the same vein, Vu et al. (2017) also find evidence of opaque sovereigns and political risks in explaining split ratings. Besides, government information disclosures play important roles in explaining rating disagreements between Moody's and Fitch in emerging markets. Dandapani and Lawrence (2007) find different relevant sources that reflect an obligor's creditworthiness as well as differing weighting assigned to determinants of credit ratings result in split ratings. Differences of opinion across CRAs may also arise from "home bias". CRAs tend to assign better ratings to issuers from same nationalities or geographic regions (Shin and Moore, 2003; Alsakka and ap Gwilym, 2012). Alsakka et al. (2017) find a strong connection between split rating and subsequent unfavourable credit signals by each CRAs. The connection between Moody's/Fitch actions and their credit rating disagreements with other agencies are more likely to be weaker in the post-regulation era. Altdörfer et al. (2019) examine whether Fitch- a European rating agency assigned more optimistic ratings compared to rating actions by Moody's and S&P in the aftermath of Eurozone sovereign debt crisis However, they find evidence of no significant impact on bond market by Fitch rating's actions during crisis. This raises doubt about the real benefit of Fitch CRA, especially during financial crisis.

2.4. The rating industry: Its rationale and importance

Credit rating agencies play a crucial role in most modern capital markets to all participants (from investors to regulators). In the bond market, a CRA provides a formal and independent assessment of the creditworthiness of financial instruments issued by governments and corporations. This allows market participants to aware the credit quality as well as specifying terms and conditions in financial contracts.

Regarding regulator's perspectives, the ratings provided by CRAs are also considered as benchmarks for financial market regulations. Some regulators now require certain public

institutions to hold investment grade bonds, which have a rating of BBB or higher on the Standard & Poor's scale. Their aim is to limit the riskiness of the assets that such institutions hold. More specifically, banks were encouraged to invest only in safe financial instruments that were "investment grade" by bank regulators since 1936. As a consequence, banks were prohibited to hold bond that were categorised as "Speculative" in modern ratings. In the following decades, the US insurance regulators also followed a similar strategy of a related restriction limits investment with "Speculative" bonds. In the 1970s, federal pension regulators pursued a similar path with an accompanying restriction on investment funds to investment-grade securities. In respect of broker-dealers who include major investment banks and securities firms, in 1975, SEC initiated "nationally recognized statistical rating organization" category (NRSROs) for safety regulation in calculating the broker-dealers' capital requirements. It requires broker-dealers to reduce from net worth certain percentages of the market value of their owned securities (SEC, 1994, 1997). In short, the judgments of CRAs do play an important role in debt markets. Banks and many other financial institutions- such important players in the bond market- could satisfy the safety requirements by just paying particular attention to the ratings rather than their own assessment on bond's credit quality (White, 2010).

At the customer level, credit ratings are main drivers for an issuer to gain access to capital markets. Issuers seeking fund from international capital markets generally look for a CRA to rate their debt securities in order to attract investors who tend to prefer securities to be covered by several CRAs rather than unrated securities at the same credit risk. CRA earned their incomes for issuing assessments on the creditworthiness of debt issuers and/or debt issues. Furthermore, banks also use credit ratings assigned by recognised CRAs to determine the terms of a loan. A bad credit rating indicates a higher risk premium of this debt security, which lead to an increased interest rate

to issuers with a low credit rating. On the other hand, issuers with favourable credit rating tend to access more easily the debt markets or financial institutions at the lower cost of debt.

At the corporate level, credit ratings are important tools in investor's decisions to buy a company's debt securities, or even the stock. CRAs can help lenders pierce adverse selection issues resulting from information asymmetry between borrowers and investors and hence solve the "lemon" problems (Boot et al. 2006). More precisely, issuers possess more information regarding their creditworthiness compared to lenders, which leads to higher quality borrowers opting to stay out of the credit markets by higher rates and hence market failures. A CRA acts as a trusted and independent third party to provide new information or verify information relating to borrower's creditworthiness. This results in decreased adverse selection problems and hence an increased financial market liquidity. Besides, outlooks and reviews or watch notifications are considered as supplemental tools to provide indicators of uncertain changes in credit quality in the near term under a formal review prior to an actual credit rating change. These tools hence play crucial roles in improving firm's creditworthiness (Boot et al. 2006). Although investors' decisions are also based on financial intermediaries and underwriters, ratings republished by international CRAs are considered to be more reliable and accurate as CRAs assign ratings based on information received from different relevant sources: public and non-public information.

At the country level, investors also apply sovereign credit ratings as a way to assess the riskiness of a particular country's bond. Nowadays, several countries sell their sovereign bonds in international credit markets. A favourable rating is not only as an important factor in gaining access high-value investors but also may appeal other forms of investments, such as foreign direct investments to a country. In contrast, a sovereign with a low rating can discourage the inflow of foreign capital. For example, Greece, Portugal, and Ireland had their sovereign debt downgraded to junk status by S&P in 2010.

2.5. Criticisms during the recent crises

Methodological flaws:

Asset-backed securities have been developed for decades. However, the issuance of two new types of structured debt products: subprime Mortgage-Backed Securities (MBSs), and Collateralized Debt Obligations (CDOs) grew spectacularly over the period from 2001-2006. CRAs are accused of bearing a strong responsibility for fuelling the unsustainable growth of the asset-backed securities market**.** Scholars and regulators generally agree that a key determinant in the chain leading to a world financial meltdown is developed by the fact that CRAs were too eager to give the highest rating (AAA) to most of the collateralised debt obligations (CDO) securities that were backed by these sub-prime mortgages. These failures are related to large losses on securities that had received overly optimistic ratings initially (Benmelech and Dlugosz, 2009). Indeed, CRAs' methodologies of evaluating the credit risk related to CDOs did not reflect actual risk elements involved in these types of financial instruments. This leads to rating firms' incompetence and hence their overrated securities. Despite recent criticism since the 2007–2008 financial turmoil, credit ratings, along with the growing prestige of CRAs still provide valuable functions in managing credit quality and in developing financial markets.

Conflicts of interest:

CRAs face serious inherent conflicts of interest between producers of ratings (the agencies) and users of ratings (such as investors). "The heart of the problem is the flow of money from issuers to ratters" (Baghai and Becker, 2018), which provides evidence about the ability of issuers to pay more for more optimistic ratings. Firstly, the concerns with the rating system are associated with a CRA's business model. They get the bulk of revenue by selling their assessments of creditworthiness's issuer. Under the pressure of gaining or keeping its business and being paid by the issuers, a CRA might be upward biased by distorting credit standards in order to please their

customers' expectations in exchange for increased fees and hence an increased market share. Secondly, CRAs are allowed to provide a variety of non-rating services such as pre-rating assessments and corporate consultants. Those services facilitate rating shopping, which induces issuers to choose a CRA that is willing to give the highest rating to their debt securities. This creates concerns whether these issuers switch between CRAs in exchange better ratings. This hence creates a prima facie conflict of interest

In response to the accusation, CRAs essentially argue that they cannot afford a dangerous attitude, since their reputation is at stake (e.g., Mathis et al. 2012). Previous literature (e.g., Becker and Milbourn, 2011; He, Qian, and Strahan, 2012; and Efing and Hau, 2015) explain the fundamental conflict of interest. Inherent conflicts may arise due to the high competitions among CRAs (Becker and Milbourn, 2011) or when service fees of individual issuers account for large shares of the total business (He, Qian, and Strahan, 2012; and Efing and Hau, 2015). However, there is no evidence to date on whether the flow of money from issuers to ratters is associated with upward biased ratings. Goldstein and Huang. (2019) examine the impact of credit rating on firm investment by developing a model of feedback. This model is allowed to analyse the real effects of CRAs on firm investment and issues regarding credit rating inflation. They indicate that a high credit rating is more likely to be potentially inflated. This creates an optimistic belief of creditors, which leads to a reduction in financial cost hence changes in investments. Therefore, an inflated credit rating could have positive or negative real effects on investments. In case of firms with a high credit rating, some firms tend to invest riskier, which indicates negative CRA's effects. However, some firms are more likely to invest safer and more efficiently, which indicates favourable CRA's real effects. Furthermore, they show that a credit rating drives new informative messages to the corporate debt market. There is a positive relationship between a credit rating and an firms' investment efficiency. Resulting from the feedback effects between credit ratings and investments,

CRAs are more likely to assign more favourable ratings to more firms. This implies negative effects on the corporate bond market.

2.6. Conclusion

Recent financial and debt crises have drawn a huge interest upon CRAs. Researchers, investors, regulators, policy makers, public authorities, politicians and other market participants have been concerning over credit rating industry more than ever.

CRAs are important information providers in global financial markets. Accessing international capital markets is the main reason for issuers seeking credit ratings from CRAs. Credit ratings help to mitigate the fundamental problem of adverse selection, informational asymmetry between investors and borrowers, fears of lemon investments, and thus decrease costs of capital.

Chapter 3: The review of related literature on sovereign and corporate ratings

3.1. Introduction

This chapter aims at providing an overview of prior literature on both sovereign and corporate credit ratings and highlighting important gaps, of which three key topics shall be investigated in in the following chapters. Prior literature for both sovereign and corporate credit ratings primarily focus on the following main issues: the determinants and methods of both sovereign and corporate credit ratings, sovereign ratings' market impacts and behaviour of firms in case of change in both sovereign and corporate rating. The remaining of this chapter is organised as followings. The definition, determinations of sovereign rating and its impacts on financial markets are discussed in section 2. Section 3 highlights the definition, determinations of corporate rating and its impacts on firms' policies.

3.2. Sovereign credit rating

2.1. What is a sovereign credit rating?

A sovereign credit rating is an opinion regarding the summary creditworthiness measure assigned by CRAs to sovereign debt (debt incurred by governments). Sovereign borrowers consist of national governments, state governments, municipalities, and other sovereign-supported institutions. In other words, a sovereign rating is referred to an assessment of a government's capacity and willingness to service its public debt obligations in full on a timely basis. This sovereign credit rating could reflect factors such as a country's economic status, transparency in

the financial markets, levels of international investment flows, foreign direct investment, foreign currency reserves, or political risk (Schweinitz, 2007),

Sovereign credit ratings are key determinants of countries' access to international capital markets and the terms of that access. Changes in sovereign credit ratings might trigger significant impacts on the ability of public and private sectors to access to capital markets.

2.2. Determinants of sovereign credit rating

There are a number of studies attempting to explain the determinants of sovereign ratings by linear estimation methods and ordered response models (see, for instance, Bissoondoyal-Bheenick, 2005, Afonso and Rother, 2011) for both developed and developing countries. Generally, the level of GDP per capita, real GDP growth, external debt, the public debt level and the government budget balance are considered as main drivers in explaining the rating scale of sovereign debt rating.

Bissoondoyal-Bheenick (2005) examine the relationship between sovereign ratings provided by the two major rating agencies: Moody's and S&P, and economic variables, based on the sample of 95 sovereigns spanning from 1995 to 1999. In term of methodology, an ordered response model is employed in analysing determinants of sovereign ratings. The sample is categorised into 2 sup-samples consisting of 25 high-rated countries and 70 low-rated countries. Among economic indicators used, Bissoondoyal-Bheenick (2005) show evidence that GNP per capita and inflation, on average, are more likely associated with sovereign ratings. In low-rate countries, there is a link between sovereign ratings and some economics variables including GNP per capita, inflation, current account balance and foreign reserves. However, there is no evidence of economic variables as main drivers in explaining sovereign ratings' variations in high-rated countries, which implies that this finding can be explained by the lack of variability in the ratings assigned to high-rated countries.

Mellios and Paget-Blanc (2006) analyse the determinants of sovereign ratings by the three leading CRAs, namely Moody's; S&P; and Fitch based on the analysis of a broad set of economic, social, and political factors, using the sample of 86 countries on December 31st, 2003. In term of methodology, linear regression and ordered logistic models are employed in interpreting sovereign ratings, with 49 economic and political variables. Mellios and Paget-Blanc (2006) find strong evidence that sovereign ratings are positively associated with per capita income, government income, real exchange rate changes, and default history. While there is a negative link between inflation rates and sovereign ratings. They also report that a corruption index as a proxy of both development level and the quality of governance of a country is critically influential to sovereign credit ratings. The regression model logistic models do provide high predictive powers. On average, 55% (74%) of all observations on sovereign credit ratings are correctly predicted with a difference of one notch. The percentage increases to more than 84% (95%) when two notches between predicted and observed ratings errors are allowed.

Using a data set of sovereign credit ratings assigned by Moody's, S&P, and Fitch on 78 sovereigns over the period from 1995 to 2005, Afonso and Rother (2011) investigate the relationship between sovereign ratings from the three main rating agencies and a set of macro-economic variables. They apply similar methods in Mellios and Paget-Blanc (2006) in examining the determinants of sovereign debt ratings. This allows them to distinguish short and long-term effects of macroeconomic and fiscal variables on sovereign ratings, after including time averages of the explanatory variables as additional time-invariant regressors. Afonso and Rother (2011) provide strong evidence that GDP per capita, GDP growth, government debt, and government balance play important roles in explaining the short-run determinants of sovereign rating; meanwhile, changes in government effectiveness, external debt, foreign reserves, and default history are considered as long-term impacts on sovereign ratings.

Using a quarterly database of 103 S&P sovereign credit ratings for long-term foreign currency-denominated debt during 1982–2012, Chen et al. (2016) examines impacts of a sovereign rating revision of one country on the economic growth rates of other countries. In term of methodology, they employ a system generalized method of moments (system GMM) approach and a difference-in-differences framework in explaining the relation between sovereign credit rating revisions and economic growths of the re-rated countries. Additionally, a three-stage least squares model is applied in order to investigate the transmission channels. Chen et al. (2016) provide evidence of significant output spill-over effects resulting from rating revisions. More precisely, on average a one-notch upgrade (downgrade) results in a 0.6% (0.3%) increase of re-rated countries' five-year average annual growth rates in the consideration of economic growths and issues related to potential endogeneity. Besides, Chen et al. (2016) find that economic growths will be influenced by changes in the country rating via two transmission channels: interest rate and capital flows. Specifically, the effect of rating downgrades results in higher sovereign bond yield spreads and decreased capital inflows that stimulate poor re-rated countries' economic performance, and the converse holds for the impact of rating upgrades.

Broto and Molina (2016) explore the presence of asymmetry between upgrade and downgrade phases and its determinants during such phases, based on a panel data model of 67 countries, including 43 emerging countries and 24 developed countries over the period from 1994 Q1 to 2013 Q1. In term of methodology, probit and logit models are adopted in order to explain the asymmetric rating paths. Besides, the pooled OLS and the ordered logit models are also used as robustness tests. Broto and Molina (2016) provide that downgrade phases are more likely to be deeper and faster than upgrade phases. Improvements in economic and financial domestic positions are play crucial roles in smoothing and slowing down the path of sovereign downgrade. While there is no evidence of the acceleration of sovereign upgrades in term of positive fundamentals. This indicates

that it takes longer time for a country to be able to recover their prior credit rating status after a sovereign downgrade period.

Using panel regression models with random effects on a sample of 19 Eurozone sovereigns in the period from 2002 to 2015, Boumparis et al. (2017) analyses the quantitative determinants of sovereign ratings assigned the three most prominent rating agencies, namely Moody's; S&P; and Fitch. In term of methodology, a panel quantile framework is employed in investigating the determinants of sovereign credit ratings. The main advantage of this method is to allow the relative significance of the explanatory variables to vary across the quantile distribution of sovereign ratings. Boumparis et al. (2017) provide strong evidence of unemployment rate; regulatory quality and competitiveness as main drivers of sovereign ratings in low rated countries. While GDP per capita is associated with sovereign ratings in high rated countries. More specifically, a high-rated country with a higher degree of GDP per capita is more immune against downgrades. A rating or outlook upgrade for low rated countries can be explained by a decreased current account deficit or an increased current account surplus. Furthermore, there is a negative relationship between economic policy uncertainties and changes in credit ratings across the quantile distribution, especially for the lower rated countries. In other words, low rated countries have worse impacts on their sovereign ratings compared to high rated countries when European policy uncertainty is on the rise.

Reusens and Croux (2017) explore determinants of sovereign credit rating for the largest three CRAs, based on the sample of 90 countries during the period from 2002 to 2015. In term of methodology, a multi-year ordered probit regression model is adopted in order to assess ten determinants of sovereign rating. They find that the financial balance, the economic development and the external debt are considered as main factors in explaining sovereign ratings after the beginning of the European debt crisis since 2009. There is a strong relationship between GDP

growth and sovereign rating, especially for countries with high government debt. Moreover, the impact of public debt on sovereign rating will be larger in case of countries with low GDP growth. Their findings indicate changes in assessment of sovereign rating of CRAs in the early aftermath of the European debt crisis.

De Moor et al. (2018) focus on subjective components of sovereign rating, based on the sample of 103 countries during the period between 1995Q2 and 2014Q1. In term of methodology, sovereign credit rating is decomposed into two different components. The first component includes unbiased and objective variables such as macroeconomic and political variables. The second component includes bias and subjective characteristics resulting from the effects of rater's unfamiliarity and lobbying activities of a sovereign. Subjective components are measured based on five variables, including Lobbying power, Trade proximity, Common language, Religious proximity and Nearest geographical distance. In term of methodology, a random-effects ordered-logit panel and a machine-learning approach based on decision tables are applied to access determinants of sovereign ratings. De Moor et al. (2018) provide evidence that subjective components play crucial roles in explaining sovereign rating within one and two years. Furthermore, the magnitude of the subjective adjustment varies across rating notches and overtime. They also find a significant decrease in the subjective component for low rated countries. While there is an increased subjective component of the sovereign rating in case of high-rated countries.

Employing panel regression models with random effects on a data set on bilateral FDI flows of 31 OECD donor countries to 72 recipient (OECD and non-OECD) countries over the period of 1985–2012, Cai et al. (2018) examines the relationship between sovereign credit ratings provided by the three main agencies, namely S&P, the Fitch and the Moody's, and FDI flows. They take three groups of control variables that are potential affected by FDI flows into the regression model. These control variables include bilateral linkages (common language and distance); economic and

financial development measures (population, bank credit extended, and interest rate spread); and market openness (foreign exchange regime, investment barriers and total trade). Cai et al. (2018) show that sovereign credit ratings of both donor and recipient countries are significantly associated with bilateral FDI flows. Regarding recipient countries, higher-rated OECD countries are more attractive than lower-rated OECD countries, in favour of FDI flows; meanwhile, non- OECD countries with lower ratings tends to appeal more FDI flows compared to non-OECD countries with higher ratings. Furthermore, countries with a high credit rating of their geographic regions receive more FDIs. Cai et al. (2018) also find a negative relationship between FDI flows and bilateral linkages. Additionally, economic and financial development, and market openness play important roles in attracting more FDIs.

Agnello et al. (2019) analyse the duration and determinants of sovereign credit ratings through discrete-time Weibull models, based on the sample of Fitch long-term sovereign ratings data covering 130 countries over the period from 1980 to 2017. In term of methodology, sovereign ratings are spited into investment and speculative grades to construct sovereign rating phases. Then, Weibull models are adopted in order to investigate the duration dependence and identify the drivers of each sovereign rating phases. They find positive duration dependence in the 'speculative-grade' phase, while there is no evidence of duration dependence in the 'investment-grade' phase. Furthermore, country's economic conditions play important roles in explaining the length of both phases. Specifically, Agnello et al. (2019) find that lower inflation rates, stronger GDP growths and sounder fiscal positions decrease (increase) the length of the speculative-(investment-) grade phase. Furthermore, a strong governance quality is considered as a crucial factor that could shorten the speculative grade phase.

Marchesi and Masi (2020) investigate the impact of sovereign debt restructuring on sovereign ratings, using biannual data of 178 countries during the period from 1979 to 2016. In term of

methodology, a pooled OLS model and Synthetic Control Method (SCM) are used to examine this relationship between a debt restructuring and ratings. Marchesi and Masi (2020) find the presence of some reputational costs regarding private defaulters following the restructuring. While there is no evidence of the spill-over effect of the restructuring episodes on "official defaulters". Furthermore, they find the heterogenous effects of official and private restructurings on Investor's ratings. This indicates different costs as a result of debt restructurings and then leads to selective defaults.

In summary, both prior literature and disclosures from major CRAs confirm that the sovereign's economic fundamentals, political stability, and governance quality indicators do play important roles in explaining sovereign credit ratings

2.4. Market impact of sovereign ratings

2.4.1. Impact on bond markets

Given the important influence of sovereign ratings, prior literature find evidence supporting that sovereign credit risk can spill-over to bond markets in several ways.

Böninghausen and Zabel (2015) analyse the reaction of the bond market to sovereign credit announcements from Moody's, S&P and Fitch spanning from 1994- 2011. The data set in the study covers 73 developed and emerging countries. In term of methodology, Böninghausen and Zabel (2015) establish an explicit counterfactual analysis explaining cross- border spill-over effects arising from sovereign rating changes. In more detail, this counterfactual identification strategy is to compare the bond market reactions to small revisions in an agency's assessment of a country's creditworthiness against those induced by all other, more major revisions. They find significant evidence that sovereign downgrades induce negative cross-border spill-overs for countries within the same region. Strikingly, there is weak evidence of these spill-over effects in favour of fundamental linkages and similarities between countries, such as trade.

Using an event study technique for the sample of rating announcements spanning from November 2008 to June 2015 by S&P's and November 4, 2008 to May 27, 2015 by Moody, Cooke and Bailey (2015) investigate how Government of Jamaica (GOJ) USD-denominated global bond market responds to credit rating events. In term of methodology, they firstly examine differences between sovereign rating announcements from 2 CRAs, made by S&P's and Moody. Secondly, they define an event window of 10 days before and post-event of GOJ global bond price. Abnormal returns are estimated by differences between the actual return- daily holding period return and the expected return- the average holding period return within the estimation window 100 days in explaining the effects of sovereign ratings on bond returns. Cooke and Bailey (2015) provide strong evidence of market overreaction arising from both upgrade and downgrade announcements. However, market responds to sovereign credit rating downgrade is stronger compared to an upgrade. Greater Excess returns are observed resulting from an unanticipated downgrade rather than from an anticipated downgrade, while abnormal returns arising from an anticipated upgrade which were higher than from unanticipated upgrades.

Using daily data of long-term foreign-currency sovereign credit ratings, outlook and watch statuses by S&P, Moody's and Fitch on 122 countries during the period from 2000-2012, Vu et al. (2015) study the sovereign bond reactions in term of the rating split between each pair of the CRAs. In term of methodology, firstly, regression analysis is applied in explaining the relationship between sovereign bond credit spreads and split ratings. Bond spreads are measured in basis points in the [0, +1] time window. Secondly, Vu et al. (2015) study the sovereign bond reactions arising from higher (superior) and lower (inferior)ratings in a situation of split ratings. They find strong evidence of a significant spread adjustment resulting from negative credit events. However, positive credit events induce weaker impact on bond spreads. Vu et al. (2015) also provide significant evidence of market reactions to negative events by S&P which is the more conservative

agency in this data sample. Spread adjustments to Moody positive credit events are more pronounced when Moody's assigns superior pre-event compared to S&P's. Market reactions to Moody's positive events also induce greater changes in sovereign spreads, compared with S&P. There is little evidence of the effects of split ratings related to Moody's on market responses.

Huang and Shen (2015) examine the relation between sovereign ratings and bank credit ratings, based on the sample of 13,975 (16,897) S&P (Fitch) bank-year credit ratings from 85 (89) countries. In term of methodology, they employ the benchmark model to investigate whether changes in bank credit rating are related to sovereign rating's changes. Sovereign rating changes are then categorised into before, concurrent, and after bank rating changes. Additionally, the sample is classified into high-income countries and non-high-income countries. Year fixed effects and country fixed effects for year-specific and country-specific factors are controlled in explaining changes in bank ratings. Huang and Shen (2015) find that a sovereign rating change is a main factor in interpreting changes in bank credit rating after controlling macroeconomic variables. They provide evidence that a downgrade induces a stronger impact on bank credit rating compared to an upgrade. Banks with large shares of national bonds is more likely to be affected by sovereign rating changes, while banks holding foreign subsidiaries seems to be less affected by changes in sovereign rating.

Jakob and Nam (2017) examine the impact of cultural norms on abnormal market reactions before the official announcements of sovereign credit rating downgrades, using the sample of 58 countries over the period from 1989 to 2012. In term of methodology, ordinary least squares (OLS), multi-variate regression models and two stage least squares (TSLS) univariate regression models are used in order to explore the influence of cultural dimensions on market reactions to new messages prior to the official news of sovereign downgrades. Jakob and Nam (2017) find that masculinity and individualism are considered as important factors in explaining abnormal market reactions.

Specifically, the higher level of masculinity and individualism could reduce abnormal market reactions. When institutional quality and other macroeconomic variables are taken into account the estimation model, they still find the strong impact of masculinity on market prices.

Poon et al. (2017) examine the cross-border spill-over effects of sovereign ratings and bank credit ratings relied on the sample of 397 rated commercial banks in 14 eurozone countries and six other EU countries during the period from 2011-2015. In term of methodology, Poon et al. (2017) investigate the link between sovereign ratings and bank credit ratings through a ratings channel and an asset holdings channel. Firstly, they measure a bank's credit rating change in term of changes in the creditworthiness of the GIIPS; changes in its home country's creditworthiness; changes in the home country's credit watch; the bank's own creditworthiness; and important periods, and find evidence of rating downgrades of banks resulting from the impairment of sovereign debt in GIIPS (Greece, Italy, Ireland, Portugal, and Spain) countries. In favour of banks' asset management policies, the credit risk of bank is more likely to be more negatively affected in case of larger asset holdings of GIIPS debt, which leads to an increased bank downgrade probability.

El-Shagi and Von Schweinitz (2018) investigate the dynamics relationship between government ratings and sovereign bond yields, using sovereign rating data from for the three main CRAs, which covers 46 countries over the period from January 1980 to January 2014. In term of methodology, a bivariate semiparametric dynamic panel model is used in order to examine this dynamics relationship. Firstly, they explore the existence of a vicious cycle of rising government bond yields, which leads to a country default during sovereign downgrade periods. However, they find significant empirical evidence against the theory of vicious cycle. Secondly, El-Shagi and Von Schweinitz (2018) analyse the volatility of the short- to medium-run of yields in response to sovereign rating shocks. They predict that substantial costs in response to sovereign downgrades.

There is a sharp increase in interest rate resulting from sovereign rating which are downgraded below a B rating,

Binici and Hutchison (2018) investigate behaviour of the CDS market against rating announcements by CRAs from Moody's, S&P and Fitch, using monthly data of 56 advanced and emerging countries spanning from January 2004 through August 2012. In term of methodology, a panel framework is employed in examining how the sovereign CDS market responds to credit rating announcements after controlling for macroeconomic factors and, positive and negative watch/outlook statuses before the sovereign upgrades or downgrades. Binici and Hutchison (2018) provide strong evidence of watch/outlook status as a main factor in explaining market behaviours through a CDS response estimation to changes in credit ratings. Specifically, a downgraded sovereign bond results in the highest CDS price in case of this bond which is not placed on watch or outlook status. They also find changes in credit ratings arising from bonds on negative outlook status, but no evidence of any rating change when a bond is placed on watch announcements.

Bales and Malikane (2020) examine the impact of sovereign rating on bond market, using the sample of 31 emerging countries over the period from 1990 to 2016. In term of methodology, an EGARCH and a fixed effects panel regression models are used in explaining the reaction of bond volatility in response changes in sovereign ratings. Continuously compounded log returns for bonds are used to calculate the bond volatilities. Bales and Malikane (2020) find a symmetry effect of sovereign rating to bond reactions. There is a significant positive link between changes in sovereign rating and bond volatility. Furthermore, the response of bond volatility to changes in sovereign ratings is stronger for countries who are rated at speculative grade, compared to those who are rated at investment grade.

2.4.2. Impact on equity and foreign exchange (FX) markets

Alsakka et al. (2017) examine the impact of sovereign rating on the own-country stock market and its spillover effect to other European markets, using daily long-term foreign currency sovereign ratings, watch and outlook statuses from the "Big Three" CRAs. The sampled data covers 27 European countries over the period between July 2006 and November 2014. In term of methodology, they focus on the impact of pre-event split ratings on the stock market in response of negative credit events. These effects could be either weaker or stronger the volatility of stock prices. They find that negative rating actions assigned by S&P play the most important role in explaining the reactions of stock indexes. Furthermore, rating disagreements between S&P and Moody's/Fitch also impact on the stock market's response. They find evidence of the spill-over effects of S&P's negative actions on stock markets of other EU countries

Abad et al. (2018) examine the cross-country spill-overs in the stock market resulting from the competition versus contagion effects of sovereign rating actions, using daily equity indices from 39 countries on the Europe and Central Asia regions and daily data on sovereign rating actions by Fitch, Moody's and S&P during the period from August 1994 to October 2015. In term of methodology, Abad et al. (2018) develop competing hypotheses on the potential spill-over effects within and between high-rated and low-rated countries who will be impacted by the sovereign rating levels, split ratings and the extent of rating convergence. They find strong evidence that downgrades of high-rated countries create contagion effects to both high and low-rated countries. On the other hand, downgrades of low-rated countries induce competitive effects to both high and low-rated countries. Furthermore, CRAs' differences of opinion (split ratings) and rating convergence/divergence across similarly-rated sovereigns are considered as key factors in explaining stock market spill-over effects. More specifically, in case of the downgrades of high-rated countries, the contagion effects on other high-rated countries in the region are mitigated by

rating convergence, but this contagion effect is unlikely to be affected to low-rated countries by rating convergence. Likewise, for the downgrades of low-rated countries, rating convergence plays an important role in fostering the competitive effects on other low-rated countries; However, it influences insignificantly the competitive effect to high-rated countries.

Tran et al. (2019) investigate the impact of sovereign ratings news on equity and foreign exchange (FX) market responses, based on a sample sovereign credit rating from Fitch, Moody's and S&P, covering 41 countries over the period between January 2007 and April 2013. They find interesting evidence of the coordination between sovereign rating news and investors' beliefs. There is a strong impact of rating news on stock index returns and FX with the same magnitude. An increase in FX and stock index reactions correspond to the first move of sovereign rating news. This directly presents a high level of heterogeneity in investors' beliefs in term of rating news releases. However, they find a significant reduction in the volatilities when the additional messages do not contain any new information but rather confirms the previous action. In term of methodology, they adopt a model in which sovereign credit news from the largest three CRAs interacts with heterogeneous beliefs. These heterogeneous beliefs are measured by abnormal returns of FX rate and stock indexes following first-move and additional-move rating news.

Bales and Malikane (2020) examine the impact of sovereign rating on stock market, using the sample of 31 emerging countries over the period from 1990 to 2016. In term of methodology, an EGARCH model and a fixed effects panel regression are used in explaining the reaction of stock volatility in response changes in sovereign ratings. Continuously compounded log returns for stocks are used to calculate the stock volatility. Bales and Malikane (2020) find an asymmetry effect of sovereign ratings on stock prices. There is a significant adverse link between sovereign downgrades and stock volatilities. While they do not find any evidence of the impact of sovereign upgrades on stock volatilities. Furthermore, the response of stock volatility to changes in sovereign

ratings is stronger for countries who are rated at speculative grade, compared to those who are rated at investment grade.

Rosati et al. (2020) investigate the impact of sovereign ratings on stock markets during periods of crisis by developing a new empirical model based on Markov Chains. They focus on three European countries- Portugal, Spain and Greece from 2009 to 2014 and two countries in Asia including South Korea and Indonesia over the period from 1997 to 2003. In term of methodology, they use a generalized ordered probit model in order to examine the impact of changes in sovereign ratings on stock exchange indices. They find evidence that either sovereign rating changes or a poorer macroeconomic condition could impact on the dynamics of stock markets. Furthermore, Rosati et al. (2020) find evidence in Greece that at the threshold of B- rating level, the chance of an increase in stock market index is nearly zero. Instead, this stock market index is likely to decrease from 50% to 70%. The default probability of a country and the sovereign ceiling play important roles in explaining the expectation future stock returns and volatilities. Moreover, the effects of macroeconomic on stock markets tend to be stronger for low-rated countries.

2.4.3. Impact on derivative markets.

Drago and Gallo (2016) investigate the relationship of sovereign credit rating announcements and CDS markets, based on a sample of S&P's rating changes and daily 5- year maturity CDS premiums on 15 EMU Member States during the period from 2004 to 2015. In term of methodology, they firstly adopt an event study methodology in explaining the effects arising from sovereign rating changes and rating warnings (outlooks and reviews) announcements on the euro area CDS markets. Rating announcements are categorised into two groups: negative events (downgrades, negative outlooks and negative reviews) and positive events (upgrades, positive outlooks and positive reviews). Secondly, they investigate a spill-over effect of a rating announcement by employing a modified model, proposed by Gande and Parsley (2005). Drago

and Gallo (2016) find strong evidence of the impact on financial market resulting from the introduction of "new" information after rating changes (downgrades and upgrades). Conversely, there is weak evidence of the CDS market reaction to rating warnings (outlooks and reviews). They conclude that only a downgrade announcement has a significant spill-over effect on the euro area CDS markets. The size of this effect depends on economic and financial determinants of event countries. Furthermore, international bank flows among EMU Member States plays important roles in explaining a transmission channel of the spill-over effect.

Binici and Hutchison (2018) investigate behaviour of the CDS market against rating announcements by CRAs from Moody's, S&P and Fitch, using monthly data of 56 advanced and emerging countries spanning from January 2004 through August 2012. In term of methodology, a panel framework is employed in examining how the sovereign CDS market responds to credit rating announcements after controlling macroeconomic factors and, positive and negative watch/outlook before sovereign upgrades or downgrades. Binici and Hutchison (2018) provide strong evidence of watch/outlook status as a main factor in explaining market behaviours through a CDS response estimation to changes in credit ratings. Specifically, a downgraded sovereign bond results in the highest CDS price response in case of this bond not placed on watch or outlook status. They also find changes in credit ratings arising from bonds on negative outlook status, but no evidence of any rating change when bond is placed on watch announcements.

2.4.4. Impact on non-financial corporate sector.

Chen et al. (2013) investigate the impact of sovereign rating on aggregate private investment of re-rated countries and conclude a temporary reduction in investment when confronted with downgrades in sovereign ratings, using the sample of 48 S&P rated countries during 1983–2009. Specifically, sovereign rating downgrades lead to the increased cost of capital and create unfavourable effects on the net present value (NPV) of some investment projects, which in turn

results in a decrease in real private capital investments. This reduction occurs only in the downgrade year and in the following year. The results remain unchanged after considering investment opportunities, endogeneity, omitted variables and other factors that could potentially impact on private investments. This finding also supports that the spill-over of sovereign's risks into nonfinancial institutions through the 'sovereign ceiling' channel.

Almeida et al. (2016) examines impacts of sovereign rating downgrades on firms' cost of capital, investments, and financing decisions based on data from 80 countries and S&P foreign currency long-term issuer rating announcement on the countries during the period from 1990- 2013. Almeida et al. (2016) find that the sovereign ceiling is associated with signification changes in corporate ratings in the wake of sovereign downgrades. The effect is asymmetric. More specifically, the credit risk of firms rated equal or higher than their sovereign (bound firms) before the downgrade tend to be worse after a sovereign downgrade, compared to firms with a rating lower than their sovereign (non-bound firms). As a consequence, these bound firms are more likely to curtail their investment than non-bound firms. Additionally, Almeida et al. (2016) also provide evidence supporting that downgrade effects lead to a decreased net debt issuance and an increased equity issuance. In short, sovereign debt impairments can have a statistically and economically significant impact on corporate bond markets, as bound firms issue higher yields than non-bound one. In term of methodology, they employ a difference-in-differences framework in interpreting the spill-over effect of sovereign rating downgrades on corporate rating as well as investments and financial policies. However, a potential issue arising from the implication of difference-in-differences methods is that the differential behaviour in the post-treatment period can be interpreted by other macro factors rather than sovereign downgrades. Placebo Tests are therefore applied to strengthen the link between corporate ratings and sovereign downgrades. In more detail, three placebo periods are considered to compare treated and non-treated firms during periods

without taking into account a sovereign downgrade. These periods include: (1) recession periods, (2) the 2007 to 2009 financial crisis, and (3) currency crises.

3.3. Corporate credit rating

3.3.1. What is a corporate credit rating?

A corporate credit rating is a quantified assessment of the creditworthiness of a corporation in terms its contractual, financial obligations as they become due on a timely basis. A corporate credit rating are entirely forward-looking indicators in measuring the default probability. However, credit ratings are not intended as guarantees of future events.

3.3.2 Determinants of corporate credit rating

Employing a panel regression analysis on a sample of non-financial firms listed on the Athens Stock Exchange (ASE) in the period 2005–2010, Dasilas and Papasyriopoulos (2015) investigate the relationship between corporate governance, credit ratings and the capital structure of Greek listed firms, both small-to-medium enterprises (SMEs) and large ones. They find strong evidence that corporate governance structures and credit ratings are two main drivers in explaining the capital structure of Greek listed firms, notably during the global financial crisis (2008-2010). Firm characteristics such as size, profitability, asset structure and growth opportunities are also play important roles in the capital structure of Greek listed firms. Excluding growth opportunities, there are positive relationships between these variables and leverage. In case of large firms, Dasilas and Papasyriopoulos (2015) find weaker evidence of effects of corporate governance on the capital structures compared to SMEs. They also find board independence, external auditing and credit quality are main factors of firms' capital structure decisions during the financial crisis.

Cornaggia et al. (2017) study whether managerial ability influences corporate credit ratings, using the sample of 25,113 firm-year observations and its long-term credit ratings from S&P's spanning from 1987- 2013. In term of methodology, they firstly measure managerial ability by firms' characteristics such as total asset, ages; financial indicators; market share and cashflow. CEO and CFO experience, including age, tenure, compensation and prior managerial experience are also considered as determinants of managerial ability. Secondly, cross-sectional analyses are employed to explain the relationship between managerial ability and credit ratings. Cornaggia et al. (2017) provide significant evidence of the managerial ability as an independent major determinant of credit ratings after controlling past performances, especially, when firms face financial constraints and are under competitive pressures. Cornaggia et al. (2017) defined managerial ability as a proxy of soft information by credit rating analysts and report that higher-ability managers are more likely to obtain higher corporate credit ratings.

Using data including all financial statement variable and S&P long-term credit rating of 8,432 US firm-years spanning from November 15, 2007, (the date in which SFAS 157 first became mandatory) to ending on or before December 31, 2014, Ayres (2016) investigates the effects of firm's holdings of Statement of Financial Accounting Standards (SFAS) 157 level three fair value assets (level three assets) on corporate credit ratings. SFAS 157 refers to measurements of fair value on assets and liabilities with regard to the degree of certainty in valuation. Financial Accounting Standards Board, 2007 state that" Level One – measured using identifiable and quoted prices in active markets of the same asset/liability; Level Two – measured using quoted prices for similar assets/liabilities in active markets or the same asset/liability in inactive markets, as well as other valuation inputs that are not quoted (e.g. interest rates); Level Three – measured using unobservable inputs for the asset/liability, typically involving some theoretical method of valuation". In term of methodology, the following pooled cross-sectional model using ordered

logistic regression is employed in explain the relation between level three assets and credit ratings. Ayres (2016) find a negative relation between increased quantities of level three assets and credit ratings, especially for firms with higher financial leverage. Ayres (2016) also provide economically significant evidence that higher holdings of level three assets negatively impact on bond spreads However, other specific risk factors associated with level three assets such as a potential lower liquidity and a higher operating risk for these types of assets are not taken into the regression model in explaining the level three assets- credit ratings relation.

Borensztein et al. (2013) develop hypothesis that whether sovereign credit ratings are main determinants of corporate credit ratings, based on the sample consisting of S&P foreign-currency corporate and sovereign credit ratings and all financial statement variables for 29 advanced and emerging economies spanning from 1995–2009. After controlling for firm-level financial indicators of creditworthiness and macroeconomic conditions in the country, Borensztein et al. (2013) provide significant evidence of the positive link between sovereign credit ratings and corporate credit ratings. This correlation is higher in countries consistent with high political risks and capital account restrictions. Several methodologies are employed in order to confirm the robustness of the findings, including firm- and time-fixed effects and to instrument for sovereign credit ratings. They report greater effects of sovereign credit ratings on corporate credit ratings for firms operating in domestic markets and in emerging countries. In addition, there is a non-parametric analysis and a powerful set of asymmetries and non-linear effects that are associated with a sovereign ceiling policy.

Hill et al. (2018) examine whether sovereign credit ratings actions could spill- over into corporate ratings produced by S&P based on a day-by-day and country-by-country basis, using the sample of S&P-rated firms across 34 countries for the period between June 1996 and May 2012. In term of methodology, logit models are employed to study the sovereign spill-over effects on domestic

firm-level ratings through a "Firm-action" dependent variable. This variable is a dummy variable, which equals 1 when the corporate rating change is in the same direction as the change in sovereign rating during the period of 3 days after the sovereign rating change, and 0 otherwise. Hill et al. (2018) conclude that both positive and negative sovereign spill-over effects into corporate ratings in non-high-income countries (NHICs) are more likely to be higher than to domestic firm-level ratings in high income countries (HICs). Especially, this effect arising from negative sovereign-rating actions is stronger than from positive sovereign-rating actions. Hill et al. (2018) also categorise firms into 2 groups, including bound and non-bound firms and find evidence that firms rated higher than their sovereign are relatively more immune against unfavourable changes in their sovereign rating compared to firms with a rating equal their sovereign. In favour of firm rated equal their sovereign, there is evidence of the odds of spill-over arising from investment-grade sovereigns are stronger than from sub-investment grade sovereigns.

Chintrakarn et al (2020) examine the relationship between Lesbian, Gay, Bisexual, and Transgender (LGBT)-supportive policies and corporate credit ratings, using the sample of 7469 US observations during the period from 1996 to 2011. In term of methodology, an instrumental-variable (IV) analysis is used to investigate this relationship. The use of this model is to deal with endogeneity concerns. Chintrakarn et al (2020) use an estimated percentage of the LGBT population by state as an instrument of LGBT-friendly policies. This rate is calculated based on the Gallup Survey. This survey is conducted by telephone interviews, using a random sample of 710,252 people between January 1, 2015 and December 30, 2016. They also use propensity score matching as a robustness test. They find evidence that LGBT-friendly policies bring benefits to firms, and hence increase the expected cashflows. Additionally, LGBT-friendly policies are considered as important factors to CRAs assign better firm's credit ratings.

Zhang (2019) investigate the relationship between credit ratings and cash flow/accruals management, using the sample of US firms over the period from 1994-2010. In term of methodology, cash flow from operating activities (CFO) management is measured by the estimation of unexpected CFO. While accruals management is measured by the estimation of unexpected accruals. Logit models are adopted to analyse the credit rating- CFO/accruals management relationship. Zhang (2019) find evidence of the negative link between cash flow management and credit rating. While there is no relationship between rating default predictability and accruals management. These differential results could arise from that fact that CRAs are stronger scepticism about accruals management than cash flow management and the cheaper cost of adjustment on accruals management, compared to adjustments related to CFO management. Furthermore, the effect of CFO management on credit rating tends to be worse in the immediate post- the Sarbanes–Oxley Act (SOX) period, but there is no significant effect in the later post-SOX period. However, this effect is weaker for highly leveraged firms and firms with previous credit ratings around the boundary between investment and speculative grade.

Papadimitri et al. (2020) explore the link between board of directors' education and firms' credit ratings, using the sample of 1,618 firms from 39 countries. In term of methodology, a Leadership Education Index is constructed in order to represent the level of education of the directors of the board. These key board members include Chair of the board, the Chief Executive Officer, and the Chief Financial Officer. Besides, several firm-level variables and macroeconomic characteristics are also taken into ordered logit models to examine the influence of board of directors' education on firms' credit ratings. They find that firms whose keys members having a greater educational level tend to obtain more favourable credit ratings. This indicates that educational characteristics of key board members are considered as determinants of credit ratings.

3.3.3. Firm behaviours in response to changes in credit rating

Huang and Shen (2015) examine the relationship between credit ratings and capital structures in the consideration of cross-country variations, using firms' financial information; industry classifications and S&P long-term credit ratings spanning from 1994-2008. In term of methodology, they firstly study the asymmetric effect of rating changes on capital structures by examining the relation between leverages and downgraded/ upgraded ratings. Secondly, financial development level and legal and institutional environment are taken into the regression model in explaining this asymmetric influence. Huang and Shen (2015) provide strong evidence of the existence of asymmetric effect. More specifically, firms tend to adjust capital structures in case of downgraded ratings. However, there is no evidence of an adjustment of capital structure resulting from an upgrade. The effects of both downgraded and upgraded ratings on leverage ratios are faster for countries with strong legal and institutional environments compared to weak ones. In other words, the financial development and legal and institutional environments are considered as major drivers in interpreting the credit rating- capital structure relation.

Running logit model on the sample of quarterly data of firm financial and monthly S&P ratings of more than 30,000 active and inactive publicly listed firms in the U.S. from Q1 1985 to Q4 2010, Hung et al. (2017) examine the effect of the delay in information arrival of credit rating changes on firms' financial policies. In term of methodology, they categorise firms into two groups: "bad" firms whose ratings are foreseeable downgraded, and "other" firms whose credit rating are forecasted to be upgraded or to remain unchanged. In order to measure the information gap between firms and the market, a logit model is then employed in predicting of a downgrade in the next period relied on firm's behaviours and all other available information in the current period. Hung et al. (2017) find that due to owning superior information, firms tend to change their financial

policies prior to information regarding a credit rating downgrade is updated. Moreover, an additional debt is raised rather than the repurchase of equity in the quarter before the disclosure of a long-term credit rating downgrade because of a more expensive cost of debt in the near future. However, there is no evidence of an adjustment of firm capital structure prior to or in the aftermath of a rating upgrades.

Using a sample consisting of 6,402 US firm-year observations in manufacturing industry with its S&P credit ratings from 1989- 2009, Brown et al. (2015) study the relationship between earning management and changes in credit ratings. In term of methodology, ratings are divided into investment and speculative grades which are BBB- and above, and BB+ and below, respectively. Brown et al. (2015) develop a hypothesis whether firms near the investment–speculative reference point are more likely to aggressively manage earnings following a credit rating change through real activities choices. More specifically, real earning management is measureed through three variables including abnormal level of production costs, discretionary expenses, and operating cash flows. Brown et al. (2015) report significant evidence that real earning management is the most aggressive among firms, rated at BBB and BB based on S&P's, near the threshold of investment-speculative grade. More precisely, these firms tend to increase production costs and decrease discretionary expenses in increasing earnings. Finally, there is no evidence of a negative relation between real earning management and changes in credit ratings in the subsequent year.

Khieu and Pyles (2016) examine effects of changes in credit ratings on firm's financial policies, using US nonfinancial firms including its S&P's credit rating and firm characteristics during the period from 1984 to 2012. In term of methodology, they firstly employ difference-in-differences method in comparing dividend and investing decisions between downgraded (upgraded) firms and no- rating-change firms during the same period. Besides, they implement a propensity score matching method to create a matched control sample. Secondly, seemingly unrelated regression

(SUR) method is applied to in order to confirm the robustness of the findings. Khieu and Pyles (2016) conclude that firms experiencing a credit downgrade cut down both dividends and investments compared to firms with their creditworthiness remaining unchanged. This evidence is consistent with the managerial protection view that following a downgrade, a dividend reduction and curtailment of capital spending is to maintain the financial flexibility. They also find strong evidence of a positive relationship between investment levels and an upgraded credit rating. However, no evidence of changes in dividend pay-out policy following an upgraded rating.

Gounopoulos and Pham (2017) investigate the impact of credit rating on earnings management (EM) around initial public offering (IPO), based on a sample of US common share IPOs and its long-term domestic issuer credit ratings from S&P, Moody's, and Fitch during the period from 1 January 1991, to 31 December 2011. In term of methodology, both accrual-based and real EM are considered to examine the EM- credit rating association. In order to mitigate issues related to endogenous selection, they employ three estimation methods: Heckman's two-step treatment effect model, MLE treatment effect model, and 2SLS IV model. Gounopoulos and Pham (2017) find significant evidence of a negative relationship between EM and credit ratings in the offer year. More precisely, there is a less engagement in both income-enhancing accrual-based and real EM in the offering year for IPOs rated firm. For unrated firms, no evidence of a relation between income-increasing EM and future earnings. On the other hand, in case of rated firms, there is a positive link between the income-increasing EM in the offering year and subsequent accounting performance. Gounopoulos and Pham (2017) also examine the relationship between income-increasing EM and long-run stock performance following the offering, and they report a negative one for unrated firms, but no relation for rated firms. In short, managers in unrated firms tend to opportunistically manipulate their discretion in accounting and operating decisions to mislead

investors; meanwhile, managers 'behaviours in rated firms are more likely manage their earnings for informative purposes.

Salvade (2018) investigate the stock prices in the response of the removal of the issuer ratings, based on the sample of 238 firms during the period from 2004 to 2011. In term of methodology, Salvade (2018) look at two different types of rating withdrawals. The first type occurs when a firm decide to stop purchasing a credit rating issued by Moody's. The second type happens because of a Moody's policy change which aims to consolidate the credit rating of firms which belongs to a group. Salvade (2018) first estimate the abnormal returns which is the difference between actual and expected return. Next, a multivariate analysis is used to examine the effect of rating withdrawals on stock prices. They find evidence of positive reactions in the stock market in response of the rating withdrawals. Furthermore, there is not a necessary association between rating withdrawal and the increased cost of equity. Salvade (2018) shows an increased abnormal stock price when the issuer rating removal improves the remaining level of rating. These findings indicate that firms tend to publish only the best ratings.

Bedendo and Siming (2018) investigate the relationship between firm debt structure and rating downgrades, using the sample of rated U.S. firms traded on the American Stock Exchange (AMEX), Nasdaq, and New York Stock Exchange (NYSE) during the period from 2001-2013. In term of methodology, a standard event study is employed in examining changes in firm financial policies and shareholder value for high-yield and investment grade firms separately following a rating downgrade. Bedendo and Siming (2018) conclude in case of high yield firms that bank financing plays an important role in alleviating unfavourable effects on shareholder value and firm's capital structure arising from a rating downgrade. In respect of high- yield segment, firms with the higher proportion of bank debt over total debt witness: i) lower negative abnormal stock returns; ii) a lower level of leverage; iii) greater capital expenditures post-downgrade compared to

peers with a lower recourse to bank debt. In contrast, there is no evidence of the benefits associated with bank financing for investment-grade firms.

Goldstein and Huang (2019) examine the impact of credit ratings on firm investments by developing a model of feedback. This model is allowed to analyse the real effect of CRAs on firm investments and issues related to credit rating inflation. They indicate that a high credit rating is more likely to be potentially inflated. This creates an optimistic belief of creditors, which leads to a reduction in financial cost hence changes in investments. Therefore, inflated credit ratings could have positive or negative real effects on investments. In case of firms with a high credit rating, some firms tend to invest riskier, which indicates negative CRA's effects. However, some firms are more likely to invest safer and more efficiently, which indicates favourable CRA's real effects. Furthermore, they show that credit rating drives new informative messages to the corporate debt market. There is a positive relationship between credit ratings and firms' investment efficiencies. Resulting from the feedback effects between credit ratings and investments, CRAs are more likely to assign more favourable ratings to more firms. This implies negative effects on the corporate bond markets.

Lee and Schantl (2019) examine the relationship between credit rating and financial report. They developed a game model that features three different type of players. The first player is a firm who raises external fund to invest risky projects from debt markets. The second ones are investors or creditors who set interest rates and the third ones are CRAs who are paid to assign credit rating to the debt-issuing firm. They show that the greater competition in rating industry might trigger exacerbate incentives regarding corporate misreporting. When CRAs act as de facto gatekeepers to corporate debt markets, issues related to financial misreporting incentives would improve. Furthermore, there are strategic complements between entrepreneur's misreporting and credit rating inflation, as a result of the enhancement of CRA's gatekeeper status. Therefore, more

scrutiny on CRAs provide not only more relative informative credit ratings, but also better financial reporting quality. Under the scrutiny on CRAs by regulators, the increased competition in rating industry or an impairment in CRAs gatekeeper role might lead to an investment inefficiency as a result of increased misreporting incentives.

Guo and Wu (2019) investigate the role of credit ratings in the relationship between short interest changes and stock returns, using the sample of 301,868 stock-month observations between January 1986 and February 2017. In term of methodology, they explore the influence of short selling activities on future stock returns in different rating categories to access the role of financial distress for stock returns. Stocks are divided into 2 groups, including investment grade (from BBB- to AAA) and non-investment grade (from C to BBB) groups. They first examine the relationship between short interest changes and credit ratings and conclude that short interest changes are as predictors for future stocks, especially for distressed firms who are rated at BB+ and below. For firms with rating from BBB- and above, there occur abnormal returns in the portfolio which consists of longs stocks along with the greatest reduction in the short interest level and shorts stocks with the largest rise in the level of short interest. For firms with rating BB+ and below, the high level of financial distress might trigger the greater sensitivity of stock price to earnings levels. This provides evidence of changes in short interest in explaining future stock returns.

Wojewodzki et al. (2018) revisit the effects of credit rating on corporate leverage and its speed of adjustment on capital structure, based on S&P firms in 19 countries spanning from 1991-2010. In term of methodology, two-step system GMM dynamic models are employed to mitigate the endogenous problems arising from the bidirectional link between credit ratings and firm's leverages. Wojewodzki et al. (2018) firstly conclude a negative relation between credit ratings and leverage ratios. Firms with a favourable rating tend to be more conservative about using debt financing and issue more equity, compared to those with a low credit rating. Secondly, lower-rated

firms tend to adjust their capital structures more quickly than highly rated firms. Further, the impact of credit ratings on firms' capital structures is stronger in case of countries with a more market-oriented financial system. In my opinion, there are some points which could be improved. Firstly, public and private debts do not take into the measurement of firms' leverages. Secondly, Wojewodzki et al. (2018) still apply the traditional method in estimating market leverage ratios by excluding off-balance sheet debts such as leases. This leads to an understatement of leverage ratios. Sethuraman (2019) examine the impact of CRA's reputation on corporate bond issuers' disclosure practices, using two US samples. The first sample include 16,214 quarter-observations from January 1, 2001 to December 31, 2003 and the second one consists of 27,344 quarter-observations between October 1, 2004 and June 30, 2008. In term of methodology, Sethuraman (2019) measure discretionary disclosures by using management earnings forecasts. Difference-in-difference method is designed to explore the relationship between a reputation loss of CRA and the discretionary disclosures of bond issuer. They find evidence that rated firms tends to issue earnings forecasts in case that CRAs face a reputation damage. Firms with "investment grade" credit ratings are more likely to increase their disclosures compared to those with "speculative grade" ratings. There is a higher level of disclosure for firms with "low investment grade" ratings, compared to counterparts which are rated at "mid or high investment grade". They also provide evidence that the increased disclosure is persistent, especially for firms with higher level of uncertainty, in response to the reputation loss of CRA.

Chava et al. (2019) investigate the role of CDS on the relationship between stock prices and corporate credit downgrades, using the sample of 644 firms experiencing rating downgrades during the period between January 1996 and December 2010. In term of methodology, Chava et al. (2019) focus on the cumulative abnormal returns (CARs) within the short time windows around the announcement date of firm's rating downgrade with/ without the presence of CDS trading.

Difference-in-difference method is used to examine the effect of CDS on the reaction of stock price to rating downgrade. They show that CDS trading plays an important role in explaining the reaction of stock market to rating downgrade events, especially for firms (a) whose rating is near the cut-off between investment and speculative grade, those (b) having a large number of rating-based performance pricing covenants, those (c) having a high number of active bank loan. Chava et al. (2019) find evidence the muting of stock market by 44–52% in response to a credit rating downgrade if the firm has a CDS contract which is introduced following a rating downgrade. Following the rating downgrade, a non-CDS firms experience a reduction in debt level and an increased cost of debt financing, which in turn reduces their investments. While there is no evidence of a significant decrease in debt financing and investments for CDS firms. Their financing costs are thus cheaper than those of non-CDS firms following rating downgrade events. The findings indicate that the introduction of CDS reduce the costs of market frictions for downgraded firms.

Hung et al. (2020) investigate the effects of changes in credit rating of industry peers on a future firm's financing decision, based on a sample of US non-financial firms consisting of its S&P's credit rating and firm characteristics for the 1985-2013 time period. In term of methodology, net debt issuance is the main dependent variable in explaining changes in firm's corporate capital structure for the next year following changes in credit ratings of peer firms. Hung et al. (2020) provide significant evidence of peer firms' credit rating downgrades as main drivers of changes in capital structure policies in the same industry, even after controlling for the lower-than-average credit quality effect. More precisely, firms are more likely curtail long-term debt rather than short-term debt in their capital structures following downgrades of peer firms. The spill over effect from peer firms' rating downgrades is stronger and more pronounced in case of firms in the highest investment- and speculative-grade categories. Hung et al. (2020) also find significant evidence that

small firms and firms operating in more concentrated industries manage their capital structures by reducing net debt more aggressively in response to the peer effects.

Liu et al. (2017) examine the effect of negative credit watch on earning management (EM), based on the sample of 458 non-financial firms on negative watch by Moody's during the period from 1992–2006. They provide strong evidence of income-enhancing accrual-based for firms placed under negative watch in order to be lower the probability of being downgraded. More precisely, negative watch firms are much more likely to manage their earnings by increasing discretionary expenses compared to their industry, rating, and performance matched peers. Employing a multivariate regression, they report that effects of negative credit watch on earning management during negative watch is much stronger than from pre- and post-watch periods, after controlling for accrual reversal. However, upward accrual management is restrained when firms under the scrutiny of public. Using propensity score matching, Liu et al. (2017) also study the relationship between watch resolution and EM, and they find a positive relation between income-increasing accrual management and the watch resolution during a negative watch period.

Employing Fama–MacBeth regressions and Fama–French three-factor regressions on the sample of 2,239 issuer-level watch assignments with direction downgrade by Moody's spanning from 1992-2008, Liu and Sun (2017) revisit the relationship between firm financial performances and credit watches. In term of methodology, Fama–MacBeth regressions are applied to investigate whether watches/downgrades are associated with abnormal stock returns. Furthermore, the implementation of Fama–French three-factor regressions is to measure long-term returns. Liu and Sun (2017) find that significant evidence for firms placed on credit watches with direction downgrade that these firms show better financial performance regarding operating profitability, financial leverage, and overall default risk, and the lower likelihood of being continually downgraded in subsequent periods compared to directly downgraded firms. After examining

watch- period long-term stock returns, firms with watch-preceded downgrades establish greater returns than those not placed on watches. They report the recovery effect is a main driver in interpreting long-term downgraded firms' performance and stock returns, suggesting a positive relationship between credit watches and the firm's performances in the post-downgrade period.

Driss et al. (2019) examine the effects of CRA certification on corporate outcomes of firms placed under negative watches, using the sample of 2016 bond issuers' rating downgrades and credit watch placements from Moody's during the 1992- 2014 period. In term of methodology, Driss et al. (2019) employ both one-way difference and difference-in-differences tests in investigating CRA's effects on corporate financing, investment, or profitability from four quarters before to four quarters after the negative watch period. They find evidence that firms with confirmed ratings increase their long-term debt and hence invest more in the four quarters during the credit watch period. Compared to firms receiving watch-preceded downgrades, Driss et al. (2019) report strong evidence that confirmed firms are able to maintain the stability of operating profitability in the ex-ante and post-watch periods. However, there is no evidence supporting for both hereafter and non-confirmed firms. After the watch period, confirmed firms facing financial constrains experience increases in their long-term debt financing with cheaper costs of debt, suggesting that firm capital constraints are alleviated by CRA certification via the watch mechanism.

In summary, the majority of empirical studies have found that sovereign credit rating downgrades leads to negative reactions from the financial markets and banking system, while rating upgrades typically do not elicit a significant response. However, there are few studies in prior literature attempting to explain the spill over effects of sovereign rating actions on corporate sector. They primarily pay attention to the sovereign ceiling or credit rating channel in order to interpret the substantial impact of sovereign rating news on domestic firm activities. Specifically, Borensztein et al. (2013) show that sovereign ratings represent a strong upper bound and an important

determinant of corporate ratings. Almeida et al. (2017) find that firms rated equal or higher than their sovereigns (bound firms) are more likely to curtail investments following a sovereign downgrade. Chen et al. (2013) document temporary investment reduction following sovereign rating downgrades due to an increased cost of capital. Drago and Gallo (2017a) also find that sovereign downgrades cause a significant increase in domestic firms' borrowing cost. However, they do not find evidence of a significant impact generated by a sovereign upgrade. Hill et al. (2018) find significant increases of corporate rating actions immediately follow sovereign-rating changes. The sovereign-to-corporate spill-over effect is asymmetric. Negative rating actions triggers significant changes while the impact of positive news is more muted. The first objective of this thesis is to examine a new channel that explains sovereign-corporate spillovers.

Additionally, previous literature has shown that sovereign credit rating downgrades have a negative impact on corporate financing and investment decisions. However, surprisingly little is known about the effects of such downgrades on trade credit policies. When a sovereign downgrade occurs, the cost of external financing increases, and firms' future cash flows become more volatile. As a result, firms tend to hold more cash to buffer against macroeconomic shocks and sustain their operations (Almeida et al., 2017). This, in turn, causes firms to reduce their investments and delay decisions related to mergers and acquisitions. In sum, a sovereign downgrade results in higher borrowing costs, shorter debt maturity (Drago and Gallo, 2017), and financial constraints for financial institutions (Meriläinen and Junttila, 2020). Therefore, the second objective of this thesis is to investigate whether firms will increase their trade credit as an alternative source of funding due to limitations in raising further debt.

Chapter 4: The real impact of sovereign rating changes: Sovereign ceiling or public debt overhangs?

4.1. Introduction

In response to the Covid-19 pandemic, governments have been rolling out extraordinary stimulus measures. As a result, many countries are facing mounting fiscal pressures and negative implication for their creditworthiness. Sovereign credit rating downgrades trigger significant changes in corporate credit risk and borrowing costs (e.g., Borensztein el al. 2013; Bedendo and Colla, 2015; Drago and Gallo, 2017a). In extreme cases, sovereign debt restructuring evaporates liquidity and the ability of private sectors to access to capital markets (e.g., Arteta and Hale, 2008). Much literature identifies that the sovereign ceiling or credit rating channel plays a critical role in explaining the impacts of sovereign ratings on corporate performances (e.g., Almeida et al. 2017; Hill et al. 2018). I focus instead on public debt overhang behind reductions in corporate activities following sovereign downgrades.

Given the strong linkage between sovereign and corporate ratings, significant changes in corporate behaviours following sovereign downgrades are highly anticipated. Extraordinary stimulus measures implemented in response to the Covid-19 pandemic have led to a surge of public debt across the world. The increased government debt level and severe funding pressures have brought once again discussions on the problems of sovereign debt. The elevated level of debt will affect negatively on a long-term growth prospect. This concern is relied on increased distortionary taxes, elevated inflation rate and higher uncertainty or expectations of future financial repression through efforts to inflate debt away. Issuing more government debt and greater future tax pressure on corporate profits therefore have a significant negative impact on corporate investment. Indeed, public debt overhang significantly drives up interest rates (e.g., Demirci et al. 2019; Krugman,

1988). An increase of government borrowing is likely to rise returns of close substitutions including corporate debt issuance. As a result, firms face increased uncertainties on raising further debts and financing their investments. The prominence of both public debt overhang and sovereign creditworthiness instigate an interesting question on the interactions between government debts and credit rating actions on domestic investments. To the best of my knowledge, public debt overhang, a potential candidate in explaining sovereign corporate rating spill-overs, has not been investigated.

The data sample covers 1,328 non-financial firms (18,141 firm-year observations) spanning from 1994 to 2020. The sampled firms domicile in 30 high income countries. Methodologically, I estimate regressions of investment changes one year following sovereign rating changes. Control variables include corporate ratings, firm characteristics and macroeconomic variables. Following Almeida et al. (2017), I also control for firm fixed effects, year effects, year-industry effects to further mitigate potential omitted variables. Number of robustness checks and investigations on subsamples of firms without rating changes are conducted.

The empirical analysis provides a number of intriguing results. First, there is a significant relationship between sovereign rating transition and corporate investing activities. The results are consistent with Chen et al. (2013) and Almeida et al. (2017). On average, a notch change in sovereign ratings leads to an around 0.272% change in corporate investments in the following year. However, different from prior papers which focus on the credit rating channel, I present novel empirical evidence that the investment reductions are recorded even in cases of firms without credit rating changes following the sovereign event. Second, the effect of sovereign rating change is asymmetric. Specifically, firms domiciled in a recently downgraded sovereign reduce investments by around 0.21%. There is no evidence of an increase in investment spending following a sovereign upgrade. Finally, an increased effect of sovereign downgrades arising from high

government debts leads to a further reduction in corporate investments. Specifically, there is a non-linear negative impact of government debt on corporate investment following sovereign downgrades. The debt-to-GDP turning point of this concave relationship is on average around 60% in our sample. It suggests that a debt-to-GDP ratio above such threshold is associated with declines in corporate investment in the event of sovereign downgrade. The results are robust across all specifications and subsamples

The contributions to prior literature are twofold. First, I document an asymmetry effect of sovereign ratings on domestic corporate investments. Sovereign rating downgrades put domestic firms under pressures to cut their investments. Second, this analysis also complements and extends the empirical literature. This chapter presents empirical evidence that public debt overhang is a significant channel for the spill-over effects of sovereign downgrades to domestic corporate activities. Prior papers focus on the sovereign ceiling or credit rating channel (e.g., Almeida et al. 2017; Borensztein at el. 2013) while public debt overhangs should not be overlooked. Systematic risk exposures of public debt overhang have important implications for corporate investments. It can significantly distort domestic firms' investment decisions in the event of sovereign downgrades. Therefore, governments should factor negative externalities into public debt management decisions. The findings raise caveats against excessive uses of public debts in financing economic stimulus policies during current crises. There should be a fine balance between stimulated demand and hampered corporate investments, hence, negative implications for aggregate supply.

The remain of this chapter is organized as follows. Section 2 reviews related literature. The research methodology and data description are discussed in section 3. Section 4 provides empirical results. Section 5 presents the conclusion.

4.2. Literature review and hypothesis development

Sovereign ratings are considered as a key determinant of private sectors' borrowing costs in international capital markets. Multiple studies show significant impacts of sovereign credit ratings on corporate ratings (Borensztein et al, 2013) and on real economic activities (Almeida et al. 2017). A rich empirical literature documents the presence of the credit rating channel in explaining substantial impacts on domestic corporate activities (e.g., Almeida et al. 2017; Hill et al. 2018).

Using data for 29 countries, 14 advanced and 15 emerging economies, Borensztein et al. (2013) investigate the impact of sovereign ceiling "lite" policy on corporate ratings over the period from 1995 to 2009. Under sovereign ceiling policies, firms generally cannot be rated higher than their sovereign. Borensztein et al. (2013) suggest three reasons to expect the positive relationship between sovereign and corporate rating.

Firstly, macro-level vulnerabilities, such as significant external shocks affecting the terms of trade, increase the likelihood of default for both the sovereign and corporations domiciled in that country. Secondly, there is a spill-over effect from sovereign defaults to the private sector, leading to a credit crunch in financial markets and heightened default risks for both governments and firms. Finally, capital account restrictions hinder private sector access to external funding sources. Consequently, corporate debt is perceived to carry higher risk compared to sovereign debt due to these restrictions.

Therefore, when a sovereign defaults, the private sector is more likely to experience default as well, providing evidence of the existence of a sovereign ceiling. Consistent with their hypothesis, the authors find empirical evidence supporting a positive correlation between sovereign and corporate ratings, even after controlling for firm-level and country-level macroeconomic variables. These findings hold across different samples and regression models.

The study also highlights that a sovereign rating change has a more significant impact on firms domiciled in distressed emerging and advanced countries. This emphasizes the crucial role of sovereign risk in explaining a substantial increase in corporate cost of debt in distressed developed economies. The effect is particularly pronounced for firms with cash flows in domestic currency within the non-tradeable sector. The authors confirm that the sovereign ceiling policy continues to negatively influence firms with ratings above the sovereign, suggesting its ongoing importance in interpreting changes in corporate ratings, although S&P has relaxed this policy since 1997.

Additionally, capital account restrictions and political risk are identified as important drivers explaining the impact of the sovereign ceiling on corporate ratings. The study incorporates non-parametric analysis and explores powerful asymmetries and non-linear effects associated with the sovereign ceiling policy. As a result, the paper suggests that governments should consider the potential negative impact of sovereign downgrades on the private sector in the short term. Moreover, policy makers should take into account these externalities when making decisions about external financing in the medium term.

In terms of methodology, Borensztein et al. (2013) employ ordinary least squares (OLS) regression with clustering by year and country, as well as an instrumental variable-two stage least squares (IV-2SLS) model to examine the impact of the sovereign ceiling on corporate ratings. The main dependent variable is the foreign-currency long-term corporate rating provided by S&P, while the main independent variable is the foreign-currency long-term sovereign rating also provided by S&P. Control variables include various firm-level variables such as profitability, leverage, liquidity, interest coverage, and firm size. Macroeconomic variables, such as GDP per capita, GDP growth, growth volatility, inflation rate, and current accounts, are also incorporated in the analysis.

Augustin et al. (2018) study the spill-over effect between sovereign and corporate credit risks using a sample of 226 companies in 15 European countries. The study focused on the period from

February 15, 2010, to May 2, 2010. To measure the credit risks of both sovereigns and corporations, the researchers utilized data on credit default swaps (CDS).

Employing a quasi-experimental design, Augustin et al. (2018) observed a 1.1% increase in corporate credit risk in response to a 10% increase in sovereign risk following the first Greek bailout on April 11, 2010. This event was regarded as an unfavourable exogenous shock impacting European credit risks, leading to heightened economic uncertainties and potential future defaults. The spill-over effect from sovereign to corporate risk varied across countries and companies, taking into account various firm-level and country-level characteristics. Countries within the Eurozone exhibited greater sensitivity to increased sovereign credit risk, underscoring the significance of fiscal policies for nations within the common currency union. Moreover, the effect was more pronounced for firms with significant public ownership, greater reliance on bank financing, and whose credit risks were more closely tied to their sovereign's risk.

Augustin et al. (2018) provide confirmation of the sovereign ceiling as an important channel through which the spill-over effect from sovereign to corporate occurs. Firms with credit risks rated close to their sovereign were found to be more vulnerable to shocks associated with increases in sovereign risk. The authors focused their analysis on firms with CDS spreads rated slightly above but in proximity to their sovereign's rating. They examined the differences in CDS spreads between corporate and sovereign before, during, and after the Greek bailout. The robustness of their findings supports the sovereign ceiling hypothesis based on credit ratings. Furthermore, the authors discovered that bound firms, referring to those with close credit risk ties to their sovereign, experienced more negative effects from unexpected shocks to sovereign credit risks.

Almeida et al. (2017) investigate to quantify the actual impact of sovereign downgrades on corporate ratings, particularly for firms whose ratings are equal to or higher than the sovereign rating (referred to as bound firms). The focus was on foreign currency long-term issuer ratings, as

they are more likely to be bound by the sovereign rating. The authors utilized rating announcements by S&P in their analysis due to S&P's proactive approach in adjusting ratings, which often sets the trend for other credit rating agencies.

The findings of the study revealed an asymmetric effect of sovereign ceiling on corporate ratings following sovereign downgrades. Bound firms were more susceptible to downgrades compared to firms with ratings below the sovereign, indicating that the sovereign downgrade had a greater impact on bound firms. Consequently, these bound firms reduced their investments and net debt issuance to a greater extent than non-bound firms in the context of a sovereign downgrade. This effect can be attributed to changes in the capital supply rather than the capital demand. The authors compared investment and net debt issuance between bound and non-bound firms, considering various firm characteristics such as country, industry, size, investment, Tobin's Q, cash flow, cash, leverage, and foreign sales, before and after the sovereign downgrade. Additionally, Almeida et al. (2017) conducted placebo tests to validate their findings. They examined changes in investments of both treated and control groups during recession periods, such as the 2007-2009 financial crisis and currency crises. They also accounted for the impact of financial repression resulting from sovereign downgrades.

The robustness of the findings was confirmed through the use of linear regression and instrumental variable methods. In the year of sovereign downgrades, bound firms reduced their investments by 10.2%, whereas control firms only cut their investments by 2.8%. Prior to the event, both groups had similar investment rates. Treated firms also exhibited a 5.8% reduction in net debt issuance in response to a sovereign downgrade, whereas there was no change in net debt issuance for control firms following a sovereign downgrade. This suggests that treated firms were more inclined to switch from debt to equity financing in response to a sovereign downgrade, resulting in a change in leverage. Following a sovereign downgrade, bound firms tended to replace long-term debt with

short-term debt. This adjustment in the firm's financial structure occurred a year after the sovereign downgrade, as it takes more time to implement compared to changes in investments and net debt issuance. Additionally, the study found a greater increase in bond yields for bound firms compared to non-bound firms, indicating that the cost of borrowing for treated firms was higher. This suggests that the increased cost of borrowing and the reduced availability of debt capital were due to the asymmetric effect of the sovereign ceiling on corporate ratings following sovereign downgrades, rather than a decrease in the demand for debt capital.

In terms of methodology, Almeida et al. (2017) employed a difference-in-differences technique using a sample of 80 countries over the period from 1990 to 2012 to examine the impact of the sovereign ceiling on firm investments and financial policies. However, there are limitations associated with quasi-natural experiments. The sample size was limited as the focus was primarily on the real impact of sovereign ceiling on bound firms during sovereign downgrades. Additionally, the study was unable to estimate the impact of sovereign downgrades on firms with characteristics different from bound firms. Nevertheless, the findings suggest that bound firms tend to be rated pessimistically by credit rating agencies even in the absence of sovereign downgrades. Consequently, these firms would have had a higher likelihood of enhancing their access to bond markets and increasing their investment rates if not for the presence of sovereign ceiling policies.

Chen et al. (2013) use GMM model to explain the impact of sovereign rating changes on private investments through its effect on the cost of capital. By using the sample of 48 countries during the period of 1983–2009, they find the symmetric effect of sovereign rating changes on corporate investments. They document temporary investment reductions following sovereign rating downgrades. Sovereign rating downgrades lead to the increased cost of capital and create unfavourable effects on the NPV of some investment projects, which in turn results in a decrease

in real private capital investments. However, these reductions are temporary. Firms reduce their investments in the year and the following year of sovereign downgrades.

Chen et al. (2013) also find significant and temporary growths in private investments following a sovereign upgrade. The effects of sovereign rating transition on domestic investments are robust after controlling for problems related to potential endogeneity and macroeconomic conditions. They also control for the potential direction of a sovereign rating change by adding two indicator variables which are changes in rating outlooks or credit watches in their regression models. They find that a negative watch list is associated with reductions in private investment growth. However, there is no evidence of the link between changes in sovereign rating outlooks and domestic investments.

Chen et al. (2013) suggest that the irreversible nature of investment is a possible explanation for the temporary changes in private investment following a sovereign rating change. There are two important characteristics of investment. The first part of investment expenditure is sunk costs. If the macroeconomic environment is worse than expected, these costs cannot be recovered. Irreversibility is the second important component of investment process. Investment is sensitive to different form of risks such as uncertainties related to future interest rates, future produces prices and operating cost. Sovereign downgrade leads to an increased country risk. Firms hence face uncertainties and delay their investments until the arrival of new information following a sovereign downgrade. Meanwhile, there are more investment opportunities after a sovereign upgrade due to reductions in country risk and uncertainties.

Drago and Gallo (2017a) examine the impact of sovereign rating transition on the spread of European corporate loans, using the sample of 7,184 loans granted to 1,723 European firms between January 2004 and February 2016. They find evidence of a significant increase in domestic firms' borrowing cost, especially for unrated firms following a sovereign downgrade. This is

because there are fewer chances for unrated firms to switch bank loans with other types of funding. Rating-based regulation on credit rating is considered as an important factor to explain the impact of sovereign downgrade on loan spreads. These regulations lead to reductions in loan size and create supplementary burdens for firms rated above BBB- -the investment-grade threshold. However, they do not find evidence of a significant impact generated by a sovereign upgrade. These results are robust after accounting for several macro-level, firm-level variables, loan characteristics and potential endogeneity problems. Drago and Gallo (2017a) suggest that the reliance of financial regulation on credit ratings might give rise an increase in sizeable costs and deteriorate financial stability.

Hill et al. (2018) examine the spill-over effect of sovereign rating changes on firm-level ratings. Their analysis covered a sample of 34 countries spanning the period from June 1996 to May 2012. The study sheds light on the crucial aspect of timing in sovereign spill-overs. Prior to controlling for firm and sovereign characteristics, the negative spill-over from sovereign ratings to firm ratings is more pronounced than the positive spill-over. However, when focusing on a country-by-country perspective, a higher correlation between sovereign and firm-level ratings is observed in the month following positive sovereign news compared to negative sovereign actions in certain countries.

Overall, the spill-over from sovereign to corporate ratings is more significant for firms domiciled in non-high-income (NHI) countries, as opposed to those operating in high-income (HI) economies. However, the country-by-country analysis reveals an asymmetric effect of the sovereign spill-over on corporate ratings within both NHI and HI countries. After accounting for firm and sovereign characteristics, both negative and positive spill-overs are greater for firms in NHI status countries. The country-by-country analysis also identifies persistent negative sovereign spill-over biases for countries such as Spain, Hong Kong, Indonesia, Colombia, and Brazil.

Argentina stands out as the only country experiencing a persistent positive sovereign spill-over bias.

In other words, the study finds a substantial increase in domestic firm rating actions following a sovereign rating change. The spill-over from sovereign to corporate ratings exhibits an asymmetric nature, with negative rating actions having a more significant impact compared to positive news. Firms domiciled in non-high-income countries are particularly vulnerable to the spill-over effect. Additionally, pre-existing stock-market volatility and the current corporate rating are identified as important factors explaining the spill-over from sovereign to corporate ratings.Importantly, Hill et al. (2018) confirm the existence of the sovereign ceiling policy. Bounded firms, especially those with sovereign ratings higher than investment-grade, are more likely to be affected following a sovereign downgrade.

An alternative explanation for the spill-over of sovereign's risks to firms is through bank lending channels. A deterioration in sovereign creditworthiness reduces banking liquidity, hence, makes bank-funding more costly (e.g., Adelino and Ferreira ,2016; Meriläinen and Junttila, 2020).

Adelino and Ferreira (2016) examine the impact of sovereign downgrades on bank ratings and lending supply. They employed a difference-in-differences estimator to compare the lending behaviour of banks rated equal to or higher than their sovereign (bounded banks) with non-bounded banks during sovereign downgrades. The focus was on S&P foreign currency long-term issuer ratings, as S&P is known for being more active in rerating and leading other credit rating agencies in making adjustments.

The study also took into account the stock market impact conveyed in S&P ratings announcements. Various bank characteristics and macroeconomic variables were included in the regression models. The findings revealed an asymmetric effect of sovereign downgrades. Bounded banks were found to significantly reduce their lending compared to banks with ratings lower than the sovereign

bound in the event of sovereign downgrades. Specifically, the volume of syndicated loans made by bounded banks decreased by approximately 25% compared to loans made by non-bounded firms in the same country and quarter following a sovereign downgrade. Prior to the sovereign downgrade period, both groups exhibited similar loan activity growth.

Furthermore, treated banks (bounded banks) reduced their long-term borrowing and interbank funding by an additional 3% compared to control banks following a sovereign downgrade. Additionally, there was a 15% increase in the credit default swaps (CDS) of bounded banks compared to non-bounded banks. These findings confirm that sovereign downgrades have a negative impact on the cost of bank funding. Moreover, they can impair a bank's ability to access rating-sensitive external funding sources, particularly bond markets and wholesale funding. Furthermore, due to rating triggers, downgraded banks may face more stringent collateral requirements.

Cantero-Saiz et al. (2014) examine the role of sovereign risk on the bank lending supply, in the context of monetary policy changes, using the sample of 3125 banks from 12 European countries over the period between 1999 and 2012. Using the System-GMM methodology, they investigate the effect of sovereign risk in easy and tight monetary policies. They find that banks domiciled in countries with greater sovereign risk premium cut their lending more than banks that operate in lower sovereign risk countries during the period of monetary policy contractions. A higher sovereign risk induces an increase in cost of funding and a high level of precautionary liquidity during tight monetary policies. However, Cantero-Saiz et al. (2014) find weak evidence of the relationship between sovereign risk and bank credit risk during the time of easy monetary policies.

Meriläinen and Junttila, (2020) study the role of sovereign rating in the relationship between bank ratings and asset liquidity, based on the sample of Western European banks during the period from 2005 to 2017. They find evidence of the negative impact of sovereign downgrades of the domestic

bank credit ratings. Banks with less liquid asset portfolio are more likely to be downgraded than liquid banks, following a sovereign downgrade. Sovereign downgrades deteriorate the bank liquidity, especially for the most liquidity-constrained banks. In turn, it impairs the ability to provide capital to firms and hence makes bank-funding more expensive. A new liquidity regulation might be a good suggestion to ease the negative impact of sovereign downgrades on bank ratings. Drago and Gallo (2017b) verify the impact of sovereign rating revision on banking industries, using the sample of 118 listed banks in in 25 of 28 EU member countries. In term of methodology, they estimate a GMM system and employ an instrumental variable approach. After controlling for sovereign macroeconomics variables and potential endogeneity issues, they confirm the asymmetric effect of sovereign rating changes on bank activities. These activities include regulatory capital ratio, profitability, liquidity, and lending supply.

They find a significant impact of sovereign downgrades on lending supply of domestic banking and capital ratios. While there is a lower impact of sovereign downgrade on their profitability and liquidity, in the short term. On the contrary, the impact sovereign upgrade is more muted. They highlight that sovereign rating revision is the important determinant of a bank's rating. Sovereign downgrades, especially sovereign ceiling policies put a downward pressure on bank' ratings, especially for banks whose rating is close to their sovereign rating. In a meanwhile, it is not necessary for domestic issuers' ratings to rerate a bank rating following a sovereign upgrade. Therefore, the impact of sovereign downgrades seems to be more certain, severe and immediate than the impact of upgrades. A sovereign downgrade is considered as a wakeup call in term of the country's financial stability, that affects negatively and significantly on all domestic issuers.

Drago and Gallo (2017b) find three potential channels to explain the real impact of sovereign rating on banking sector. These includes assets channel, funding channel, and rating channel. Particularly, the risk-weighted assets (RWA) of the banks are used in order to verify the assets

channel. They find that there is an increase in RWA by 7% in response to a sovereign downgrade. This finding confirms the asset channel in explaining the impact of sovereign downgrade on a bank capital ratio. Drago and Gallo (2017b) use short- term debt to verify the funding channel and they find that a sovereign downgrade affects heavily on bank's short-term funding. For the rating channel, they find that bound banks witness lower capital ratios compared to other banks. They also highlight the role of current rating-based regulation on the banking activities, in the context of sovereign downgrades.

Due to the important role of financial intermediaries in channelling funds into productive investments (e.g., Ndikumana, 2005), sovereign downgrades might give rise to negative impacts on firm performances, especially on investment. Bedendo and Colla (2015) examine the spill-over of sovereign to corporate, using the sample of 118 firms in 8 European countries (Belgium, Finland, France, Germany, Italy, the Netherlands, Portugal and Spain) during the period from January 2008 to December 2011. CDS is used to measure the credit risk. In term of methodologies, Bedendo and Colla (2015) use several techniques including ordinary least-squares, dynamic panel and instrumental variables regressions. They show that an increase in sovereign risk is associated with increases in corporate spreads and firms' borrowing costs, after accounting for several country and firm level variables. Their estimates indicate that a 10% increase in sovereign spread leads to a 0.5%–0.8% increased corporate spread.

Bedendo and Colla (2015) consider three channels to explain the spillover of sovereign to corporate. These includes government guarantees, sales concentration in the domestic market, and reliance on bank financing. In term of the government guarantees channel, it is more likely for state-owned enterprises to be bailed out compare to other firms. However, in term of an increased sovereign risk, the creditworthiness of these firms also tends to be impaired because government guarantees lose value. To verify the government guarantees channel, they create an indicator

represent a firm that has been entirely or partially controlled by a state, and find a greater spill-over effect of sovereign risk into corporate. These firms witness a two or three time increases in CDS spreads compared to other firms, in respond to an increase in sovereign risk.

Turning to the domestic demand channel, in order to restore the sovereign creditworthiness, there might be an adoption of restrictive monetary or fiscal measures, as a result of an increased sovereign risk. This might result in a significant negative impact on domestic demand. This, in turn, leads to an increased default risk for firms who depend on the domestic market. These firms experience reductions in profits and net worth and, therefore, to face financial constraints. To verify the domestic demand channel, Bedendo and Colla (2015) use the proportion of domestic sales and confirm a significant impact of an increase sovereign risk on firms who rely heavily on the domestic market.

In favour of the credit squeeze channel, a sovereign default also leads to an increase in banks' funding costs for two main reasons. Firstly, as the sovereign creditworthiness impairs, implicit and explicit guarantees provided by government to the financial system became at risk. Secondly, banks tend to own a large proportion of government securities in their portfolios. Because of an increased sovereign risk, there are reductions in their value of investment portfolios. Their findings provide evidence of a spill-over of sovereign risk into corporate via the financial intermediation channel.

In sum, a deterioration in a country's credit quality affects more adversely for firms that are more beneficial from government aid, those whose sales are more focused in the domestic market, and those that rely more heavily on bank financing. Their findings show that a 10% increased sovereign spreads translate into a 0.7%–1.2% increased corporate spreads for those firms. Thus, they suggest that a government in financial distress is more likely to "transfer risk" to corporates. Therefore, I hypothesise as follows:

H1: There is a positive link between sovereign rating changes and corporate investments even for firms whose credit ratings are unaffected by recent sovereign rating changes.

H2: The effect of sovereign downgrade on investment is stronger than the impact of sovereign upgrades.

Taken together, there are significant changes in corporate behaviours following sovereign downgrades (e.g., Almeida et al.2017; Chen et al. 2013). However, prior papers have primarily focused on the sovereign ceiling or credit rating channel in explaining the spill-overs of sovereign ratings to firms' performances. This chapter, instead, aims at the role of public debt in explaining sovereign-corporate spillovers. An important channel via which an increase of government debts can crowd out private investments is that of long-term interest rates (e.g., Baum et al. 2013) and of heightened uncertainties over future investment outcome prospects.

Krugman (1988) predicts that higher levels of outstanding public debt may contribute to rising the expected return on assets that are close substitutes including corporate debt issuance. In the same vein, Demirci et al. (2019) examine the impact of high government debt on corporate capital structures, based the sample of 40 countries from 1990 to 2014. Using an instrumental variable approach and a quasi-natural experiment, they suggest that public debt is negatively associated with corporate debt. The high public debt generates a crowding out effect on corporate debt if investors attempt to maintain a stable proportion of equity and debt securities in their portfolios. Therefore, firms might decrease debt issuance due to a more expensive cost of corporate lending. Demirci et al. (2019) find a larger crowding out effect when the government debt is financed domestically. Additionally, the crowding out effect is more pronounced for firms and countries who experience lower financing frictions. The effect is also stronger for firms domiciled in countries with relatively large equity markets and less bank dependent economies. These firms are more likely to be more financial flexibility to switch between equity and debt financing.

Krishnamurthy and Vissing-Jorgensen (2012) evaluate the US treasury yield in term of liquidity and safety perspectives, over the period from 1926-2008. Using a piecewise linear specification, they find evidence supporting that an increase in government borrowing has a large negative effect on Treasury-corporate spreads, in term of liquidity and safety perspectives. Investors value the liquidity and safety of treasury which is high when there is a low supply of public debt. Government bonds thus offer lower yields compared to less liquidity and safety debt securities (e.g., corporate debt). However, the opposite applies in case of an increasing supply of government debt.

Furceri and Zdzienicka (2012) examine the impact of government debt on GDP, using the sample of 154 countries during the period from 1970 to 2008. There are three main channels to explain the impact of government debt on the economy. The first channel is through the international market. On average, after a sovereign debt default episode, a country might be excluded to the international capital markets for approximately 4 years. The second channel is through an increased cost of borrowing. A sovereign default might lead to a significant increase in bond yields in comparation with tranquil times. The third channel is through the international trade, resulting from a significant decreased bilateral trade in respond to a sovereign default.

Using a two-step GMM-system estimator, they find the evidence supporting that debt crisis leads to a reduction in output growth by 6-10%, in the short term. In the medium term, the GDP reduction is in range from 5-10% in respond to the occurrence of a debt crisis. Additionally, when the public debt level is greater than 70% of GDP, there is a reduction in output growth by 1.8%. In other words, excessive public debt and defaults tend to reduce the country's fiscal sustainability. Governments react to large debt build-ups by raising the primary surplus or reducing deficits. Eberhardt and Presbitero (2015) analyse the relationship of public debt and long-run output growths, based on the sample of 118 countries over the period between 1961 and 2012. They

confirm the non-linearity effect of government debt on GDP growths. A greater volume of government debt is more likely to be associated with a lower output growth. Debt composition and several country characteristics are taken into account to explain the impact of public debt on GDP growths. Via an increased interest rate, higher public debt might lead to a reduction in savings and capital accumulation, in turn a decreased GDP growth. High public indebtedness also reduces the effectiveness of productive government expenditure on economic growths.

Reinhart et al, (2012) investigate the public debt-growth relationship in advanced economies over the period from 1800-2011. On average, there is a reduction in GDP growth by 1.2 % when the government debt level is above 90% of GDP, compared to periods when public debt ratio is lower than 90%. During the period of financial crisis or recessions, there have been significant increases in public debt levels in advanced countries. There are two main potential channels to explain the connection between government debt and output growths. The first channel is through the negative impact of debt overhang on private sector investment and savings. High public debt is more likely to soak up the available investment funds and therefore private investment is crowed out. It also might trigger increased distortionary taxes, elevated inflation rates and higher uncertainties or expectations of future financial repression. Then private investment might be discouraged further. The second channel is through an increase in risk premium of interest rate for public debt. High public debt raises a question whether a government has an ability to repay debts and obligations in time. As a result, it leads to an increase in risk premia and long-term interest rates. Thus, government debt overhang has detrimental effects on private investments and long-run growths due to a weakening of incentives to invest, cash flow tribulations, and moral hazard effects.

Therefore, high public financing may crowd out private investments. In response, firms face uncertainties and decisions of scaling down their investments. Therefore, I believe that the impact of sovereign downgrades on domestic investments is stronger for firms operating in countries with

high level of government debts. Furthermore, sovereign downgrades increase a country's risk and uncertainties which in turn discourages new investments. Firms instead prefer to wait and see to avoid costly mistakes.

H3: Firms cut down their investments further in the event of sovereign downgrades associated with public debt overhang.

4.3. Data and methodology

4.3.1. Data

The sample consists of firms with credit ratings (foreign currency long-term issuer ratings) issued by S&P from January 1st, 1994, to December 31st, 2020. Data are retrieved from Capital IQ. Excluding financial and utility firms and observations that had negative total assets, and a total debt-to-lagged asset ratio of less than 0 or greater than 1, the final sample consists of 18,141 firm-year observations. The sample includes 1,328 rated firms from 30 high income countries. The sample distribution of firms across countries is reported in Table 4.1. The sample encompasses corporations originating from diverse global regions: Europe, Asia, North America, and South America. The U.S, Japan, Canada and the U.K are the countries with the largest number of firms within the dataset.

Corporate ratings are converted to numerical scores within a 20-point credit rating scale. Rating symbols are converted as follows: AAA ≡ 20, AA+ ≡ 19, AA ≡ 18 ... CCC- ≡ 2, C-D ≡ 1. Followed by previous papers (e.g., Adelino and Ferreira, 2016; Almeida et al, 2017), S&P ratings history is preferable over other credit agencies' history for the following reasons. Firstly, S&P is more likely to be more active rerating and to lead other rating agencies in making ratings revisions. Secondly,

a greater amount of information related to the country stock market impact is conveyed in Ratings announcements by S&P.

The sampled firms' investments and other financial data are from the WRDS Fundamentals Annual Fiscal (North America and International) database. For industry classification, the firms are classified by using the Fama-French 17-industry groups. I exclude firm-years observations with a missing Fama- French 17-industry classification, and ones from financial institutions, regulated utilities (e.g., Billett et al. 2011; Smith, 2016; Wei and Zhang, 2008), and industries that are not clearly defined (i.e., industries coded "almost nothing"). Financial and regulated utility firms tend to have significantly different investment and financial policies. To avoid the effect of outliers and measurement errors, all continuous variables are winsorised at the top and bottom 1%.

The first year of the sample is determined by the availability of the firm-level and country-level data which varies across countries. I keep only firms domiciled in countries whose sovereign ratings changed at least once during the sampled period. Table 4.2 reports the list of sample countries. For country-level variables, data from the World Bank and the OECD is used. To ensure that macroeconomic variables are consistent over time, I use the data source that provides with the longest time series.

The sovereign credit rating dataset consists of daily observations of long-term foreign-currency credit ratings, outlook announcements or watch listings of sovereigns rated by S&P, collected from S&P publications. In order to identify upgrades and downgrades, sovereign ratings are first converted to numerical scores within a 58-point comprehensive credit rating (CCR) scale to capture information on both actual ratings and outlook/watch procedures. On the CCR scale, rating symbols are converted as follows: AAA≡ 58, AA+ ≡ 55, AA ≡ 52 ... CCC- ≡ 4, CC-D ≡ 1.

Adjustments for (positive/negative) outlook and watch announcements are made by adding ±1 and ±2, respectively. Negative/ Positive watch shows a possible downgrade/upgrade of sovereign on watch (without an actual downgrade/upgrade rating). Negative outlook shows changes in outlook from stable or positive outlook to negative outlook and changes from positive outlook to stable outlook (without any change in sovereign rating). Positive outlook shows changes in outlook from negative outlook to stable outlook or changes from stable or negative outlook to positive outlook. Furthermore, the differences between rating levels are not equal due to the non-linearity in the rating scale (e.g., Tran et al. 2019; Ratings, S.P.G. 2019). For example, there are different implications between a downgrade from AAA to AA+ and one from the investment grade to the junk grade or from A to A-. A logit-transformation of the comprehensive credit rating (CCR) rating scale is employed (see Appendix A4.2 & A4.3 for details). This scale is constructed which aims at incorporating information in ratings and outlook, watch notifications and controlling for possible non-linearity. Additionally, Tran et al. (2019) show that changes in rating which are near bankruptcy issuers or AAA or at the speculative-investment threshold are more significant compared to other creditworthiness changes. The benefit of CCR rating scale is to illustrate the varying effect of a given rating action across the creditworthiness levels. Specifically, the log-transformation of the rating scale assigns greater weight for rating changes which are near-default or triple-A or at the speculative-investment threshold. This rating scale also assigns the lowest weight for rating changes which are near the investment-speculative boundary.

Table A4.1 summarises the sovereign credit rating events. The S&P's released 443 rating events during the sample period. Nearly 29% of the daily observations are in the triple-A rating category, and roughly 14% and around 10% are at AA+, AA categories, respectively. There are 96 (69) positive (negative) outlook signals. The corresponding figures of watch actions are 46 (40). More

than 62% S&P downgrades follow negative outlook or watch, which implies heavy utilisation of outlook/watch procedures prior to actual sovereign credit rating changes during the sample period. While 17% S&P upgrades follow positive outlook or watch. Overall, the events by one notch constitute the highest share among all credit events (89% for positive events and 72% for the negative). For this period, qualified sovereigns rated by S&P recorded 88 sovereign downgrades and 104 sovereign upgrades. Some of these countries had multiple downgrades over the sample period, such as Greece with 13 downgrades, Italy and Portugal with six downgrades, Korea with four, and France with two. There are 65 downgrades during the post-2007 period corresponding to the global financial crisis and eurozone. The median sovereign rating downgrade is one notch and the average is one notches. The median sovereign upgrade is also one notch and the average is one notch.

Since both rating data and firm-level data are used in the same regression, data frequency and timing are important. The rating data are daily, while the firm-level data are annual. Moreover, firms in the sample end their fiscal years in different months and some firms may have more than 12 months between accounts when they change their financial year. Those firms are thus excluded so that the data refer to 12-month accounting periods. To match up the sovereign ratings and corporate ratings with the firm-level data, all changes in sovereign ratings and corporate ratings are combined that refer to the same firm within the fiscal year into one observation in order to avoid double counting.

4.3.2. Summary statistics.

Table 4.3 reports the summary statistics for country- and firm-level variables for our base-case specification. Panel A shows the descriptive statistics for firm-level variables for the entire sampled firms. Panel B show the descriptive statistics for country-level variables.

Regarding firm-level variables, investment is defined as capital expenditures (CAPEX) to lagged Total Asset. Other Firm-level control variables include: Δ $Rating_{corporate}$, Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and Lagged investment variable. Δ $Rating_{corporate}$ is corporate rating changes. Size is the natural logarithm of Total Assets in U.S dollar. ROA is the ratio of earnings before interest and tax (EBIT) to lagged Total Assets. Leverage is total debt divided by lagged Total Assets. Cash holding is the rate of cash holding plus marketable securities to lagged Total Assets. Cash flow is defined as earnings before interest, taxes, depreciation, and amortization (EBITDA) plus depreciation and amortization scaled by lagged Total Assets. Market-to-book is measured as the market value of equity plus the book value of assets minus book value of equity, all divided by book value of Total Assets. Lagged Investment is a two-year lagged investment variable.

At the country-level variables, the main variable of interest is ΔLCCR, which is changes in the log-transformed credit rating of a sovereign in which a firm domicile. Country characteristics are also controlled, which include GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. Table A4 in the Appendix details the construction of all variables.

The average investment expenditure of firms in our sample is equal to 5.9 % of the total assets with a standard deviation of 5.7 percentage points. The mean (median) corporate credit rating is 10.58 (11) implying a credit rating in the BB+ to BBB- range. About 54.5 per cent of our samples have an investment grade corporate credit rating. The average value of leverage is nearly 26% with a standard deviation of 18%. This figure may reflect the fact that the sampled firms are mainly equity financed. Most firms in our sample are profitable, as captured by the median ROA of 8%.

The average Market-to-book of 162.7% represents market expectations of strong growth opportunities over this sample period.

Regarding country level variables, the mean (median) sovereign credit rating is 47.723 (51) implying a credit rating in the A+ to AA range. The government debt-to-GDP ratio has a mean of 57% and an interquartile range of 33.7% and 77%. The mean of GDP growths, changes in S&P and inflation are 2.9%, 8.4% and 3.3%, respectively.

4.3.3. Methodology

The baseline regression is as follows:

$$\text{Investment}_{i,t+1} = \beta_0 + \beta_1 \Delta \text{ LCCR}_{i,t} + \sum \gamma \text{control variables}_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where

Subscripts i for firms, j for industries and t for years.

The dependent variable is the investment ratio at year t+1.

Δ LCCR $_{i,t,}$ denotes changes in the log-transformed credit rating of the sovereign in which firm i domiciles. In the analysis conducted, only rating changes are taken into consideration as the focal point of investigation. To assess these sovereign rating changes, the LCCR table is utilised, which not only captures the explicit adjustments in ratings but also considers the inclusion of outlook and watch actions. By incorporating outlook and watch actions, the analysis accounts for the potential non-linearity of the rating scale and aims to provide a more comprehensive understanding of the fluctuations in sovereign credit ratings. The inclusion of these supplementary indicators enhances the overall perspective of the analysis and ensures a more nuanced assessment of the changes in sovereign ratings.

Control variables include country-level and firm-level variables following prior papers (e.g., Almeida et al.2017; Julio and Yook, 2012; Demirci et al. 2019). For country characteristics, I include several macroeconomic variables that are country-specific and time-varying to capture expectations about mis-measured investment opportunities and future economic conditions in which firms operate. These country-level variables include GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. Changes in economic conditions can significantly affect the performances and investment decisions of firms domiciled there. Indicators of economic conditions provide important insights into firm's sale growths and profitability. Additionally, macroeconomic shocks are considered as main drivers of firm's financing decisions (e.g., Dittmar and Dittmar, 2008). Begenau and Salomao (2019) suggest that in periods of economic expansion, large firms are likely to issue more debt and increase their investments due to a cheaper cost of external borrowing. While equity issuance is more preferable and investment reductions are recorded due to limitations in accessing external funds during a deterioration in economic conditions. Additionally, Chen (2010) shows that the arrival of a recession brings bad news of low expected GDP growth rates and high economic uncertainty, which affects negatively on firm investing and financing decisions. Lower expected GDP growth rates lead to increases in firm's default risks and limitations in raising further debt. This in turn reduces investment rates. Therefore, I expect a positive link between GDP growths and investment rates.

Changes in government debt and changes in inflation rate are to account for the possibility of fiscal and monetary policies affecting corporate investments. Firms tend to face a significant amount of uncertainty related to government policy changes. Using a heterogeneous firm New Keynesian model, Ottonello and Winberry (2020) investigate the impact of changes in monetary policies on

firm's investing decisions. They find that firms with low default risk are more responsive to monetary policies compared to firms affected by high default risk. Changes in monetary policies might trigger changes in expected return on capital, which in turn alter investments. Using a data set of 40 countries during the period from 1990 to 2014, Demirci et al. (2019) investigate how changes in government debt affect corporate capital structures. They find strong evidence that an increase in government debt might lead to an increase in the required returns on debt securities, and thereby can crowd out corporate debt. Thus, there is a negative relationship between government debt and corporate debt financing. Firms therefore find more difficult to obtain additional debt to finance their investment projects and hence cut down their investments. Gillman and Kejak (2011) examine the impact of inflation rate on corporate investment rates. They find that an increase in inflation is associated with a decrease in investment in case of moderately high rate of inflation. This in turn reduces output growths and real interest rates in the long run. Therefore, I expect a negative link between changes in government debt and changes in inflation rate in corporate investments.

Changes in S&P Global Equity Index are to control for the movements in the stock market. Prior papers suggest that there is a contagion of aggregate stock markets in response to macroeconomic shocks (e.g., Dungey et al. 2010), which in turn affects negatively on corporate sector. Firms tend to be more financially constrained and thus reduce their investing decisions because of a more expensive cost of borrowing. Thus, I expect a positive link between Changes in S&P Global Equity Index and investment.

Firm level variables include changes in corporate rating, Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and Lagged investment. I expect a positive coefficient for changes in corporate rating since a firm's creditworthiness obviously affects its borrowing costs, hence,

abilities to finance investment projects. Khieu and Pyles (2016) examine effects of changes in credit rating on firm's financial policies, using US nonfinancial firms including its S&P's credit rating and firm characteristics during the period from 1984 to 2012. Khieu and Pyles (2016) conclude that downgraded firms cut down investments compared to firms with their creditworthiness remaining unchanged. They also find strong evidence of a positive relationship between investment levels and an upgraded corporate credit rating.

The link between firm size and investment is negative. Rated firms are mostly large and therefore largely unconstrained financially (Faulkender and Petersen, 2006). However, it is more difficult for them to find profitable investment opportunities in proportion to their current total assets. In respect to the inverse capital growth-size relationship, this link is ambiguous. More specifically, size may also affect firm investment levels directly because smaller and younger firms are more likely to have higher growth opportunities. Smaller firms witness greater hurdles when raising funding. First, their borrowing costs tend to be higher. Second, they get less analyst coverage and may have more difficulties in accessing external sources of capital because of adverse selection problems. Third, transaction costs related to security issues decrease with the issue size, which is likely to be higher at larger firms. Hence, smaller firm are more likely to face several limitations in boosting their investments.

Return on asset (ROA) is considered as an important financial metric used to assess a company's profitability by comparing its revenue with earnings. A large body of research suggest that the profitability and investment are known to be persistent (e.g., Fama and French, 1995). It also seems reasonable that current profitability is related to future investment, and that current investment is related to future profitability. Thus, it suggests a positive link between ROA and level of investment.

Leverage is predicted to exert a negative effect on investment. This effect is much larger for firms with weak growth prospects (Aivazian at el. 2005). Leverage and Market-to-book are as proxies of investment opportunities. Firms with strong growth prospects will be able to make more investments (Abel, 2018). High Market-to-book value firms (those with strong growth prospect) have expectations of higher cash flows, or net worth, and this may reduce moral hazard and adverse selection problems inherent in the supply of credit to the firm in the capital market. For those firms, leverage is less of a constraint on investment since a firm with strong growth prospects can more easily refinance and recapitalise in the capital market. For firms with low Market-to-book value, leverage would be a tighter constraint limiting investment, since such firms would find it harder to recapitalize given their perceived weak growth prospects. Therefore, there should be a positive relationship between Market-to-book and investment.

Cash holding and Cash flow can be used as liquidity signals. High liquidity firms have better investment opportunities (Lewellen and Lewellen, 2016; Meyer and Kuh, 1957), especially during financial and sovereign debt crises (Mercatanti et al. 2019). Meyer and Kuh (1957) is a very first study attempting the question over the determinants of investment. They examine the relationship between investment and liquidity effects, and conclude that high liquidity signals are associated with better investment opportunities. Therefore, I expect a positive link between liquidity ratios and investment.

The lagged investment is used in explaining the stickiness of investment behaviour (e.g., Doms and Dunne, 1998). Lagged investment is considered as the most relevant predictor of current investment at the firm level (Eberly et al. 2012). There is a positive association between the lagged variable and the dependent variable because of the lumpiness of investment behaviour (Doms and Dunne,1998). There are active capital adjustments in a short amount of time and almost no

adjustments in the other periods. In contract, Nini et al. (2009) also report a negative link between investment behaviours and the poor financial performance such as a decline in cash flow, a financial covenant violation, or a downgrade in the firm's credit rating, which hence also leads to a negative association between the investment variable and its lagged dependent one.

The error term in Equation (1) consists of the following components: (i) v_i denotes a firm-specific component; (ii) v_t represents time-fixed effects; (iii) $v_{j,t}$ represents industry-time fixed effects; and (iv) $e_{i,t}$ which is an idiosyncratic component. Following Bedendo and Colla (2015), I use time fixed effects in order to better control for omitted variables. A time-specific component also accounts for possible business cycle effects. The presence of firm fixed effects are to control for unobserved time-invariant firm characteristics. Year fixed effects are also taken into account in order to control for common shocks across countries and for changes related to economic and monetary regime. Industry x year fixed effects are included to control variation within a given industry and industry-year. The reported standard errors are clustered at the firm level.

The correlation matrix presented in Table 3 illustrates the correlation coefficients among the variables employed in the model. Pearson correlation matrix clearly demonstrates that the correlation between any given pair of independent variables does not exceed 0.8. It means that the explanatory variables, are not highly correlated. Hence, multicollinearity issues do not seem to be a concern. The maximum correlation is found in cash flow and investment or Market to book value. The results of the correlation are significantly different from zero at 1% level. Moreover, the signs observed in the correlation matrix coefficients further reinforce our initial expectations regarding the relationship between firms' investment and the explanatory variables. More specifically, there is a significant positive correlation between investment and change in LCCR,

change in corporate rating, ROA and Cash flow. On the other hand, there is a significant negative correlation between investment and Cash holding, Leverage and change in government debt.

4.4. Empirical results

4.4.1. The effect of sovereign rating changes on corporate investment.

To formally investigate the effect of variations in sovereign rating on corporate investments, fixed effect models are used with different set of control variables to mitigate potential omitted factors. Table 4.4 presents the regression results. Results in all columns control for both country and firms-level variables. These variables include $\Delta Rating_{corporate}$, Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and lagged investment. These macroeconomic variables include GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. In the second column, year-industry fixed effects are added.

The coefficient on changes in LCCR is positive as expected in all models and statistically significant. This confirms a strong relationship between changes in sovereign rating and domestic corporate investments. On average, a notch change in sovereign credit rating results in an around 0.27% changes in investments in the following year. All control variables enter with the expected signs. There is a significant positive relationship between changes in corporate rating and firm's investing behaviours. Interestingly, the magnitude of sovereign rating changes is greater than changes in corporate rating on investment, implying the implication of sovereign rating changes on domestic firm investing activities. This evidence also supports the credit rating channel, which is consistent with previous findings (e.g., Almeida et al. 2017). Firm leverage is significantly negative in explaining investment changes, indicating that highly indebted firms invest less. The

coefficient of Market-to-book ratio is positive implying that firms with higher growth prospects invest more. There is significant and positive serial correlation in the investment values indicating sticky investments. In other words, the sampled firms tend to plan their investment policies in a long-term basis. Regarding macro variables, there is a significant negative relation between government debt and corporate investment. Furthermore, there is a positive link between changes in S&P Global Equity Index and corporate investment at 1% level of significance.

4.4.2. Sovereign rating changes and investment in case of no change in corporate rating.

Next, I examine whether the spill-over of sovereign ratings into firm's investments across transmission channels other than via the credit rating channel. I keep only firms without any rating change during a year period following a sovereign rating event. Table 4.5 shows a significant positive coefficient on sovereign rating changes in explaining changes in domestic corporate investments. This provides interesting evidence that firms tend to alter their investments following a sovereign rating change, even their corporate ratings were not impacted. On average, each one notch sovereign rating change could result in a change in investments by 0.195% in the next year. A sovereign downgrade from AA+ to AA triggers a 0.15% reduction in investments while a 1-notch downgrade of a BBB+-rated sovereign leads to 0.12% investment cuts in the following year[1].

In addition, I examine whether sovereign downgrades and upgrades have a differential effect on firm's investment policies. In particular, equation (1) is estimated for subsamples of sovereign downgrades and upgrades, separately. It is noteworthy that these subsamples only include firms without any rating change during a year period following a sovereign rating event. Panel A and

[1] -0.15% = [0.195%] * [-0.743]; 0.12% = [0.195%] * [-0.617]. -0.743 and -0.894 are ΔLCCR for rated issuers (see Table A3)

Panel B in Table 4.6 report the results for sovereign downgrades and sovereign upgrades, respectively. In panel A, the coefficients of sovereign rating changes indicate a highly negative correlation investments and sovereign downgrades, which is consistent with prior literature (e.g., Almeida et al. 2017). Compared to an average investment rate of 5.9%, this is a substantial effect in the order of reduced investment by 0.21% to 0.22%. On average, a notch of sovereign downgrade leads firms to cutting their capital spending by around 0.21% in the next year. Considering Belgium as an example, S&P had announced a sovereign downgrade from AA+ with a negative outlook to AA- with a negative outlook in 2011. This could lead to a 0.25% [2]corporate investment cuts in 2012. In panel B, the coefficient estimates for sovereign upgrades in all columns are insignificant. On average, the coefficient of sovereign downgrades is much greater than the coefficient of sovereign upgrades. Therefore, the findings confirm that the effect of sovereign ratings on investments is asymmetric. The findings are, to some extent, consistent with the evidence of Hill et al. (2018).

4.4.3. The role of high government debt on the link between sovereign downgrades and corporate investments.

An intuitive question follows previous empirical results concerns the impact of sovereign downgrades on corporate investments at different public debt-to-GDP levels. In this section, I analyse the role of public debt overhang in reductions in corporate investments during sovereign downgrade periods. Interaction terms between sovereign downgrade ($\Delta Rating_{sovereign}$) and government debt dummy variables are constructed. The dummy variables take the value of 1 if the debt-to-GDP ratio of a given country in a year crosses certain threshold (i.e., 80%, 90%, 100%), and 0 otherwise. The interaction terms are designed to capture any incremental impact from

[2] 0.25% = [0.21%] * [-1.185]; -1.185 is ΔLCCR for rated issuers (see Table A3)

simultaneous changes in sovereign ratings and public debt overhang. Therefore, the predicted signs of this interaction term would be positive. I estimate the following equations:

$$\text{Investment}_{i,t+1} = \beta_0+\beta_1 \Delta \text{ LCCR x Government debt}_{i,t}+ \beta_2\Delta \text{ LCCR}_{i,t} + \beta_3\text{Government debt}_{i,t} + \sum \gamma \text{control variables}_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where

Subscripts i for firms, j for industries and t for years.

The dependent variable is the investment ratio at year t+1.

Δ LCCR $_{i,t,}$ denotes changes in the log-transformed credit rating of the sovereign in which firm i domiciles. The analysis focuses primarily on examining changes in sovereign ratings. These sovereign rating changes are evaluated by referring to the LCCR table, which encompasses not only the explicit alterations in ratings but also incorporates outlook and watch actions. This allows for possible non-linearity of the rating scale. The intention behind incorporating these supplementary indicators is to achieve a more comprehensive perspective of changes in sovereign credit ratings.

Δ LCCR x Government $\text{debt}_{i,t}$ denotes the interaction between government debt and changes in the log-transformed credit rating of the sovereign in which firm i domiciles.

Government debt are dummy variables take the value of 1 if the debt-to-GDP ratio of a given country in a year crosses certain threshold (i.e., 60%, 80%, 100%), and 0 otherwise

The error term in Equation (2) consists of the following components: (i) v_i denotes a firm-specific component; (ii) v_t represents time-fixed effects; (iii) $v_{j,t}$ represents industry-time fixed effects; and

(v) $e_{i,t}$ which is an idiosyncratic component The reported standard errors are clustered at the firm level and t-statistics are reported in parentheses. I use a sub-sample of firms without corporate rating change in year t where t is the period of sovereign downgrades. The baseline model for this analysis is the same as that presented in Equation (1).

Table 4.7 show our regression results[3]. Panel A indicates results when government debt to GDP is less than 60%. Panel B, panel C and panel D show results in case of the public debt to GDP ratio which are more than 60% ,80% and 100%, respectively. When public debt to GDP is below 60%, there is no evidence supporting the joint effect between sovereign downgrades and government debt overhang. While the public debt level is above 60% of GDP, government debt starts to be harmful to corporate investment after periods of sovereign downgrades. Firms, on average, reduce their investments by 0.265%, which indicates a further investment cuts by around 0.015%, in response to sovereign downgrades. When public debt ratio exceeds the 80% threshold, the coefficient of interaction term is positive and statistically significant for all regressions, ranging from 0.305% to 0.31%. This suggests an additional investment cuts by around 0.06%, in response to sovereign downgrades. Furthermore, there is interesting evidence that the negative impact of sovereign downgrades on corporate investments is much stronger in case of public debt ratios

[3] As a robustness check, I run several regressions with the variable of sovereign downgrade with government debt dummy variables taking the value of 1 if the debt-to-GDP ratio of a given country exceeds 5% until I reach the level of 120%, and 0 otherwise. The debt-to-GDP turning point of this concave relationship is about between 60 and 65% on average for the sample, across all models. This means that a debt-to-GDP ratio above such threshold is associated, on average, with lower domestic investment growth rates in the aftermath of sovereign downgrades. In sum, the cross-sectional findings in the model emphasise the importance of government debt in explaining the spill-over effect of sovereign rating changes on corporate investments.

above a threshold of 100% of GDP. Specifically, a notch of sovereign downgrade might trigger a decrease in investment spending, on average 0.395%. The public debt overhang effect thus leads to a further 0.145% reduction of corporate investments after a year of sovereign downgrades. Therefore, the public debt overhang is a significant channel for the spill-over effects of sovereign downgrades to domestic corporate activities, especially at public debt levels above 100% of GDP. Coefficient estimates on the standard determinants of investments are very much in line with those usually found in the investment literature (i.e., positive coefficient on Market-to-book, and negative coefficient on Leverage).

4.6. Conclusion

This chapter investigates the impact of sovereign rating changes on domestic investments, based on the sample of 1,328 rated firms from 30 high income countries over the period between 01/01/1994 and 31/12/2020. Prior literature shows that sovereign ceiling or credit rating is the main mechanism behind sovereign-corporate spillovers (e.g., Almeida et al. 2017, Hill et al. 2018). I revisit the impact of sovereign rating changes on investment policies and find strong evidence of public debt overhangs in explaining the sovereign-corporate transmission. Firstly, there is an asymmetric effect of sovereign rating changes on domestic businesses. Sovereign downgrades impose significant decreases in corporate investments, even their credit ratings were not affected. Firms cut investments by 0.25%, on average, following sovereign downgrades. Meanwhile, the influence of sovereign upgrades is muted. Secondly, the channel through which government debt level is found to have a non-linear detrimental impact on corporate investments during sovereign downgrade periods. I do not record any significant reductions in corporate investments when public debts are lower than 60% of GDP, while the magnitude of the reductions is about 0.305% to 0.31% when public debt ratio exceeds the 80% threshold. This indicates a further investment

reduction by around 0.05% after a year of sovereign downgrade. This empirical evidence also points out that 100% of GDP is an important threshold. An additional investment cut of 0.145% can be observed, in response to a sovereign downgrade. A unique contribution to the literature is made by (1) identifying an asymmetric effect of sovereign rating transition on corporate investments; (2) demonstrating a new channel to explain the spill-over of sovereign to corporate- the government debt channel; (3) providing the evidence of the non-linear relationship of government debt and domestic investments in the aftermath of sovereign downgrades. Therefore, fiscal policy makers should factor these negative externalities into public debt management decisions. Government should take a consideration of the excessive used of government debt especially during the period of Covid -19 time or financial crisis. There should be a fine balance between stimulated demand and hampered corporate investments, hence, longer-term impacts on supply. It would not only improve a sovereign creditworthiness, but also decrease the corporate cost of debt and in turn, could foster economic growth and help stabilise corporate investments.

Chapter 5: Sovereign downgrades, corporate leverage and investment

5.1.Introduction

Sovereign creditworthiness plays an important determinant for business activities. Sovereign debt restructuring deteriorates the ability of private sectors to access to capital markets (e.g., Arteta and Hale. 2008) while sovereign credit rating downgrades trigger significant changes in corporate credit risk and borrowing costs (e.g., Borensztein el al. 2013; Bedendo and Colla. 2013). A deterioration in sovereign creditworthiness reduces banking liquidity, hence, make bank-funding more costly (Adelino and Ferreira.2016). It also creates a contraction in the supply of debt capital and increase the firm's costs of debt (Almeida et al. 2017). In response, firms face uncertainties and decisions of scaling down their investments due to limitations in raising further debts. This chapter builds on these considerations and investigates the link between indebtedness and investments at the firm level in the event of sovereign downgrades. In continuation of the preceding chapter (Chapter 4), Chapter 5 delves further into an in-depth investigation of heterogeneous effects of sovereign downgrades on investment decisions within the context of high leverage firms. The literature on corporate finance identifies that high debt financing implies greater interest expenses and therefore decreases funds available for investing decisions (e.g., Gebauer, et al. 2018; Myers. 1977). High leveraged firms also find more difficult in obtaining external sources of finance in good conditions because of greater risks of default and bankruptcy. The desire to repair poor balance sheets in order to reduce costs of external funding leads these firms to increase savings and to forgo valuable growth opportunities. In commination, the prominence of both corporate indebtedness and sovereign creditworthiness instigate an interesting question on the interactions between firm leverages and sovereign credit rating actions on domestic investments.

Chapter 5 follows the same research methodologies and sample selection as described in Chapter 4. However, in this chapter, the focus is solely on firms domiciled in countries that have experienced at least one sovereign rating downgrade. As a result, five countries that did not undergo any sovereign downgrades during the sample period, namely Australia, Canada, Denmark, Israel, and Sweden, have been excluded. The final data sample consists of 1206 non-financial firms with credit ratings spanning from 1994 to 2020. The sampled firms domicile in 25 high income countries. Methodologically, I estimate regressions of investment changes one year following sovereign rating changes. Control variables include corporate ratings, firm characteristics and macroeconomic variables. To address potential omitted variables, I include firm fixed effects, year effects, and year-industry effects, following the approach of Almeida et al. (2017).

The results are robust across all specifications and subsamples. Firstly, a notch sovereign downgrade, on average, may give rise to a 0.605% decrease in investments for highly leveraged firms in the next year. Second, there is evidence for some heterogeneity across type of firms. Poorer performance, lower investment opportunities, financial constraints and lower cash holding are factors which reduce the capacity to tolerate high levels of debt and lead to a more negative debt-investment relationship in the event of sovereign downgrades. Building on the cross-sectional heterogeneity, this chapter provides additional evidence that highly leveraged firms with lower profitability, lower Market-to-book value and higher KZ indexes experience 0.181%, 0.127% and 0.24% respectively lower relative-to-investments than other firms during sovereign downgrade periods. Finally, this chapter highlights that greater cash holdings are associated with higher levels of investments for highly leveraged firms following sovereign downgrades. The findings are

therefore consistent with the interpretation that firms hoard more cash under the precautionary motive.

The contributions to prior literature are twofold. First, there are non-linear effects of corporate debt on investment after a year of sovereign downgrades. For highly indebted firms, there is a significant negative leverage-investment link, suggesting that firms with weak balance sheets forgo some profitable investment opportunities, following a sovereign downgrade. Furthermore, it contributes to the literature by identifying the role of cash holding for highly leveraged firms during the sovereign downgrade periods. As leverage increases, firms are more likely to experience financial distress and hence face the threat of bankruptcy, especially in the event sovereign downgrades. This, in turn, gives firms incentives to accumulate larger cash reserves to minimise the risk of financial distress and costly bankruptcy.

The remain of this chapter is organized as follows. Section 2 reviews related literature. The research methodology and data description are discussed in section 3. Section 4 provides empirical results. Section 5 presents the conclusion.

5.2. Literature review and hypothesis development

Under the original Modigliani and Miller (1958) propositions, a firm's investment choice is independent of its capital structure. This theorem is called "The Irrelevance Theorem". In a frictionless world, a firm should theoretically invest under the consideration of the positive NPV regardless of the nature of its current balance sheet. Nevertheless, outside a Miller –Modigliani world, a large theoretical and empirical literature suggest a strong relationship between investment decisions and financing considerations.

Indeed, underinvestment or overinvestment incentives are considered as consequences of agency problems arising from relationships between managers and firm's stakeholder. Due to transaction

costs and asymmetric information, investment is more likely not to be fully responsive or over-responsive to macroeconomic shocks. Myers (1977) investigate the role of debt on the optimal investment strategies and find that profitable investment opportunities could go unfunded as a result of debt overhang accumulated by previous debt financing. Specifically, highly levered firms discourage management from undertaking positive NPV projects since the benefits from the investment might accrue to bondholders and leads to underinvestment. Hence, firms with high level of leverage tend to forgo valuable growth opportunities in comparation with low leverage firms.

The trade-off theory of capital structure provides an exposition of the benefits and dangers of debt use. Several papers have concentrated on the optimal capital structure and suggest that each firm set an optimal (target) combination between debt and equity in order to maximise the value of shareholders. Therefore, firms tend to raise new funding from external sources in a manner that will make attempts to maintain their actual capital structures on target over time. The use of debt brings benefits to current shareholders as long as a return generated by additional debt raised which is greater than the borrowing cost. Financial leverage leads to an increase in firm's business risk on its shareholders rather than debt holders due to the fact that debt holders will receive fixed income referred to the interest payments.

No taxes are one of the main assumptions of the MM theorem. The trade-off theory is developed by the Modigliani and Miller's (1958) theory but taken into account the impact of taxes and bankruptcy costs on the capital structure. This theory explains how firm use debt as a tax shield in manipulating profitability because debt's interest is deductible before tax payments. It however leads to an increased bankruptcy risk since the debt holders require a greater interest rate. Therefore, firms with safe and fixed assets as well as having taxable income to shield are more likely to set a high target debt to equity ratio. In a meanwhile, unprofitable firms having a large

amount of risky and intangible assets tend to finance their investments by equity. If there was no cost related to capital structure adjustment, each firm should always have an optimal debt to equity ratio. The trade-off theory suggests that a firm should set a target debt level that maximises the firm value where the benefit arising from tax shield is maximised and the bankruptcy cost related to debt used is minimised.

According to a static trade-off theory (e.g., Myers, 2001; Niu, 2008), a firm set an optimal leverage level where the benefits of issuing further debt, mainly from tax savings, is offset additional cost of financial distress, based on the assumption of no transaction cost associated with issuing or repurchasing debt securities. The heterogeneity of the optimal leverage ratio is the variation across firms. Profitability, bankruptcy probability or investment opportunities are main factors that firms should consider in their capital structure decisions. Due to expensive transaction costs related to issuing or repurchasing debt, dynamic trade off theory (e.g., Hovakimian et al. 2001; Flannery and Hankins, 2007) shows an existence of an optimal leverage ratio if the benefits of achieving a target level outweigh the cost of capital structure adjustment. More specifically, in order to achieve the maximisation of firm value, there is an existence of long-term target leverage ratio and a firm will gradually make attempts to alter their actual leverages toward that optimal debt level at a certain speed of adjustment (SOA). Macroeconomic factors such as economic environment, financial development, tax systems, government policies are suggested to be the primary sources in explaining the magnitude and its leverage SOA. However, the heterogeneity of the SOAs also varies across firms domiciled in the same country. Firm performances (e.g., profitability, earnings volatility), default risk, bankruptcy costs or opportunity costs related to differences between an actual and target leverage level are main firm-level drivers in explaining those heterogeneities.

Additionally, over-leveraged firms with a financial surplus are more likely to adjust their leverages to their target capital structures faster compared to underleveraged firms with a financial deficit.

Meanwhile, the SOAs of over-leveraged firms with a financial deficit tends to be slower than those of underleveraged firms with a surplus deficit. In sum, although existing debt can act as a tax shield (Modigliani and Miller. 1963) and increases proportionally a firm value, risk increases with respect to proportions of debts. Additional costs related to financial distress and bankruptcy begin to be far above the tax advantage, and a firm value begins to level off, and then to decline (Stretcher and Johnson, 2011).

The free cash flow theory developed by Jensen (1976) and Stulz (1990) highlights the disciplinary and monitoring role of debt use. This theory is conceptualised by the agent and principal. The shareholders (Principals) delegate decision-making authority to the managers (Agents) in order to maximise firm values and shareholder's welfare. However, there is a conflict interest between managers and shareholders, arising from problems related to information asymmetric and different incentives. Managers are more interested in their own personal interests which do not necessarily maximise the benefits of shareholders. They also have information advantage compared to investors in term of cash flow, investment opportunities and future prospects. They thus tend to expand the firm's scale more than the optimal size in order to increase their powers and the availability of discretionary amount. Excess cash flow available gives them more freedom in investment decisions, which leads to an overinvestment problem. They can invest in both profitable and low-quality projects at below the cost of capital, which might be desirable for them. This therefore decreases the firm value.

Jensen (1976) and Stulz (1990) suggest the use of debt in order to mitigate the overinvestment problem. Specifically, higher leverage will reduce the free cash flow level under managers' discretion due to an enlargement of repayment obligations and interest payments. It forces managers to service debt commitments, that might have otherwise been funded for poorly quality investment projects. An increased debt use also leads to an increased bankruptcy risk, managers

therefore have to monitor their investments and tend to curtail too risky and negative NPV projects. This thereby decreases the cost of free cash flow. Therefore, firm with weak investment opportunities are more likely to set high leverage ratios since debts can acts as a valuable bonding role in mitigating the risk that managers will invest in unprofitable projects, and thereby reducing the manager power. Consequently, major interest conflicts between managers and shareholders might be optimally reduced through a capital structure decision by raising more debt.

Furthermore, when a firm is facing financial constrained problems, abundant capital under the managers' responsibility also reduces. A limited amount of capital might enhance the investment efficiency by motivating managers to cut down unprofitable projects and give priority to undertake high quality projects. In order words, under the financial constrained condition, managers do not have enough funds for all desired investments. They thus transfer fund from unprofitable projects to positive NPV ones. This thus improves the efficiency of capital allocation, in turn increase the firm value. Moreover, when a firm find difficult in obtaining external funds, internally generated funds become a priority source in financing new investment projects. The negative effect of financial constrained issues on more profitable projects can be reduced by increasing the priority in the capital allocation. This suggests that greater level of financial constrained might lead to an improvement in both external and internal capital allocation efficiency.

The existing literature shows that increasing debt capacity exert a negative effect on investment (e.g., White and Wu, 2006; Occhino and Pescatori, 2015) for the following reasons. First, highly leveraged firms face substantial debt service obligations and might not be able to obtain additional debt in good conditions. Extra pressures from maintaining a positive cash flow cushion and weak balance sheets may lead to desires to give up investment opportunities (White and Wu, 2006). Second, higher debt levels create a greater default probability, in turn causing financial distress, which is reflected in a higher "external finance premium" (Bernanke and Gertler, 1989) or the

rationing of credit (Stiglitz and Weiss, 1981). Highly indebted firms therefore prefer scarifying profitable investment opportunities resulting from the lack of sufficient internal sources of funding (Myers, 1977), especially in times of financial turbulence and heightened uncertainties (Bernanke et al. 1999). Finally, high debt holding may capture a "debt-overhang distortion" (Occhino and Pescatori, 2015), which alleviates shareholder value by leading them to invest beyond the optimal investment level. Specifically, when the burden of outstanding debt grows beyond a certain limit, default risks increase significantly.

At the event of default, a fraction of the value generated by new investment would only benefit the creditors. This on average lowers the marginal return from further investments and decreases the incentive to invest for borrowers. Dang (2011) examine the interaction between investing activities and leverage in the presence of incentive problems, based on a panel of UK firms from 1996 to 2003. In term of methodology, a two-stage estimation procedure and the GMM estimators are applied in explaining the investment-leverage link. Consistent with Myers' (1977) hypothesis, he finds evidence of negative impact of leverage on investment for high growth firms. Dang (2011) highlights the disciplining role of leverage for firms having weak investment opportunities. Leverage affects negatively investing decisions in order to limit the free cash flow level and lower the manager power. Thus, the agency problem will reduce, which is consistent with the free cash flow theory of Jensen (1976).

Using the sample of about 920 thousand firms during the period from 2005 to 2014, Gebauer, et al. (2018) investigate the relationship between leverage and investment for 5 Euro area countries (Italy, Spain, Portugal, Greece and Slovenia). They find evidence supporting a non-linear relationship between investment and leverage. They identify leverage thresholds beyond which leverage impacts negatively and significantly on corporate investment. The debt-to-asset turning point of this concave relationship is on average around 80-85 percent in their sample. In normal

periods, they only find evidence of negative impact of leverage on investment for overleveraged firm. Specifically, firms having a debt ratio of 90 percent cut down 0.7% investments more than firms having a leverage ratio of 80%. However, in certain periods such as post- the global financial crisis of 2008 period, there is also a significant reduction in investments for firms with lower leverage levels, especially for smaller and less productive firms. In particular, a firm having a debt ratio of 60% experiences a further investment cut of 1.4% compared to a firm having a leverage level of 30%. These results are robust across various specifications.

Gebauer, et al. (2018) find the investment-dampening impact of high leverage in all major industries as well as for both unprofitable and profitable firms. The heterogeneity of the high leverage also varies across firm size. They find strong evidence supporting a negative impact of leverage on investment for micro, small and medium-sized firms, but weak evidence for large firms, suggesting a less essential role of debt overhang effect on large firms.

Kalemli-Özcan. (2018) examine the impact of leverage on investing activities for European firms during the period from 200 to 2012. They find evidence of a significant reduction investments for high leveraged firms after the financial crisis in 2008. One standard deviation increase in firm leverages could trigger a decrease in investing activities by 20%. The impact is more pronounce for firms having high short-term debt in countries who experience high sovereign risks. Kalemli-Özcan. (2018) find a persistent negative effect of leverage on investment for several years after macroeconomic shocks in those countries who are under sovereign stress. In particular, high indebted firms cut down 10% their investments immediately after the shock, 8% after a year and 4% after 4 years. They highlight the important role of the leverage channel in explaining reductions in investments in the aftermath of crisis periods. The overhang debt channel could explain 40% of the aggregate investment reduction.

A large strand of studies documents the negative impact of sovereign downgrades on domestic corporate investments through its effect on firm's costs of capital (e.g., Chen et al. 2013; Almeida et al.2017). Chen et al. (2013) investigate the impact of sovereign rating changes on investments, based on the sample of 48 countries over the period from 1983–2009. They suggest that the negative impact of sovereign downgrades on domestic investments is due to through its effect of the costs of debt. Sovereign downgrades lead to the increased cost of debt and create unfavourable effects on the NPV of some investment projects.

Another explanation of the unfavourable impact of sovereign downgrades on costs of debt is through risk premium. The country risk is considered as a systematic risk which is unlikely to totally diversify away. Therefore, an increased country risk associated with a sovereign downgrade lead to an extra premium risk and an increased cost of capital and in turn a reduction in domestic investment. Using a system generalized method of moments, Chen et al. (2013) find a symmetric effect of sovereign rating changes on investments. Specifically, there is a significant negative impact of sovereign downgrades on domestic investments. However, the impact is temporary. Firms experience reductions in investments in a year and the following year of sovereign downgrades. For sovereign upgrades, they also find an increase in investments in a year and the following year of sovereign upgrades. Their results are robust after accounting for several macroeconomic variables and the potential endogeneity problems.

Bedendo and Colla, (2013) investigate the spill over effect of sovereign risk to corporate sector, based on the sample of on 240 companies and 11 sovereigns in the Eurozone during the period from January 2008 to December 2011. Credit risk is measured by the use of credit default swap (CDS). Using dynamic panel specification and an instrumental variable approach to deal with endogeneity issues, they show that an 10% increase in sovereign credit spreads lead to an increase in corporate credit spreads by roughly 0.5%–0.8%. Bedendo and Colla (2013) focus on variation

in firm characteristics to find three channels of transmission in explaining the spill over effect of sovereign risk into corporate. These three channels include government aid, domestic demand and credit squeeze. Firstly, politically connected firms are beneficial from debt guarantees and favourable credit lines by the government. Following an increase in sovereign risk, there is a reduction in government guarantee's values, which in turn leads to a deterioration in creditworthiness of these government-controlled firms. They find evidence supporting that an increase in sovereign risk induce an increased CDS of these firms which is two or three time greater than other firms. Secondly, as a result of an increased sovereign, the introduction of restrictive monetary or fiscal measures is to improve the sovereign creditworthiness. This leads to an increased default risk for firms mostly operating in domestic markets. These firms tend to face a reduction in profit, net sales and financial constrained issues. Bedendo and Colla, (2013) use the sale ratio in order to measure domestic market concentration and find a significant impact of changes in sovereign risk on those firms. Finally, a deterioration in sovereign creditworthiness reduces banking liquidity, hence, make bank-funding more costly. Following an increased sovereign risk, government bond accounted for a majority of bank investment portfolio loses value. This in turn crowds out corporate lending. They find evidence of a stronger impact of changes sovereign risk on bank-dependent firms.

Adelino and Ferreira (2016) investigate the impact of sovereign downgrades on bank lending to the private sector, based on the sample of 20,850 loans from the Thomson Reuters DealScan database during the period between January 1, 1989, and December 31, 2012. They apply a quasi-natural experiment in order to quantify the impact of bank downgrades on private lending in the aftermath of sovereign downgrades. By comparing banks whose ratings equal or above their sovereign (bounded banks) with banks having ratings lower than their sovereign (non-bounded banks), they first find an asymmetric effect of sovereign rating on those groups. Bounded banks

are more likely to be downgraded in comparation with non-bounded ones following a sovereign downgrade. This negative impact of sovereign downgrades on bank ratings in turn affects unfavourably the bank lending to the private sector. This also might lead to significant negative changes in bond coupons and loan interest rates. In the worst scenario, it increases the likelihood of debt covenant violations. Therefore, an impairment of access to financial market, greater collateral requirements and an increase in cost of funding are typical consequences of downgraded bank ratings. Bounded banks reduce their long-term borrowing and interbank funding by 3% compare to non-bounded banks during sovereign downgrade periods. Sovereign downgrade also triggers an increase in CDS by 15% for bounded bank. This confirms a negative impact of sovereign downgrade on bank's funding costs.

Employing a difference-in-differences technique, Adelino and Ferreira (2016) compare the syndicated loans number that are made by bounded banks versus non-bounded banks following a sovereign downgrade. Bank level variables, country characteristics variables and country-by-quarter fixed effects are also taken into the specification model. They find evidence supporting a further reduction by 25% in the number of syndicated loans made by bounded banks in comparation with non-bounded firms following sovereign downgrades. They also find a negative impact of sovereign downgrades on loan pricing. Bounded banks lift their interest rate spreads between 5 and 40 basis points more than non-bounded banks, in the event of sovereign downgrades. In sum, Adelino and Ferreira (2016) suggest that a deterioration in sovereign creditworthiness reduces banking liquidity, hence, make bank-funding more costly. This confirms the bank lending channel to explain the impact of sovereign downgrades on corporate activities.

Almeida et al, (2017) examine the real impact of sovereign downgrade on firm performance, using the sample of 55,422 firms from 80 countries during the period from 1990 to 2012. They find evidence of an asymmetric effect of sovereign downgrades on corporate ratings. Firms that have a

rating equal or above their sovereign (treatment group or bounded firms) are more likely to be downgraded compared with firms whose ratings different from their sovereign (control group or non-bounded firms). This confirms the sovereign ceiling channel in interpreting the spill over effect of sovereign downgrade into corporate sector. This asymmetric effect of sovereign downgrade might lead to signification changes in investments and financial policies of bounded firms versus non-bounded ones. It could be explained by changes in lending supply rather than lending demand. Changes in ratings trigger significant changes in firm policies. Credit rating plays an important role in a firm's access to financial markets. Rating downgrade leads to an increase in cost of debt (coupon and interest rate of loans) as well as an increased likelihood of bond covenant violations. It also affects negatively clients and employee relationships as well as firm operations. Almeida et al, (2017) find that a significant reduction in investment rates of bounded firms in comparation with non-bounded firms in a year of sovereign downgrade. Bounded firms reduce their investments by 10.8% while non-bounded firms only cut their investments by 2.8%, following a sovereign downgrade. They also find evidence supporting an immediate reduction in net debt issuance in both groups in a year of sovereign downgrades. However, the magnitude effects are different among groups. Bounded firms decrease their net debt issuance by 5.8% while non-bounded firms only reduce their net debt issuance by around 1.6% in a year of sovereign downgrades. They also find evident of an increase in equity issuance following sovereign downgrades. It suggests that sovereign downgrades affect negatively the ability of raising further debt. Therefore, firms are more likely to switch debt to equity. Almeida et al, (2017) also find bounded firms decrease their long-term leverages more than non-bounded firms in the periods of sovereign downgrade. This suggests that bounded firms tend to replace long-term debt to short-term debt as a respond of sovereign downgrades. They find reductions in leverages after a year of sovereign downgrades because the speed of adjustment in leverage is typically slower than

investment rate or debt issuance. In term of liquidity perspective, they also observe an immediate further reduction in cash holdings by 2.1% of bounded firms compared to non-bounded firms in response to a sovereign downgrade.

Furthermore, they find a negative impact of sovereign downgrades on corporate bond yields. Bounded firms increase their bond yields 34 basis points more than non-bounded firms in the aftermath of sovereign downgrades. In term of methodology, a difference-in-differences estimator, linear regression and instrumental variable methods are used to explore the real effect of sovereign downgrades on firm policies. More specifically, Almeida et al, (2017) classify firms as treated or control group based on the sovereign bound and multiple dimensions. These dimensions include country where firms are domiciled, industry, firm size, investment rate, Tobin's Q, cash flow, cash holding, leverage, and foreign sales proportion. They conduct several placebo tests in order to prove alternations in firm decisions as a response of sovereign downgrades rather than other macroeconomic factors. They examine changes in investments and financial policies during recession periods, the 2007- 2009 financial crisis and currency crises.

In sum, Almeida et al, (2017) conclude that sovereign downgrades create a contraction in the supply of debt capital and increase the firm's costs of debt. In response, firms face uncertainties and decisions of scaling down their investments due to limitations in raising further debts

Given the predictions and evidence in previous literature, this chapter puts this seminal notion to the test in the event of sovereign downgrades. Due to restricted access to external funding markets, I expect that highly leveraged firms reduce more investments in response of sovereign downgrades. The first hypothesis is:

H1: The negative effect of sovereign downgrades on investments is greater among high indebted firms.

The "pecking order" suggests that the firm's financial structure and investment decisions are irrelevant, in perfect capital markets (Myers and Majluf.1984). Firm thus can raise external funds (either debt or equity) to finance their investments without facing any additional cost. However, asymmetric information and market imperfections increase the monitoring and evaluation costs faced by creditors and shareholders. This generates a wedge between the external financing cost and the opportunity cost of internally generated funds. Therefore, firms should first use internal sources to finance their investments and only raise external funds when those are insufficient. Several papers have devoted considerable attention to the precautionary motive for cash holdings (e.g., Almeida et al. 2004; Denis and Sibilikov ,2011). Capital market frictions triggers an increase in cost of external funding relatively to internal financial sources. As a result, financial constrained firms are likely to invest less than their optimal investment levels. This thus decreases future growths and the firm value. In order to mitigate these unfavourable effects, financially constrained firms tend to depend on internally generated funds which are cash flow and cash holding to fund the necessary investment expenditures. Consistent with this view, Opler et al. (1999) examine the determinant of cash holding and find evidence that firms more likely to hold more cash when the cost of external financing becomes more expensive and the cash flow level for investing activities is low.

In the same vein, Bates et al. (2009) also find that firms tend to keep more cash and lower cash substitutes such as inventories or receivable in order to smooth out volatilities in investment expenditures, as a precautionary motive. Ferreira and Vilela (2004) also document a strong positive relationship between cash holding and investment level. While there is negative link between cash holding and bank debt. Almeida et al. (2004) show that financial constrain is considered as an important factor in explaining why firm hoard more cash. They suggest that financial constrained firms should hold more cash in order to secure future financing for investments and thus lower the

cost of external funding. Similarly, Denis and Sibilikov (2011) find evidence supporting a positive link between cash holding and investment in the presence of financial constraints, which is consistent with precautionary motives. In one direction, sovereign downgrades induce an increased cost of borrowing for firms (Almeida et al.2017). In the face of increased financial constraint, the second hypothesis suggests:

H2: Highly indebted firms with larger cash reserves undergo a greater reduction in investment than their counterparts with lower cash levels in the event of sovereign downgrades.

5.3. Data and methodology

5.3.1. Data

The selected sample comprises firms with credit ratings (foreign currency long-term issuer ratings) issued by S&P from January 1st, 1994, to December 31st, 2020. Chapter 5 adheres to the sample selection outlined in Chapter 4. Nevertheless, this chapter concentrates exclusively on firms located in countries that encountered at least one sovereign rating downgrade. Consequently, five countries, namely Australia, Canada, Denmark, Israel, and Sweden, which did not undergo any sovereign downgrades during the sample period, have been excluded from the analysis. The data used in chapter 5 are obtained from Capital IQ. Excluding financial and utility firms and observations that had negative total assets, and a total debt-to-lagged asset ratio of less than 0 or greater than 1, the final sample consists of 1,326 firm-year observations. The sample includes 1,206 rated firms from 25 high income countries. The distribution of firms across countries is reported in Table 5.1. The sample encompasses corporations from various global regions, such as Europe, Asia, North America, and South America, with the largest number of firms originating from the United States, Japan, and the United Kingdom.

Corporate ratings are converted to numerical scores within a 20-point credit rating scale. Rating symbols are converted as follows: AAA ≡ 20, AA+ ≡ 19, AA ≡ 18 ... CCC- ≡ 2, C-D ≡ 1. Followed by previous papers (e.g., Adelino and Ferreira, 2016; Almeida et al, 2017), S&P ratings history is preferred over other credit agencies' histories for two primary reasons. Firstly, S&P is more active in conducting re-ratings and often leads other rating agencies in making rating revisions. Secondly, S&P ratings announcements contain a greater amount of information regarding the impact on the country's stock market.

The sampled firms' investments and other financial data are from the WRDS Fundamentals Annual Fiscal (North America and International) database. Firms are classified into the Fama-French 17-industry groups for industry classification purposes. Firms with missing Fama-French 17-industry classification, financial institutions, regulated utilities (e.g., Billett et al. 2011; Smith, 2016; Wei and Zhang, 2008) and industries that lack clear definitions ("almost nothing" industries) are excluded from the analysis. Financial and regulated utility firms tend to have significantly different investment and financial policies. To address outliers and measurement errors, all continuous variables are winsorised at the top and bottom 1%.

The starting year of the sample is determined by the availability of firm-level and country-level data, which varies across countries. Only firms domiciled in countries that experienced at least one sovereign rating downgrade during the sampled period are included. Table 5.2 reports the list of sample countries. For country-level variables, data from the World Bank and the OECD are utilised, with preference given to the data source providing the longest time series to ensure consistency of macroeconomic variables over time.

The dataset on sovereign credit ratings used in this chapter comprises daily observations of long-term foreign-currency credit ratings, as well as outlook announcements and watch listings for sovereign entities rated by S&P. These data are sourced from publications by S&P. To accurately identify upgrades and downgrades, the sovereign ratings are initially converted into numerical scores using a comprehensive credit rating (CCR) scale consisting of 58 points. This CCR scale incorporates information regarding both the actual ratings and the outlook/watch procedures.

On the CCR scale, the conversion of rating symbols follows a specific mapping: AAA is assigned a score of 58, AA+ is assigned 55, AA is assigned 52, and so on, with CCC- assigned a score of 4 and CC-D assigned a score of 1. Adjustments are made for outlook and watch announcements by adding ±1 and ±2, respectively. The presence of a negative or positive watch indicates the possibility of a downgrade or upgrade, respectively, without an actual change in the sovereign rating. A negative outlook signifies a shift from a stable or positive outlook to a negative outlook, while a positive outlook represents a change from a negative outlook to either a stable or positive outlook, without any alteration in the sovereign rating.

It is important to note that the rating scale exhibits non-linearity, resulting in unequal differences between rating levels. This non-linearity has been documented in previous studies such as Tran et al. (2019) and Ratings, S.P.G. (2019). For instance, the implications of a downgrade from AAA to AA+ differ from those of a downgrade from an investment grade to a junk grade or from A to A-. In order to address this non-linearity and effectively incorporate information from ratings, outlooks, and watch notifications while controlling for potential non-linearities, a logit transformation of the comprehensive credit rating (CCR) scale is employed. Detailed information on this transformation can be found in Appendix A4.2 and A4.3.

The logit transformed CCR rating scale aims to illustrate the varying impact of a given rating action across different creditworthiness levels. Specifically, the logarithmic transformation assigns greater weight to rating changes that are closer to default, triple-A, or the speculative-investment threshold. Conversely, it assigns the lowest weight to rating changes near the boundary between investment and speculative grades. This use of the CCR rating scale enhances the understanding of the diverse effects associated with rating actions at various creditworthiness levels, as demonstrated by Tran et al. (2019). Table A5.1 presents a comprehensive overview of the sovereign credit rating events observed in the chapter. Specifically, S&P issued a total of 422 rating events during the sample period. Notably, approximately 30% of the daily observations fall within the triple-A rating category, while approximately 15% and 12% are assigned to the AA+ and AA categories, respectively. Moreover, there were 92 positive outlook signals and 65 negative outlook signals, along with 43 watch actions (positive) and 38 watch actions (negative).

An intriguing finding is that over 62% of S&P downgrades were preceded by negative outlook signals or watch actions, indicating a significant reliance on these indicators as precursors to actual sovereign credit rating changes. Conversely, 19% of S&P upgrades followed positive outlook signals or watch actions. Interestingly, events involving a change of one notch in the ratings constituted the largest proportion among all credit events, accounting for 87% of positive events and 73% of negative events.

During the sample period, qualified sovereigns rated by S&P experienced a total of 88 downgrades and 96 upgrades. Noteworthy among these countries were those that underwent multiple downgrades, such as Greece with 13 downgrades, Italy and Portugal with six downgrades each, Korea with four, and France with two. Moreover, there were 65 downgrades recorded during the post-2007 period, coinciding with the global financial crisis and the eurozone situation.

In terms of magnitude, the median sovereign rating downgrade amounted to one notch, with an average downgrade of one notch as well. Similarly, the median sovereign rating upgrade was one notch, with an average upgrade of one notch.

The integration of rating data and firm-level data in the same regression necessitates careful consideration of data frequency and timing. The rating data are available on a daily basis, whereas the firm-level data are reported annually. Additionally, the fiscal year-end varies among the sampled firms, and some firms may have irregular accounting periods exceeding 12 months when they switch their financial year. Consequently, these firms are excluded from the analysis to ensure consistency within 12-month accounting periods.

To align the sovereign ratings and corporate ratings with the firm-level data, any changes in ratings that pertain to the same firm within a fiscal year are consolidated into a single observation. This consolidation approach is implemented to prevent duplication of data and maintain the integrity of the analysis.

5.3.2. Summary statistics.

Table 5.3 presents the summary statistics for both country-level and firm-level variables in our base-case specification. Panel A provides descriptive statistics for the firm-level variables across all sampled firms, while Panel B presents descriptive statistics for the country-level variables.

At the firm-level, investment is defined as capital expenditures (CAPEX) divided by lagged Total Assets. Other firm-level control variables include Δ Ratingcorporate (corporate rating changes), Firm size (natural logarithm of Total Assets in U.S. dollars), ROA (earnings before interest and tax (EBIT) divided by lagged Total Assets), Leverage (total debt divided by lagged Total Assets), Cash holding (rate of cash holding plus marketable securities divided by lagged Total Assets), Cash flow (EBITDA plus depreciation and amortization scaled by lagged Total Assets), Market-

to-book (market value of equity plus book value of assets minus book value of equity divided by book value of Total Assets), and Lagged investment (two-year lagged investment variable).

At the country-level, the main variable of interest is ΔLCCR, representing changes in the log-transformed credit rating of the sovereign where a firm is domiciled. Country characteristics are controlled for, including GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. Appendix A4 provides further details on the construction of all variables.

In terms of the firm-level variables, the average investment expenditure of sampled firms is 5.9% of total assets, with a standard deviation of 5.78 percentage points. The mean (median) corporate credit rating is 9.63 (10), indicating a credit rating in the BB+ to BBB- range. Approximately 53% of the sampled firms have an investment-grade corporate credit rating. The average leverage is around 26.55%, with a standard deviation of 18.41%, suggesting that the sampled firms are predominantly equity-financed. Most firms in the sample are profitable, as indicated by a median ROA of 8.86%. The average Market-to-book ratio of 164 % reflects market expectations of strong growth opportunities during the sample period.

Regarding country-level variables, the mean (median) sovereign credit rating is 47.962 (51), corresponding to a credit rating in the A+ to AA range. The government debt-to-GDP ratio has a mean of 57.6%. The mean values for GDP growths, changes in S&P Global Equity Index, and inflation are 2.87%, 8.48%, and 3.25%, respectively.

Long-term debt is used in constructing the high leverage measure because long-term debt is less likely to be adjusted in response to short-term performances (Campello, 2006). Firms are defined as ‘high-leverage’ firms if their long-term leverage ratios are greater than the median across all firms. Thus, firms are classified as either high leverage or low leverage for the duration of their presence in the sample.

5.3.3. Methodology

The baseline regression is as follows:

$$\text{Investment}_{i,t+1} = \beta_0+\beta_1 \text{ Leverage x } \Delta\text{LCCR}_{i,t} + \beta 2\Delta\text{LCCR}_{i,t} + \beta 3\text{Leverage } i_{,t} + \sum \gamma \text{control variables}_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$\text{Investment}_{i,t+1} = \beta_0+\beta_1 \text{ High leverage x } \Delta\text{LCCR}_{i,t} + \beta 2\Delta\text{LCCR}_{i,t} + \beta 3 \text{ High Leverage}_{i,t} + \sum \gamma \text{control variables}_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where

Subscripts i for firms, j for industries and t for years.

The dependent variable is the investment ratio at year t+1.

Δ LCCR $_{i,t,}$ denotes changes in the log-transformed credit rating of the sovereign in which firm i domiciles. In the analysis conducted, only rating changes are taken into consideration as the focal point of investigation. To assess these sovereign rating changes, the LCCR table is used, which not only captures explicit adjustments in ratings but also incorporates outlook and watch actions. By considering outlook and watch actions, the analysis acknowledges the potential non-linear nature of the rating scale and aims to provide a more comprehensive understanding of fluctuations in sovereign credit ratings. Including these additional indicators enhances the overall perspective of the analysis and ensures a more nuanced assessment of changes in sovereign ratings.

(High) Leverage x Δ LCCR $_{i,t}$, is the interaction of (High) Leverage with changes in credit rating of sovereign.

Leverage is total long-term debt divided by lagged Total Assets. High leverage is equal to 1 if the firm ‘s total long-term debt to Lagged total assets is greater than the median of the sample.

Similar to chapter 4, the control variables in chapter 5 consist of both country-level and firm-level variables, which have been utilised in previous research (e.g., Almeida et al., 2017; Julio and Yook, 2012; Demirci et al., 2019). To capture expectations about mis-measured investment opportunities and future economic conditions faced by firms, several macroeconomic variables that are specific to each country and vary over time are included as country-level variables.

These country-level variables include GDP growth, changes in government debt, changes in the S&P Global Equity Index, and changes in the inflation rate. Economic conditions play a significant role in influencing firm performance and investment decisions. Indicators of economic conditions provide insights into a firm's sales growth and profitability. Moreover, macroeconomic shocks are considered as primary drivers of a firm's financing decisions (e.g., Dittmar and Dittmar, 2008). Begenau and Salomao (2019) suggest that during periods of economic expansion, large firms are more likely to issue debt and increase their investments due to lower external borrowing costs. Conversely, during economic downturns, firms face limitations in accessing external funds, leading to a preference for equity issuance and reductions in investment. Chen (2010) demonstrates that the arrival of a recession brings negative news, such as low expected GDP growth rates and high economic uncertainty, which negatively affect firm investment and financing decisions. Lower expected GDP growth rates increase default risks and limit a firm's ability to raise additional debt, resulting in reduced investment rates. Therefore, a positive relationship between GDP growth and investment rates is expected.

Changes in government debt and changes in the inflation rate are included to account for the impact of fiscal and monetary policies on corporate investments. Firms often face uncertainty related to changes in government policies. Ottonello and Winberry (2020) investigate the effect of changes in monetary policy on firm investment decisions using a heterogeneous firm New Keynesian model. They find that firms with low default risk are more responsive to monetary policy changes compared to firms with high default risk. Changes in monetary policy can influence the expected return on capital, thereby affecting investment decisions. Demirci et al. (2019) analyze a dataset of 40 countries from 1990 to 2014 and find strong evidence that an increase in government debt can lead to higher required returns on debt securities, crowding out corporate debt. As a result, firms may face difficulties in obtaining additional debt to finance their investment projects, leading to a reduction in investments. Gillman and Kejak (2011) examine the impact of the inflation rate on corporate investment rates and find that moderately high inflation rates are associated with a decrease in investment. This, in turn, affects output growth and real interest rates in the long run. Therefore, a negative relationship between changes in government debt and changes in the inflation rate is expected in corporate investments.

Changes in the S&P Global Equity Index are included to control for movements in the stock market. Prior studies suggest that there is contagion among aggregate stock markets in response to macroeconomic shocks (e.g., Dungey et al., 2010), which can have a negative impact on the corporate sector. Firms may face greater financial constraints and reduce their investment decisions due to higher borrowing costs. Hence, a positive relationship between changes in the S&P Global Equity Index and investment is anticipated.

I expect a positive coefficient for changes in corporate rating since a firm's creditworthiness obviously affects its borrowing costs, hence, abilities to finance investment projects. Khieu and

Pyles (2016) investigate the relationship between credit rating changes and firm financial choices, using the sample of US nonfinancial firms over the period between 1984 and 2012. They find strong evidence of the symmetric effect of credit rating changes on firms' financial capital structure and investing decisions. Specifically, downgraded (upgraded) firms experience reductions (increases) in investments compared to firms whose creditworthiness remain unchanged.

The link between firm size and investment is ambiguous. Rated firms are mostly large and therefore largely unconstrained financially (Faulkender and Petersen, 2006). However, it is more difficult for them to find profitable investment opportunities in proportion to their current total assets. On the other side, smaller and younger firms tend to have more investment opportunities. However, these firms experience a more expensive cost of external borrowing due to problems related to adverse selection. Thus, it is more difficult for them to invest more because of limitations in raising further debt.

Return on assets (ROA) is a crucial financial metric used to evaluate a company's profitability by comparing its revenue with earnings. Extensive research has consistently shown the persistence of profitability and investment (e.g., Fama and French, 1995). It is also reasonable to assume that current profitability is connected to future investment, and vice versa. Thus, a positive correlation is suggested between ROA and the level of investment.

Leverage is expected to have a negative impact on investment, particularly for firms with weak growth prospects (Aivazian et al., 2005). Leverage and market-to-book ratio are used as proxies for investment opportunities. Firms with strong growth prospects are more likely to engage in greater investments (Abel, 2018). High market-to-book value firms, indicating strong growth prospects, anticipate higher cash flows or net worth, which reduces the issues of moral hazard and

adverse selection in obtaining credit from the capital market. For these firms, leverage poses less of a constraint on investment since they can easily access capital markets for refinancing and recapitalization. In contrast, firms with low market-to-book value face tighter constraints on investment due to perceived weak growth prospects and difficulty in raising capital. Therefore, a positive relationship between market-to-book ratio and investment is expected.

Market-to-Book variable is added in order to capture forward-looking stock market valuation (Aivazian at el. 2005). In the absence of financial constraints, high growth firm are likely to make more investment decisions. Firm with strong growth prospect exhibits higher cash flows and firm value, which eliminates problems related to moral hazard and adverse selection. These firms therefore find easier to access to external financial sources. For firms with low growth prospects, they are likely to face financial constraints and thus might have to forgo positive NPV investment opportunities.

Cash holding and cash flow can be considered as liquidity signals. Firm with strong liquidity position are likely to have more investment projects (Lewellen and Lewellen, 2016; Meyer and Kuh, 1957), especially during periods of financial and sovereign debt crises (Mercatanti et al. 2019). Meyer and Kuh (1957) investigate how liquidity effects affect firm investing activities. They find significant evidence that high liquidity signals are associated with better investment opportunities. Therefore, I expect a positive relationship between liquidity ratios and investment rate.

Lagged investment is included as an explanatory variable in order to capture a potential accelerator effect of investment (Eberly et al. 2012). They find strong evidence of a positive relationship between lagged variable and the dependent variable because of the stickiness of investment

behaviour. However, Nini et al., (2009) show a negative link between investment variable and its lagged dependent one when a firm experience a decline in cash flow, a financial covenant violation, or a downgrade in the firm's credit rating.

The error term in Equation (1) and (2) consists of the following components: (i) v_i denotes a firm-specific component; (ii) v_t represents time-fixed effects; (iii) v_j represents industry-year fixed effects; and (v) $e_{i,t}$ which is an idiosyncratic component. Following Bedendo and Colla (2015), time fixed effects are used instead of indicators of macroeconomic fundamentals in order to better control for omitted variables. A time-specific component also accounts for possible business cycle effects. The presence of firm fixed effects are to control for unobserved time-invariant firm characteristics. Industry-year fixed effects are included to control variation within a given industry within a year. The reported standard errors are clustered at the firm level.

5.4. Empirical results

5.4.1 Investment sensitivity to leverage in the event of sovereign downgrade

I first analyse whether the effects of sovereign downgrades on corporate investments can be transmitted through leverage. Results from estimation of equation (1) is presented in Table 5.4. Results in all columns control for both country and firms-level variables. These variables include $\Delta Rating_{corp}$, Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and lagged investment. These macroeconomic variables include change in LCCR, GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. In the second column, year-industry fixed effects are added.

In Table 5.4, I compare the impact of sovereign downgrades on the investment-leverage link for the sub-sample of low leveraged firms in panel A and the sub-sample of high leveraged firms in Panel B. The coefficients on Leverage x Δ LCCR are positive and statistically significant in the

high leverage group. In panel A, the coefficients of Leverage x Δ LCCR are in the range of 0.005-0.008 percent. This suggests that a 1% increase in leverage will reduce the investment to capital ratio by 0.005 to 0.008 percent following sovereign downgrades. Meanwhile, the negative debt-investment link is stronger for high indebted firms, in the range of 0.018-0.022% in Panel B following sovereign downgrades. This suggests a larger reduction in investment for high leverage firms in sovereign downgrade periods. On average, firms with high leverage experience 0.013% higher investments cut than other low leveraged firms following sovereign downgrades. Coefficient estimates on the standard determinants of investment are very much in line with those usually found in the investment literature (i.e., negative coefficient on size, positive coefficient on 2- year lag investment)

I next examine the impact of sovereign downgrades on domestic investments for high levered firms. Results from estimation of equation (2) are presented in Table 5.5. As postulated by the trade-off theory, high leverage is associated with a negative and significant effect on investment in the following year. Therefore, the predicted signs of the interaction between high leverage and sovereign downgrade would be positive. The coefficient for the interaction term is positive as expected and statistically significant at the 1% and 5% confidence level. This suggests that a sovereign downgrade leads to a significant reduction in investments for firms possessing a high leverage ratio. Generally, a notch downgrade, on average may give rise to a 0.605% decrease in investments for highly leveraged firm in the next year. In term of non- linearity in the rating scale, a sovereign downgrade from AA to AA- triggers a 0.338% reduction in investments while a 1-notch downgrade of a A-rated sovereign leads to 0.286% investment cuts in the following year[4].

[4] 0.338% = [0.605%] * [-0.558]; 0.286% = [0.605%] * [-0.472]. -0.558 and -0.472 are ΔLCCR for rated issuers (see Table A3)

These magnitudes are large, but quite reasonable after macroeconomic shocks associated with the sovereign rating downgrade. As indicated above, the debt overhang accumulated depicts an investment-dampening factor after a year of sovereign downgrade. Other control variables have the same expected signs. Results for the additional explanatory variables are in line with expectations and previous empirical findings. An increase in cash flow positively affects investment activities. Firm size is negatively associated with investment rate, potentially due to decreasing returns to scale.

5.4.2. Financial constrained, Investment and High Leverage following a sovereign downgrade.

In an effort to address this ambiguity and shed further light on precisely how sovereign downgrades influence corporate investment behaviours through the leverage channel, I test for heterogeneity in the investment-leverage relations across firms in the event of sovereign downgrades. The argument for lower profitability, lower market-to-book value and higher Kaplan-Zingales (KZ)-Index [5] indexes as good observable measures of financial constrained. As Jensen (1986) and Stulz (1990) suggest that, the negative leverage -investment relationship could be beneficial for firms with low growth and poorly performing since the outstanding debt limits manager powers and lower level of free cash flow. I expect that there is substantial heterogeneity across types of firms and that sovereign downgrades increase the sensitivity of investment to leverage for firms that are more likely financial constrained.

Firms are ranked based on their profitability/ market-to-book/ KZ indexes and assigned to the financial constrained group. By doing this, the sample is spited by median financial constrain indexes. Lower profitable/ Lower Marker-to book value/ Higher KZ indexed firms are expected

[5] [5] The Kaplan-Zingales Index is calculated as ($-1.002 * $ operating cash flow to asset ratio $- 0.283 *$ Market to book value + $3.139 *$ long-term debt to total assets – 39.368 * dividend payment- $1.315*$ actual cash holding)

to be more financially constrained. Those firms typically have substantial unexploited growth opportunities, since they find more difficult to obtain external financial sources and thus forces them to give up profitable investment opportunities (Almeida et al. 2004). This implies a higher investment sensitivity of debt for those firms following sovereign downgrades.

Table 5.6 presents the estimation of the effects of high leverage on corporate investment following a sovereign downgrade across financial constrained firms based on three criteria. These criteria include Low profitability (Panel A), Low Market-to-Book value (Panel B) and High KZ indexes (Panel C). Generally, there are the relations between the investment, leverage and proxies for financial constrained are statistically significant, in the event of sovereign downgrades. In panel A, the empirical results point to a noticeable impact of profitability on the debt-investment nexus following sovereign downgrades. The coefficients on the interaction term between High Leverage and Δ LCCR are positive and statistically significant. The coefficients range in value from 0.751% to 0.821%. On average, high leverage firms with poorer profitability reduce 0.786% investments after a year of sovereign downgrade. These firms, on average, experience 0.181% lower relative-to-investment than other high indebted firms during sovereign downgrade periods. These results suggest that lower profitability in combination with higher long-term debt is most likely to spur investments during the periods of sovereign downgrade. In panel B, the negative effect of high leverage on investment occurs for firms with lower investment opportunities. On average, high leverage firms with lower growths reduce 0.732% investments after a year of sovereign downgrade. These firms, on average, experience 0.127% lower investment rates than other high-leveraged firms during sovereign downgrade periods. In panel C, high leverage firms with higher KZ indexes reduce 0.845% investments after a year of sovereign downgrade. This suggests that there is a further investment cut of 0.240% compared to other high indebted firms during sovereign downgrade periods in term of non- linearity in the rating scale, a sovereign downgrade from AA

to AA- triggers a 0.438% ,0.408% and 0.047 [6]reduction in investments for high leverage firms with low profitability, low Market-to-book value and higher KZ indexes, respectively. While a 1-notch downgrade of a A-rated sovereign leads to 0.371%, 0.345% and 0.040% [7]investment cuts for high indebted firms with poorer performance, lower low investment opportunities and those with low investment opportunities, respectively in the following year.

In sum, the results are consistent with the findings in previous papers (e.g., Lang et al. 1996; Aivazian et al. 2005), which show that the negative relation between leverage and investment is more pronounced and stronger for lower growth, poorly performing and financial constrained firms during periods of sovereign downgrade.

5.4.3. Cash Holding, Investment and High Leverage following a sovereign downgrade.

Greater cash holdings might bring benefits to financial constrained firms because they allow firms to avoid underinvestment and reduced growths when other external sources of funds become more expensive, or unavailable. To explore the second hypothesis, I examine whether the investment-leverage sensitivity is stronger for lower cash holding firms than for higher cash hoarding firms in the event of sovereign downgrades.

Table 5.7 presents the results of the various specification of Equation (2). Panel A shows the results for Higher Cash holding firms and Panel B indicates the results for firms with Lower Cash holding. High-leveraged firms with lower cash holding invest significantly less than their higher cash holding peers, during periods of sovereign downgrade. For lower cash holding firms, there is a significant negative leverage-investment link following sovereign downgrades in panel B. This

[6] 0.438% = [0.786%] * [-0.558]; 0.408% = [0.732%] * [-0.558]; 0.047% = [0.084%] * [-0.558]. -0.558 is ΔLCCR for rated issuers (see Table A3)

[7] 0.371% = [0.786%] * [-0.472]; 0.345% = [0.732%] * [-0.472]; 0.040% = [0.084%] * [-0.472]. -0.472 is ΔLCCR for rated issuers (see Table A3)

suggests that firms with weak balance sheets give up some valuable investment opportunities. By contrast, a higher leverage level does not seem to depress much investment for firms with higher cash holdings. This finding supports the precautionary motives. In term of the non-linearity of rating, a notch downgrade, on average may give rise to a 0.858% decrease in investments for high leveraged firms with lower cash holding, while it may only lead to a 0.316% reduction in investments for higher cash holding peers in the next year. In term of non- linearity in the rating scale, a sovereign downgrade from AA to AA- triggers a 0.479% reduction in investment for high indebted firm with lower cash holding while it only leads to 0.176% investment cuts for those with higher cash holding in the following year[8].

5.5. Conclusion

This chapter aims to provide new evidence on the relationship between corporate debt and investments following sovereign downgrades, based on the sample of 1206 firms in 25 countries during the period from 1994 to 2020. Debt overhang distorts investment due to higher default risks and higher costs of financing. The finding shows that debt holding back investment following sovereign downgrades. A notch downgrade on average may give rise to a 0.605% decrease in investments for high leveraged firms in the next year. There is evidence for heterogeneity across types of firms. Poorer performance, lower investment opportunities, financial constrained and lower cash holding are factors which reduce the capacity to tolerate high levels of debt and lead to a more negative debt-investment relationship in the event of sovereign downgrades. This chapter

[8] 0.479% = [0.858%] * [-0.558]; 0.176% = [0.316%] * [-0.558]. -0.558is ΔLCCR for rated issuers (see Table A3)

highlights the role of cash holding by showing that holding more cash reduces the investment-leverage sensitivity following a sovereign downgrade. The findings are therefore consistent with the interpretation that firms hoard more cash under the precautionary motive.

This chapter makes a unique contribution to the existing literature by shedding light on two important aspects: (1) the non-linear effects of leverage on corporate investment during sovereign downgrade periods, and (2) the crucial role of cash holdings for highly leveraged firms in the event of sovereign downgrades.

Firstly, the chapter examines the non-linear relationship between leverage and corporate investment specifically during periods of sovereign downgrades. It provides compelling evidence supporting the notion that highly indebted firms experience a negative impact on their investment levels following sovereign downgrades. This finding highlights the importance of considering the financial health and leverage position of firms in the context of sovereign downgrade. As firms become more heavily leveraged, the negative impact of sovereign downgrades on their investment becomes more pronounced. This suggests that highly indebted firms face heightened financial constraints and increased risk aversion during periods of economic uncertainty triggered by sovereign downgrades.

Secondly, the chapter emphasises the role of cash holdings in mitigating the adverse effects of leverage on investment decisions following sovereign downgrades for highly leveraged firms, particularly in the face of sovereign downgrades. It is well-established that firms with high leverage ratios are more vulnerable to financial distress and have a higher risk of bankruptcy. By maintaining substantial cash reserves, highly leveraged firms are better equipped to adjust their investment levels, thereby minimizing the risk of financial distress and costly bankruptcy. The

findings highlight the importance of prudent cash management as a risk-mitigation strategy for firms facing the challenges associated with high leverage and sovereign downgrades.

Overall, this chapter advances our understanding of the complex dynamics between leverage, sovereign downgrades, and corporate investment decisions. By uncovering the non-linear effects of leverage and the protective role of cash holdings, it provides valuable insights for policymakers, investors, and corporate managers in navigating the challenges posed by sovereign credit rating changes and managing the financial health of firms operating in uncertain economic environments.

Chapter 6: The real impact of sovereign downgrade on trade credit policies

6.1. Introduction

The term ‘‘trade credit’’ refers to a short-term loan that a supplier provides to its buyers upon a purchase of its product (Huyghebaert, 2006). Trade credit is considered as an important short-term financing instrument for non-financial enterprises (e.g., Abdulla et al. 2017; Chen et al. 2017). An efficient trade credit management can be beneficial for firms, especially financially constrained ones, to maintain their day-to-day operations, yield higher returns on asset (Cowton and San-Jose, 2017), and decrease the firms' costs (Choi and Kim, 2005). A number of papers have investigated that macro factors such as economic policy uncertainty and monetary shocks (e.g., Guariglia and Mateut, 2006; Ferrando and Mulier,2013) influence the firms' trade credit policies. This chapter extends the literature by examining the impact of sovereign downgrades on the use of trade credit. Previous literature document that the negative impact of sovereign downgrades on corporate financing and investments, but surprisingly little is known about its effect on trade credit policies. A sovereign downgrade leads to an increased cost of external financing. Firms' future cash flows become more volatile, which causes firms to hold more cash to buffer against macroeconomic shocks and continue their businesses (e.g., Almeida et al.2017). In turn, firms cut down their investments and delay decisions related to mergers and acquisitions in the aftermath of sovereign downgrades. In sum, a sovereign downgrade increases borrowing costs, shortens debt maturity (Drago and Gallo, 2017), and creates financial shortages for financial institutions (Meriläinen. and Junttila, 2020), I thus believe that firms will increase their trade credit as an alternative source of funding.

The data sample covers 895 non-financial firms with credit rating spanning from 1994 to 2020. The sampled firms domicile in 38 developed and developing countries. In term of methodologies, I estimate regressions of trade payable days one year following sovereign downgrades. Control variables include corporate ratings, firm characteristics and macroeconomic variables. I also control for firm fixed effects, year effects, year-industry effects to further mitigate potential omitted variables.

This chapter provides robust evidence that firms increase their payable days during periods of sovereign downgrade. On average, a 1-notch sovereign downgrade is associated with 2.3 days increase in trade payables. Moreover, the effect of sovereign downgrades on trade credit is consistent and broadly independent of firms' products, degrees of financial constraints and market power. Firstly, a supplier' willingness to extend more trade credit for buyers of differentiated products, compare to those of standardised products, following sovereign downgrades because differentiated products are more difficult to resell and the switching supplier cost is high. Secondly, credit-constrained firms rely relatively more on trade credit, compared to unconstrained ones in the aftermath of sovereign downgrades. This suggests that financially constrained firms use trade credit as a financing motive. Finally, during periods of sovereign downgrade, firms with a stronger marker power position could negotiate better credit terms with their suppliers. Next, debt overhang is an important channel to explain the spill over effect of sovereign downgrades on trade credit. There is a non-linear impact of government debt on corporate trade credit following sovereign downgrades. Firms increase their trade credit related to different public debt-to-GDP levels during sovereign downgrade periods, especially when the public debt level is above 90% of GDP.

This chapter contributes to the literature in two important ways. Firstly, sovereign downgrades influence the suppliers' decision to grant more trade payables to their customers, due to limitations in raising external funds. This chapter has important implications for corporate managers regarding

firm risk and liquidity as well as policymakers on the market-wide consequences of their policy decisions. Given the magnitude of trade credit as a proportion of firm assets, corporate managers should put greater emphasis on maximising its utility at the benefit of their shareholders, during periods of sovereign downgrade when firms find more difficult to obtain external funds via credit institutions. An efficient working capital management is highly valuable to provide an alternative financing source, which could be ultimately employed in profitable investment projects. In turn, it would maximise the value of shareholder. Secondly, public debt crowding out is a significant channel for the spill-over effects of sovereign downgrades to trade credit extensions. These results have important implications for public policies. Governments should factor negative externalities into public debt management decisions. The findings raise caveats against excessive uses of public debts in financing governments' policies, especially during current crises.

The rest of this chapter is structured as follows. Section 2 reviews the relevant literature and develops the hypothesis. Section 3 provides the sample selection procedure and the method of analysis. Section 4 reports the results of the empirical model. Section 5 presents additional analyses and robustness tests. Section 6 provides the summary and conclusions.

6.2. Literature review and hypothesis development

Literature on trade credit provision by suppliers focuses on four motives of non-financial firms. These include information asymmetry reduction, transaction cost reduction, element of competitive strategy, and financing. Specifically, trade creditors might have a comparative informational advantage over other financial intermediaries, especially banks in providing credit to the buyers. Trade suppliers can mitigate informational friction since they can obtain detailed proprietary information regarding product quality between supplier and buyer. They also can use trade credit in order to identify customers with liquidity problems. They can directly observe

payment behaviours. Buyers postponing payment terms will require stricter screening and monitoring than those paying the invoices on time. Therefore, this advantage allows sellers to ease lending standards or offer more attractive credit on terms to larger creditworthy borrowers.

In term of transaction motive, trade credit reduces transaction costs of using cash since trade credit simplifies cash management to better match cash inflows with outflows. In Ferris' (1981) model, a separator between the exchange of goods from the exchange of money allows firms to reduce uncertainty about the level of precautionary cash reserves and instead hold interest-earning assets. Cheng and Pike (2003) show evidence supporting that larger firms could limit their transaction costs by allowing their customers to lump payments for several deliveries into a single bulk transaction. Therefore, there are reductions in monitoring costs related to the whole process from selling to delivery to collection of goods. Additionally, granting a longer trade credit period is beneficial for sellers due to reductions in storage cost of the excessive inventories that accumulate if they kept a constant production level, especially during periods of unexpectedly reduced demand. Thus, firms are able to limit the cost of altering plant capacity.

Referring to trade credit as part of a competitive strategy, boosting the sales' conditions by granting favourable trade credit terms stimulates customer demand, facilitate the establishment of long-term relationships with key customers and, therefore, ensures stable future cash flows (Blazenko and Vandezande, 2003). Trade credit also reinforces seller's competitive position and maintain or expand their customer base in the market (Ng et al.1999). Moreover, the use of trade credit strengthens access to external finance for firms who perceive extension of trade credit from their suppliers because obtaining longer repayment periods is regarded as a signal of good financial status (Biais and Gollier, 1997).

Finally, trade credit can be considered as an important short-term financing instrument. Garcia-Appedini and Montoriol-Garriga (2013) report that during the financial crisis 2008-2009 period,

credit constrained firms prefer using supplier trade credit in response to a shock to the supply of firm external finance. Schwartz (1974) conduct a chain-based analysis of trade credit, and find evidence that in order to maintain long-term commercial relationships, upstream firms with cheap cost of capital even increase their external borrowing to provide more trade credit to downstream firms who have expensive financing costs. Jaffee and Russell (1976) find that financially constrained firms are more likely to use trade credit as alternative sources of funding. In the same vein, Nielsen (2002) examine the trade credit policy at the time of contractionary monetary policy shocks for the sample of US firms and find that both small- and large firms increase reliance on trade credit in order to compensate for unavailable bank credit. Similarly, De Blasio (2003) find firms are turning to use trade credit when they are affected by credit constraints in the use of bank loans at times of tight monetary policy. Guariglia and Mateut (2006) investigate the existence of a trade credit channel in the case of a tightening in monetary policy, based on the sample of 609 UK firms during the period 1980–2000. Using error-correction inventory investment equations, they find evidence that financial constrains are associated with an increase in trade credit. In order words, firms facing tighter financing constraints make a heavy use of trade credit in response to declines in cash flows, in periods of tight monetary policy.

Love et al (2007) show evidence of an immediate increase in trade credit in the aftermath of the financial crisis. Ferrando and Mulier (2013) investigate the role of trade credit for non-financial firms, using the sample of over 2.5 million observations for 600.000 firms in 8 European countries over the period from 1993 to 2009. They also find that trade credit is a vital source of finance, especially for firms that are more likely to be financially constrained. Additionally, trade credit between firms have served as a buffer role during the recent 2007-2009 financial crisis. The heterogeneity of change in trade credit policy varies across countries and firms. At the country level, firms domiciled in countries where the financial system, especially debt security market is

well developed, are less sensitive to the trade credit channel. At the firm level, firm size and age are considered as important factors in explaining the trade credit behaviour. In this chapter, I am interested in examining whether firms change their trade credit policies in the event of sovereign downgrades that potentially erodes their liquidity positions.

Sovereign downgrade is considered as the risk resulting from uncertainties in fiscal, regulatory, and monetary policies at the country level. It is more consequential than a temporary economic shock. Sovereign debt restructuring deteriorates the ability of private sectors to access to capital markets (e.g., Arteta and Hale, 2008) while sovereign credit rating downgrades trigger significant changes in corporate credit risk and borrowing costs (e.g., Borensztein el al. 2013; Bedendo and Colla, 2013).

Chen et al. (2013) investigate the impact of sovereign rating changes on investing activities, based on sample of for 48 countries during the period from 1983 to 2009. Chen et al. (2013) suggest two potential channels to explain the spill over effect of sovereign rating changes to corporate sector. Firstly, a sovereign rating transition might affect domestic investment through its effect of the firm's cost of capital. Sovereign rating changes create uncertainties in international financial markets, such as liquidation shocks. Sovereign downgrades lead to an increase in country risk, thus increase the cost of debt and create unfavourable effects on the NPV of some investment projects. In turn, firms cut off their investments in the event of sovereign downgrades.

Risk premium is the second channel to explain the impact of sovereign downgrades on costs of capital and thus domestic investments. Sovereign downgrade is considered as systematic risk, which is not entirely diversified away. Therefore, it leads to an increase in risk premium and the cost of capital. This in turn decreases domestic investment in the aftermath of sovereign downgrades. Empirically, Chen et al. (2013) find evidence supporting a significant and temporary reduction in investments following a sovereign downgrade. These reductions occur in the year of

a sovereign downgrade and in the second year after the downgrade. After this time period, they do not find any changes in investments in respond to a sovereign downgrade. They also find a temporary increase in investment growths following a sovereign upgrade. They confirm that changes in investment in respond to sovereign downgrades due to changes in firm's cost of capital. These results are robust after taking consideration of macroeconomic variables and potential endogeneity problems. In term of methodology, a system GMM is applied to examine the impact of sovereign rating changes on corporate investments.

Adelino and Ferreira (2016) study the impact of sovereign downgrades on bank lending supply, using the sample of 20,850 observations from 22 countries over the period between January 1, 1989 and December 31, 2012. They find a sovereign ceiling channel to explain the impact of sovereign downgrades on the supply of bank lending. They define banks whose credit ratings equal or above their sovereign as treated banks. And control banks are ones with credit ratings lower than their sovereign. Adelino and Ferreira (2016) find significant evidence of the asymmetric effect of sovereign downgrades on those groups. Treated banks are more likely to be downgraded following a sovereign downgrade, compare to control banks. In turn, this affects negatively the bank lending supply due to the impairment of bank access to financial markets. In respond to a rating downgrade, there are increases in bond coupons and loan interest rates. It also leads to debt covenant violations. Because of rating triggers, treated banks tend to face greater collateral requirements and an increase in cost of funding. They find that long-term borrowing and interbank funding of treated banks reduce by 3% more than those of control banks. CDS is increased 15% more for treated banks than for control banks, in the event of sovereign downgrades. These findings confirm the negative impact of sovereign downgrades on the banks' funding costs.

In term of methodology, a difference-in-differences technique is employed in order to examine the impact of sovereign downgrades on bank lending. Country-level and bank- level variables are also

included in the specification. They find a significant reduction in lending supply of treated banks compared to control banks. More specifically, treated banks reduce their syndicate loans by 25% more than control banks following a sovereign downgrade. While the growth rates of number of loans between both groups are the same before a sovereign downgrade. They also find the negative impact of sovereign downgrades on loan pricing. There is an additional increase in interest rate spreads between 5 and 40 basis points for treated banks, in comparison with control banks, in the event of sovereign downgrades. In sum, Adelino and Ferreira. (2016) suggest that a deterioration in sovereign creditworthiness reduces banking liquidity, hence, make bank-funding more costly.

Almeida et al. (2017) examine the impact of sovereign downgrades on firm performances, based on the sample of 3,991 unique firms from 80 countries during the period from 1990-2013. They confirm that sovereign ceiling channel is an important channel to explain the spill-over effect of sovereign downgrade into corporate sector. They define firms whose credit ratings are equal or above their sovereign as bounded firms, and firms with credit ratings lower than their sovereign as non-bounded firms. They find one matched "non-bounded" observation for each "bounded" observation, based on several categories including firm size, investment rate, Market to book value, cash flow, cash holding, leverage ratio, foreign sales rate, government ownership, as well as exposure to government spending.

They find that treated firms are more likely to be downgraded compared to control firms following a sovereign downgrade. In term of methodology, a difference-in-difference technique is employed. They compare changes in firms' outcomes between bounded and non-bounded firms in the aftermath of sovereign downgrades. Almeida et al. (2017) find a significant reduction in investments for bounded firms, compared to non-bounded firms in the event of sovereign downgrades. Specifically, bounded firms cut their investments by 8.9% in a year of sovereign downgrade, while non-bounded firms only reduce their investments by 2.6%. Treated firms also

cut their net debt issuance by 5.1%. In a meanwhile, there is only a decrease in net debt issuance by 2.3% for non-bounded firms. It suggests that bounded firm face more financial constrained to obtain more debt in the event of sovereign downgrades. Thus, they are likely to issue more equity and cut down investments, compared to non-bounded firms. They also find a negative impact of sovereign downgrades on cost of debt. There is a significant increase in bond yields for treated firms, compared to non-bounded firms following a sovereign downgrade.

As robustness tests, several placebo tests are taken into account in explaining the impact of sovereign downgrades on firm outcomes. Three placebo periods are considered, which includes (1) recession periods; (2) the 2007-2009 financial crisis; and (3) currency crises. Almeida et al. (2017) conclude that sovereign downgrades create a contraction in the supply of debt capital and increase the firm's costs of debt.

Bedendo and Colla (2015) investigate to spill over impact of sovereign credit risk into corporate sector, using the sample of CDS data on 118 companies and 8 sovereigns during the period between January 2008 and December 2011. CDS spreads are used in order to measure credit risks of both sovereign and corporate. They find an increase in corporate credit risk and borrowing cost in response to an increase in sovereign risk, after taking into account macro level and firm level variables that might affect corporate CDSs.

Bedendo and Colla (2015) identify three channels to explain the spill over effect of sovereign risks into corporate sector. The first channel is Government guarantees. A loss in sovereign creditworthiness might lead to reductions in the value of deep credit lines and government guarantees enjoyed by government-controlled firms. Consequently, changes in sovereign risk affects more adversely for those firms. Empirically, an indicator variable Govt is created from the FEEM—KPMG Privatization Barometer database. They find that CDS spreads of government-controlled firms are increased by 40% more than other firms without government guarantees.

The second channel is Domestic demand. Eroding the sovereign creditworthiness also might trigger a significant decrease in aggregate domestic demand since governments have been rolling out stimulus measures in order to restore their creditworthiness. Therefore, the impact of an increased sovereign risk is stronger for non-exporting firms who depend heavily on the domestic market, compared to exporting firms. Empirically, using the Bureau Van Dijk's Orbis database, the ratio of domestic sales is used as a proxy of "Domestic market". They find a greater sensitivity in response to an increased sovereign credit risk for high domestic concentrated firms.

The third channel is Credit squeeze. Concerns about sovereign crises negatively affects the domestic financial system. Since the sovereign creditworthiness deteriorates, banks who hold disproportionately large amounts of government bonds are more likely experience significant reductions in value of their investment portfolios. Thus, bank-funding becomes more costly due to the deleveraging of banks' balance sheets. Hence, firms relying heavily on bank financing should be more sensitive to an increase in sovereign credit risk since they might find more difficult in obtaining new bank debt. Empirically, the ratio of bank loans to total debt is used as a proxy for those firms heavily exposed to bank debt. Results from both pooled OLS and firm-by-firm regressions show evidence supporting that bank-dependent firms are more severely affected by a deterioration in sovereign credit risk.

Bedendo and Colla (2015) suggest that a government in financial distress is more likely to "transfer risk" to corporates by increasing taxation, imposing foreign exchange controls, or expropriating private investments. In sum, sovereign rating downgrades might trigger significant changes in firms' cost of capital, investment, and financing decisions (Almeida et al. 2017). Moreover, banks also face capital shortages following sovereign downgrades (Meriläinen. and Junttila, 2020). This suggests that firm use trade credit as a financing motive amid sovereign downgrades.

In summary, during times of sovereign downgrade, firms are likely to be more risk averse and reduce their investments, financial institutions are more reluctant to lend, costs of debt increase, debt maturity shortens, and firms tend to hold more cash. Against this backdrop, I predict that during the periods of sovereign downgrade, firms make attempts to postpone their trade credit offered to their suppliers. The first hypothesis is as follows:

H_1: Sovereign downgrade is positively related to firms' payables.

This chapter also aims at the role of public debt in explaining sovereign spillovers on firm trade credit policies. An increase of government debts can lead an increased long-term interest rates (e.g., Baum et al. 2013) and of heightened uncertainties over future investment outcome prospects. Krugman (1988) predicts that higher levels of outstanding public debt may contribute to rising the expected return on assets that are close substitutes including corporate debt issuance. In the same vein, Demirci et al. (2019) investigate the impact of government debt on the financing choices of corporations, using a large cross-country sample from 40 countries during the period from 1990 to 2014. They confirm that public debt is negatively associated with corporate debt. The results are robust after taking into account several macro-level, firm-level variables as well as country- and year-fixed effects. They suggest that an increased government debt leads to an increase in return on debt. As a result, the high public debt generates a crowding out effect on corporate debt if investors attempt to maintain a stable proportion of equity and debt securities in their portfolios. Therefore, firms might decrease debt issuance due to a more expensive cost of corporate lending. They also find strong evidence supporting that the crowding effect of public debt on corporate leverage is stronger if the government debt is financed domestically.

On the other hand, they do not find any evidence of the relationship between capital structure and public debt if the government debt is financed internationally due to the fact that domestic investors hold largely corporate leverage. Demirci et al. (2019) study the impact of firm characteristics on

crowding out effects, and find that the crowding out effect is more pronounce for large and profitable firms, mainly because of the following reasons. Firstly, debt securities held by those firms are likely less risky and more liquid. Those debts thus are considered as closer substitutes for public debt. Secondly, larger and more profitable firms are more financial flexibility. They thus tend to adjust their capital structures and reduce their leverages following changes in government debt due to a cheaper switching cost between debt and equity. The impact of government debt on corporate debt also differs across countries. The crowding out effect is stronger for firms domiciled in countries with more developed equity markets and in countries where firms rely less on bank financing. In term of methodology, fixed effects models, instrumental variable approach and a quasi-natural experiment are applied in explaining the impact of government debt on capital structures. Using a two-step GMM-system estimator,

Furceri and Zdzienicka, (2012) study the impact of government debt on economic growth in the short and in the medium term, using the sample of 154 countries during the period from 1970 to 2008. There are three main channels to explain the impact of debt crisis on output growth. Firstly, a country experiencing a sovereign default is excluded from international capital markets. This exclusion might last on average 4 years. Secondly, a sovereign default might trigger an increase in cost of borrowing. Thirdly, there are significant decreases in bilateral trade after a sovereign default. Moreover, there are occurrences of banking and currency crises after a sovereign default episode. In sum, excessive public debt and defaults tend to reduce the country's fiscal sustainability. Reinhart et al. (2012) suggest that governments react to large debt build-ups by raising the primary surplus or reducing deficits. Moreover, high public indebtedness might trigger increased distortionary taxes, elevated inflation rate and higher uncertainties or expectations of future financial repression. In sum, government debt overhang has detrimental effects on firm private sector and long-run growth due to a weakening of incentives to invest, cash flow

tribulations, and moral hazard effects. In response, firms face uncertainties and make attempts to delay their trade credit payments to deal with financial constrained issues. Therefore, I believe that firms operating in countries with high level of government debts negotiate more credit terms with their suppliers during sovereign downgrade periods.

H2: Firms increase more trade credit in the event of sovereign downgrades associated with public debt overhang.

6.3. Data and methodology

6.3.1. Data

The sample consists of firms with credit ratings issued by Standard and Poor's (S&P) from 01/01/1994 to 31/12/2020. Data are retrieved from Capital IQ. Financial, utility and service firms are excluded, as well as observations with negative values for total assets, missing data for the variables of interest, a total debt-to-asset ratio less than 0 or greater than 1. The final sample consists of 12,402 firm-year observations for 895 unique firms from 38 developed and developing countries. The sample distribution of firms across countries is reported in Table 6.1. The dataset includes non-financial firms from various regions across the globe, namely Europe, Asia, North America, and South America. Among the countries represented in the dataset, the United States, Japan, the United Kingdom and France have the highest concentration of firms.

The data on trade credit and other financial variables for the sampled firms are obtained from the WRDS Fundamentals Annual Fiscal (North America and International) database. The first year of the sample is determined by the availability of the firm-level and country-level data which varies across countries. I keep only firms domiciled in countries whose sovereign ratings changed at least once during the sampled period. I remove countries who only experience sovereign upgrade. Table

6.2 reports the list of sample countries. For country-level variables, data from the World Bank and the OECD are used, prioritising the data source with the longest time series.

Accounting variables of the sampled firms are WRDS Fundamentals Annual Fiscal (North America and International) database. For industry classification, the firms are classified by using the Fama-French (1997) 48-industry groups. I exclude firm-years observations with a missing Fama- French (1997) 48-industry classification, and ones from financial institutions, regulated utilities (e.g., Smith, 2016), and industries that are not clearly defined (i.e., industries coded "almost nothing"). Financial and regulated utility firms tend to have significantly different investment and financial policies. Service firms are also removed because of the nature of their businesses. These firms make very few purchases; hence their credit purchases are also small. To avoid the effect of outliers and measurement errors, all continuous variables are winsorised at the top and bottom 1%.

The credit rating dataset consists of daily observations of S&P 's long-term foreign-currency credit ratings, collected from S&P publications. S&P's corporate ratings (foreign currency long-term issuer ratings) are collected from Capital IQ. To identify downgrades and upgrades, both sovereign ratings and corporate rating are first converted to numerical scores within a 20-point credit rating scale. S&P letter ratings are converted as follows: AAA ≡ 20, AA+ ≡ 19, AA ≡ 17 ... CCC- ≡ 2, C-D ≡ 1.

Table A6.1 summarises the sovereign credit rating events. The S&P's released 331 rating events during the sample period. Nearly 17% of the daily observations are in the triple-A rating category, and 8%, roughly 5.5% and around 5.6% are at AA+, AA categories, respectively. Overall, the events by one notch constitute the highest share among all credit events (88% for positive events and 84% for the negative). For this period, qualified sovereigns rated by S&P recorded 165 sovereign downgrades and 166 sovereign upgrades. Some of these countries had multiple

downgrades over the sample period, such as Greece with 13 downgrades, Italy and Portugal with six downgrades, Korea with four, and France with two. There are 108 downgrades during the post-2007 period corresponding to the global financial crisis and eurozone. The median sovereign rating downgrade is one notch and the average is one notches. The median sovereign upgrade is also one notch and the average is one notch.

Since both rating data and firm-level data are used in the same regression, data frequency and timing are important. The rating data are daily, while the firm-level data are annual. Moreover, firms in the sample end their fiscal years in different months and some firms may have more than 12 months between accounts when they change their financial year. I thus excluded firms that changed the date of their accounting year-end, so that the data refer to 12-month accounting periods. To match up the sovereign rating and corporate rating with the firm-level data, I combine all changes in sovereign rating and corporate rating that refer to the same firm within the fiscal year into one observation in order to avoid double counting.

6.3.2. Summary statistics.

Table 6.3 reports the summary statistics for country- and firm-level variables for the base-case specification. Panel A shows the descriptive statistics for firm-level variables for the entire sampled firms. Panel B shows the descriptive statistics for country-level variables.

Regarding firm-level variables, Payables days is measured by 365 days x trade payables to cost of goods sold. Other Firm-level control variables include: Δ Rating $_{corporate}$, Firm size, Cash holding, Market-to-book, Total Long-term Leverage, Operating Cycles, Asset Turnover, Collateral and Current Asset. Δ Rating corporate is a change in corporate rating from year t-1 to year t. Size is the natural logarithm of Total Assets in U.S dollar. Cash flow is defined as EBITDA plus depreciation and amortisation, all divided by Total Assets. Market-to-book is measured as the market value of equity plus the book value of assets minus book value of equity, all divided by

book value of assets. Leverage is Total Long-term Debt divided by Total Assets. Operating Cycles is the natural logarithm of days of accounts receivable plus days of inventories. Asset turnover is the ratio between sale and total asset. Collateral is the ratio of net property, plant, and equipment to assets. Current asset is the ratio of noncash current assets to the book value of total assets.

At the country-level variables, the main variable of interest is $\Delta Rating_{sovereign}$, which is a change in the credit rating of a sovereign in which a firm domicile. Besides the main Δ sovereign rating variable, other country characteristics are obtained. These variables include GDP growths, changes in government debt to GDP, changes in S&P Global Equity Index and changes in inflation rate. Table A6.2 in the Appendix details the construction of these variables.

The average payable days of firms in the sample are 66.7 days. The mean (median) corporate credit rating is 9.6 (10) implying a credit rating in the BB to BB+ range. About 54.5 per cent of the samples have an investment grade corporate credit rating. The average value of leverage is nearly 29.6% with a standard deviation of 17 % percentage points. This figure may reflect the fact that the sampled firms are mainly equity financed. The sample average Market-to-book of 165.7% represents market expectations of strong growth opportunities over this sample period.

Regarding country level variables, the mean (median) sovereign credit rating is 18 (19) implying a credit rating in the AA to AA+ range. The government debt-to-GDP ratio has a mean of 77% and an interquartile range of 46% and 96%. The median GDP growths is 2.2%. The median of changes in S&P Global Equity index is 9.6%. The average inflation is 2.3%.

6.4. Methodology

The baseline regression is as follows:

$$\text{Payable day}_{i,\,t+1} = \beta_0 + \beta_1 \Delta\,\text{Rating}_{\text{sovereign i,t}} + \sum \gamma \text{control variables}_{i,t} + \varepsilon_{i,t} \quad (1)$$

Subscripts i for firms, j for industries and t for years.

The dependent variable is the payable day ratio at year t+1. Payable day ratio is the number of days a firm take to repay the trade credit.

$\Delta\,\text{Rating}_{\text{sovereign i,t,}}$ show changes in the credit rating of the sovereign in which a firm domicile.

Control variables include country-level and firm-level variables that could influence a trade credit policy. For country characteristics, these variables include GDP growths, changes in government debt, changes in S&P Global Equity Index and changes in inflation rate. Deteriorating macroeconomic conditions might trigger significant changes in firm's capital structure (e.g., Dittmar and Dittmar, 2008). Large firms tend to issue more debt in periods of economic expansion due to a cheaper cost of external borrowing. In a meanwhile, they prefer to issue equity during a deterioration in economic conditions because of difficulties in accessing external funds. Additionally, Chen (2010) show that the arrival of a recession brings bad news of low expected GDP growth rates and high economic uncertainties, which affects negatively financing decisions. Lower expected GDP growth rates leads to an increase in firm's default risk and limitations in raising further debt. There would be an increase in levels of accounts payable level as firms postpone paying their trade credit offered during economic downturns (e.g., Jacobson and Von Schedvin, 2015). I control for the evolution of the economic cycle by using GDP growth and expect a negative link GDP growth and trade credit.

Changes in government debt and changes in inflation rate are to account for the possibility of fiscal policy affecting corporate performances. Government policy changes might create a significant

amount of uncertainty on firm performance. Ottonello and Winberry (2020) examine how changes in monetary policy affect firm's financing decisions. Using a heterogeneous firm New Keynesian model, they find strong evidence that changes in monetary policy lead to changes in expected return on capital, which in turn changes in cost of external borrowing. Demirci et al. (2019) examine the relationship between changes in government debt and corporate capital structures, using the sample of 40 countries during the period from 1990 to 2014. They find that an increase in government debt is associated with an increase in the required returns on debt securities, and thereby can crowd out corporate debt. It suggests the negative impact of government debt on corporate debt financing. Kang and Pflueger (2015) investigate the impact of inflation risk on corporate debt. They find that unexpectedly low inflation rate increases the likelihood of default risk because of high real liabilities. Inflation uncertainties might trigger an increase in corporate bond yields. Additionally, either inflation volatility or the inflation-stock correlation lead to an increase in credit spreads. Firms find more difficult to obtain external funds and make attempts to increase their trade credit as an alternative financing tool. Therefore, I expect that a positive link between change in government debt, changes in inflation rate and trade credit policies.

Changes in S&P Global Equity Index are to control for the movements in the stock market. Previous papers suggest a contagion of aggregate stock markets as a response of macroeconomic shocks (e.g., Dungey et al. 2010), which in turn affects negatively on corporate sector. Firms are more likely to be financially constrained due to a more expensive cost of borrowing. Thus, I expect a negative link between Changes in S&P Global Equity Index and trade credit since firms could use trade credit as an alternative source of funding.

Firm level variables include changes in corporate rating, Firm size, Cash holding, Cash flow, Market-to-book, Total Long-term Leverage, Operating Cycles, Asset Turnover, Collateral and

Current Asset. These variables are considered as the relevant variables which could influence the association between changes in sovereign ratings and the trade credit policies. The natural logarithm of total assets as a proxy for firm size is included since firm size is an important determination of the firms' access to finance. Smaller firms tend to have a lower level of creditworthiness due to having a greater level of information asymmetry between a firms and lenders. Therefore, it is more difficult for smaller for to obtain external funds than larger firms (Petersen and Rajan 1997). Rated firms are mostly large and therefore largely unconstrained financially (Ng et al. 1999). They are thus less likely rely on trade credit.

Market-to-book is considered as a function of growth opportunities. Firms with strong growth prospects will be able to make more investments and more demand for credit in order to finance their new investments in working capital (e.g., Petersen and Rajan, 1997). Cunat (2007) also provide strong evidence of a positive relationship between trade credit and growth opportunities. A firm with a higher level of growth seem to have relatively higher levels of trade credit, compared with a firm with a lower growth prospect.

Changes in corporate credit rating is included since a firm's creditworthiness obviously affects its capital structure decision making (e.g., Kisgen. 2006; Khieu and Pyles, 2012). Corporate credit rating is considered as a signal of firm quality. Changes in rating might trigger costs (benefits) for the firm and thus changes in a firm's cost of capital. When a credit downgrade occurs, there is an increase in direct and indirect costs to external financing. Therefore, firms with downgraded credit ratings are more likely to be credit-rationed and prefer using more trade credit in order to relax borrowing constraints. In a meanwhile, firms with better creditworthiness could receive more finance from their suppliers due to decreases in default and bankruptcy risks. However, these firms are easier access to the capital markets and less likely depend on trade credit.

Since firms increase reliance on trade credit in order to compensate for unavailable debt from banks or other financial institutions (Cull et al. 2009). More specifically, suppliers seem to lend to their customers who face temporary liquidity shocks, even when banks hesitate to lend. This is because trade creditors might have a comparative informational advantage over other financial intermediaries, especially banks in providing credit to the buyers. I add the ratio of long-term debt to the book value of assets in the regression model and expect the negative coefficient of Leverage on trade credit.

Cash holding, current asset holdings and cash flow are considered as liquidity signals, which provide sellers with information about their buyers' current financial statuses. Kling et al. (2014) investigate the relationship between trade credit, cash holding and short-term bank finance, for the sample of UK firms from 1988 to 2008. They find that firms face liquidity shocks try to hoard more cash or increase their trade credit due to restricted access to alternative sources of financing. In order words, firms with high liquidity needs and financial distress are likely to depend more on the use of trade credit. On the other side, there can be a positive relationship between liquidity position and trade credit. Sellers could consider cash holding, current assets and cash flow as positive liquidity signals whether a buyer is able to pay back the trade credit offered.

I include the ratio of net property, plant, and equipment to total assets which is pledged as a collateral to financiers. Fabbri and Menichini (2010) examine determinants of trade credit, and suggest a positive link between collateral and the use of trade credit. If firms have a large value of intangible asset, providers are not willing to grant more trade credit due to an increased liquidation risk. Especially in the event of firm's default, intangibles asset has zero collateral value. I also expect that firms with high collateral value are likely to receive more trade credit.

Asset turnover is added in measuring the length of the production cycle. Hill et al. (2012) suggest a negative relationship between asset turnover and trade credit. Trade suppliers can mitigate informational friction since they can obtain detailed proprietary information regarding product quality between supplier and buyer. Due to reductions in information asymmetries, sale should be improved by trade credit for those firms producing goods which is more difficult to assess. Asset turnover is one of proxies of product quality assessment. They find that the lower the ratio, the more trade credit should be extended since longer production time should be positively associated with trade credit.

Finally, I add the natural logarithm of number of days of accounts receivables plus days of inventories in order to control for the operating cycle. This ratio also reflects the level of operation activity of the firm (e.g., Cunat. 2007). Kling et al. (2014) suggest a positive link between a proxy of the operating cycle and trade credit. Firms would face a higher liquidity need since a longer number of days of accounts receivables plus days of inventories leads to an increase in cash holding. As a demand-side effect, firms with a bad liquidity position therefore try to increase their trade credit. Additionally, an increase in trade payable can be invested in accounts receivable or other current assets. Thus, I also expect a positive relationship between this variable and trade credit. All variable definitions are detailed in Appendix A6.2.

The error term in Equation (1) consists of the following components: (i) v_i denotes a firm-specific component; (ii) v_t represents time-fixed effects; (iii) v_j represents industry fixed effects; (iv) v_c represents country-fixed effects; (v) $v_{j,t}$ represents industry-time fixed effects; and (v) $e_{i,t}$ which is an idiosyncratic component. Following Bedendo and Colla (2015), time fixed effects instead of indicators of macroeconomic fundamentals are included in order to better control for omitted variables. A time-specific component also accounts for possible business cycle effects. The

presence of firm fixed effects are to control for unobserved time-invariant firm characteristics. Industry x year fixed effects are included to control variation within a given industry-year.

The correlation matrix presented in Table A6.3 illustrates the correlation coefficients among the variables employed in the model. Pearson correlation matrix clearly demonstrates that the correlation between any given pair of independent variables does not exceed 0.8. It means that the explanatory variables, are not highly correlated. Hence, multicollinearity issues do not seem to be a concern. The maximum correlation is found in cash flow and investment or Current assets and Operating cycle. The results of the correlation are significantly different from zero at 1% level. Moreover, the signs observed in the correlation matrix coefficients further reinforce our initial expectations regarding the relationship between firms' investment and the explanatory variables. More specifically, there is a significant negative correlation between trade credit and change in sovereign rating, change in corporate rating, Asset turnover and Current assets. On the other hand, there is a significant positive correlation between Payable days and Firm size, Market-to-book value and Collateral.

6.5. Empirical results

6.5.1. The effect of sovereign downgrade on trade credit policy

Fixed effect models are used in order to mitigate potential omitted factors. Table 6.4 presents the regression results. Results in columns 1 and 2 control for both country and firms-level variables. These firm-level variables include $\Delta Rating_{corporate}$, Firm size, Cash holding, Market-to-book, Total long-term Leverage, Total Operating Cycles, Asset Turnover, and Collateral. These macroeconomic variables include GDP growths, changes in government debt, changes in S&P

Global Equity Index and changes in inflation rate. In the second column, Year- industry fixed effects are included, which allows to control the industry effects in the baseline specification.

The coefficient on the variable sovereign downgrade is positive and significant at the 1% level across model specifications, suggesting that firms increase their trade credit in the event of sovereign downgrades. On average, a 1-notch sovereign downgrade is associated with 2.3 days increase in payables. Turning to the control variables, suppliers tend to provide more trade credit to growth firms and smaller firms. Moreover, trade credit extension is associated with firms with a higher days of accounts receivable plus days of inventories, and lower values of current asset and asset turnovers. Regarding macro variables, there is no significant impact of firms' trade credit policy. Overall, the empirical analysis presented in Table 6.3 supports the first hypothesis of the association between sovereign downgrades and trade credit. The results show that firms tend to increase their trade credit during sovereign downgrade periods since these firms find more difficult to obtain to traditional forms of financing, which leads them to use trade credit to maintain their day-by-day operations.

6.5.2. Further analysis

6.5.2.1. The impact of sovereign downgrades on trade credit policies: Do types of products traded by the firm matter?

Giannetti et al. (2011) show that trade credit varies with different product characteristics. More specifically, buyers of differentiated products may find difficult to replace suppliers or resell input products because these sellers provide unique or highly customised inputs. Due to a higher switching costs, a lower risk of default on supplier and a stronger trading relationship between supplier and customer, suppliers of differentiated products should be more willing to grant more

trade credit when their buyers have financial problems, compared to suppliers of standardised products. In this section, I examine whether sovereign downgrades affect trade credit differently for differentiated versus standardized goods.

Table 6.5 reports the results of the regressions of payable days on sovereign downgrades for subgroups of firms producing differentiated goods (Panel A) and producing standardized goods [9](Panel B). Results in all columns control for both country and firms-level variables. In column 2 and 4, year- industry fixed effects are included. The effect of sovereign downgrades on payable days is negative and significant among all two subgroups of firms. On average, a 1-notch sovereign downgrade is associated with 2.31 days increase in payables for differentiated goods' firms while standardized goods' firms could extend their trade credit to 2.05 days. These results indicate that supplier provide slightly more trade credit to differentiated goods' firms than those of the standardised goods' firms. This evidence is consistent with Giannetti et al. (2011)'s findings that trade credit policy varies with product characteristics.

6.5.2.2. The impact of sovereign downgrade on trade credit policy: Does financial constraint matter?

Financial health affects the volume of trade credit. For credit constraints firms, trade credit can act as an alternative short-term source of financing that could eases their financial burden (e.g., Cowton and San-Jose, 2017). To test the effect of financial constraints on the relation between sovereign downgrades and trade credit, I run separate fixed effects regressions for the subgroups

[9] I follow the product classification of Rauch (1999), who distinguishes between standardized goods and differentiated goods. In the appendix A6.3, I include a comprehensive list where each two-digit industry is assigned to one of three product classes.

of financially constrained and unconstrained firms. Specifically, financial constraints are measured by using the Kaplan-Zingales (KZ)-Index [10](Kaplan and Zingales, 1995) and the Whited-Wu (WW) index [11](Whited and Wu, 2006). A firm is considered financially unconstrained (constrained) if its KZ-Index and/or WW-Index value below (above) the sample median.

Panel A and panel B of Table 6.6 report the results from the regressions for firms sorted on financial constraints (columns 1 and 2) and non-financial constraints (columns 3 and 4), respectively. Results related to WW (KZ) index present in columns 1 and 3 (2 and 4). Results in all columns are controlled for country and firms-level variables, and year- industry fixed effects. The effect of sovereign downgrades on payable days is negative and significant among both groups. On average, a 1-notch sovereign downgrade is associated with 1.5 day-increases in payables for non-financial constrained firms, while financial constrained firms might have to extend their trade credit to 2.8 days. It means that financial constrained group increase 1.3 more payable days compared to non-constrained one during the period of sovereign downgrade. In sum, financially constrained firms tend to increase their trade credit during the sovereign downgrade periods due to their weak liquidity positions.

[10] The Kaplan-Zingales Index is calculated as (−1.002 ∗ operating cash flow to asset ratio − 0.283 ∗ Market to book value + 3.139 ∗ long-term debt to total assets – 39.368 * dividend payment- 1.315∗ actual cash holding)

[11] The Whited-Wu index is calculated as (−0.091 ∗ operating cash flow to asset ratio − 0.062 ∗ dummy for firms paying dividend in the year + 0.021 ∗ long-term debt to total assets − 0.044 ∗ ln (firm assets) + 0.1021 ∗ annual SIC 3-digit industry growth − 0.035 ∗ firm annual growth)

6.5.2.3. The impact of sovereign downgrade on trade credit policy: Does market power matter?

Love and Zaidi (2010) and Dass et al. (2015) show that firms with stronger market power can negotiate with their suppliers to provide them favourable credit terms, especially when they have financial difficulties. In order to gauge the effect of market power on the impact of sovereign downgrades on corporate trade credit, I run separate fixed effects regressions for the subgroups of higher and lower market power firms. Panel C, Table 6.6 reports the results from the regressions for firms sorted on lower market power firms in column 5 and higher market power firms in column 6. Results in all columns are controlled for country and firms-level variables, and year-industry fixed effects. Followed Xu et al (2020), I use market share, which is the percentage of a firm's annual sales to total annual sales of all firms in the same industry based 2-digit SIC codes, to divide the sample into two groups, including Group 1 (with the market share greater than the industry median market share in a given country and year) and Group 2 (with the market share less than or equal to the industry median market share in a given country and year). The coefficient on sovereign downgrades is negative and statistically significant in the payable-days regressions for both subgroups of firms. The coefficients on the sovereign downgrade variable are different in magnitude between the two subgroups, 2.1 and 2.5 days for lower and higher market firms, respectively. This suggest that firms with more market power are able to obtain extended credit periods from their suppliers following sovereign downgrades. This is consistent with previous literature (e.g., Dass et al.2015)

6.5.3. High government debts, sovereign downgrade and Trade Credit Days

In order to remove the direct effect of sovereign downgrade on trade credit via a credit rating channel, I first investigate the relation between sovereign downgrades and trade credit policy, based on a sub sample of firms without corporate rating change in year t where t is the period of sovereign downgrade. Table 6.7 shows regression results. The coefficient on the variable sovereign downgrade is positive and significant at the 1% and 5% level across model specifications, suggesting that firms extend their trade credit to their suppliers amid sovereign downgrade. A 1-notch sovereign downgrade is associated with 2.35 days increase in payables.

I then investigate the impact of sovereign downgrades on trade credit at different public debt-to-GDP levels. Interaction terms between sovereign downgrade (Δ $Rating_{sovereign}$) and government debt dummy variables are constructed. The dummy variables take the value of 1 if the debt-to-GDP ratio of a particular country in a given year is below 60%, above 60%, above 90%, and 0 otherwise. The interaction terms are designed to capture any incremental impact from simultaneous changes in sovereign rating and public debt overhang. Therefore, the predicted signs of this interaction term would be positive. The regression equation is as follows:

$$\text{Payable day}_{i,\,t+1} = \beta_0+\beta_1\Delta\ \text{Rating}_{\text{sovereign x}}\ \text{Government debt}_{i,t} + \beta 2\Delta\ \text{Rating}_{\text{sovereign i,t}} + \sum \gamma \text{control variables}_{i,t} + \varepsilon_{i,t} \quad (2)$$

Subscripts i for firms, j for industries and t for years.

The dependent variable is the payable day ratio at year t+1. Payable day ratio is the number of days a firm take to repay the trade credit.

Δ $Rating_{sovereign\ i,t,}$ show changes in the credit rating of the sovereign in which a firm domicile.

Δ $Rating_{sovereign}$ x Government $debt_{i,t}$ are Interaction terms between sovereign downgrade (Δ $Rating_{sovereign}$) and government debt dummy variables.

Government debt (GD) are the dummy variables which take the value of 1 if the debt-to-GDP ratio of a particular country in a given year is below 60%, above 60%, above 90%, and 0 otherwise

The error term in Equation (2) consists of the following components: (i) v_i denotes a firm-specific component; (ii) v_t represents time-fixed effects; (iii) $v_{j,t}$ represents industry-time fixed effects; and (v) $e_{i,t}$ which is an idiosyncratic component. I use a sub-sample of firms without corporate rating change in year t where t is the period of sovereign downgrades. The baseline model for this analysis is the same as that presented in Equation (1).

Table 6.8 shows the regression results. Panel A indicates results when government debt to GDP is less than 60%. Panel B and panel C show results in case of the public debt to GDP ratio which are more than 60% and 90%, respectively. When public debt to GDP is below 60%, there is no evidence supporting the joint effect between sovereign downgrades and crowding out effect of government debt. When the public debt level is above 60% of GDP, government debt starts to be harmful to firm performances after periods of sovereign downgrades. Firms, on average, extend their trade credit by 2.43 days, which indicates a slight increase in trade credit by around 0.1 days, in response to sovereign downgrades. Furthermore, there is interesting evidence that the negative impact of sovereign downgrades on trade credit is stronger in case of public debt ratios above a threshold of 90% of GDP. Specifically, a notch of sovereign downgrade is associated with 3.5 days increase in trade payables. The crowding out effect thus leads to firms increase their trade credit by nearly 1.2 more day after a year of sovereign downgrade. Coefficient estimates on the standard

determinants of investment are very much in line with those usually found in the previous literature (i.e., positive coefficients on Market-to-book and Operating Cycles

6.6. Conclusions

This chapter investigates the relationship between sovereign downgrades and trade credit, for the sample of 895 non-financial firms from 38 countries during the period from 1994 to 2020. Firms increase reliance on trade credit during periods of sovereign downgrades. There is strong evidence for heterogeneity across types of firms. The effect of sovereign downgrades on trade credit is consistent and broadly independent of firms' products, degrees of financial constraints and market power. Moreover, credit extensions are related to different public debt-to-GDP levels during sovereign downgrade periods, especially when the public debt level is above 90% of GDP. This chapter has important implications for corporate managers regarding firm risk and liquidity as well as policymakers on the market-wide consequences of their policy decisions.

This chapter contributes to the existing literature in two significant ways. Firstly, it expands the understanding of the effects of sovereign downgrades by examining their impact on firm trade credit, an area that has not been extensively explored in previous research. This chapter sheds light on an important aspect of corporate financial management that can be influenced by changes in sovereign credit ratings.

Secondly, this chapter introduces a new channel through which the spill-over effects of sovereign downgrades on the corporate sector can be explained, namely the government debt channel. This chapter provides additional insights into the mechanisms through which sovereign downgrades can affect corporate behaviour and performance. The findings of this chapter are consistent with the results obtained in Chapter 4, which further strengthens the empirical evidence supporting the

existence and relevance of the government debt channel. By establishing a link between sovereign downgrades, firm trade credit, and the government debt channel, this chapter contributes to a more comprehensive understanding of the spill-over effects of sovereign risk on the corporate sector.

Overall, this chapter adds to the existing literature by uncovering the impact of sovereign downgrades on firm trade credit and highlighting the importance of the government debt channel in explaining the transmission of sovereign risk to the corporate sector. These findings have implications for policymakers, practitioners, and researchers interested in understanding the interconnectedness between sovereign and corporate credit dynamics.

Chapter 7: Thesis summary and conclusions

Sovereign creditworthiness plays an important role in business activities. Most previous studies mainly focus on the credit rating channel to explain the spill over effect of sovereign rating changes on corporate sector. Significant changes of corporate rating actions follow sovereign-rating changes, which leads to changes in firm investing and financing activities (e.g., Almeida et al. 2017; Hill et al. 2018). This thesis has aimed to provide new evidence for the relationship between sovereign rating transition and corporate activities and find a new channel in explaining sovereign-corporate spill-overs.

Chapter 2 discussed the main concepts and recent developments related to the credit rating business and CRA regulation. Key concepts related to the core of this thesis are discussed in this chapter. Chapter 3 reviews the prior literature on credit rating (both sovereign and corporate ratings) and its impact on corporate sector. The main aim is to identify the gaps in previous literature which motivate empirical investigations in the subsequent chapters.

Chapter 4 investigates the impact of sovereign rating changes on domestic investments. By employing fixed effect models and controlling for several country level and firm level variables to mitigate potential omitted factors, there is strong evidence of the positive relationship between sovereign rating changes and corporate investments. On average, one notch change on sovereign rating might trigger an around 0.272% changes in investments in the following year. Without the impact of the credit rating channel, coefficient on sovereign rating changes is still positive and significant at 5% level. Firms tend to alter their investments around 0.195% in the next year following a sovereign rating change, even their corporate ratings were not impacted.

Next, I examine whether sovereign downgrades and upgrades have a differential effect on firm's investment policies and find the asymmetric effect of sovereign rating changes on domestic

investing activities. Specifically, a notch downgrade of sovereign rating will lead to a reduction in investments by 0.21% in the following year. While the impact of sovereign upgrades on investments is not recorded. This finding is consistent with previous literature (e.g., Hill et al. 2018).

Finally, I analyse the role of public debt overhang in reductions in corporate investment during sovereign downgrade periods. There is a non-linear negative impact of government debt on corporate investments following sovereign downgrades. The joint effect between sovereign downgrades and government debt overhangs is not recorded, when public debt to GDP is below 60%. When public debt ratio exceeds the 80% threshold, firms on average, reduce their investments by 0.31%, which indicates an additional investment cuts by around 0.1%, in response to sovereign downgrades. In case of public debt ratios above a threshold of 100% of GDP, firm experience a further 0.19% reduction of corporate investments after a year of sovereign downgrade. These results suggest that public debt overhang is a significant channel in explaining the spill-over effects of sovereign downgrades to domestic corporate activities.

Chapter 5 investigates heterogeneous effects of sovereign rating actions on the relationship between investments and leverages. A firm uses debt as a tax shield in manipulating profitability because debt's interest is deductible before tax payments. It however leads to an increased bankruptcy and business risks since the debt holders require a greater interest rate. Therefore, profitable investment opportunities could go unfunded as a result of debt overhang accumulated by previous debt financing. This chapter provides evidence supporting that debt holding back investment following sovereign downgrades. Highly leveraged firms reduce their investments by 0.605% following a sovereign downgrade.

There is strong evidence for heterogeneity across firm characteristics. Lower profitability, lower market-to-book value and higher Kaplan-Zingales -Index are used as proxies of firm financial

difficulties. Those firms typically have substantial unexploited growth opportunities because it is more difficult for them to obtain external financial sources and thus forces them to give up valuable investment opportunities. A sovereign downgrade increases the sensitivity of investment to leverage for firms that are more likely financial constrained. More specifically, highly leveraged firms with poorer profitability, lower growth and higher KZ indexes experience 0.181%, 0.127% and 0.24% respectively lower relative-to-investment than other firms during sovereign downgrade periods.

Finally, I examine the role of cash holding on the relationship between investment and leverage following a sovereign downgrade. I expect that firms tend to keep more cash in order to smooth out volatilities in investment expenditures, as a precautionary motive in the aftermath of sovereign downgrades. As expected, the finding shows that high leverage does not seem to depress much investment for firms with higher cash holdings. In term of methodology, two-step system GMM models are used to control for biases due to unobserved firm-specific effects and endogenous issues.

Chapter 6 examines the impact of sovereign downgrades on trade credit policies. Prior papers have mainly focused on significant changes on firm financing and investing activities in response to a sovereign downgrade, but surprisingly little is known about how a deterioration in sovereign creditworthiness affects trade credit policies. Trade credit is an important short-term financing tool for non-financial firms (e.g., Abdulla et al. 2017; Chen et al. 2017). During periods of sovereign downgrade, firms tend to be more risk averse, more financial constrained, reduce their investments and alter their financing decisions. Therefore, I expect that firms postpone their trade credit offered to their suppliers following a sovereign downgrade. As expected, there is strong evidence of an increase in trade credit in the aftermath of sovereign downgrades. On average, a 1-notch sovereign downgrade is associated with 2.3 days increase in trade payables.

There is evidence of heterogeneity in terms of trade credit policy across firm characteristics. Specifically, because of a more expensive switching costs, a lower risk of default on supplier and a stronger trading relationship between supplier and client, firms producing differentiated goods can increase more trade credit than ones producing standardized goods following a sovereign downgrade, which is consistent with previous literature (e.g., Giannetti et al. 2011). As financial health affects the volume of trade credit, financially constrained firms tend to increase their trade credit as a short-term financing instrument during the sovereign downgrade periods. Two indexed (KZ and WW) are used in order to measure firm's financial constraint. Moreover, I investigate the effect of market power on the impact of sovereign downgrades on corporate trade credit and find that firms with stronger market power can negotiate with their suppliers to grant them better credit terms in the time of sovereign downgrades.

Interestingly, government debt overhang is an important channel to explain the spill over effect of sovereign downgrade on trade credit policy. Systematic risk exposures of public debt overhang have important implications for corporate policies. More specifically, this chapter provides evidence of a non-linear negative impact of government debt on corporate trade credit following sovereign downgrades. When the public debt level is above 60% of GDP, government debt starts to be harmful to firm performance after periods of sovereign downgrades. Firms thus increase their trade credit by 2.43 days following a sovereign downgrade. The impact of sovereign downgrades on trade credit is more pronounced in case of public debt ratios above a threshold of 90% of GDP. There is an increase in trade payable by 3.5 days. Therefore, an efficient trade credit management is highly valuable to provide an alternative financing source, during periods of sovereign downgrades.

This thesis contributes to literature in a number of respects. Firstly, the thesis provides strong evidence of the impact of sovereign rating changes on firm activities, even their corporate ratings

were not impacted by the sovereign event. Firms experience reductions in their investments, especially for highly levered ones and increase their trade credit as an alternative financial source, following a sovereign downgrade. Secondly, the thesis highlights the important role of government debt in explaining the spill-over effect of sovereign rating changes on firm activities. Issuing more government debt might lead to increased distortionary taxes, elevated inflation rate and higher uncertainty or expectations of future financial repression, which therefore have a significant negative impact on corporate sector, especially during period of sovereign downgrades. The findings raise caveats against excessive uses of public debts in financing economic stimulus policies during current crises, especially during the Covid-19 pandemic when a significant level of government debt is raised for funding extraordinary stimulus measures. This thesis also has important implications for corporate managers regarding firm risk and liquidity. Improving working capital management plays an important role to reduce less investment and lower the risk of financial distress and bankruptcy during periods of sovereign downgrades, which in turn enhances shareholder value.

Finally, a limitation of this thesis is the limited number of sampled countries, particularly in the context of developing countries. Hill et al. (2018) suggest that the spill-over effects of sovereign downgrades to firms domiciled in developing countries tend to be more pronounced compared to firms in developed countries. Therefore, expanding the scope of research to include a broader sample of developing countries would be promising, as it would provide a more comprehensive understanding of the dynamics between sovereign ratings and corporate activities in different economic contexts. Furthermore, there are still important corporate aspects that have not been extensively investigated in the context of sovereign downgrades. For instance, exploring how a deterioration in sovereign creditworthiness affects corporate governance practices and whether an improvement in reporting quality could mitigate the negative effects on firm financial positions

during periods of sovereign downgrade are potential avenues for future research. Understanding the interplay between sovereign risk and corporate governance mechanisms, as well as the role of transparency and disclosure in mitigating the impact of sovereign downgrades, could provide valuable insights for policymakers and practitioners.

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Results for chapter 4

Table 4.1: Sample distribution

This table reports the sample distribution of firms across countries during the sampled period.

Country	Number of firms
Australia	33
Austria	4
Bahrain	1
Belgium	5
Canada	70
Chile	17
Cyprus	3
Czech Republic	1
Denmark	1
Finland	9
France	46
Greece	4
Hongkong	11
Hungary	3
Ireland	23
Israel	1
Italy	19
Japan	179
Korea	23
Netherlands	26
New Zealand	7
Panama	2
Poland	5
Portugal	4
Qatar	2
Spain	15
Sweden	17
Trinidad	1
UK	63
USA	733
	1328

Table 4.2: List of sample countries

This table reports the numbers of sovereign rating events during the period from 01/01/1994 – 31/12/2020. The sample covers 30 high income countries that their ratings changed at least once during the sampled period. Sovereign credit ratings are from S&P's.

Country	Sovereign upgrades	Sovereign downgrades	Country	Sovereign upgrades	Sovereign downgrades
Australia	2	0	Israel	3	0
Austria	0	1	Italy	1	6
Bahrain	1	5	Japan	1	5
Belgium	0	1	Korea	10	4
Canada	1	0	Netherlands	1	1
Chile	4	1	New Zealand	2	1
Cyprus	9	12	Panama	4	1
Czech Republic	3	1	Poland	5	1
Denmark	1	0	Portugal	4	6
Finland	3	1	Qatar	5	1
France	0	2	Spain	6	6
Greece	12	13	Sweden	1	0
Hongkong	6	2	Trinidad	5	4
Hungary	7	5	UK	0	1
Ireland	7	6	USA	0	1

Table 4.3: Descriptive Statistics

This table presents the descriptive statistics for the variables listed. Panel A shows the descriptive statistics for firm-level variables while Panel B reports for country-level variables for the sampled firms from 1994 to 2020. Investment (Inv) is defined as a ratio between CAPEX (Capital Expenditure) to lagged Total Assets. Size is the natural logarithm of Total Assets. ROA is a ratio of EBIT to lagged Total Assets. Leverage is Total Long-term Debt divided by lagged Total Assets. Cash holding is measured by total cash plus marketable securities to lagged Total Assets. Cash flow is defined as EBITDA plus depreciation and amortisation, all divided by lagged Total Assets. Market-to-book is measured as the market value of equity plus the book value of assets minus book value of equity, all divided by book value of assets. Macroeconomic variables include Comprehensive sovereign credit rating (CCR), Log-transformation comprehensive sovereign credit rating (LCCR), GDP growths, Government debt to GDP, Changes in S&P Global Equity index, and Inflation rate.

Panel A: Firm-level variables					
	Mean	**SD**	**Median**	**Min**	**Max**
Investment (Inv)	5.896	5.664	4.197	0.196	33.577
$Rating_{corp}$	10.580	3.553	11.000	1.000	20.000
Size	8.540	1.498	8.481	5.028	12.175
ROA	8.793	7.703	7.999	-13.749	33.714
Leverage	26.216	17.859	23.799	0.000	87.083
Cash holding	11.501	11.589	7.968	0.023	60.963
Cash Flow	18.442	10.044	16.945	-5.122	52.529
Market-to-book	162.758	82.937	138.515	66.850	559.900
Panel B: Country level variables					
	Mean	**SD**	**Median**	**Min**	**Max**
CCR	47.723	10.554	51.000	1.000	58.000
LCCR	8.487	2.585	8.801	-3.332	11.296
GDP growths	2.916	3.079	2.858	-9.132	13.182
Government debt to GDP	57.076	35.403	49.914	4.974	180.636
Changes in S&P Global Equity index	8.453	28.356	7.996	-69.860	120.452
Inflation rate	3.334	5.093	2.096	-4.483	55.256

Table 4.4: The impact of sovereign rating changes on corporate investment

This table reports the estimates from the fixed effect panel regressions of domestic corporate investments by sovereign rating changes. The dependent variable is Investment, measured by CAPEX to lagged Total Assets. The main independent variable is change in log-transformation comprehensive sovereign credit rating (LCCR). Firm-level variables include changes in corporate rating, Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and Lagged Investment. Macroeconomic variables include GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. T-statistics are clustered at firm level. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	(1)	(2)
	Inv_{t+1}	**Inv_{t+1}**
Δ LCCR $_t$	0.273**	0.271**
	(2.562)	(2.485)
Δ $Rating_{corp\ t}$	0.188***	0.182***
	(5.751)	(5.655)
Size $_{t-1}$	-0.723***	-0.732***
	(-7.368)	(-7.388)
ROA $_t$	0.028	0.027
	(1.439)	(1.364)
Leverage $_t$	-0.025***	-0.026***
	(-7.816)	(-7.865)
Cash holding $_t$	0.004	0.004
	(0.613)	(0.613)
Cash flow $_t$	0.069***	0.071***
	(3.874)	(4.021)
Market-to-book $_t$	0.007***	0.007***
	(8.517)	(8.325)
Investment $_{t-1}$	0.144***	0.144***
	(8.050)	(8.046)
GDP growth $_t$	-0.007	-0.010
	(-0.267)	(-0.407)
Δ Government debt $_t$	-0.012***	-0.011***
	(-3.319)	(-3.107)
Δ S&P Global Equity index $_t$	0.008***	0.008***
	(2.844)	(2.925)
Δ Inflation rate $_t$	0.046*	0.040
	(1.699)	(1.511)
Year effects	Yes	No
Firm effects	Yes	Yes
YearxIndustry FE	No	Yes
Observations	18,141	18,141
R-squared	0.229	0.237

Table 4.5: Results for firms facing sovereign rating change but no change in corporate rating

This table reports the estimates from the fixed effect panel regressions of domestic corporate investments by sovereign rating change based on a sub sample of firms without any rating change during a year period following a sovereign rating event. The dependent variable is Investment, measured by CAPEX to lagged Total Assets. The main independent variable is change in LCCR. Firm-level variables include Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and Lagged Investment. Macroeconomic variables include GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. T-statistics are clustered at firm level. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	(1)	(2)
	Inv_{t+1}	**Inv_{t+1}**
Δ $LCCR_t$	0.194**	0.196**
	(2.298)	(2.315)
$Size_{t-1}$	-0.815***	-0.825***
	(-7.753)	(-7.786)
ROA_t	0.026	0.025
	(1.202)	(1.176)
$Leverage_t$	-0.026***	-0.026***
	(-7.120)	(-7.114)
$Cash\ holding_t$	0.007	0.007
	(1.102)	(1.077)
$Cash\ flow_t$	0.067***	0.068***
	(3.418)	(3.491)
$Market\text{-}to\text{-}book_t$	0.007***	0.007***
	(7.886)	(7.751)
$Investment_{t-1}$	0.144***	0.144***
	(6.820)	(6.849)
$GDP\ growth_t$	0.017	0.015
	(0.565)	(0.500)
Δ $Government\ debt_t$	-0.012***	-0.011***
	(-2.988)	(-2.859)
Δ S&P Global Equity $index_t$	0.008**	0.008**
	(2.546)	(2.564)
Δ $Inflation\ rate_t$	0.049*	0.047
	(1.687)	(1.606)
Year effects	Yes	No
Firm effects	Yes	Yes
YearxIndustry FE	No	Yes
Observations	14,529	14,529
R-squared	0.211	0.217

Table 4.6: The impact of sovereign rating changes on corporate investment in the event of sovereign downgrade and upgrades

This table reports the estimates from the fixed effect panel regressions of domestic corporate investments by sovereign downgrades and upgrades, respectively for the sub samples of firms without any rating change during a year period following a sovereign rating event. Panel A and Panel B indicates results for sovereign downgrades and sovereign upgrades, respectively. The dependent variable is Investment, measured by CAPEX to lagged Total Assets. The main independent variable is change in LCCR. Firm-level variables include Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and Lagged Investment. Macroeconomic variables include GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. T-statistics are clustered at firm level. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	***Panel A**: Sovereign downgrade*		***Panel B**: Sovereign upgrade*	
	(1)	(2)	(1)	(2)
	Inv $_{t+1}$	**Inv$_{t+1}$**	**Inv $_{t+1}$**	**Inv$_{t+1}$**
Δ LCCR $_t$	0.208**	0.218***	0.088	0.081
	(2.528)	(2.637)	(0.448)	(0.411)
Size $_{t-1}$	-0.860***	-0.870***	-0.789***	-0.800***
	(-7.972)	(-8.015)	(-7.476)	(-7.524)
ROA $_t$	0.030	0.029	0.033	0.033
	(1.363)	(1.333)	(1.577)	(1.550)
Leverage $_t$	-0.026***	-0.025***	-0.027***	-0.027***
	(-7.154)	(-7.154)	(-7.077)	(-7.067)
Cash holding $_t$	0.006	0.006	0.006	0.006
	(1.043)	(1.003)	(0.917)	(0.876)
Cash flow $_t$	0.062***	0.063***	0.061***	0.062***
	(3.105)	(3.165)	(3.159)	(3.195)
Market-to-book $_t$	0.007***	0.007***	0.007***	0.006***
	(7.902)	(7.767)	(7.460)	(7.334)
Investment $_{t-1}$	0.146***	0.147***	0.148***	0.149***
	(6.754)	(6.799)	(7.809)	(7.808)
Macro controls	Yes	Yes	Yes	Yes
Year effects	Yes	No	Yes	No
Firm effects	Yes	Yes	Yes	Yes
YearxIndustry FE	No	Yes	No	Yes
Observations	14,087	14,087	13,471	13,471
R-squared	0.213	0.220	0.214	0.220

Table 4.7: High government debts, sovereign downgrade and corporate investment

This table reports the estimates from the fixed effect panel regressions of domestic corporate investments by sovereign downgrades associated with public debt overhangs countries based on a sub-sample of firms without any rating change during a year period following a sovereign downgrade event. Panel A, panel B, panel C and panel D indicate results in case of government debt to GDP which is below 60%, above 60%, above 80% and above 100%, respectively. The dependent variable is Investment, measured by CAPEX to lagged Total Assets. The main independent variable is GD x Δ $Rating_{LCCR}$, which is the interaction between Government debt variable and change in LCCR. Government debt (GD) is a dummy variable equal to 1 in a given year, respectively, if the country has total debt (% of GDP) below 60%, above 60%, above 80% and above 100%, respectively and 0 otherwise. Firm-level variables include Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and Lagged Investment. Macroeconomic variables include Change in LCCR, GD, GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. T-statistics are clustered at firm level. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	Panel A: *Public debt to GDP<=60%*		***Panel B****: Public debt to GDP>60%*		***Panel C:*** *Public debt to GDP>80%*		***Panel D:*** *Public debt to GDP>100%*	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
	Inv_{t+1}	**Inv_{t+1}**	**Inv_{t+1}**	**Inv_{t+1}**	**Inv_{t+1}**	**Inv_{t+1}**	**Inv_{t+1}**	**Inv_{t+1}**
Gov debt x Δ $LCCR_t$	0.166	0.156	0.267**	0.262**	0.305**	0.310**	0.397***	0.393***
	(1.745)	(1.645)	(1.866)	(1.837)	(2.031)	(2.067)	(2.971)	(2.950)
Δ $LCCR_t$	0.191**	0.192*	0.025	0.031	0.016	0.018	0.027	0.032
	(2.482)	(2.482)	(0.376)	(0.478)	(0.251)	(0.285)	(0.472)	(0.559)
Government debt $_t$	-0.049	-0.068	0.139	0.153	0.271*	0.271*	0.102	0.108
	(-0.266)	(-0.365)	(0.738)	(0.813)	(1.789)	(1.783)	(0.706)	(0.760)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	No	Yes	No	Yes	No	Yes	No
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YearxIndustry FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	14,087	14,087	14,087	14,087	14,087	14,087	14,087	14,087
R-squared	0.211	0.218	0.212	0.221	0.211	0.219	0.213	0.220

Appendix
Table A4.1: Rating events

This table reports numbers of rating events released by S&P during the sample periods. Columns (1), (2), (3), (4) report numbers of negative events based on changes in notch. Columns (6), (7), (8) report numbers of positive events based on changes in notch. Column (5), (9), (10) report total negative rating signals, total positive rating signals and total rating signals respectively. (5) = (1) + (2) + (3) + (4); (9) = (6) + (7) + (8); (10) = (5) + (9)

	Negative				**Positive**				**Total**
Δnotch	<= -3	-2	-1	∑	1	2	>= 3	∑	∑
Column number	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)	(10)
Actual rating	5	19	64	88	94	7	3	104	192
Outlook				69				96	165
Watch				40				46	86
Total				197				246	443

Appendix A4.2: Log-transformation of rating scale (Tran et al. 2019)

$$LCCR = \begin{cases} \ln\left[\dfrac{CCR}{29 - CCR}\right] & \forall CCR \in [1..28] \\ \ln\left[\dfrac{(CCR - 28) * (CCR + 28)^{\sqrt{\pi}}}{59 - CCR}\right] & \forall CCR \in [29..58] \end{cases}$$

Note:

AAA with stable outlook/watch:	CCR =58
BBB- with negative watch (investment-grade boundary):	CCR = 29
BB+ with stable outlook/watch (junk-grade boundary):	CCR = 28
CC to Default/ Selective Default:	CCR = 1

Table A4.3: Credit rating scale- Negative rating actions. (Tran et al. 2019)

This table presents the transformation of ratings to CCR, LCCR numerical scores and how the effect of a given rating action varies across the levels of creditworthiness. Columns (1) and (2) report the starting points of a rated issuers. For ease of presentation, column (1) specifies rating symbols from S&P. Column (3) shows how the rating symbols along with outlook/watch statuses can be converted to a 58- point CCR scale. Column (4) reports a logit-transformation (to address possible rating scale non- linearity) of the 58-point CCR using Equation (18). Columns (5) - (7) illustrate how the effects of the same rating actions vary depending on the current level of creditworthiness. This table only reflects negative signals (for sake of brevity).

Pre-event ratings		**CCR**	**LCCR**	**Δ LCCR**		
Rating	**Outlook/watch status**			**Negative outlook action**	**Negative watch action**	**1-notch downgrade**
(1)	(2)	(3)	(4)	(5)	(6)	(7)
AAA	Stable	58	11.296	-0.748	-1.209	-1.555
	Neg. outlook	57	10.549			-1.089
	Neg. watch	56	10.087			-0.871
AA+	Stable	55	9.742	-0.282	-0.526	-0.743
	Neg. outlook	54	9.459			-0.659
	Neg. watch	53	9.216			-0.600
AA	Stable	52	8.999	-0.198	-0.383	-0.558
	Neg. outlook	51	8.801			-0.527
	Neg. watch	50	8.616			-0.504
AA-	Stable	49	8.441	-0.167	-0.329	-0.487
	Neg. outlook	48	8.274			-0.475
	Neg. watch	47	8.112			-0.467
BBB+	Stable	37	6.505	-0.190	-0.394	-0.617
	Neg. outlook	36	6.315			-0.678
	Neg. watch	35	6.111			-0.764
BBB	Stable	34	5.888	-0.250	-0.541	-0.894
	Neg. outlook	33	5.638			-1.115
	Neg. watch	32	5.347			-1.583
BBB-	Stable	31	4.994	-0.471	-1.229	-1.661
	Neg. outlook	30	4.523			-1.920
	Neg. watch	29	3.765			-1.605
B+	Stable	19	0.642	-0.149	-0.294	-0.434
	Neg. outlook	18	0.492			-0.423
	Neg. watch	17	0.348			-0.417
B	Stable	16	0.208	-0.139	-0.277	-0.415
	Neg. outlook	15	0.069			-0.417
	Neg. watch	14	-0.069			-0.423
B-	Stable	13	-0.208	-0.141	-0.285	-0.434
	Neg. outlook	12	-0.348			-0.450
	Neg. watch	11	-0.492			-0.473
CCC+	Stable	10	-0.642	-0.157	-0.323	-0.503
	Neg. outlook	9	-0.799			-0.545
	Neg. watch	8	-0.965			-0.604
CCC	Stable	7	-1.145	-0.199	-0.423	-0.687
	Neg. outlook	6	-1.344			-0.816
	Neg. watch	5	-1.569			-1.034
CCC-	Stable	4	-1.833	-0.327	-0.770	-1.500
	Neg. outlook	3	-2.159			
	Neg. watch	2	-2.603			
CC/D		1	-3.332			

Table A4.4: Credit rating scale-Positive rating actions. (Tran et al. 2019)

This table presents the transformation of ratings to CCR, LCCR numerical scores and how the effect of a given rating action varies across the levels of creditworthiness. Columns (1) and (2) report the starting points of a rated issuers. For ease of presentation, column (1) specifies rating symbols from S&P. Column (3) shows how the rating symbols along with outlook/watch statuses can be converted to a 58- point CCR scale. Column (4) reports a logit-transformation (to address possible rating scale non- linearity) of the 58-point CCR using Equation (18). Columns (5) - (7) illustrate how the effects of the same rating actions vary depending on the current level of creditworthiness. This table only reflects negative signals (for sake of brevity).

Pre-event ratings		**CCR**	**LCCR**	**Δ LCCR**		
Rating	**Outlook/watch status**			**Positive outlook action**	**Positive watch action**	**1-notch upgrade**
(1)	(2)	(3)	(4)	(5)	(6)	(7)
AAA	Stable	58	11.296	0.748	1.209	1.555
AA+	Pov. watch	57	10.549			1.089
	Pov. outlook	56	10.087			0.871
	Stable	55	9.742	0.282	0.526	0.743
AA	Pov. watch	54	9.459			0.659
	Pov. outlook	53	9.216			0.600
	Stable	52	8.999	0.198	0.383	0.558
AA-	Pov. watch	51	8.801			0.527
	Pov. outlook	50	8.616			0.504
	Stable	49	8.441	0.167	0.329	0.487
BBB+	Pov. watch	48	8.274			0.475
	Pov. outlook	47	8.112			0.467
	Stable	37	6.505	0.19	0.394	0.617
BBB	Pov. watch	36	6.315			0.678
	Pov. outlook	35	6.111			0.764
	Stable	34	5.888	0.25	0.541	0.894
BBB-	Pov. watch	33	5.638			1.115
	Pov. outlook	32	5.347			1.583
	Stable	31	4.994	0.471	1.229	1.661
B+	Pov. watch	30	4.523			1.920
	Pov. outlook	29	3.765			1.605
	Stable	19	0.642	0.149	0.294	0.434
B	Pov. watch	18	0.492			0.423
	Pov. outlook	17	0.348			0.417
	Stable	16	0.208	0.139	0.277	0.415
B-	Pov. watch	15	0.069			0.417
	Pov. outlook	14	-0.069			0.423
	Stable	13	-0.208	0.141	0.285	0.434
CCC+	Pov. watch	12	-0.348			0.450
	Pov. outlook	11	-0.492			0.473
	Stable	10	-0.642	0.157	0.323	0.503
CCC	Pov. watch	9	-0.799			0.545
	Pov. outlook	8	-0.965			0.604
	Stable	7	-1.145	0.199	0.423	0.687
CCC-	Pov. watch	6	-1.344			0.816
	Pov. outlook	5	-1.569			1.034
	Stable	4	-1.833	0.327	0.77	1.500
CC/D	Pov. watch	3	-2.159			
	Pov. outlook	2	-2.603			
	Stable	1	-3.332			

Table A4.5: Correlation matrix

This table reports the correlation matrix of the variables. Δ LCCR is a change in S&P Log-transformation comprehensive credit rating of a sovereign in which a firm domicile. Investment is defined as a ratio between CAPEX (Capital Expenditure) to lagged Total Assets. Δ $Rating_{corp\ is}$ a change in S&P corporate rating. Size is the natural logarithm of Total Assets. ROA is a ratio of EBIT to lagged Total Assets. Leverage is Total Long-term Debt divided by lagged Total Assets. Cash holding is measured by total cash plus marketable securities to lagged Total Assets. Cash flow is defined as EBITDA plus depreciation and amortisation, all divided by lagged Total Assets. Market-to-book is measured as the market value of equity plus the book value of assets minus book value of equity, all divided by book value of assets. GDP growths are annual percentage growth rates of GDP at market prices based on constant local currency. Δ Government debt is a change in government debt to GDP in year t-1 to year t. Δ S&P Global Equity index is the U.S. dollar price change in the stock markets covered by the S&P/IFCI and S&P/Frontier BMI country indices. Δ Inflation rate is a change in inflation rate (GDP deflator) in year t-1 to year t. * indicates the significance level of 5% or smaller.

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**
(1) Δ LCCR	1.000												
(2) Inv	0.047*	1.000											
(3) Δ $Rating_{corp}$	0.110*	0.064*	1.000										
(4) Size	-0.024*	-0.025*	-0.002	1.000									
(5) ROA	0.019*	0.170*	0.186*	0.047*	1.000								
(6) Leverage	-0.022*	-0.143*	-0.028*	-0.115*	0.034*	1.000							
(7) Cash Holding	-0.026*	-0.096*	0.058*	-0.063*	0.122*	-0.158*	1.000						
(8) Cash flow	0.036*	0.469*	0.145*	0.015*	0.791*	0.135*	0.040*	1.000					
(9) Market to Book	0.019*	0.037*	0.087*	-0.027*	0.529*	-0.025*	0.204*	0.418*	1.000				
(10) GDP growths	0.187*	0.166*	0.108*	-0.060*	0.163*	0.015*	-0.097*	0.161*	0.057*	1.000			
(11) Δ Government debt	-0.129*	-0.085*	-0.046*	0.023*	-0.070*	-0.008	0.040*	-0.072*	-0.074*	-0.331*	1.000		
(12) Δ S&P Global Equity index	0.107*	0.008	0.063*	-0.006	0.035*	-0.004	0.023*	0.041*	0.076*	0.065*	-0.136*	1.000	
(13) Δ Inflation rate	0.017*	0.147*	-0.046*	-0.071*	0.131*	0.045*	-0.050*	0.156*	0.003	0.156*	-0.163*	0.008	1.000

Table A4.6: Definition of all variables used

Dependent variable	Description	Data Source
Investment (Inv)	Investment is measured by CAPEX to lagged Total Assets	WRDS Fundamentals Annual Fiscal
Country level variables		
Δ LCCR	changes in S&P Log-transformation comprehensive credit rating of a sovereign in which a firm domicile.	S&P publications
GDP growths	an annual percentage growth rate of GDP at market prices based on constant local currency.	World Bank and OECD
Δ government debt	a change in government debt to GDP in year t-1 to year t	World Development Indicators.
Δ inflation rate	a change in inflation rate (GDP deflator) in year t-1 to year t	World Bank and OECD
Δ S&P Global Equity index	the U.S. dollar price change in the stock markets covered by the S&P/IFCI and S&P/Frontier BMI country indices.	Standard & Poor's, Global Stock Markets Factbook and supplemental S&P data.
Government debt	dummy variables taking the value of 1 if the debt-to-GDP ratio of a particular country in a given year is below 60%, above 5%, above 10% until I reach the level of 100%. and 0 otherwise.	World Development Indicators and OECD.
GD x Δ $Rating_{sovereign}$	the interaction between Government debt variables and change in sovereign rating.	
Firm level variables		
Δ $Rating_{corp}$	a change in S&P corporate rating	Capital IQ
Firm size	the natural logarithm of Total Assets in U.S. dollars.	WRDS Fundamentals Annual Fiscal
Leverage	total long-term debt divided by lagged Total Assets	
ROA	The ratio of EBIT to lagged Total Assets	
Cash holding	Total cash holding plus marketable securities scaled by lagged Total Assets.	
Cash flow	EBITDA plus depreciation and amortization scaled by lagged Total assets	
Market-to-book	Market value + book value of assets - common equity, scaled by the book value of assets	WRDS Security Daily and CRSP

Results for chapter 5

Table 5.1: Sample distribution

This table reports the sample distribution of firms across countries during the sampled period.

Country	Number of firms
Austria	4
Bahrain	1
Belgium	5
Chile	17
Cyprus	3
Czech Republic	1
Finland	9
France	46
Greece	4
Hongkong	11
Hungary	3
Ireland	23
Italy	19
Japan	179
Korea	23
Netherlands	26
New Zealand	7
Panama	2
Poland	5
Portugal	4
Qatar	2
Spain	15
Trinidad	1
UK	63
USA	733
	1,206

Table 5.2: List of sample countries

This table reports the numbers of sovereign rating events during the period from 01/01/1994 – 31/12/2020. The sample covers 25 high income countries that their ratings changed at least once during the sampled period. Sovereign credit ratings are from S&P's.

Country	Sovereign upgrades	Sovereign downgrades	Country	Sovereign upgrades	Sovereign downgrades
Austria	0	1	Japan	1	5
Bahrain	1	5	Korea	10	4
Belgium	0	1	Netherlands	1	1
Chile	4	1	New Zealand	2	1
Cyprus	9	12	Panama	4	1
Czech Republic	3	1	Poland	5	1
Finland	3	1	Portugal	4	6
France	0	2	Qatar	5	1
Greece	12	13	Spain	6	6
Hongkong	6	2	Trinidad	5	4
Hungary	7	5	UK	0	1
Ireland	7	6	USA	0	1
Italy	1	6			

Table 5.3: Descriptive Statistics

This table presents the descriptive statistics for the variables listed. Panel A shows the descriptive statistics for firm-level variables while Panel B reports for country-level variables for the sampled firms from 1994 to 2020. Investment (Inv) is defined as a ratio between CAPEX (Capital Expenditure) to lagged Total Assets. Size is the natural logarithm of Total Assets. ROA is a ratio of EBIT to lagged Total Assets. Leverage is Total Long-term Debt divided by lagged Total Assets. Cash holding is measured by total cash plus marketable securities to lagged Total Assets. Cash flow is defined as EBITDA plus depreciation and amortisation, all divided by lagged Total Assets. Market-to-book is measured as the market value of equity plus the book value of assets minus book value of equity, all divided by book value of assets. Macroeconomic variables include Comprehensive sovereign credit rating (CCR), Log-transformation comprehensive sovereign credit rating (LCCR), GDP growths, Government debt to GDP, Changes in S&P Global Equity index, and Inflation rate.

Panel A: Firm-level variables					
	Mean	**SD**	**Median**	**Min**	**Max**
Investment (Inv)	5.777	5.440	4.160	0.220	32.145
$Rating_{corp}$	9.630	3.510	10.000	1.000	20.000
Size	8.649	1.481	8.597	5.188	12.253
ROA	8.858	7.559	7.965	-13.105	34.654
Leverage	26.548	18.410	23.921	0.000	94.295
Cash holding	11.561	11.466	8.155	0.030	60.409
Cash Flow	18.371	9.873	16.815	-3.364	52.399
Market-to-book	164.038	86.707	138.105	65.682	588.400
Panel B: Country level variables					
	Mean	**SD**	**Median**	**Min**	**Max**
CCR	47.962	9.815	51.000	1.000	58.000
LCCR	8.502	2.527	8.742	-3.332	11.296
GDP growths	2.870	2.832	2.847	-9.237	12.939
Government debt to GDP	57.604	34.386	48.260	4.046	180.340
Changes in S&P Global Equity index	8.481	27.529	8.135	-69.176	120.452
Inflation rate	3.246	4.515	2.069	-3.401	52.746

Table 5.4: The relationship between Investment and Leverage following a sovereign downgrade. This table reports the estimates from the fixed effect panel regressions of the leverage -investment relationship following a sovereign downgrade. The dependent variable is Investment, measured by CAPEX to lagged Total Assets. The main independent variable is Leverage x Δ LCCR- the interaction between Leverage and change in LCCR. Firm-level variables include Leverage, Δ $Rating_{corp}$, Firm size, ROA, Leverage, Cash holding, Cash flow, Debt service capacity, Market-to-book and Lagged Investment. Macroeconomic variables include Δ LCCR, GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. T-statistics are clustered at firm level. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	Panel A: Low leveraged firm		***Panel B:*** High leveraged firms	
	(1)	(2)	(1)	(2)
	Inv_{t+1}	**Inv_{t+1}**	**Inv_{t+1}**	**Inv_{t+1}**
Leverage x Δ $LCCR_t$	0.005	0.008	0.018***	0.022***
	(0.002)	(0.031)	(2.975)	(3.001)
Δ $LCCR_t$	0.361*	0.269*	0.364**	0.283**
	(0.477)	(0.343)	(2.486)	(2.446)
$Leverage_t$	0.023	0.029	-0.096**	-0.095**
	(0.744)	(0.884)	(-2.562)	(-2.530)
Δ $Rating_{corp\,t}$	0.119	0.144	0.356**	0.355**
	(0.120)	(0.270)	(2.410)	(2.452)
$Size_{t-1}$	-0.870	-0.819	-0.820**	-0.850**
	(-1.460)	(-1.356)	(-2.120)	(-2.150)
ROA_t	0.015*	0.026	0.222	0.247
	(0.127)	(0.230)	(1.001)	(1.102)
Cash $holding_t$	0.006	0.011	0.056	0.054
	(0.265)	(0.499)	(1.195)	(1.148)
Cash $Flow_t$	0.125	0.124	0.147*	0.173*
	(1.153)	(1.145)	(1.695)	(1.860)
Market-to-$Book_t$	0.004	0.004*	0.016	0.017*
	(0.937)	(0.838)	(1.541)	(1.697)
Lagged $Investment_{t-1}$	0.125	0.118	0.378**	0.378**
	(1.164)	(1.108)	(2.232)	(2.229)
GDP $growth_t$	0.073	0.069	0.129	0.114
	(0.784)	(0.808)	(0.588)	(0.518)
Δ Government $debt_t$	-0.155*	-0.163*	-0.135**	-0.127**
	(-1.834)	(-1.878)	(-2.111)	(-2.033)
Δ S&P Global Equity $index_t$	0.064	0.063	0.140	0.132
	(1.568)	(1.411)	(1.545)	(1.482)
Δ Inflation $rate_t$	-0.078	-0.076	-0.031	-0.097
	(-1.350)	(-1.288)	(-0.466)	(-0.398)
Year effects	Yes	No	Yes	No
Firm effects	Yes	Yes	Yes	Yes
Year x Industry FE	No	Yes	No	Yes
Observations	780	780	546	546
R-squared	0.186	0.206	0.199	0.208

Table 5.5: The relationship between Investment and High Leverage (HL) following a sovereign downgrade. This table reports the estimates from the fixed effect panel regressions of the high leverage -investment relationship following a sovereign downgrade. The dependent variable is Investment, measured by CAPEX to lagged Total Assets. The main independent variable is HL xΔ LCCR- the interaction between change in LCCR and High Leverage. High leverage is equal to 1 if the firm 's total long-term debt to Lagged total assets is greater than the median of the sample. Firm-level variables include HL, Δ $Rating_{corp}$, Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and Lagged Investment. Macroeconomic variables include Δ LCCR, GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. T-statistics are clustered at firm level. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	(1)	(2)
	Inv_{t+1}	**Inv_{t+1}**
HL x Δ $LCCR_t$	0.580***	0.629**
	(2.477)	(2.208)
Δ $LCCR_t$	0.159	0.127
	(0.648)	(0.490)
HL_t	0.184	0.083
	(0.526)	(0.245)
Δ $Rating_{corp\ t}$	0.136	0.142
	(1.108)	(1.126)
$Size_{t-1}$	-0.852***	-0.867***
	(-3.056)	(-3.064)
ROA_t	0.072	0.058
	(0.906)	(0.722)
$Leverage_{t-1}$	-0.025	-0.025*
	(-1.670)	(-1.689)
Cash $holding_t$	-0.003	-0.001
	(-0.137)	(-0.039)
Cash $Flow_t$	0.003*	0.001*
	(0.044)	(0.019)
Market-to-$Book_t$	0.003	0.003
	(0.976)	(0.941)
Lagged $Investment_{t-1}$	0.296***	0.290***
	(3.371)	(3.312)
GDP $growth_t$	-0.170	-0.146
	(-1.160)	(-1.027)
Δ Government $debt_t$	0.060	0.052
	(0.780)	(0.673)
Δ S&P Global Equity $index_t$	-0.033	-0.030
	(-1.472)	(-1.370)
Δ Inflation $rate_t$	0.016	0.039
	(0.075)	(0.185)
Year effects	Yes	No
Firm effects	Yes	Yes
Year x Industry FE	No	Yes
Observations	1,326	1,326
R-squared	0.188	0.209

Table 5.6: Financial constraints, Investment and High Leverage following a sovereign downgrade. This table reports the estimates from the fixed effect panel regressions of the high leverage -investment relationship following a sovereign downgrade across firms with low investment opportunities based on two criteria. These criteria include Low profitability (Panel A), Low Market-to-Book value (Panel B) and High KZ indexes (Panel C). The dependent variable is Investment, measured by CAPEX to lagged Total Assets. The main independent variable is HL xΔ LCCR- the interaction between change in LCCR and High Leverage. High leverage is equal to 1 if the firm 's long-term debt to Lagged total assets is greater than the median of the sample. Firm-level variables include HL, Δ $Rating_{corp}$, Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and Lagged Investment. Macroeconomic variables include Δ LCCR, GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. T-statistics are clustered at firm level. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	Panel A: Low Profitability		***Panel B:*** Low Market-to-book		***Panel C:*** High KZ indexes	
	(1)	(2)	(1)	(2)	(1)	(2)
	Inv_{t+1}	**Inv_{t+1}**	**Inv_{t+1}**	**Inv_{t+1}**	**Inv_{t+1}**	**Inv_{t+1}**
HL x Δ $LCCR_t$	0.751***	0.821**	0.710**	0.754**	0.824**	0.865**
	(1.668)	(2.327)	(0.912)	(0.510)	(1.974)	(1.910)
Δ $LCCR_t$	0.179	0.185*	0.512	0.355	0.313	0.335
	(0.261)	(1.688)	(1.169)	(0.532)	(0.022)	(0.553)
HL_t	0.207	0.298	0.198	0.227	0.183	0.201
	(0.448)	(0.644)	(0.377)	(0.048)	(0.991)	(0.787)
Δ $Rating_{corp\,t}$	0.379*	0.315**	0.288*	0.311*	0.343**	0.340**
	(2.697)	(2.028)	(1.183)	(1.299)	(2.617)	(2.539)
$Size_{t-1}$	-0.815**	-0.739***	-0.885*	-0.889*	-0.727**	-0.742***
	(-3.388)	(-3.190)	(-1.824)	(-1.958)	(-3.986)	(-3.945)
ROA_{t-1}	0.120	0.133	0.157	0.154	0.141	0.141
	(1.159)	(1.168)	(1.317)	(1.294)	(1.162)	(1.117)
$Leverage_{t-1}$	-0.044**	-0.042**	-0.034	-0.034	-0.064***	-0.064***
	(-2.424)	(-2.413)	(-1.453)	(-1.423)	(-3.105)	(-3.078)
Cash $holding_t$	0.036	0.029	0.027	0.023	0.016	0.019
	(0.912)	(0.707)	(0.840)	(0.673)	(0.467)	(0.539)
Cash $Flow_t$	0.087*	0.096*	0.091**	0.071*	0.020	0.030*
	(1.889)	(1.919)	(2.038)	(1.469)	(0.460)	(0.652)
$Market\text{-}to\text{-}Book_{t-1}$	0.001	0.003	0.005	0.006	0.002	0.004
	(0.278)	(0.554)	(0.536)	(0.601)	(0.385)	(0.555)
Lagged $Investment_{t-1}$	0.370***	0.361***	0.290**	0.290**	0.480***	0.475***
	(3.300)	(3.298)	(2.049)	(2.075)	(3.607)	(3.564)
GDP $growth_t$	0.037	0.204	-0.009	0.059	-0.082	-0.001
	(0.222)	(1.071)	(-0.060)	(0.340)	(-0.430)	(-0.007)
Δ Government $debt_t$	0.094	0.083	0.001	-0.036	-0.039*	-0.003
	(1.300)	(1.106)	(0.008)	(-0.193)	(-1.728)	(-1.274)
Δ S&P Global Equity $index_t$	-0.056	-0.056	-0.056	-0.050	-0.027	-0.017
	(-1.515)	(-1.560)	(-1.576)	(-1.419)	(-0.665)	(-0.392)
Δ Inflation $rate_t$	0.027	0.186	0.084	0.083	-0.066	0.021
	(0.103)	(0.757)	(0.710)	(0.850)	(-0.249)	(0.078)
Year effects	Yes	No	Yes	No	Yes	No
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
Year x Industry FE	No	Yes	No	Yes	No	Yes
Observations	667	667	732	732	678	678
R-squared	0.179	0.192	0.188	0.205	0.171	0.196

Table 5.7: Cash holding, Investment and High Leverage following a sovereign downgrade
This table presents the estimation of the effects of high leverage on corporate investment following a sovereign downgrade across Low cash (Panel A) and High cash (Panel B) firms. The dependent variable is Investment, measured by CAPEX to lagged Total Assets. The main independent variable is HL xΔ LCCR- the interaction between change in LCCR and High Long-term Leverage. High leverage is equal to 1 if the firm 's total debt to Lagged total assets is greater than the median of the sample. Firm-level variables include HL, Δ $Rating_{corp}$, Firm size, ROA, Leverage, Cash holding, Cash flow, Market-to-book and Lagged Investment. Macroeconomic variables include Δ LCCR, GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. T-statistics are clustered at firm level. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	Panel A: High cash		***Panel B:*** Low Cash	
	(1)	(2)	(1)	(2)
	Inv_{t+1}	**Inv_{t+1}**	**Inv_{t+1}**	**Inv_{t+1}**
HL x Δ $LCCR_t$	0.257**	0.375**	0.852***	0.863**
	(0.647)	(0.432)	(2.038)	(1.294)
Δ $LCCR_t$	0.219	0.232	0.408	0.496*
	(0.669)	(0.602)	(0.584)	(1.767)
HL_t	0.396	0.443	0.396	0.397
	(0.617)	(0.688)	(1.756)	(0.911)
Δ $Rating_{corp\,t}$	0.178	0.182	0.347**	0.300***
	(1.140)	(1.134)	(2.446)	(3.431)
$Size_{t-1}$	-0.877**	-0.847**	-0.820**	-0.838**
	(-2.347)	(-2.148)	(-2.465)	(-2.450)
ROA_t	0.131	0.137	0.132*	0.174
	(1.057)	(1.073)	(0.771)	(1.590)
$Leverage_{t-1}$	-0.007	-0.004	-0.036	-0.046
	(-0.298)	(-0.161)	(-1.286)	(-1.557)
Cash $holding_{t-1}$	0.012*	0.013	0.023	0.014*
	(0.434)	(0.461)	(0.326)	(0.193)
Cash $Flow_t$	0.004	-0.006	0.102	0.158
	(0.040)	(-0.061)	(0.954)	(1.500)
Market-to-$Book_t$	0.005*	0.005	0.014**	0.015**
	(1.139)	(0.972)	(2.302)	(2.224)
Lagged $Investment_{t-1}$	0.314*	0.308*	0.171*	0.173*
	(1.955)	(1.893)	(1.769)	(1.724)
GDP $growth_t$	0.048	0.059	-0.127	1.156***
	(0.447)	(0.565)	(-0.342)	(3.302)
Δ $Government\ debt_t$	0.043	0.035	-0.097	-0.190*
	(0.758)	(0.608)	(-0.614)	(-1.815)
Δ S&P Global Equity $index_t$	0.077*	0.075*	0.004	0.097***
	(1.941)	(1.844)	(0.091)	(3.064)
Δ Inflation $rate_t$	0.113	0.118	0.013	0.038*
	(0.659)	(0.689)	(1.102)	(1.873)
Year effects	Yes	No	Yes	No
Firm effects	Yes	Yes	Yes	Yes
Year x Industry FE	No	Yes	No	Yes
Observations	772	772	554	554
R-squared	0.166	0.207	0.182	0.204

Appendix
Table A5.1: Rating events

This table reports numbers of rating events released by S&P during the sample periods. Columns (1), (2), (3), (4) report numbers of negative events based on changes in notch. Columns (6), (7), (8) report numbers of positive events based on changes in notch. Column (5), (9), (10) report total negative rating signals, total positive rating signals and total rating signals respectively. (5) = (1) + (2) + (3) + (4); (9) = (6) + (7) + (8); (10) = (5) + (9)

	Negative				**Positive**				**Total**
Δnotch	<= -3	-2	-1	∑	1	2	>= 3	∑	∑
Column number	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)	(10)
Actual rating	5	19	64	88	88	6	2	96	184
Outlook				65				92	157
Watch				38				43	81
Total				191				231	422

Table A5.2: Definition of all variables used

Dependent variable	**Description**	**Data Source**
Investment (Inv)	Investment is measured by CAPEX to lagged Total Assets	WRDS Fundamentals Annual Fiscal
Country level variables		
Δ LCCR	changes in S&P Log-transformation comprehensive credit rating of a sovereign in which a firm domicile.	S&P publications
GDP growths	an annual percentage growth rate of GDP at market prices based on constant local currency.	World Bank and OECD
Δ government debt	a change in government debt to GDP in year t-1 to year t	World Development Indicators.
Δ inflation rate	a change in inflation rate (GDP deflator) in year t-1 to year t	World Bank and OECD
Δ S&P Global Equity index	the U.S. dollar price change in the stock markets covered by the S&P/IFCI and S&P/Frontier BMI country indices.	Standard & Poor's, Global Stock Markets Factbook and supplemental S&P data.
Firm level variables		
Δ $Rating_{corp}$	a change in S&P corporate rating	Capital IQ
Size	the natural logarithm of Total Assets in U.S. dollars.	WRDS Fundamentals Annual Fiscal
Leverage	total long-term debt divided by lagged Total Assets	
Leverage xΔ LCCR	The interaction between change in LCCR and Leverage	
High Leverage	equal to 1 if the firm ‘s total long-term debt to Lagged total assets is greater than the median of the sample	
HL xΔ LCCR	The interaction between change in LCCR and High Leverage	
ROA	The ratio of EBIT to lagged Total Assets	
Cash holding	Total cash holding plus marketable securities scaled by lagged Total Assets.	
Cash flow	EBITDA plus depreciation and amortization scaled by lagged Total assets	
Market-to-book	Market value + book value of assets - common equity, scaled by the book value of assets	WRDS Security Daily and CRSP

Results for chapter 6

Table 6.1: Sample distribution

This table reports the sample distribution of firms across countries during the sampled period.

Country	Number of firms	Country	Number of firms
Argentina	2	Korea	16
Austria	2	Mexico	21
Belgium	3	Netherlands	17
Brazil	26	New Zealand	3
Chile	10	Panama	1
China	20	Peru	5
Colombia	1	Poland	2
Cyprus	3	Portugal	2
Finland	7	Russia	21
France	29	South Africa	2
Greece	2	Spain	8
Hong Kong	4	Taiwan	8
Hungary	2	Thailand	3
India	10	Trinidad	1
Indonesia	17	Turkey	6
Ireland	20	UK	39
Italy	13	USA	437
Japan	128	Ukraine	1
Kazakhstan	2	Venezuela	1

Table 6.2: List of sample countries

This table reports the numbers of sovereign rating events during the period from 01/01/1994 – 31/12/2020. The sample covers 38 developed and developing countries that their ratings changed at least once during the sampled period. Credit ratings are from S&P's.

Country	Sovereign upgrade	Sovereign downgrade	Country	Sovereign upgrade	Sovereign downgrade
Argentina	8	12	Korea	10	4
Austria	0	1	Mexico	5	2
Belgium	0	1	Netherlands	1	1
Brazil	8	5	New Zealand	2	1
Chile	4	1	Panama	3	1
China	6	2	Peru	5	1
Colombia	3	2	Poland	4	1
Cyprus	8	12	Portugal	3	6
Finland	3	1	Russia	9	8
France	0	2	South Africa	4	3
Greece	9	13	Spain	4	6
Hongkong	6	2	Taiwan	0	2
Hungary	6	5	Thailand	3	3
India	2	1	Trinidad	5	2
Indonesia	11	11	Turkey	6	4
Ireland	6	6	UK	0	1
Italy	1	6	USA	0	1
Japan	1	5	Ukraine	6	9
Kazakhstan	7	4	Venezuela	6	12

Table 6.3: Descriptive Statistics

This table presents the descriptive statistics for the variables listed. Panel A shows the descriptive statistics for firm-level variables while Panel B reports for country-level variables for the sampled firms from 1994 to 2020. Payables days is measured by 365 days x trade payables to cost of goods sold. Size is the natural logarithm of Total Assets. Cash holding is measured by total cash to Total Assets. Cash flow is defined as EBITDA plus depreciation and amortisation, all divided by Total Assets. Market-to-book is measured as the market value of equity plus the book value of assets minus book value of equity, all divided by book value of assets. Leverage is Total Long-term Debt divided by Total Assets. Operating Cycles is the natural logarithm of days of accounts receivable plus days of inventories. Asset turnover is the ration between sale and total asset. Collateral is the ratio of net property, plant, and equipment to assets. Current asset is the ratio of noncash current assets to the book value of total assets. Macroeconomic variables include Sovereign credit rating), GDP growths, Economy size, Government debt to GDP, Changes in S&P Global Equity index, Unemployment rate and Inflation rate.

Panel A: Firm-level variables					
	Mean	**SD**	**Median**	**P25**	**P75**
Payable days	66.717	63.522	50.068	32.868	76.224
Corporate rating	9.625	3.523	10.000	7.000	12.000
Size	8.620	1.480	8.555	7.590	9.653
Cash holding	8.659	8.082	6.401	2.672	12.105
Cash Flow	12.642	7.200	11.799	8.138	16.392
Market-to-book	165.631	88.385	138.999	109.551	188.910
Leverage	29.621	16.906	28.221	17.928	39.812
Operating Cycles	4.395	0.602	4.456	4.075	4.777
Asset turnover	0.951	0.621	0.814	0.526	1.182
Collateral	33.439	22.879	29.002	14.374	48.812
Current asset	0.271	0.154	0.255	0.149	0.370
Panel B: Country level variables					
	Mean	**SD**	**Median**	**P25**	**P75**
Sovereign rating	17.998	3.011	19.000	17.000	20.000
GDP growths	2.219	2.156	2.217	1.528	3.116
Government debt to GDP	76.984	44.175	68.251	46.010	96.342
Changes in S&P Global Equity index	8.352	22.840	9.614	-2.743	22.500
Inflation rate	2.298	2.717	2.130	1.262	2.931

Table 6.4 - Impact of Sovereign Downgrades on Trade Credit Policies

This table reports the estimates from the fixed effect panel regressions of Trade Credit Days by sovereign downgrade. The dependent variable is Trade Credit Days, measured by 365 days x trade payables to cost of goods sold. The main independent variable is change in sovereign downgrade. Firm-level variables include Change in Corporate rating, Firm size, Cash holding, Cash Flow, Market-to-book, Leverage, Operating Cycles, Asset turnover, Collateral and Current asset Macroeconomic variables include GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	Pay days $_{t+1}$	**Pay days $_{t+1}$**
Δ Rating $_{sovereign\ t}$	-2.184***	-2.439***
	(-3.862)	(-3.867)
Δ Rating$_{corporate\ t}$	0.421	0.602
	(1.045)	(1.385)
Size $_t$	-4.315*	-4.982**
	(-1.947)	(-2.228)
Cash holding $_t$	-0.043	-0.025
	(-0.448)	(-0.281)
Cash Flow $_t$	0.071	0.138
	(0.497)	(0.896)
Market-to-book $_t$	0.036***	0.026**
	(3.144)	(2.124)
Leverage $_t$	0.003	0.000
	(0.042)	(0.004)
Operating Cycles $_t$	17.767***	16.813***
	(3.031)	(2.721)
Asset turnover $_t$	-7.861	-10.481*
	(-1.429)	(-1.683)
Collateral $_t$	0.109	0.203*
	(0.975)	(1.890)
Current asset $_t$	-45.117**	-39.444**
	(-2.401)	(-2.210)
GDP growth $_t$	0.157	0.241
	(0.512)	(0.709)
Δ Government debt $_t$	-0.051	-0.025
	(-0.679)	(-0.355)
Δ S&P Global Equity index $_t$	-0.056**	-0.060**
	(-2.163)	(-2.043)
Δ Inflation rate $_t$	-0.237	-0.313
	(-1.146)	(-1.392)
Year effects	Yes	No
Firm effects	No	Yes
YearxIndustry FE	Yes	Yes
Observations	12,402	12,402
R-squared	0.049	0.163

Table 6.5 - Impact of Sovereign Downgrades on Trade Credit Policies - By Firm Types

This table reports the estimates from the fixed effect panel regressions of Trade Credit Days by sovereign downgrade by each firm type. Firms are classified by their types of products including (1) Differentiated Goods, (2) Standardized Goods. The dependent variable is Trade Credit Days, measured by 365 days x trade payables to cost of goods sold. The main independent variable is change in sovereign rating. Firm-level variables include Change in Corporate rating, Firm size, Cash holding, Cash Flow, Market-to-book, Leverage, Operating Cycles, Asset turnover, Collateral and Current asset. Macroeconomic variables include GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	Panel A: Differentiated Goods		**Panel B:** Standardized Goods	
	(1)	(2)	(3)	(4)
	Pay days $_{t+1}$	**Pay days $_{t+1}$**	**Pay days $_{t+1}$**	**Pay days $_{t+1}$**
Δ Rating $_{sovereign\ t}$	-2.165***	-2.448***	-2.054**	-2.053**
	(-3.114)	(-3.517)	(-2.315)	(-2.208)
Δ Rating$_{corporate\ t}$	0.306	0.265	0.030	0.272
	(1.119)	(0.762)	(0.057)	(0.474)
Size $_t$	-2.888*	-2.432	1.849	-1.114
	(-1.917)	(-1.501)	(0.520)	(-0.326)
Cash holding $_t$	0.017	0.030	0.026	0.066
	(0.188)	(0.342)	(0.158)	(0.429)
Cash Flow $_t$	0.024	0.105	-0.305*	-0.184
	(0.226)	(0.903)	(-1.670)	(-0.921)
Market-to-book $_t$	0.002	0.002	0.055**	0.034
	(0.253)	(0.182)	(2.551)	(1.585)
Leverage $_t$	0.141***	0.113***	-0.105	-0.154
	(3.182)	(2.872)	(-0.760)	(-1.131)
Operating Cycles $_t$	-4.330	-3.603	5.488	4.707
	(-0.937)	(-0.732)	(0.912)	(0.847)
Asset turnover $_t$	-16.715***	-17.057***	-0.966	-3.542
	(-3.771)	(-3.735)	(-0.159)	(-0.596)
Collateral $_t$	0.169	0.205	-0.003	0.075
	(1.386)	(1.573)	(-0.023)	(0.612)
Current asset $_t$	-26.837**	-25.517**	-41.933	-35.081
	(-2.300)	(-2.092)	(-1.183)	(-1.079)
GDP growth $_t$	-0.138	-0.121	0.824*	0.605
	(-0.394)	(-0.349)	(1.682)	(1.154)
Δ Government debt $_t$	0.080	0.080	-0.010	-0.052
	(1.153)	(1.132)	(-0.078)	(-0.442)
Δ S&P Global Equity index $_t$	-0.007	0.006	-0.003	-0.020
	(-0.250)	(0.237)	(-0.087)	(-0.692)
Δ Inflation rate $_t$	-0.799**	-0.932***	-0.252	-0.101
	(-2.246)	(-2.622)	(1.006)	(0.384)
Year effects	Yes	No	Yes	No
Firm effects	Yes	Yes	Yes	Yes
YearxIndustry FE	No	Yes	No	Yes
Observations	5,467	5,467	4,398	4,398
R-squared	0.066	0.156	0.099	0.253

Table 6.6: Impact of Sovereign Downgrades on Trade Credit Days – Firms with Different Characteristics

This table reports the estimates from the fixed effect panel regressions of Trade Credit Days by sovereign downgrade separately for the subsample of firms with Low/High Financial Constraints/ Market Power. The dependent variable is Trade Credit Days, measured by 365 days x trade payables to cost of goods sold. The main independent variable is change in sovereign rating. Firm-level variables include Change in Corporate rating, Firm size, Cash holding, Cash Flow, Market-to-book, Leverage, Operating Cycles, Asset turnover, Collateral and Current asset. Macroeconomic variables include GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	Panel A: Low Financial Constraints		**Panel B:** High Financial Constraints		**Panel C:** *Low Market Power*	**Panel D:** *High Market Power*
	(1) *Low WW*	(2) *Low KZ*	(3) *High WW*	(4) *High KZ*	(5)	(5)
	Pay days $_{t+1}$	**Pay days $_{t+1}$**	**Pay days $_{t+1}$**	**Pay days $_{t+1}$**	**Pay days $_{t+1}$**	**Pay days $_{t+1}$**
Δ Rating $_{sovereign\ t}$	-1.484*	-1.505**	-3.478***	-2.133*	-2.127**	-2.463***
	(-1.678)	(-1.978)	(-2.699)	(-1.893)	(-2.151)	(-2.752)
Δ Rating$_{corporate\ t}$	0.694	0.414	0.569	1.608**	1.117	0.133
	(0.921)	(0.791)	(1.219)	(2.296)	(1.519)	(0.258)
Size $_t$	-5.445**	-6.839**	-6.553**	-3.142	-2.500	-8.834**
	(-2.202)	(-2.191)	(-2.077)	(-0.836)	(-0.678)	(-2.279)
Cash holding $_t$	-0.135	0.016	0.143	0.019	-0.095	-0.148
	(-1.215)	(0.143)	(1.282)	(0.145)	(-0.775)	(-1.075)
Cash Flow $_t$	0.119	0.063	0.154	-0.009	0.063	0.170
	(0.598)	(0.423)	(0.614)	(-0.035)	(0.317)	(1.025)
Market-to-book $_t$	0.026**	0.037***	0.036**	0.039**	0.051***	0.006
	(2.035)	(3.116)	(2.000)	(2.326)	(3.246)	(0.538)
Leverage $_t$	-0.020	-0.017	0.079	-0.051	-0.012	-0.069
	(-0.254)	(-0.171)	(1.127)	(-0.438)	(-0.148)	(-0.806)
Operating Cycles $_t$	-7.474	-10.607*	-7.455	-10.732*	-10.581*	-10.705*
	(-1.287)	(-1.583)	(-1.2762)	(-1.678)	(-1.903)	(-1.669)
Asset turnover $_t$	26.122***	8.252	11.028	23.617**	16.222*	10.315
	(3.113)	(1.494)	(1.624)	(2.126)	(1.872)	(1.314)
Collateral $_t$	0.148	0.163	0.371***	0.239**	0.102	0.307*
	(0.348)	(1.105)	(2.611)	(1.975)	(0.750)	(1.751)
Current asset $_t$	-39.348***	-19.895	-13.261	-31.568***	-37.768**	-18.177

	(-3.172)	(-2.092)	(-0.776)	(-2.889)	(-2.081)	(-1.326)
GDP growth $_t$	0.527	0.709*	0.019	-1.275	0.710	-0.164
	(1.256)	(1.655)	(0.025)	(-1.454)	(1.324)	(-0.399)
Δ Government debt $_t$	-0.035	0.103	0.013	-0.235*	0.084	-0.081
	(-0.407)	(1.345)	(0.097)	(-1.808)	(0.651)	(-0.956)
Δ S&P Global Equity index $_t$	-0.080**	-0.065**	-0.045	0.046	-0.095*	-0.033
	(-2.523)	(-2.490)	(-0.983)	(0.867)	(-1.821)	(-1.127)
Δ Inflation rate $_t$	-0.468	0.054	-0.474	-1.580**	-0.173	-0.405
	(-1.612)	(0.203)	(-1.210)	(-2.440)	(-0.454)	(-1.419)
Year effects	Yes	No	Yes	No	Yes	No
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
YearxIndustry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,010	7,218	5,392	5,184	6,183	6,219
R-squared	0.182	0.219	0.259	0.286	0.252	0.253

Table 6.7: Results for firms facing sovereign rating changes but no change in corporate rating
This table reports the estimates from the fixed effect panel regressions of Trade Credit Days by sovereign downgrade based on a sub sample of firms without corporate rating change in year t where t is the period of sovereign rating change. The dependent variable is Trade Credit Days, measured by 365 days x trade payables to cost of goods sold. The main independent variable is change in sovereign rating. Firm-level variables include Firm size, Cash holding, Cash Flow, Market-to-book, Leverage, Operating Cycles, Asset turnover, Collateral and Current asset. Macroeconomic variables include GDP growths, changes in government debt, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	(1)	(2)
	Pay days $_{t+1}$	**Pay days $_{t+1}$**
Δ Rating$_{sovereign\ t}$	-2.310***	-2.398***
	(-3.351)	(-3.297)
Size $_t$	-3.733	-4.673**
	(-1.614)	(-2.080)
Cash holding $_t$	0.001	0.006
	(0.009)	(0.069)
Cash Flow $_t$	0.050	0.007
	(0.301)	(0.038)
Market-to-book $_t$	0.037***	0.029**
	(3.290)	(2.324)
Leverage $_t$	-0.035	-0.052
	(-0.459)	(-0.714)
Operating Cycles $_t$	17.561***	17.001**
	(2.860)	(2.578)
Asset turnover $_t$	-7.491	-10.121*
	(-1.479)	(-1.613)
Collateral $_t$	0.096	0.199*
	(0.829)	(1.817)
Current asset $_t$	-39.406*	-34.006*
	(-1.933)	(-1.759)
GDP growth $_t$	0.478	0.563
	(1.441)	(1.554)
Δ Government debt $_t$	-0.043	-0.038
	(-1.356)	(-1.072)
Δ S&P Global Equity index $_t$	0.011	0.012
	(0.139)	(0.152)
Δ Inflation rate $_t$	-0.451	-0.562*
	(-1.514)	(-1.829)
Year effects	Yes	No
Firm effects	Yes	Yes
YearxIndustry FE	No	Yes
Observations	10,038	10,038
R-squared	0.166	0.188

Table 6.8: High government debts, sovereign downgrades and Trade Credit Days

This table reports the estimates from the fixed effect panel regressions of Trade Credit Days by sovereign downgrades associated with public debt overhangs, based on a sub-sample of firms without corporate rating change in year t where t is the period of sovereign downgrades. Panel A, panel B and panel C indicate results in case of government debt to GDP which is below 60%, above 60% and above 90%, respectively. The dependent variable is Trade Credit Days, measured by 365 days x trade payables to cost of goods sold. The main independent variable is change in sovereign rating. Firm-level variables include Firm size, Cash holding, Cash Flow, Market-to-book, Leverage, Operating Cycles, Asset turnover, Collateral and Current asset. Macroeconomic variables include Government debt, GDP growths, changes in current account, changes in S&P Global Equity Index, and changes in inflation rate. All independent variables are 1-year lagged. ***, **, * indicate statistical significance at 1%, 5% and 10 % levels, respectively.

	Panel A: *Public debt to GDP<=60%*		**Panel B:** *Public debt to GDP>60%*		**Panel C:** *Public debt to GDP>90%*	
	(1)	(2)	(3)	(4)	(5)	(6)
	Pay days $_{t+1}$	**Pay days $_{t+1}$**	**Pay days $_{t+1}$**	**Pay days $_{t+1}$**	**Pay days $_{t+1}$**	**Pay days $_{t+1}$**
Δ Rating$_{sovereign}$x GD $_t$	-1.332	-1.805	-2.200***	-2.660**	-3.483***	-3.518***
	(-0.221)	(-0.547)	(-2.530)	(-2.454)	(-3.581)	(-3.580)
Δ Rating$_{sovereign\ t}$	-1.230**	-1.171**	-1.549*	-1.027	-1.962	-1.541
	(-2.703)	(-2.583)	(-1.893)	(-1.520)	(-1.011)	(-0.567)
GD $_t$	-0.303**	-0.284**	1.374**	1.341**	1.503**	1.604**
	(-2.302)	(-2.297)	(2.331)	(2.321)	(2.075)	(2.095)
Size $_t$	-2.969*	-3.309*	-2.872*	-3.210**	-2.868**	-3.205*
	(-1.202)	(-1.421)	(-1.156)	(-1.371)	(-1.154)	(-1.369)
Cash holding $_t$	0.008	0.013	0.012	0.007	0.013	0.008
	(0.076)	(0.028)	(0.115)	(0.068)	(0.119)	(0.072)
Cash Flow $_t$	-0.363	-0.346	-0.383	-0.367	-0.385	-0.368
	(-0.773)	(-0.758)	(-0.814)	(-0.804)	(-0.818)	(-0.806)
Market-to-book $_t$	0.033***	0.032***	0.033***	0.032***	0.033***	0.032***
	(2.949)	(2.855)	(2.935)	(2.841)	(2.939)	(2.845)
Leverage $_t$	-0.047	-0.041	-0.045	-0.039	-0.044	-0.038
	(-0.544)	(-0.471)	(-0.526)	(-0.452)	(-0.513)	(-0.438)
Operating Cycles $_t$	20.415***	20.065***	20.255***	19.921***	20.313***	19.983***
	(4.342)	(4.304)	(4.318)	(4.284)	(4.331)	(4.296)
Asset turnover $_t$	0.131	0.134	0.127	0.130	0.129	0.132

	(0.242)	(0.255)	(0.319)	(0.341)	(0.324)	(0.346)
Collateral $_t$	0.101	0.184*	0.101	0.192**	0.101	0.182*
	(0.817)	(0.710)	(0.814)	(0.714)	(0.816)	(0.715)
Current asset $_t$	-31.595***	-36.086***	-32.431***	-37.921***	-34.574***	-39.064***
	(-3.760)	(-3.781)	(-3.747)	(-3.769)	(-3.757)	(-3.779)
GDP growth $_t$	0.462	0.395	0.387	0.333	0.299	0.246
	(1.452)	(1.231)	(1.239)	(1.058)	(0.951)	(0.775)
Δ Government debt $_t$	-0.024	-0.023	-0.008	-0.007	-0.011	-0.009
	(-0.803)	(-0.765)	(-0.291)	(-0.245)	(-0.370)	(-0.331)
Δ S&P Global Equity index $_t$	0.033	0.030	0.010	0.012	0.018	0.021
	(0.412)	(0.371)	(0.129)	(0.150)	(0.233)	(0.261)
Δ Inflation rate $_t$	-0.372	-0.365	-0.384*	-0.383	-0.395	-0.395*
	(-1.359)	(-1.337)	(-1.332)	(-1.330)	(-1.364)	(-1.363)
Year effects	Yes	No	Yes	No	Yes	No
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
YearxIndustry FE	No	Yes	No	Yes	No	Yes
Observations	10,038	10,038	10,038	10,038	10,038	10,038
R-squared	0.147	0.177	0.149	0.176	0.152	0.178

Appendix

Table A6.1: Rating events:
This table reports numbers of rating events released by S&P during the sample periods.

	Negative				**Positive**				**Total**
Δnotch	<= -4	-2	-1	∑	1	2	>= 3	∑	∑
Column number	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)	(10)
Actual rating	9	17	139	165	146	9	11	166	331

Table A6.2: Definition of all variables used

Dependent variable	Description	Data Source
Payable days	365 days x payables to Cost of goods sold	WRDS Fundamentals Annual Fiscal
Country level variables		
Δ $Rating_{sovereign}$	changes in S&P sovereign credit rating from year t-1 to t.	S&P publications
GDP growths	an annual percentage growth rate of GDP at market prices based on constant local currency.	World Bank and OECD
Δ Inflation rate	a change in inflation rate (GDP deflator) in year t-1 to year t	World Bank and OECD
Δ Government debt	a change in government debt to GDP in year t-1 to year t	
Δ S&P Global Equity index	the U.S. dollar price change in the stock markets covered by the S&P/IFCI and S&P/Frontier BMI country indices.	Standard & Poor's, Global Stock Markets Factbook and supplemental S&P data.
Government debt	dummy variables taking the value of 1 if the debt-to-GDP ratio of a particular country in a given year is below 60%, above 60% and above 90% and 0 otherwise.	World Development Indicators and OECD.
GD x Δ $Rating_{sovereign}$	the interaction between Government debt variables and changes in sovereign ratings.	
Firm level variables		
Δ $Rating_{corporate}$	a change in S&P corporate rating from year t-1 to t	Capital IQ
Firm size	the natural logarithm of Total Assets in U.S. dollars.	WRDS Fundamentals Annual Fiscal
Leverage	total long-term debt divided by Total Assets	
Cash holding	Total cash holding plus marketable securities scaled by Total Assets.	
Cash flow	EBITDA plus depreciation and amortization scaled by Total assets	
Operating Cycles	the natural logarithm of days of accounts receivable plus days of inventories	
Asset turnover	the ratio between sale and total asset	
Collateral	the ratio of net property, plant, and equipment to assets	
Current asset	the ratio of noncash current assets to the book value of total assets	
Market-to-book	Market value + book value of assets - common equity, scaled by the book value of assets	WRDS Security Daily and CRSP

Table A6.3: Correlation matrix. This table reports the correlation matrix of the variables. Payable Days, measured by 365 days x trade payables to cost of goods sold. Δ $Rating_{sovereign}$ is a change in S&P sovereign credit rating from year t-1 to t. Δ $Rating_{corp\ is}$ a change in S&P corporate rating. Size is the natural logarithm of Total Assets. ROA is a ratio of EBIT to lagged Total Assets. Cash holding is measured by total cash plus marketable securities to Total Assets. Cash flow is defined as EBITDA plus depreciation and amortisation, all divided by Total Assets. Market-to-book is measured as the market value of equity plus the book value of assets minus book value of equity, all divided by book value of assets. Leverage is Total Long-term Debt divided by Total Assets. Operating cycle is the natural logarithm of days of accounts receivable plus days of inventories. Asset turnover is the ratio between sale and total asset. Collateral is the ratio of net property, plant, and equipment to assets. Current asset is the ratio of noncash current assets to the book value of total assets. GDP growth is an annual percentage growth rates of GDP at market prices based on constant local currency. Δ Government debt is a change in government debt to GDP in year t-1 to year t. Δ S&P Global Equity index is the U.S. dollar price change in the stock markets covered by the S&P/IFCI and S&P/Frontier BMI country indices. Δ Inflation rate is a change in inflation rate (GDP deflator) in year t-1 to year t. * indicates the significance level of 5% or smaller.

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**	**(16)**
(1) Payable days	1.000															
(2) Δ $Rating_{sovereign}$	-0.002*	1.000														
(3) Δ $Rating_{corporate}$	0.007	0.120*	1.000													
(4) Size	0.125*	-0.020*	-0.002	1.000												
(5) Cash holding	0.026*	-0.036*	0.036*	-0.077*	1.000											
(6) Cash flow	0.000	0.031*	0.167*	0.020*	-0.002	1.000										
(7) Market-to-book	0.043*	0.027*	0.087*	-0.027*	0.186*	0.492*	1.000									
(8) Leverage	-0.040*	-0.026*	-0.056*	-0.158*	-0.232*	-0.025*	-0.046*	1.000								
(9) Operating cycle	0.174*	-0.022*	-0.021*	0.019*	0.093*	-0.203*	-0.071*	-0.179*	1.000							
(10) Asset turnover	-0.281*	-0.006	0.033*	-0.183*	0.009	0.156*	0.046*	-0.099*	-0.184*	1.000						
(11) Collateral	0.026*	0.049*	-0.022*	0.014*	-0.307*	0.108*	-0.138*	0.159*	-0.369*	-0.189*	1.000					
(12) Current assets	-0.066*	-0.016*	0.013*	-0.126*	0.055*	-0.047*	-0.026*	-0.264*	0.524*	0.574*	-0.470*	1.000				
(13) GDP growth	-0.014*	0.176*	0.108*	-0.060*	-0.121*	0.142*	0.057*	-0.020*	-0.058*	0.043*	0.077*	-0.001	1.000			
(14) Δ Government debt	-0.017*	-0.123*	-0.046*	0.023*	0.057*	-0.069*	-0.074*	0.010	0.012*	0.001	-0.036*	0.004	-0.331*	1.000		
(15) Δ S&P Global Equity index	-0.001	0.093*	0.063*	-0.006	0.010	0.028*	0.076*	-0.020*	0.009	-0.019*	0.026*	-0.009	0.065*	-0.136*	1.000	
(16) Δ Inflation rate	0.025*	-0.005	-0.046*	-0.071*	-0.070*	0.129*	0.003	0.017*	-0.051*	-0.065*	0.138*	-0.085*	0.156*	-0.163*	0.008	1.000

Table A6.4: Product classification (Rauch, 1999)

The sectoral classification is based on Rauch (1999). Differentiated Inputs is the share of inputs that comes from sectors producing differentiated products. Service Inputs and Standardized Inputs are defined analogously. The sum of service inputs, standardized inputs, and differentiated inputs is 1.

Sector	SIC code	Services	Differentiated goods	Standardized goods	Service Inputs	Differentiated Inputs	Standardized Inputs
Manufacturing							
Coal mining	12	0	0	1	0.2473367	0.2351826	0.5174807
Non metallic minerals	14	0	0	1	0.2232384	0.2043024	0.5724592
Food, kindred products	20	0	0	1	0.2655311	0.1805582	0.5539107
Textile mill products	22	0	0	1	0.4500747	0.1452437	0.4046816
Apparel	23	0	0	1	0.3067605	0.2136476	0.4795919
Lumber, wood products	24	0	0	1	0.426057	0.1690576	0.4048854
Furniture, fixture	25	0	1	0	0.2765208	0.1736231	0.5498561
Paper, allied products	26	0	0	1	0.1945369	0.2103074	0.5951557
Printing publishing	27	0	1	0	0.0727125	0.2007091	0.7265784
Chemicals	28	0	0	1	0.4148054	0.2210059	0.3641887
Petroleum, coal products	29	0	0	1	0.204105	0.2041252	0.5917698
Rubber, plastic products	30	0	1	0	0.3116949	0.1837321	0.504573
Leather	31	0	0	1	0.1373474	0.1659468	0.6967058
Stone, glass, clay products	32	0	1	0	0.3002474	0.2219095	0.4778431
Primary metal industries	33	0	0	1	0.3781688	0.3018656	0.3199656
Fabricated metal products	34	0	1	0	0.4996643	0.2495302	0.2508055
Machinery	35	0	1	0	0.457209	0.1829322	0.3598588
Electrical, electronic equipment	36	0	1	0	0.3359066	0.1655259	0.4985675
Transportation, equipment	37	0	1	0	0.560825	0.2188412	0.2203338
Instruments	38	0	1	0	0.1862195	0.1596277	0.6541528
Miscellaneous products	39	0	1	0	0.2316546	0.1967686	0.5715768
Transportation, communication, public utilities							
Other surface passenger transportation	41	1	0	0	0.1202473	0.2571617	0.622591
Motor freight transportation, warehousing	42	1	0	0	0.0685221	0.419475	0.5120029
Water transportation	44	1	0	0	0.1005895	0.5277812	0.3716293
Air transportation	45	1	0	0	0.1525051	0.3030268	0.5444681
Transportation services	47	1	0	0	0.1202473	0.2571617	0.622591

Communications	48	1	0	0	0.0588434	0.3713913	0.5697653
Electric, gas, sanitary services	49	1	0	0	0.0287742	0.2277935	0.7434323
All wholesale trade							
Durable goods	50	1	0	0	0.0824163	0.2766676	0.6409161
Non-durable goods	51	1	0	0	0.0824163	0.2766676	0.6409161
All retail trade							
Building materials	52	1	0	0	0.0852815	0.2925651	0.6221534
Department stores	53	1	0	0	0.0852815	0.2925651	0.6221534
Food stores	54	1	0	0	0.0852815	0.2925651	0.6221534
Automotive	55	1	0	0	0.0852815	0.2925651	0.6221534
Apparel, accessory stores	56	1	0	0	0.0852815	0.2925651	0.6221534
Furniture	57	1	0	0	0.0852815	0.2925651	0.6221534
Miscellaneous retail stores	59	1	0	0	0.0852815	0.2925651	0.6221534
Drug and proprietary stores	61	1	0	0	0.0319826	0.3874533	0.5805641
Finance, insurance, real estate							
Insurance agents, brokers	64	1	0	0	0.0370015	0.5564879	0.4065106
Real Estate	65	1	0	0	0.07582	0.2320732	0.6921068
Other services							
Business services	73	1	0	0	0.1450169	0.3012476	0.5537355
Automobile repair, services, parking	75	1	0	0	0.2632619	0.2516201	0.485118
Legal services	78	1	0	0	0.0920972	0.3798817	0.5280211
Com. Engineering, accounting, research	79	1	0	0	0.0920972	0.3798817	0.5280211